ON SOME ASPECTS OF EDUCATIONAL ADMINISTRATION FOR UNIVERSITY-INDUSTRY LINKAGE (UIL)

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Under the Supervision of
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CERTIFICATE

This is to certify that the thesis entitled 'On Some Aspects of Educational Administration for University-Industry Linkage (UIL)' and submitted by Mukesh Chaturvedi, ID No. 79RI21003, for the award of Ph.D. Degree of the Institute embodies original work done by him under my supervision.

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PREFACE

As per Bertrand Russell, there are three divergent theories of education. The first of these considers that the sole purpose of education is to provide opportunities of growth and to remove hampering influences. The second holds that the purpose of education is to give culture to the individual and to develop his capacities to the utmost. The third holds that education is to be considered rather in relation to the community than in relation to the individual and that its business is to train useful citizens.

The first is the newest and the third is the oldest. But, it is the third which holds the view that education can give something positive to society. At the same time, it seems that, it is the third of these theories only which is the least adopted.

Traditionally, universities create new knowledge and transmit existing knowledge; industries produce and distribute goods and services for current and future needs. When a student gets ready to work, he has to enter an environment which is very much different and new to him. He may also be surprised to find that he was taught the realities of industry (in the classrooms) away from industries and, probably, that is why he finds education like a fairy tale. He asks, "Why cannot

we take help of industry to learn in real-life situations ?"

Can industry help us learn better, since the application of all that we learn has to be in industry, since we must prepare for life while training for careers ?

The answers to these questions take education to industry for an interface. We have some educational institutions which practice the idea of on-the-job education.

Professor James L. Hayes, the noted American management expert, also stresses that scholarship is not education. Formal education must be blended with on-the-job education. The academy should inculcate an ethos - not only imparting facts, but also nurturing methods and attitudes. And it must demand nothing less than the best. Students must prepare for life while training for careers.

Clearly, human development which takes place in university must be seen in the context of the surrounding society, techno-socio-economic change and industry.

In the Indian context, Education and Industry both are groping. In education, an administrator wants more resources; a teacher sees no meaning; a student fails to understand the purpose; a journalist asks, "From where to begin ?" and, a political leader proposes delinking of jobs from degrees. And, in industry, a 'manager' is constantly grappling with,

as yet unanswered, questions on manpower, like, "Can there be such a source which provides excellent manpower for semi-skilled and suboptimal work, to begin with, and for technical and professional ranks later ?" The same source should also give him improved level of maximization in talent utilization and less cost of employing and training.

What, then, is our hope ? May we look at the situation from a new angle ? But, let us make no mistakes about it. Now, education alone cannot help. The tasks are too formidable and education's resources are too meager. The only viable course will be through a co-operative alliance between education and industry - not only in higher education but in all, entire education - not only to assist the student's to learn better, but also to equip the present teachers for enriching their experience which would mean improved classroom teaching.

It is indeed, needed to be pointed out that, on June 19, 1987 at New Delhi, the Council of the Indian Institutes of Technology, discussing the recommendations of review committee on the functioning of the IITs, noted that the reason for en masse exodus of the finest scientific minds of the country after training at the IITs is their inability to establish credible links with industry.

The task of linking university training with practice of the profession has indeed been central to many educational endeavours; one such endeavour being 'University-Industry Linkage' (UIL).

UIL is built around the theme of integrating, at under-graduate, post-graduate and doctoral levels, students training with the day-to-day production of the national industry. Some of the world-over models for such UIL program are Co-operative Education, Industrial Training, Career Academy, Sandwich Education, Teaching Company, Practice School, Practice Training, Work Experience, M.E. (Collaborative) Programs, etc.

The concept of UIL education provides not only the direction but also the solutions. It links university education with industry and helps both education as well as industry in achieving maximum efficiency. In education, it has made possible the right mix of classroom lectures and industrial problem-solving. In other words, 'optimum education' can emerge. And, by virtue of this optimum education, a student is given an insight into, and an opportunity to work in, the real-life job situations, alongwith the science of a discipline, even before s/he passes out with a degree.

From the view point of an educational researcher, the UIL is essentially an educational reform characterised by various issues such as : the choice of educational objectives, academic restructuring, curricula building, approach to

university education, teaching techniques, examination methods, responsibility of a teacher, role of a student, role of a professional expert, responsibility of industry, etc.

Thus, while, on the one hand, the task of implementing UIL is concerned with the designing and developing syllabii & teaching technique and examination method, on the other hand, it concerns itself with the whole gamut of issues pertaining to the educational administration.

The fact that for successful and effective university - industry linkage we need specialized attention to its execution is evidenced by the general impression we have about the limited success of such programs in our country. The Review Committee on Post-Graduate Education and Research in Engineer--ing and Technology, June 1980, Ministry of Education and Culture, Govt. of India, also feels alike while it observes, in its Report, that such programs are well conceived but badly executed.

Thus, it is logical to conclude that a proper, systematic managerial analysis of the linkage between higher education system and industry is to be undertaken to determine how it can be made to adapt to the social and economic needs of the country.

Though the problem of effective linkage of higher education and industry has been felt to be there, no systematic,

managerial analysis of the bad execution of practice oriented programs has so far been undertaken. Recently, there have been studies on the financial management of higher education and other academic aspects of innovative programs in which the linkage between higher education and industry has been referred to as an important educational development. But, no detailed study of their managerial aspects has so far been attempted.

The Birla Institute of Technology & Science, Pilani has been operating UIL programs in the names of Practice School, M.E. (Collaborative), etc., since 1973. Their wide spread growth suggested an analysis of managerial functions that would go into the making of a UIL program effective and efficient. Such an analysis clearly points to the need for a comprehensive description of philosophy and objectives; the development; operating procedures; administration; and financial administrative practices of a UIL program. For this purpose, this study extensively draws upon the literature of P.S. Division, BITS, more specifically, Dr. V.V. Mandke's A Case Study in Industry University Collaboration, and the BITS Cooperative Education Programmes (University-Industry Linkage) Operation's Manual, Pilani, P.S. Division, BITS.

The objectives of the present study are : (1) To critically study UIL as an educational reform; (2) To critically discuss the various issues pertaining to the educational administration of UIL; (3) To make a comparative statement on the various world-over models of UIL; (4) To develop the educational planning mechanism for UIL; (5) To develop the personnel management system in UIL ;

(6) To discuss the financial management system in UIL; (7) To develop the organizational structure for the educational administration of UIL; (8) To make recommendations/ suggestions for implementation of UIL:a model for educational administration of UIL program.

Each chapter of this study focuses upon what in my judgement is the key problem or cluster of central issues on a facet of the successful development and implementation of a UIL program.

The first chapter establishes the need of UIL programs in the Indian education system and, also,brings out that UIL is an educational reform.

The second chapter takes a world-over view of UIL models and in the third chapter a comparative study of these models is made to arrive at an eclectic model of UIL program.

The fourth chapter mainly deals with the educational content in a UIL program.

The next six chapters (from 5 to 10) deal with the question of managing the UIL program successfully, that is, planning, organizing, staffing, implementing, monitoring and financing of the program effectively and efficiently.

In detail, the fifth chapter presents planning for placement of students at industry; the sixth chapter deals with implemention of UIL program; the seventh chapter

focuses on monitoring of UIL instruction; the eighth chapter develops an organization structure for UIL education; the ninth chapter brings out a system of personnel management in UIL ;and the tenth chapter discusses the financial management in UIL program.

In conclusion, chapter 11, a model for educational administration of UIL program is developed and presented.

This study does not propose to set rigid rules for the initial development, implementation and/or expansion of UIL programs. It develops and presents a model for educational administration of UIL program. Since academic and administrative methods and policies vary considerably, each university and college must operate a UIL program as per their objectives. However, it must be seen that the objectives set by this study are achieved in spirit atleast if not in letter.

CONTENTS

CHAPTER 1

INTRODUCTION

1.1 Role of Higher Education in Society

Today, this world is a high change environment. The incredible developments in science & technology have so affected our modes of living that a new situation has been created, a situation to which all institutions have to respond appropriately if they are to remain relevant.

In the West, society is going through a massive transformation. From the industrial it is becoming a super or post-industrial society. 'In the sixties and seventies, the sensitivity to this change of the new generation was reflected on the university campuses in the form of protests against irrelevant education. The new consciousness became forcefully manifest in the American educational institutions where free, experimental, and innovative programmes were developed.'[1] For the first time, both the student and the teacher, in the West, became aware of the truth that education had to involve the entire response system.

In India, a country that has the world's largest number of illiterates it would be considered unrealistic to worry over-much about university education. It must, however, be remembered that the products of our universities

though they are very small percentage (7.38% of total literates and 2.6% of total population)[2] of even the literate, and our population, constitute the ruling elite. It is, therefore of the utmost importance to consider the role played by our universities.

'The sad fact is that our universities have played only a marginal role in our affairs. Today they are more than ever isolated from the realities of the country and the education that they impart is largely irrelevant to the life of the nation.'[3] The observation has frequently been made in academic circles that our universities are becoming nothing more than examining bodies. But, even in this job they have, of late, failed. Examinations have apparently become a formality and a routine rather than an academic affair.

Ernest A. Lynton[4] says that all of us in universities today face a strange and disturbing paradox. We are witnessing all around us a growing awareness of the economic importance of skilled human resources. The development and maintenance of highly educated labor force have become essential to economic growth and vitality. Yet, in spite of that, the higher education - particularly the universities - is experiencing substantial alienation. He observes that there is a mismatch between the activities of universities and societal needs. He suggests that knowledge for its own sake is not the goal of education but that education is the acquisition

of the art of the utilization of knowledge. And, thus, the universities should be the principal societal mechanism for the creation and dissemination of new knowledge and for the provision of organized, advanced instruction which are the principal responsibilities of universities.

As centres of learning, thus, the real purpose of a university is to generate new thinking and new ideas. It has the responsibility to provide men and women who can provide leadership and who are capable of serving society as per its needs.

'The most tragic aspect of our universities is that being static bodies they can hardly be instruments for change. They represent the waste in our education. The majority of our B.A.s, and M.A.s, and M.Sc.s become bank clerks, babus in the secretariat. Most of them are in jobs that are totally unrelated to their education.'[5]

If our universities are to become the founts of new ideas and change, they must become more free, more open and more creative. And they must come close to the needs of society.

'Change, rather than status quo, has become the watch-word for successful living... .'[6] Societal development, growth, and economic prosperity are the main concerns and needs of a society.

'History has established beyond doubt the crucial role played by human resources in the development of nations. And the development of human resources is the main function of education.'[7]

In other words, a wide range of increasingly sophisticated and ever changing variety of enlightened, creative manpower is needed in industry, agriculture, administration and services. And, the higher education has been given a place of special importance because it can provide ideas and men to give shape to the future.

Education Commission (1964-66), in its report, has made it very clear that it is only the right type of education that can lead to national development. The report said, "A system of university education which produces a high proportion of competent professional manpower is of great assistance in increasing productivity and promoting economic growth. Another system of higher education with the same total output but producing a large proportion of indifferently educated graduates... could create social tensions and retard economic growth."

In conclusion, thus, it can be said that society needs an educated labor force that can be readily absorbed by it. And, to fulfil this societal need, education system needs a strategy of applied learning.

1.2 University - Industry Linkage (UIL)

In order to add a practical dimension to education that is sorely lacking today and also to convey to the student a sense of participation and productivity, there is a need of close linkage between university education and the work-bench. This linkage between the university and the work place is termed as University - Industry Linkage and is abbreviated as 'UIL'.

UIL means harnessing the resources of industry to those of university and integrating the act of learning with the context of action to produce optimum education. In other words, it is an effort to make higher education practice-based.

1.3 UIL : An Educational Reform

The concept of UIL can, perhaps, best be understood if seen as an educational reform.

Keeping in mind the changing needs of society, the changes made in the education system are called Educational Reform - not only in the contents but also in the process of learning and the process of evaluation. In other words, an educational reform means new approaches. To build a new and economically strong education system is the motivating force behind this concept of educational reform.

UIL brings university education close to industry which essentially results in a change in the learning pro-

cess - learning through working on real-life problems, learning by practising, learning not only the subjects but also decision-making, learning to exist, live and grow in real - life situations.

In a conceptual way, UIL can be described as a system, as shown in Figure 1.3.

But, before education can be brought close to industry, a university will have to transform itself from a traditional university by bringing in certain changes, e.g.,

(1) Massive revision of curricula to changeover from rigid to flexible curriculum.

(2) Courses in the entire spectrum of Engineering, Sciences and Liberal Arts to be made more analytical and mathematics-based.

(3) Overall structural redesign of all programs to achieve a better integration between disciplines and formation of similar foundation years for all programs.

(4) Introduction of internal and continuous evaluation to replace externally-conducted examination system.

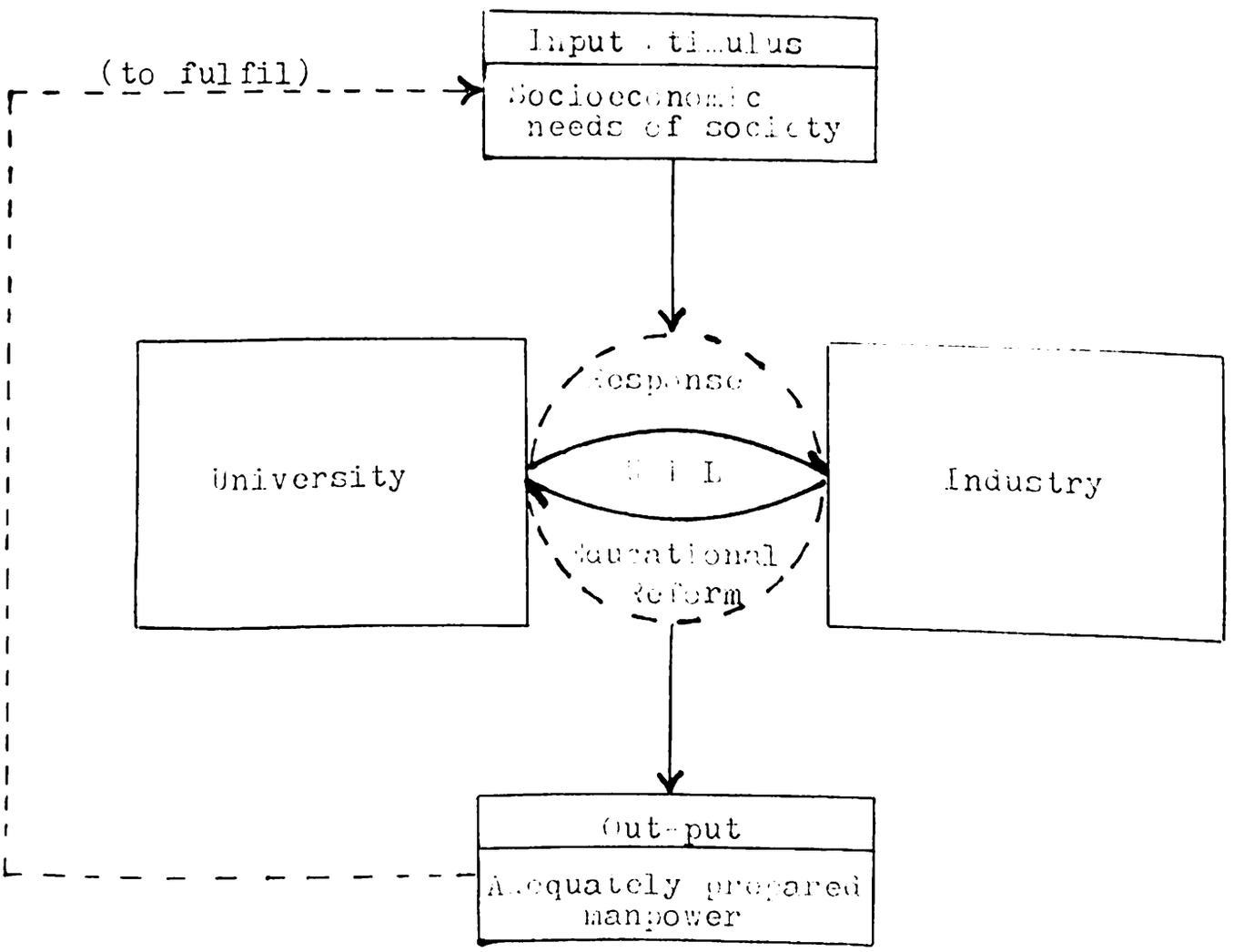
(5) Introduction of the semester system.

(6) Semesterwise registration process.

And, many more. (Refer Appendix I).

Thus, a massive revision of curricula and other changes

Education as a System



help education adopt a new culture and move towards implementation of close linkages with industry. And such close linkages will be possible only in case of universities able to fulfil the requirements.

1.3.1 Learning process in UIL

In a work-situation, real-life environmental stimuli act upon a student and create a drive (motivation) within him. Various questions (needing answers), problems (needing solutions), and decisions (to be made) bring out exploratory reactions in him. In the course of such exploring he happens to make (emit) a response which is instrumental in achieving the appropriate goal. The achievement reinforces the response and this response becomes the learned response.

Thus, a student acquires a problem-solving behaviour, through cognitive-learning, in UIL. This process of learning, in UIL, is more challenging and more involving, and, thus, more interesting, more lasting and giving a student more confidence.

Hence, UIL is intended to develop a learned response among the students. This process of learning brings in a reform in education.

1.3.2 Evaluation in UIL

Student evaluation is another significant facet of any education system. The work-situation environ-

ment is quite different from the classroom environment of a university. Therefore, the evaluation system normally operating in universities would no longer be viable in a work-situation learning, in toto.

Secondly, the evaluation system prevailing in the universities generally tests knowledge of the subject matter, memory (of the students), application of fundamentals (to some extent), self-expression, intellectual ability, and the like only. It fails to examine the various other personality traits of a student which would be needed for total evaluation of a student. Some of these traits are professional judgement and decision-making ability, skills for data handling, documentation, initiative, leadership, sense of responsibility, industry, confidence, and social sense. Truly speaking, these personality traits cannot be examined in a classroom situation because of various obvious constraints, whereas it becomes feasible to evaluate them in UIL situation.

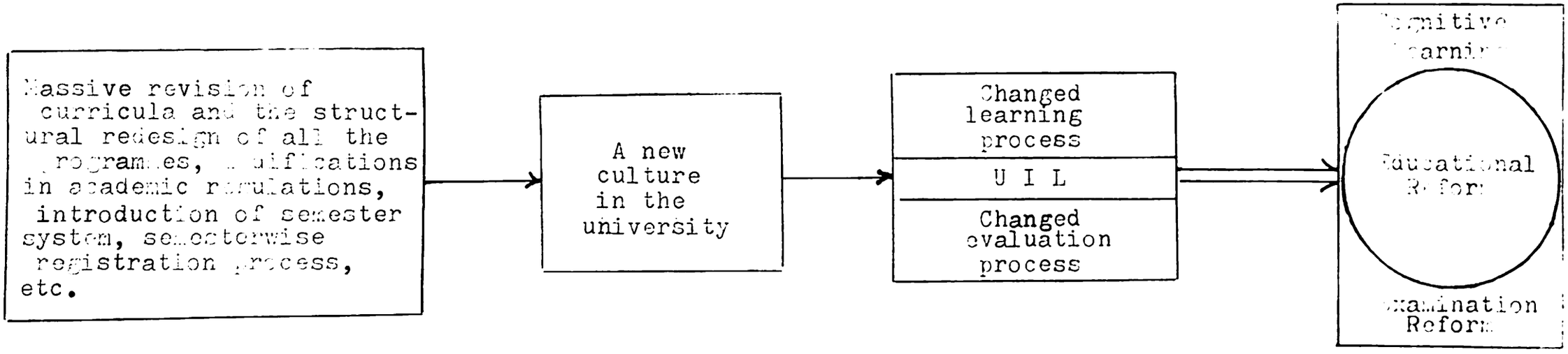
That is to say, with the change in the learning process, the objectives of testing and examination also get changed and, thus, emerges the concept of continuous and internal evaluation.

This change in the system of evaluation, as visualised in UIL, constitutes a reform in examination system.

Figure 1.3.2 gives how a traditional university can attain educational reform.

Figure 1.3.2

Educational Reform



1.4 UIL : The Beginning

Herman Schneider, a civil engineer, in the early years of this century, closely studied and analysed the impact of American socio-economic culture on how people learn in such a complex society. His basic observation was that most of the students in America take-up employment on a part-time basis, in order to earn money to offset part of the cost of their education. In many cases, the jobs obtained have no relation to ultimate career aims and, therefore, do not contribute substantially to the occupation or professional development of the student. But, they contribute to the socialization of students in an industrial society.

Schneider thought that this need of most Americans to work their way through college could be turned to positive advantage by assimilating work periods into course programmes and using them to provide relevant and professional experience.

He succeeded in selling his idea to a group of manufacturers who had already recognised the lack of practical knowledge in the engineering graduates who came for employment and, finally, also could convince the rather skeptical faculty of his university that his plan had possibilities.

Thus, in 1906 the first UIL program, in the name

of Cooperative Education, was founded in the School of Engineering at the University of Cincinnati, Ohio, United States. The organizing committee of 4th World Conference on Cooperative Education defined Cooperative Education as 'a strategy of applied learning which is a structural program developed and supervised by an educational institution in collaboration with an employing organization, in which relevant production work is an integral part of a student's regular academic program and is an essential component of the final assessment. Such programs should normally commence and terminate with an academic period and the work experience component should involve productive work and should comprise a reasonable proportion of the total programs'.[8]

There are, now, five basic types of program operative in USA using experience in a work situation :

A. For general education purposes
   1. Work observation program
   2. General work experience program

B. For occupational education purposes
   1. Work - study program
   2. Internship
   3. Cooperative education program

Looking for some other efforts in the direction of UIL in some other parts of the world one would find that some form of cooperative education, in the UK, began in

1840 at the University of Glasgow in the name of "Sandwich System", essentially to provide a mode of professional education.

Incidentally, in the British history, 1840 lies in the "Period Ten", 1815-1867, which is known as the Period of Industrial Development and Britain's getting transformed into an industrial country from an agricultural one.[9] Development of industry supported the birth and growth of UIL.

In the Indian setting, it has been a case of plenty of planning and no execution in the right and the desired direction. 'From the very beginning, on the question of Education, there has been a great deal of confusion and total loss of direction because of contradictory recommendations of numerous committees.' [10] And, for almost a century, there has been only one question asked, "From where to begin ?"

No doubt there have been expansion in education but, more than serving the purpose, these expansions have created problems of large dimension. Joshi[11] also comments, "Almost runway educational expansion over the last 30 years created problems of inadequate finance, lack of buildings and equipment, unemployment of the educated and shortage of everything except ill-equipped students." Further, the system of education has been growing very fast and there is little time to pay attention to organization and management.

The government and the planners have been till now tire-

lessly examining these problems but perhaps not in the right perspective and in isolation from each other without a systems view and, thus, have been, wrongly, emphasizing upon 'maintenance of high standards of teaching' and 'examination reforms', thinking that perhaps the biggest burden on this society today - not only unemployed but also unemployable graduates - is because of these two reasons.

The issue was different and, certainly, overlooked. Education has to be in tune with the social, economic, political and technological needs and developments of a society. And, that is why, even today, in India, the changing environments - social, economic, political and technological - demand new educational policies and decisions from planners, policy makers and all those who govern the nation, for a better education in the future.

The issues are confusing, the demands varied. An administrator wants more resources; a teacher sees no meaning of education, a student fails to understand the purpose of education; a journalist asks, "From where to begin ?"; And a political leader proposes delinking of jobs from degrees. But, in fact, at the same time, so far as the subject matter of education is concerned it will not be an overstatement to say that no national level decision has been able to command, at all times, as much unanimity of views as happens to be the case with regard to the need for establishing close linkage between the system of higher education and the industry.

An expression of this need is abundantly found in the time to time recommendations of various councils, committees and commissions, notable amongst them being the Scientific Manpower Committee (1947), Engineering Personnel Committee (1956), Committee for Postgraduate Education Commission (1966), High Power Committee of All India Council for Technical Education on studying collaboration between Technical Institutions and Industry (1970), and Review Committee on Postgraduate Education and Research in Engineering and Technology (1980).

But, in spite of frequent reiteration of the firm policy decisions to organize practical training, 'practice schools' and 'sandwich' programs* towards establishing closer interaction between the academic world and the industrial world and in spite of all the promise of necessary help, the attainment of the objective was all the time eluding the nation, except in the case of the practical training scheme which started in 1947, due to the untiring efforts of the AICTE. By 1966, the number of fresh engineering graduates and diploma holders receiving the inplant practical training in the established industrial enterprises had already risen as high as 3000, as during the training period the Government undertook the responsibility of payment of monthly stipend.

This commitment on the part of the Government, understandably, led to a massive expansion of training centres in established industrial units. And, in the universities, particularly in technical institutions, this gave spurt to the introduction of practical training in the degree and diploma

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* Types of UIL programme

programs, but basically as an add-on.

However, as the years passed it was becoming increasingly clear, mainly because of its add-on character, that the practical training scheme could not be the basis for achieving the much desired organic linkage between the university and the industry and at the same time no definite model was emerging for the implementation of UIL programs perhaps because there had been only recommendations and requests and there were no steps taken to help universities overcome their problems of lack of physical facilities, inadequate financial provisions and difficulty in securing qualified teachers and skilled and effective educational administrators. There were no incentives for the universities to go ahead and implement a UIL program. Thus, the problem of implementing a UIL program still baffles the Indian universities.

During the subsequent years, the reports of the Board of Post-graduate Engineering Studies and Research (AICTE, March, 1969); The Standing Committee of UGC on Engineering and Technical Education, etc., show that the same pattern of effort - as put in by the various committees, like Scientific Manpower Committee (1947), Engineering Personnel Committee (1956),..., and High Power Committee of AICTE on studying collaboration between Technical Institutions and Industry (1970) before, reiterating the firm policy decisions to establish UIL - was being repeated. Hence, in May 1974, the AICTE, at its meeting considered the question of UIL and

recommended the establishing of practice schools. It is notable, at this point, that around 1967, HRTI Kanpur started its Practice School Program in the Chemical Engineering discipline at the post-graduate level, on the lines of such a program operative at MIT, USA. And, in the year 1973, Birla Institute of Technology & Science, Pilani also launched its Practice School Program, at the first degree level, for a select few students.

The reflection of all these developments is to be found in the 9th report on Higher Technical Education of the Estimates Committee of the 6th Parliament (1978). This report, while summarising ways and means in term of university, industry collaboration, reiterates the need for organizing Practice Schools.

In the 1980 Report of the Review Committee on Post-graduate Education and Research in Engineering and Technology by Ministry of Education and Culture, the late professor Dr. Y. Nayudamma, the Chairman of the Committee, remarks that today industry's involvement in higher education is limited.

In 1982, L.S. Chandrakant[12] also pointed out that innovations in technical education are few and far between and whatever is claimed as an innovation is no more than a change in classroom practices centred around teachers' activity in a subject field. And, further, he remarks that polytechnic education though widely spread in India is in a bad shape and thorough reorganization of polytechnic education is urgently called for.

existent in India in the field of medicine. It is undertaken after completion of the formal degree program and involves several months of work at relatively low pay. Internships usually involve experience that is necessary for licensing, certification, or registration in a particular profession.

1.5 The Emerging Issues

Till very recently, in India, there has been no evidence of cooperative education programs, barring a few exceptions, existing in the higher education system. Secondly, whatever little is being practised at the polytechnic-level is also no model of significance. The following seem to be some important aspects of Indian setting as to why UIL programs could not be introduced and developed successfully in India :

1. Although technical manpower is the backbone of industrial development, industrial organizations, in general, did not feel greatly concerned about the efficiency and effectiveness of the country's technical education system. They viewed technical manpower not as a capital resource, but as a mere input, like electricity, coal or any other raw material. From this view point they tended to merely criticize the products of the system and did not readily come forward to share responsibility with technical institutions in improving the system for their own benefit as well as for the benefit of the society.

2. Technical institutions took a defensive position vis-a-vis industry and sought shelter in such puerile issues like

where education stops and training begins, jurisdictional responsibility between institutions and industry, and so on. They rarely took an integrated view of technical manpower development as a process, not just as a course, in which bridges must be built between the world of learning and world of work. As a sequel, barriers to industry - institution cooperation arose from the differing perceptions and attitudes of persons within the systems.

3. In the total national planning process, technical education was viewed as a part of social service and clubbed with general education, health, housing and social welfare. The immediate relevance and importance of technical education to the economic systems became secondary, and as a sequel, it did not become a central issue of concern in policy formulations in respect of industrial development.

Besides, the following factors emerge as more of the reasons as to why UIL programs could not be planned and implemented properly in India:

1. Failure to secure adequate number of work-benches for student placements.
2. Failure to develop a systematic approach to learning through practice.
3. Even the out-turn of polytechnics and industrial technical institutes (which follow some sort of Sandwich program) are not readily absorbed in the relevant professions.
4. Very little correlation with employers' needs.

5. Lack of adequate financial and other resources.
6. No faculty involvement at design, implementation and evaluation stages. 'The reasons are purely motivational and arise out of the distinctions in our technical education system. The system lays great emphasis on academic technical qualifications in the appointment of teachers and their career progression and accords little or no credit to industrial experience. Teachers' career horizons are, therefore, fixed upon their seniority in service and on acquiring higher academic qualifications. Further, technical institutions are not inclined to release their teachers during academic session except only during long vacations. Teachers, however, are not inclined to forego their vacations and be away from their families for acquiring an experience which is of doubtful benefit for their career prospects.' 13
7. One more point is the fact that when we view UIL programs as an educational innovation, we look for changes in the educational process and out comes. But, when we view them as a system, we should also be concerned with their impact, i.e., changes in attitudes, values, and perception of those who are involved, i.e., how the people involved have changed in their outlook and approach to new situations and problems.

The Indian setting failed to have a systems view and aimed only at an educational innovation which too could not be achieved.

8. No sustained efforts on part of the Government, through the ministry responsible for education, in persuing/convincing the universities to carry on with the organizing of sandwich courses. There was some initial-interest correspondence by the ministry, in December 1969 and May 1970. But, the much needed follow-up was absent, after that.

1.6 Some Problem Variables

The problem variables in implementing of a UIL program are identified as planning, organizing, staffing, managing of finances, controlling, and promoting a UIL program effectively.

If the variables, as identified above, are managed effectively and efficiently, it will ensure a successful implementation of UIL program.

The set of managerial functions, viz., planning, organizing, staffing, directing, coordinating, reporting and budgeting define Educational Administration for UIL.

The present study seeks to explore this hypothesis and develop a model for educational administration of UIL.

The study heavily draws from the experiences of BITS, Pilani which has been operating a UIL program, in the name of Practice School, at the first degree level, since 1973.

1.7 Some Studies on Cooperative Education Program

Until the early 1960s there were very few objective investigations of the educational effectiveness of cooperative programs. Perhaps, the first study was made in 1927 and was designed to find out whether engineering graduates of cooperative programs were as competent as graduates of regular programs, in spite of the fact that cooperative students generally spent about 20 percent less time on the college campus than did regular students.

The findings of the study were largely inconclusive, although revealing in some important respects. It showed no marked differences between the two groups of students in the number of positions occupied by graduates in a given period after graduation; the relationship of fields of work of graduates to courses pursued in college; levels of positions occupied; and the earnings and rates of advancement of the graduates. Also, in as much as the period that had elapsed since the establishment of cooperative courses was not great (less than 20 years) it was quite possible that sufficient time had not passed so that the graduates of the two curricula could be studied.

Another of the rare studies made of cooperative education was reported in 1944. This study was a report on cooperative education programs at the Rochester Institute of Technology. In the study it was found that more than 90 percent of the students enrolled in the

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Another of the rare studies made of cooperative education was reported in 1944. This study was a report on cooperative education programs at the Rochester Institute of Technology. In the study it was found that more than 90 percent of the students enrolled in the

co-op* program had been placed in jobs allied to their major fields of study. About 80% of the students reported that their work became more meaningful as a result of their work experience. 75% stated that they were motivated in their school work as a result of their work experience. More than 80% of the graduates indicated that their cooperative work had been of considerable value to them, and an equal number stated that they were to repeat their education.

There was the first Thomas Alva Edison Foundation conference (1957-61) on cooperative education attended by representatives of more than 80 colleges and universities and also by representatives of nearly 100 firms employing cooperative students at that time. The purpose of the conference was to examine the existing working models of cooperative education because they offered active demonstrations of what might be one way of serving effectively some of the enlarging student population seeking advanced education.

This conference revealed that cooperative education had been adapted to a variety of forms of higher education : public and private institutions, residential and non-residential colleges, and liberal arts and professional curricula. It was found that there were many kinds of

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* Cooperative Education

business and professions using cooperative education and that those experienced with cooperative education were enthusiastic about its educational and social merits. However, the conference also revealed the need for an objective scientific comparison of cooperative education with conventional education because no real evaluation of the philosophical purposes and broad values and no comprehensive documentation of the methods and results of cooperative education had ever been carried out.

The final results of the Edison Foundation conference were published in 1961. Some of them are the following :

1. There is greater contrast in perceived environmental characteristics among liberal arts, engineering, and business curricula than there is between cooperative and non-cooperative programs within each curricula. There appeared to be no single or characteristic environmental setting common to all programs of cooperative education. Instead, cooperative education was found within a variety of settings.

2. A larger proportion of noncooperative* students had origins in upper and upper-middle social classes. At the same time, the data revealed that a larger proportion of cooperative students and graduates came from the upper lower and lower-lower classes. The data also showed that a larger proportion of liberal arts students and graduates - whether cooperative or noncooperative -

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* Other than cooperative education

came from the higher social strata than did students and graduates of engineering and business programs. Conversely, more engineering and business students and graduates had origins in the lower social strata than did liberal arts students and graduates.

3. Co-oping* tended to cut down the cost of industrial recruitment and make it more efficient.

4. Cooperative education provided the organization with capable persons performing in semiprofessional jobs. The professional staff could then be released for other duties commensurate with their talent.

5. Faculty members believed co-op work experience helped give a sense of reality to the learning of the students, and that there was little, if any, academic loss for cooperative students because of a need for review for return to the campus after a cooperative work-period.

6. The academic behavior of cooperative and noncooperative students within each of the three curricula (engineering, business, and liberal arts) was quite similar.

7. Differences were found between cooperative and noncooperative graduates in their specification of the ways in which their college programs prepared them for their present employment and the ways in which they felt they might have been better prepared.

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* Participating in Cooperative Education Program

8. Cooperative students earned a considerably larger proportion of their college expenses than did noncooperative students.

9. A considerably larger proportion of cooperative students and graduates felt that college attendance would have been doubtful or impossible had they not been able to earn some portion of their expenses.

In summary, the data clearly indicate that the vast majority of cooperative students and graduates felt that their original hopes and expectations for selecting cooperative education were realized. Retrospective reflections perhaps generally tend to be favorable, but the fact remains that virtually no negative second thought cropped up among co-ops* and former co-ops.

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* Cooperative Education students

CHAPTER 2

UIL PROGRAM : THE WORLD-OVER VIEW

2.1 Introduction

As mentioned in the preceding chapter, it is being recognized the world-over that the linking of university education with industry reinforces relevant learning, helps students become productive members of society, and contributes to the development of human resources. Programs for interfacing education with work are being developed as one of the ways to make education meet the societal needs.

UIL attempts to bridge the gap between university and industry and a smooth flow of students from university to industry is made possible. UIL is intended to benefit both the university and the industry.

Many developing countries have adopted the cooperative education program from the types developed and/or currently in vogue in the developed countries.

This chapter deals with data on the world-over cooperative education programs evolved during the period 1840-1983. It also discusses the theme, the underlying philosophy and the defining concept of UIL and its various types alongwith its historical background.

2.2 Philosophy, Concept and Definition

The Cooperative Education or work-study plan is based upon two fundamental considerations regarding how people learn in a complex society. First, every profession or occupation for which students are preparing contains certain knowledge elements that cannot be taught in the classroom. These elements can be learnt only by direct on-the-job experience, being with people who are already in the occupational field.

Various institutions offer cooperative education in different types, viz., Work Observation, General Work Experience, Work-Study, Internship , and Practice School, depending upon the objective and the nature of the program and the type of profession.

Sandwich Programs (usually called Integrated/Sandwich courses) provide a mode of professional education in which "off-campus" training is an integral part of the overall period of study. These programs do not imply a one-to-one correspondence of theory to every practical instance, but, it is a study which is illustrated by applications of fundamental principles, whenever possible within the students' practical training in industry. Experience in the work-a-day world through simply taking a job is one thing, but training is another as it involves organized experience with certain declared objectives in mind.

On the other hand, the sustaining principle of the Practice School Program followed at the MIT School of Chemical Engineering, USA, is that, in the engineering profession, 'the premium is on the man who can best apply his theoretical background and research aptitude to the formulation and solution of real technical problem'.[1] The MIT Practice School Program emphasizes upon Organization and Planning, Leadership; Communication; Breadth of experience & Economic/Technological interaction.

The Practice School Program offered at Birla Institute of Technology & Science, (BITS), Pilani, is essentially an effort to institutionalize the process of building the much needed bridge between the professional world and the academic world. Just as a medico undergoes internship in a teaching hospital before his graduation, the practice method of education requires students of engineering, science and humanities to practice their respective professions in the real world during their educational years.

UIL program intends to develop professional competence and maturity as well as the ability to work in an industrial environment.

simulation of the professional life during the educational years. According to this method, the student can learn how to practice his profession even before his graduation, through his direct involvement, at industry, in problem-solving efforts pre-eminently concerned with solving practical problems, making improvements, and serving immediate needs of the environment. The linkages can be established with the professional world defined in terms of production and manufacturing units; engineering, design, development and consultancy organization; national research laboratories; social science planning cells; banks; centres for science communication; science and technology museums; publishing houses; the rural backdrop as represented through villages; etc.

Dr. Mandke in his Case Study says* that as a process of education, the UIL method can substitute the narrative approach followed within the four walls of classrooms and the two covers of the text-book by cognitive process of applied learning and teaching operative in the very way of life and, thus, making education student - centred and environment - as well as circumstance-oriented. In view of this, the attempt in UIL cannot merely be to further student knowledge in a given codified orthodoxy (as this facet of education is well achieved in the classrooms), but to train him in the art of participating and effectively contributing to real-life problem-solving efforts of production, of

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* Mandke Vijay V: BITS Practice School - A Case Study in Industry-University Collaboration, 1980, PP 22.

design, of research, etc.

Dr. Mandke most significantly observes* that basically UIL method of education aims at cultivating in students appropriate attitudes and analytical skills towards decision making, team work, sense of responsibility, leadership, importance of time schedule and regularity, skills of written and oral communication, organizational ability, etc., so necessary to respond to open-ended situations, more often than not, characterized by insufficient data, uncertainities of events and unfamiliarity with the environment.

Seen from this angle, it emerges that, though UIL would pursue project method of education, the attempt is, not to rediscover the past but, to use the contemporary day to day developmental activities of direct interest to the professional world as a vehicle to prepare students to participate in inter-disciplinary, goal and mission-oriented, and time bound problem-solving tasks.**

Also, it can be seen that, in the long run, the UIL program can act as an effective catalyst for ensuring the participation of the professional experts in the educational activities of the universities such as course-development, text book writing, development of project-oriented laboratory, joint research schemes, etc., thus providing a total set up for integrating educational and developmental processes. On a more immediate basis the

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** Mandke Vijay V: BITS Practice School - A Case Study in Industry-University Collaboration, 1980 PP 22.

* Ibid. PP.22

UIL can provide the professional world with an opportunity to use the motivated and the talented student world to give impetus to the developmental activities without making large long term financial commitments.*

In view of the preceding discussion, the model given in Figure 2.2 is adopted to describe the UIL program. The amplifiers indicate that the essence of the academic regulations and the details of education and research at the university have to be amplified in the classrooms and at the industry, respectively. And, the attenuators suggest that the experiences gained at the industry and in the university classrooms and laboratories have to be abstracted to improve upon the methods of university education as also the nature of university academic regulations, respectively. The boundary of the environment is ill-defined.**

Cooperative education may be defined in different ways. Perhaps (before the latest definition adopted by 4th World Conference on Cooperative Education (Edinburg, Scotland; September 1985) and as already mentioned in chapter 1) the most widely accepted definition was the one that was given in 1961 and is :

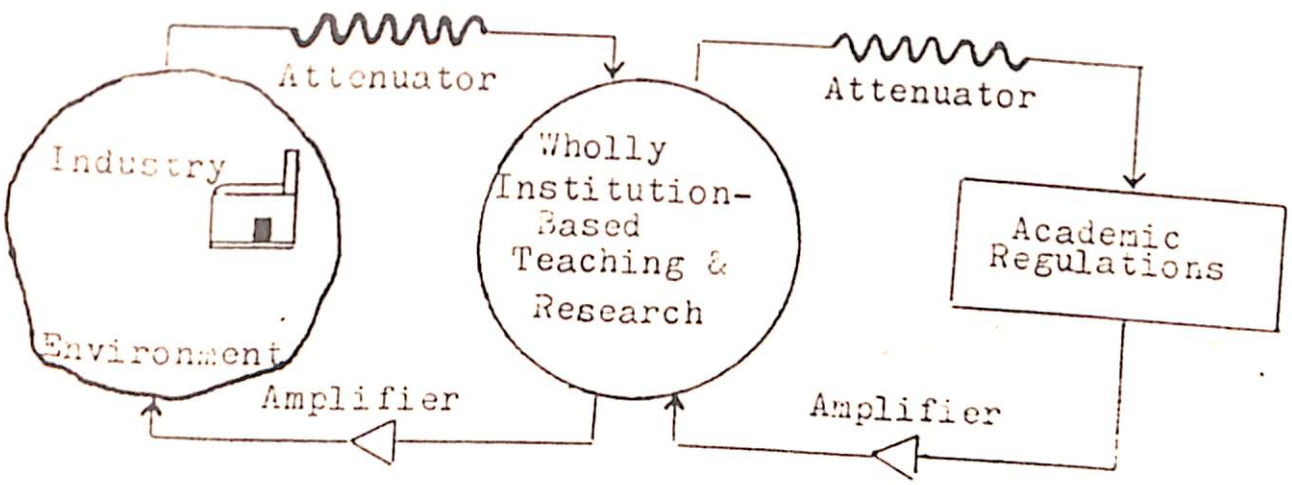
"The cooperative plan of education is that educational plan which integrates class-room experience and practical work experience in industrial, business, government, or service-type work situations. The work experience constitutes a regular and essential element

* Mandke Vijay V: BITS Practice School - A Case Study in University-Industry Collaboration, 1980 PP. 23.

** Ibid. PP. 24.

Figure 2.2

An Alternative Model* of PIL Program



*Pandke Vijay V: BITS Practice School - A Case Study in University-Industry Collaboration, 1980. PP. 23.

in the educative process and some minimum amount of work experience (atleast two different periods of work, totaling at least 16 weeks) and minimum standards of performance are included in the requirements of the institutions for a degree." [2]

In addition, there must be liaison between the administration of the institution and the employing firm. The essential criteria are that the work experience be considered an integral part of the educational process, and that the institution take a definite responsibility for this integration.

Conceptually, this and the latest definitions seem to be no different. This concept of cooperative education does not require that the students alternate between periods of classroom study and the periods of on-the-job work; it does not require that the student be paid for his employment, it does not require that the work experience be definitely related to the students' field of study; and it does not require that the student's work become progressively more difficult. Yet, in many co-operative education programs operating today it would be found that students do alternate periods of instruction in university with periods of work, that the work experience is related to the student's major field, and that the successive coeperative work assignments of the student become progressively more difficult as he advances educationally. Also, in most cases it would be found that students enrolled in cooperative education are normally paid wages for the period in which

they are employed.

Moreover, at times, the word 'Cooperative' does not convey the final idea, e.g., Sir Peter Venables [3] remarks that 'Cooperative courses' were named so for there exists cooperation between firms and colleges. Hence, the term 'work-study' has been devised as a synonym. The word 'Cooperative' might also suggest simply that the student is easy to get alongwith : cooperative in the sense of cooperation. Actually, the word 'cooperative' means that the student is enrolled in a work-study plan that integrates the theoretical knowledge available in a university with the practical work experiences available in a work situation. The cooperation or collaboration between universities and employers enables the student to obtain a university education and to acquire practical on-the-job experience alongwith it in the same time frame.

He further adds that, 'Sandwich courses' are so called for substantial 'layers' of full-time study and of organized industrial experience alternate over a period of years.

Some of the experts are not very convinced about the name 'Sandwich course'.

A. Daniels of Brunel University, England says that 'Sandwich Course' is the term in Britain. In America and Canada the term 'Cooperative Course' is used and this

describes the nature of the professional relationship between the employer and the college in a much better way.

This shows that essential meaning of sandwich courses is required to be in terms of a professional relationship between an employer and a college and not in terms of 'layers' as suggested by Sir Peter Venables.

L.Davies[4] of Salford University, England is able to put it more explicity. He says, "The British name for Cooperative education is 'Sandwich Courses', to indicate the interpolation of academic studies and paid work experience period; and 'integrated (sandwich) courses' to indicate the effort closely to relate the studies and the work.

He further explains that 'in some universities undergraduates may take a year away from studies during their courses ('an integrated year') and the purpose of absence may have nothing to do with their program of studies. There was some danger that the term 'sandwich courses' might come to include such arrangements. Therefore, the term 'integrated sandwich courses' was coined which is defined as:

An integrated sandwich course incorporates periods of industrial training or professional experience, outside the teaching institution which are planned to integrate with the academic syllabus to form an integral part of the course. The periods spent in the teaching institution and one or more employing organizations are planned as a

logical sequence and alternate in a pattern appropriate to the particular discipline. The training is arranged, supervised and assessed by academic staff, in collaboration with appropriate members of the employing organization. A student may not proceed with the course if judged unsatisfactory by this assessment.

Mason and Haines [5] mention various name of UIL program depending upon the nature of the linkage and also the type of education. They have firstly categorized education as General Education and Occupational and Professional Education. In General Education, they have classified the programs as Work Observation and General Work Experience. While, in the other, as Work-Study, Internship, and Cooperative Education. These classifications are shown in Table 2.2.

2.3 Historical Background

Cooperative Education was founded in the United States at the University of Cincinnati in the School of Engineering in 1906 by Dean Herman Schneider. He developed his idea of the cooperative plan while he was a professor at Lehigh University, Pennsylvania. While there, he found that nearly all of those graduate engineers who made outstanding contributions soon after graduation had had practical experience before graduation, either through part-time work, vacation work, or staying out of school to work and save money. This led Dean Schneider directly

Table 2.2

Classifications of Work Programs

A. For General Education Purposes		B. For Occupational and Professional Education	
(1) Work Observation	(2) General Work Experience	(1) Work-Study and (2) Internship	(3) Cooperative Education
Student observes work, does not perform tasks except to understand them. Unpaid. Usually few weeks in length at most. May be tied in with a class in which occupational information is discussed.	Student performs tasks of actual job. May or may not be paid. Typically engaged in for general education values, including exploratory. Usually one semester or less. Limited school supervision; usually no related class.	Student performs in approved job situation. Usually paid and given credit. In-school instruction usually before work period and seldom tied in directly with job experiences. Typically one semester or more. "Internship" is term used for collegiate experiences.	Occupational goals based on student's career objective. The work situation is an occupational laboratory for the classroom instruction. Selected training stations. Correlated instruction in school. Pay and credit. Consistent school supervision. Typically at least one year.

to the idea that perhaps the optimum education experience was one which combined industrial work experience with the class room. In this way a man would not have to wait, until he graduated, to start his industrial experience. When Dean Schneider moved to University of Cincinnati (in civil engineering), he succeeded in selling his idea to a group of manufacturers who had already felt the lack of practical knowledge in the engineering graduates who came for employment. He was finally able to convince the rather skeptical faculty of the University that his plan had possibilities.

Here, it is necessary to note that Sir Peter Venables[6], talking about Sandwich courses in United Kingdom, says that 'this type of course was supposed to have originated in 1906 at the University of Cincinnati, but some form of Sandwich course was in fact started at the Anderson's University (erstwhile Royal Technical College, Glasgow and now called the University of Strathclyde), around 1880 and in 1902-03 at Sunderland Technical College and at Northampton Polytechnic'.

Then, L. Davies[7] of University of Salford, England claims that, in UK, cooperative education, in the name of Sandwich Courses, began in 1840 at the University of Glasgow (it was here that the term "sandwich system" was first used) and, in 1905, at the City University.

Between 1840 and 1901, such a program had already started by Finland (1881), France (1885), The Netherlands

(1[illegible]), Belgium (1900) and The Philippines (1901).

The aforesaid pieces of information are significant from the academic point of view. Secondly, there is not enough, well organized information available before 1906. Thus, for all practical purposes, the year of origin of cooperative education can be taken as 1906 (University of Cincinnati, USA).

Starting in 1906, in the USA, the first real growth situation occurred between 1906 and 1921. Ten other universities followed the example of Cincinnati. They were: North-eastern University (1909); University of Pittsburg (1910); University of Detroit (1911); Georgia Institute of Technology and Rochester Institute of Technology (1912); University of Akron (1914); Drexel University, Massachusetts Institute of Technology, and Marquette University (1917), and Antioch College (1921).

However, the growth till 1970 is best described in three phases:

1906 to 1942	20 institutions
1943 to 1962	50 more institutions
1963 to 1970	108 more institutions

So, by 1970, 178 institutions were running cooperative education programs in the USA. And, by 1983, about a thousand.

During the growth period 1906 to 1970, two points emerged:

(a) Dean Schneider believed that work itself had a maturing and an educational role irrespective of its relationship to academic activity. This contrasted strongly with the approach of the technological universities in the UK where the emphasis was on the integrated nature of the work placement and the Academic Tutor ensured that the work placement obtained for the student related closely to the academic work of the degree.

(b) With small numbers of students, the administrative work associated with work placement would be carried out in parallel with the academic roles of lecturing, tutoring and research. However, with large numbers of students, there was a need to establish a separate organization to handle the management of the continuous interrelationship between employing organizations and the universities. Therefore, each university introduced a 'department of coordination' to handle these activities and, thus remove the administrative burden from the Academic Tutor.

The administrative problems associated with growth of UIL program, in the UK, were similar to those of the USA and were reflected in the works of Professor Musgrove and Professor Smithers, between 1965 and 1970. Smithers [8] points out some of the administrative problems in terms of

(a) search for suitable 'industrial' placements,

(b) disruption in continuity of students on campus,

(c) how well does it achieve the objectives,

(d) financial implications to institution,

(e) financial implications to industry,

(f) assessment of students,

(g) conducting and supervision of the program, and

(h) differences in the approaches of the industry and the university.

In U.K., there are basically three types of students:

(1) university-based sandwich students,

(2) industry-based sandwich students, and

(3) full-time degree course students.

University-based students are students that have applied directly to the university, on the basis of their advanced level results, for a sandwich course degree. These students depend very much on the university to find them suitable work-bench. This may be at one or more organizations depending upon the type of sandwich course degree of the requirements of the students' Academic Tutor.

In the case of Industry-based students, the organizations concerned carryout a recruitment campaign and select students for development within their company. These students are then employees of the company and are

sponsored at the university for a sandwich course degree. They have their work experience within their own company under the guidance of the company training officer.

In the early 1970s a swing away from the trend of sponsored students to a trend for students to become university-based was observed.

Besides the American and British Cooperative Education developments, there were some more beginnings, the world-over, between 1950 and 1983. Chronologically, they are as follows:

(1) Universidad Autonoma de Queretaro, Queretaro Mexico (1951).
(2) Yamagata University, Yamagata, Japan (1954).
(3) University of Waterloo, Ontario, Canada (1957).
(4) Visoka Techniskasola, Maribor, Yugoslavia (1960).
(5) Swinburne Institute of Technology, Melbourne, Australia (1963).
(6) Technical College of Iceland, Reykjavik, Iceland (1964).
(7) Vocational Training Directorate, Damascus, Syria (1965).
(8) University of the West Indies, Bridgetown, Barbados (1966).
(9) Copenhagen Advanced College of Building Technology, Copenhagen NU, Denmark (1966).
(10) University of Malawi - Polytechnic - Chichiri, Malawi (1966).

(11) HBTI, Kanpur, India (1967).

(12) Universite Nationale du Rwanda, Butare, Rwanda (1968)

(13) Instituto Technologico Centroamericano Nuevo San Salvador, El Salvador (1970).

(14) Institut Superieur de Technologie, Luxembourg - Kirchberg (1970).

(15) University of Ife, Ile - Ife, Nigeria (1970).

(16) The National Institute for Higher Education, Limerick, Ireland (1972).

(17) Hong Kong Polytechnic, Kowloon, Hong Kong (1972).

(18) Ulsan Institute of Technology (UIT), Republic of Korea (1972).

(19) Simon Bolwar University, Venezuela (1972).

(20) Instituto Euvaldo Lodi (IEL), Brazil (1972).

(21) Birla Institute of Technology & Science, (BITS), Pilani, India (1973).

(22) Universidad Nacional de Piura, Piura, Peru (1975).

(23) Universidade do Aveiro, Aveiro, Portugal (1975).

(24) The University of Malta, Msida, Malta (1978).

(25) Universidad de Moron, Buenos Aires, Argentina (1980)

(26) Universidad Estatal A Distancia, San Jose, Costa Rica (1981).

In the Soviet Union also, some form of cooperative education exists which forms an essential part of the courses at the technical institutes. In a five-year engineering curriculum, cooperative education is divided

into three sessions of four to eight weeks each, beginning in the third year, with the largest session immediately preceding the final part of the course.

Coming to the national scene, in India around 1967, HBTI, Kanpur introduced the Practice School Program for the Chemical Engineering discipline at the post-graduate level.

In 1973, BITS, Pilani started its Practice School Program, with a controlled student input of 12, accompanied by 4 faculty members. Today, during any academic year, as many as 1000 students from different subjects and more than 75 faculty members from different disciplines are participating in this joint educational endeavour, comprising two courses, at more than 80 different host organizations spread across the length and breadth of the country.

BITS deserves a special mention as at BITS cooperative education (in the form of Practice School) has been running and growing since 1973, across the Institute, in all disciplines, both at the undergraduate and post-graduate levels.

2.4 The World-Over Scenario

In 1982, Northeastern University's Center for Cooperative Education, in Boston, Massachusettes, USA, conducted a world-wide survey to assess the extent to which institutions of higher education integrated work practice and

their academic curricula. Over 2000 institutions were contacted to obtain details about their programs, in 74 nations:

15 nations in Asia, 24 in Europe, 19 in Africa, 3 in Australia, 6 in South America, 6 in Central America, and Canada. The responses were:

Asia	79.03%
Europe	60.25%
Africa	51.28%
Australia	56%
S. America	92.86%
C. America	100%
Canada	76.92%

At this stage, atleast one conclusion can be drawn very safely. After the USA and Canada, cooperative education programs seem to be adopted the most in the continents of Europe and Asia. In Europe, perhaps because of its historical origin and, in Asia, perhaps because education in most of the nations was based on British system of education.

In the continent of Asia, cooperative education is operative, in one form or the other, in China, Hong Kong, India, Indonesia, Iraq, Israel, Japan, Korea, Malaysia, The Philippines, Saudi Arabia, Singapore, Syria, Thailand, and Turkey.

In Europe, in Austria, Belgium, Bulgaria, Cyprus, Denmark, Finland, France, West Germany, Greece, Hungary, Iceland, Ireland, Luxembourg, Malta, Moscow, The Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden, UK, and Yugoslavia.

In Africa, in Algeria, Egypt, Ghana, Ivory Coast, Kenya, Lesotho, Malawi, Niger, Nigeria, Rwanda, Senegal, Sierre Leone, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, and Zambia.

In North America, in Canada and the USA.

In Central America, in Barbados, Costa Rica, El Salvador, Mexico, Panama, and Nicaragua.

In South America, in Argentina, Brazil, Chile, Ecuador, Peru, and Venezuela.

And, in the continent of Australia, in Australia, New Zealand, and Solomon Islands.

The subsections 2.4.1. through 2.4.7. give information on some 60 countries (out of the aforesaid 74). This information is in terms of:

Name of the country
The fields of study in which the work-experience is offered
Year the program was initiated
Length of a work-period

- Organization responsible for planning and evaluating the program
- Whether students are paid for their work-experience, and, if so, by whom
- Organization responsible for supervising the students

And,

- What the student receives upon graduation

2.4.1 The Asian scene

In Asia, cooperative education seems to have been initiated in The Philippines, in 1901, at The Technological University of The Philippines, Ermita, Manila. In 1935, institutions in China and Thailand also started operating such a program. And, by 1983, there were more than a dozen countries running cooperative education programs.

In Asia, planning and evaluation of cooperative education program is, generally, done by institution and/or industry. The length of the work-period is found to be varying from 3 weeks (in Thailand) to 3 years (in Japan). The students are, generally, paid during this work-period (by either industry, or government, or through scholarship). The supervision is, generally, done by institution and/or industry, but it is not known if the faculty from institution is

resident at the work-place of students or not. Anyhow, in India, BITS, Pilani keeps its faculty resident at industry in order to supervise, guide and assess the students.

In Asia, institutions offer cooperative education programs in one or more of the following disciplines:

Agriculture, Applied Arts, Applied Science, Architecture, Business, Computer Science, Dentistry, Economics, Education, (various disciplines of) Engineering, Fine Arts, Library Services, Health, Humanities, Instrumentation, Music, Naval Architecture, Social Behavioral Science, (Natural) Sciences, Social Work, Technologies, and Vocational Arts.

The program ends in either a degree or diploma, or a certificate. But, mostly in degree.

The countrywise details are given in Table 2.4.1.

4.2 The European scene

In Europe, cooperative education started in the year 1840 in Glasgow, UK at University of Glasgow (in the name of "Sandwich System") and, also, in Austria at Montanuniversitat Leoben. By 1900, such a program had already started by Finland (1881), France (1885), The Netherlands (1895) and Belgium (1900). The next to start cooperative education were Sweden (1943), West Germany (1946) and Poland (1948). By 1983, there were 22 countries operating such a program.

Table 2...1

...Asian ...

Sl.	Country	*	Fields of Study	Program Initiated	Work-Period Length	Students Paid (Generally)	Supervision (Generally, by)
1	2		3	4	5	6	7
1.	China	1	Engineering, Business.	1945	1 to 2 months	Varies	Institution & Industry
2.	Hong Kong	1	Engineering, Social Work, Natural Sciences, Vocational Arts.	1972	3 months to 1 year	Yes, by Industry	Institution
3.	India	7	Agriculture, Architecture, Applied Arts, Business, Computer Science, Economics, Education, Engineering, Humanities, Natural Sciences, Vocational Arts, etc.	1949	6 weeks to 1 year	Yes	Institution
4.	Indonesia	5	Agriculture, Architecture, Education, Engineering, Health.	1948	3 months to 2 years	No	Institution
5.	Japan	3	Dentistry, Engineering, Technologies.	1954	2 months to 3 years	No	Industry
6.	Korea	1	-	1972	-	No	-
7.	Malaysia	1	Applied Science, Education.	1972	2 to 8 weeks per year	Yes, by Scholar-ship.	Institution
8.	The Philippines	10	Agriculture, Applied Arts, Business, Education, Engineering, Health, Humanities, Library Sciences, Social Behavioral Science, Natural Sciences, Social Work, Technologies, Vocational Arts.	1901	2 months to 2 years	No	Institution and/or Industry.

* Number of institutions (on which information is available).

Table 2.4.1(Contd.)

1	2	*	3	4	5	6	7
9.	Singapore	2	Applied Arts, Engineering, Naval Architecture, Technologies, Vocational Arts.	1965	2 to 6 months	Yes, by Industry and Government	Institution and/or Industry
10.	Syria	1	-	1965	1 year	Yes, by Government	Institution and Industry
11.	Thailand	6	Agriculture, Architecture, Business, Education, Engineering Fine Arts, Health, Humanities, Social Behavioral Science, Natural Sciences, Vocational Arts.	1935	150 hours to 1 year	Yes	Institution and/or Industry
12.	Turkey	11	Agriculture, Applied Arts, Architecture, Business, Electronics, Engineering, Health, Humanities, Natural Sciences, Vocational Arts.	1935	4 weeks to 6 months	Yes	Industry

In Europe, planning and evaluation of cooperative education program is, generally, done by institution and/or industry. The length of the work-period is found to be varying from 2 weeks(in Austria) to 3 years (in Iceland). The students are, generally, paid (by either industry, or institution, or government) during this work-period. The supervision is, generally, done by institution (but, it is not known if the faculty from institution is permanently resident at the work-place of students, or not).

In Europe, institution offer cooperative education programs in one or more of the following disciplines:

Agriculture, Applied Arts, Architecture, Business Communications, Computer Studies, Dentistry, Economics, Education, Electronics, Engineering, Fine Arts, Health, Humanities, Law, Library Services, Public Administration, Social Behavioral Science, Natural Sciences, Social Work, Technologies, Tourism, Vocational Arts, and Veterinary Science.

The program ends in either a degree, or a diploma,or certificate.

The countrywise details are given in Table 2.4.2.

4.3 The African scene

In Africa, cooperative education seems to have begun between 1900 and 1920 in South Africa at Technikon Witwatersrand, Johannesburg. But, the next starting came

Sl.	Country	*	Fields of Study	Program Initiated	Work - Period Length	Student Paid (Generally)	Supervision (Generally, by)
1	2		3	4	5	6	7
1.	Austria	7	Applied Arts, Business, Communications, Economics, Education, Engineering, Humanities, Social Behavioral Science, Natural Sciences, Technologies, Vocational Arts.	1840	2 weeks to 3 months	Yes, by Employer	Industry
2.	Belgium	2	Business, Education, Engineering Health, Social Behavioral Science, Natural Sciences.	1900	-	No	Institution
3.	Bulgaria	1	Engineering	-	-	Yes, by Employer	Institution
4.	Cyprus	1	Engineering	1968	9 weeks	Yes, by Employer	Institution
5.	Denmark	1	-	1966	-	-	-
6.	Finland	3	Architecture, Engineering, Technologies, Vocational Arts.	1881	6 months to 2 years	Yes, by Employer	Industry
7.	France	47	Biology, Business, Computer Studies, Education, Engineering, Health, Humanities, Social Behavioral Science, Natural Sciences, Technologies, Vocational Arts, etc.	1885	13 months Maximum	Yes	Industry
8.	West Germany	31	Agriculture, Business, Engineering Natural Sciences, Social Work, Technologies, Vocational Arts, etc.	1946	18 to 22 months maximum	Yes	Institution

* Number of institutions (on which information is available).

Table 2.4.2 (Contd.)

1	2	*	3	4	5	6	7
9.	Greece	1	Agriculture, Forestry.	-	6 months	No	Institution
10.	Hungary	2	Agriculture, Business, Social Behavioral Science, Technologies.	1969	2 weeks to 1 month	-	Institution
11.	Iceland	1	Engineering, Health, Vocational Arts.	1964	1 to 3 years	-	-
12.	Ireland	1	Business, Engineering, Humanities, Natural Sciences.	1972	6 to 9 months	Yes, by Employer	Industry
13.	Luxembourg	1	Engineering	1970	2 months minimum	Yes, by Employer	Institution
14.	Malta	1	Applied Arts, Business, Education, Engineering, Health, Law, Social Behavioral Science.	1978	6 months	Yes	Institution and Industry
15.	The Netherlands	82	Agriculture, Applied Arts, Architecture, Business, Computer Studies, Drama, Economics, Education, Engineering, Fine Arts, Health, Humanities, Journalism, Law, Modern Languages, Museum Studies, Naval Architecture, Social Behavioral Science, Natural Sciences, Social Work, Technologies, Vocational Arts, etc.	1895	1 year minimum	Yes, by Employer	Institution and/or Industry
16.	Poland	3	Education, Engineering, Humanities, Health, Natural Sciences, Technologies.	1948	4 to 6 weeks	Yes, by Employer	Institution Industry

Table 2.4.2(Contd.)

1	2	*	3	4	5	6	7
17	Portugal	2	Education, Engineering, Natural Sciences.	1975	3 months to 1 year	Yes	-
18	Romania	1	-	1976	2 months	No	Institution
19	Spain	1	-	1982	4 months	Yes, by Employer	Industry
20	Sweden	7	Business, Computer Studies, Economics, Engineering, Health, Humanities, Public Administration, Social Behavioral Science, Natural Sciences, Social Work, Technologies, Tourism, Veterinary Science.	1943	6 weeks	No	Industry
21	United Kingdom	40	Architecture, Biological and Physical Sciences, Business, Engineering and Technology, Environmental Health, Social Sciences, etc.	1840	6 to 24 months	Yes, by Employer	Institution
22	Yugoslavia	2	Agriculture, Engineering, Law, Natural Sciences.	1959	2 weeks to continuous.	-	Institution and Industry

only in 1966 by Malawi. By 1983, there were 7 countries operating such a program.

In Africa, planning and evaluation of cooperative education program is done, generally, by institution and/or industry. The length of the work-period is found to be varying from 1 month (in S.Africa) to 1 year (in Ghana Nigeria and Rwanda). The students are, generally, paid by the employer. The supervision is, generally, done by the institution and/or industry (but, it is not known if the faculty from institution is permanently resident at the work-place of students, or not).

In Africa, institutions offer cooperative education programs in one or more of the following disciplines:

Agriculture, Applied Arts, Architecture, Business, Computer Studies, Dentistry, Education, Engineering, Health, Humanities, Journalism, Library Services, Public Administration, Social Behavioral Science, Natural Sciences Social Work, Technologies, Vocational Arts and Veterinary Science.

The program, generally, ends in a diploma.

The countrywise details are given in Table 2.4.3.

2.4.4 The North American scene

In the United States of America lies the origin of cooperative education - 1906, University of Cincinnati.

Table 2.4.3

The African Scene

Sl.	Country	*	Fields of Study	Program Initiated	Work - Period Length	Students Paid (Generally)	Supervision (Generally, by)
1.	Ghana	1	Engineering, Vocational Arts.	-	1 year	Yes, by Employer	-
2.	Malavi	1	Business, Engineering.	1966	3 months to 6 months	Yes	-
3.	Nigeria	10	Agriculture, Applied Arts, Architecture, Business, Engineering, Public Administration, Pharmaceuties, Natural Sciences, Technologies, Vocational Arts.	1970	3 months to 1 year	Yes, by Government	Institution
4.	Rwanda	1	Computer Studies, Health, Humanities, Natural Sciences, Social Behavioral Science.	1968	3 months	Yes, by Employer	Institution
5.	Senegal	1	Engineering	1974	6 weeks	Yes, by Institution and employer	Institution and Industry
6.	Republic of South Africa	6	Applied Arts, Architecture, Business, Dentistry, Education, Engineering, Health, Humanities, Journalism, Library Services, Natural Sciences, Social Work, Vocational Arts.	1900-20	1 to 6 months	Yes, by Employer	Industry
7.	Togo	1	Architecture	-	2 months, 5 months	Yes, by Employer	Institution

* Number of institutions (on which information is available).

But, in Canada such a program was initiated in 1957 by University of Waterloo, Ontario. By 1983, there were about a thousand institutions operating cooperative education, in the US. And, in Canada, there were about 39 institutions offering such a program.

In North America, planning and evaluation of cooperative education program is done, generally, by institution and/or industry. The length of the work-period is found to be varying from a minimum of 9 months (as in Saint Mary's University, Nova Scotia, Canada) to 24 months (in Memorial University of New Foundland and University of Waterloo, Canada). In the US, the length of the work-period is usually 15 months (in 5 years). The students are, generally, paid by the employer. The supervision is, generally, done by industry.

In North America, institutions offer cooperative education programs, mainly, in one or more of the following disciplines:

Anthropology, Applied Arts, Architecture, Arts, Biology, Business, Chemistry, Economics, Engineering, English, Geography, Geology, Health Studies, Kinesiology, Mathematics, Natural Science, Physics, Political Science, Psychology, Recreation, and Sociology and Technologies.

The program generally ends in a degree.

The countrywise details are given in Table 2.4.4.

Sl.	Country	*	Fields of Study	Program Initiated	Work - Period Length	Students Paid (Generally)	Supervision (Generally, by)
1.	United States	-	Mainly, Engineering	1906	Usually 15 months	Yes, by Employer	Industry
2.	Canada	30	Anthropology, Applied Arts, Architecture, Arts, Biology, Business, Chemistry, Economics, Engineering, English, Geography, Geology, Health, Kinesiology, Mathematics, Natural Sciences, Physics, Political Science, Psychology, Recreation, Sociology, Technologies.	1957	4 to 24 months	Yes, by Employer	Industry

* Number of institutions (on which information is available).

2.4.5 The Central American scene

In Central America, cooperative education seems to have begun in 1951 in Mexico at Universidad Autonoma de Queretaro. In 1966, Barbados also started it. And, by 1983, there were 6 countries operating cooperative education program.

In Central America, planning and evaluation of cooperative education program is, generally, done by institution. The length of the work-period is found to be varying from 1 month (in Nicaragua) to 1 year (in Barbados) The students are, generally, not paid. And, the supervision is generally by institution (but, it is not known if the faculty is permanently resident at work-place, or not).

In Central America, institutions offer cooperative education programs in one or more of the following disciplines:

Agriculture, Applied Arts, Busines, Education, Engineering, Health Natural Sciences, Social Behaviour Science, Technologies, and Vocational Arts.

The program, usually, ends in a degree.

The countrywise details are given in Table 2.4.5.

2.4.6 The South American scene

In South America, cooperative education seems to have begun in 1975 in Ecuador, at Escuela Superio-

Table 2.4.5

The Central American Scene

Sl.	Country	*	Fields of Study	Program Initiated	Work - Period Length	Students Paid (Generally)	Supervision (Generally, by)
1.	Barbados	1	Applied Arts	1966	1 year	No	Institution
2.	Costa Rica	1	Business, Education.	1981	6 months	No	-
3.	El Salvador	1	Technologies, Vocational Arts.	1970	3 months	Yes, by Government	-
4.	Mexico	8	Agriculture, Business, Engineering, Health, Social Behavioral Science.	1951	6 weeks to 6 months	No	Institution
5.	Panama	1	Health, Natural Sciences.	-	Varies	No	Institution
6.	Nicaragua	1	-	1981	1 month	No	-

* Number of institutions (on which information is available).

Polit[illegible]l Litoral, [illegible] in Peru, at [illegible] Nacional de Piura. In 1978 (Venezuela) and in 1980 (Argentina), two more learnings came. By 1983, there were 6 countries operating cooperative education programs.

In South America, planning and evaluation of cooperative education program is, generally, the responsibility of institution. The length of the work-period is found to be varying from 8 weeks (in Venezuela) to 1 year (in Ecuador). The students, generally, are paid by the employer. And, the responsibility of supervising the students at work is, generally, of institution (but, it is not known if the faculty is permanently resident with the students at the place of work, or not).

In South America, institutions offer cooperative education programs in one or more of the following disciplines:

Agriculture, Architecture, Business, Education, Engineering, Health, Humanities, Journalism, Law, Social Behavioral Science, Natural Sciences, and Technologies.

The program, generally, ends in a degree.

The countrywise details are given in Table 2.4.6.

2.4.7 The Australian scene

In the continent of Australia, cooperative education seems to have begun in 1968 in New Zealand at Waikato

Table 2.4.6

The South American Scene

SL.	Country	*	Fields of Study	Program Initiated	Work - Period Length	Students Paid (Generally)	Supervision (Generally, by)
1.	Argentina	2	Agriculture, Health, Natural Sciences, Technologies.	1980	Varies	No	-
2.	Brazil	2	Education, Health, Humanities, Law, Natural Sciences, Technologies.	-	6 months	-	Institution
3.	Chile	2	Agriculture, Architecture, Education, Engineering, Health, Humanities, Journalism, Social Behavioral Science.	-	3 months	No	-
4.	Ecuador	3	Engineering, Technologies.	1975	2 months to 1 year	Yes, by Employer	Institution
5.		2	Agriculture, Business, Engineering, Social Behavioral Science.	1975	3 months	Yes, by Employer	Institution
6.	Venezuela	2	Business, Education, Engineering, Health, Natural Sciences.	1978	8 weeks to 6 months	Yes, by Employer	Institution

* Number of institutions (on which information is available).

Technical Institute, Hamilton. In 1969, Solomon Islands also started it. And, Australia launched its (first) cooperative education program in 1972 at Bendigo College of Advanced Education, Victoria.

In Australia, planning and evaluation of the cooperative education program is, generally, the responsibility of institution and/or industry. The length of the work-period is found to be varying from 1 week (in Australia) to 1 year (in Australia and Solomon Islands). The students are, generally, paid by the employer. And, the supervision is, generally, done by institution and/or industry (but, it is not known if the faculty is permanently resident at the industry, or not).

In Australia, institutions offer cooperative education programs in one or more of the following disciplines:

Agriculture, Architecture, Applied Arts, Applied Science, Business, Computer Studies, Education, Engineering, Health, Maritime Studies, Mathematics, Public Administration, and Vocational Arts.

The program ends in either a degree, or diploma or a certificate.

The countrywise details are given in Table 2.4.7.

The information given hitherto is summarized in Table 2.4 (a).

Table 2.4.7

The Australian Scene

Sl.	Country	*	Fields of Study	Program Initiated	Work - Period Length	Students Paid (Generally)	Supervision (Generally, by)
1.	Australia	11	Agriculture, Applied Arts, Applied Science, Architecture, Business, Computer Studies, Education, Engineering, Mathematics, Vocational Arts.	1963	1 week to 1 year	Yes, by Employer	-
2.	New Zealand	2	Business, Engineering, Health, Vocational Arts.	1968	Varies	Yes	-
3.	Solomon Islands	1	Business, Maritime Studies, Vocational Arts.	1969	6 months, 1 year	Yes, by Employer	Institution and Industry

* Number of institutions (on which information is available).

Table ... (a)

The World-wide Scene

Sl.	Continent	*	**	Fields of Study	Program Initiated	Work - Period Length	Students Paid (Generally)	Supervision (Generally, by)
1	2			3	4	5	6	7
1.	Asia	49	12	Agriculture, Applied Arts, Architecture, Applied Science, Business, Computer Studies, Dentistry, Economics, Education, Electronics, Engineering, Fine Arts, Library Services, Health, Humanities, Music, Naval Architecture, Social Behavioral Science, Natural Sciences, Social Work, Technologies, Vocational Arts, etc.	1901 (in The Philippines)	150 hours to 8 years	Yes	Institution and/or Industry
2.	Europe	238	22	Agriculture, Applied Arts, Architecture, Business, Communications, Computer Studies, Dentistry, Economics, Education, Electronics, Engineering, Fine Arts, Health, Humanities, Law, Library Services, Public Administration, Social Behavioral Science, Natural Sciences, Social Work, Technologies, Tourism, Vocational Arts, Veterinary Science, etc.	1840 (in Austria and, also, in Glasgow)	2 weeks to 8 years	Yes	Institution

* Number of institutions (on which information is available).

** Number of countries (on which information is available).

Table 2.4(a)(Contd.)

1	2	*	**	3	4	5	6	7
3.	Africa	21	7	Agriculture, Applied Arts, Architecture, Business, Computer Studies, Dentistry, Education, Engineering, Health, Humanities, Journalism, Library Services, Public Administration, Social Behavioral Science, Natural Sciences, Social Work, Technologies, Vocational Arts, Veterinary Science.	1900-20 (in Republic of South Africa)	1 month to 1 year	Yes, by Employer	Institution and/or Industry
4.	North America	-	2	Anthropology, Applied Arts, Architecture, Arts, Biology, Business, Chemistry, Economics, Engineering, English, Geography, Geology, Health, Kinesiology, Mathematics, Natural Sciences, Physics, Political Science, Psychology, Recreation, Sociology, Technologies, etc.	1906 (in Cincinnati)	4 to 24 months	Yes, by Employer	Industry
5.	Central America	13	6	Agriculture, Applied Arts, Business, Education, Engineering, Health, Social Behavioral Science, Natural Sciences, Technologies, Vocational Arts.	1951 (in Mexico)	1 month to 1 year	No	Institution

Table 2.4(a)(Contd.)

1	2	*	**	3	4	5	6	7
6.	South America	13	6	Agriculture, Architecture, Business, Education, Engineering, Health, Humanities, Journalism, Law, Social Behavioral Science, Natural Sciences, Technologies.	1975 (in Ecuador and also, in Peru)	8 weeks to 1 year	Yes, by Employer	Institution
7.	Australia	14	3	Agriculture, Architecture, Applied Arts, Applied Science, Business, Computer Studies, Education, Engineering, Health, Maritime Studies, Mathematics, Public Administration, Vocational Arts.	1968 (in New Zealand)	1 week to 1 year	Yes, by Employer	Institution and/or Industry

The details on universities of UK and Canada operating cooperative education program are contained in tables 2.4(b) and 2.4(c) The information contained is in terms of :

- Name of the University
- Name of the program
- Starting year of the program
- Level(s) at which the program is operative
- Disciplines in which the program is offered
- Duration of the program
- Involvement of faculty
- Evaluation

Table 2.4 (b)

Cooperative ducation in U.K.

Sl.	University	Starting year	Disciplines	Duration	Faculty involvement	Evaluation
1	2	3	4	5	6	7
1.	University of Aston	-	-	-	-	-
2.	University of Bath	-	Sciences, Arts, Social Sciences, Business Administration.	6 to 24 months in 4 years	Regular visits to assess the students' efforts, progress and contribution to employer.	Tutor's visit reports and students report
3.	Brunel University	1970	All departments	18 months in 4 years	Academic tutor selects work placements.	-
4.	University of Bradford	-	-	-	-	-
5.	City University, London	1966	Engineering, Science, Social Sciences, Business Studies, Music.	-	-	-
6.	University of Essex	-	-	-	-	-
7.	University of Lancaster	1972	Engineering	1 year	-	-
8.	University of Leeds	-	-	-	-	-
9.	Loughborough University of Technology	-	Management, Engineering, Design, Languages, Sciences, Education.	12 months in 4 years	Visits regularly	Company report, Students project report and a Board of examiners

Table 2.4(b)(Contd.)

1	2	3	4	5	6	7
10.	The University of Nottingham.	-	-	-	-	-
11.	Queens University of Belfast.	-	-	-	-	-
12.	University of Reading Whiteknights	1957	Technologies, Vocational Arts.	Varies (3 months to 6 months)	-	-
13.	University of Salford	-	Engineering, Science, Languages.	12 months in 4 years	-	-
14.	University of Sheffield	-	-	-	-	-
15.	University of Southempton	-	-	-	-	-
16.	University of Strathclyde	1978	Engineering	3 to 5 months	-	-
17.	University of Surrey	1967	Engineering, Sciences, Human Studies.	40 to 46 weeks in 4 years	Visits 3 times per year (at least)	Report/ dissertation, industrial supervisor's report; visiting tutor's appraisal interviews.
18.	University of Wales Institute of Science and Technology	-	-	-	-	-
19.	University of York	-	-	-	-	-

Table 2.4(c)

Cooperative Education in Canada

Sl.	University	Starting year	Disciplines	Duration	Faculty involvement	Evaluation
1	2	3	4	5	6	7
1.	Acadia University Wolfville	-	-	-	-	-
2.	University of Alberta	-	-	-	-	-
3.	University of British Columbia	1977-78	Engineering, Forestry.	4 months	-	-
4.	Brock University	-	-	-	-	-
5.	Concordia University	1981-82	Natural Sciences, Economics, Mathematics.	8 months	-	-
6.	Dalhousie University	-	-	-	-	-
7.	University of Guelph	-	Agriculture, Natural Sciences.	-	-	-
8.	University of Lethbridge	-	-	-	-	-
9.	University of Manitoba	1982	Computer Studies	4 months	-	-
10.	Mc-Master University	-	Business, Health.	-	-	-
11.	Memorial University of New foundland	-	Civil, Mechanical Electrical, Shipbuilding.	24 months in 4 years and 8 months	Visits to Students at work to appraise and assist.	Performance report by the employer and work report by the student; seminars; design project.

Table 2.4(c)(Contd.)

1	2	3	4	5	6	7
12.	Mount St. Vincent University	1980	Business, Health, Humanities, Vocational Arts, Public Relations.	4 months	-	-
13.	University of Ottawa	1980	Engineering, Natural Sciences, Mathematics.	4 months	-	-
14.	Universite du Quebee	-	Engineering	Varies	-	-
15.	University of Regina	1968	-	4 months	-	-
16.	Saint Mary's University	1982	Geography, Sociology.	9 to 12 months in 4 years	-	Work report by employers and students and evaluated by University-dept.-advisor.
17	Universite de Sherbrooke	1966	Engineering, Education, Business Natural Sciences, Humanities, Computer Studies.	4 months	-	-
18	Simon Fraser University	1978	-	4 months	-	-
19	Technical University Nova Scotia.	-	-	-	-	-

Table 2.4(c)(Contd.)

1	2	3	4	5	6	7
20.	University of Victoria	1976	Business, Computer Studies, Leicure Studies, Humanities Natural Sciences.	4 months	-	-
21.	Wilfred Laurier University	1975	Business Administration & Economics.	12 months in 4 years	-	Employer's evaluation (form); Work report.
22.	University of Waterloo	1957	Engineering, Physics, Mathematics, Chemistry, Kinesiology Architecture, Recreation, Health Studies, Geology, Economics, Geography English, Political Science, Biology, Behavioural Sciences of Anthropology, Psychology and Sociology, Arts Applied Studies.	16 to 24 months in 4 years	They have co-ordinators who are the field personnel of the Dept. of Co-ordination and Placement. Their activities lie mainly off-campus.	Work reports, 4 in number and graded 'Outstanding', 'Satisfactory' or 'Unsatisfactory'.

CHAPTER 3

UIL MODELS : A COMPARATIVE ASSESSMENT

3.1 Introduction

This chapter attempts to make a comparative assessment of the various models of UIL program. These models are examined in terms of their objective; levels of operation and components of the program; structure of operation; role and participation of the faculty; the involvement of the professionals in the program; and evaluation of the students.

3.2 Objective

The major concern of cooperative education is career development as an integral part of the educational progress. Therefore, the cooperative program is based on paid engagement in practical, curriculum-related jobs structured to meet the interests, abilities, and the aptitudes of students. An effort is made to place professionally oriented students on a sequence of assignments with increasing responsibility, often with one employer. Through a series of assignments the students thus receive progessive experience, enabling them to become increasingly proficient in the intended career.

Sir Peter Venables[1] says that training in sandwich courses involves organized experience with certain

declared objectives in mind, e.g., acquiring specific skills and knowledge; insights and values; and relating to colleagues and co-workers under the inherent constraints of the working conditions and economics.

Thus, there is a difference in acquiring experience through simply taking a job and through training, i.e., between the objectives of Cooperative Education Program and Sandwich Course.

The objectives of Practice School (PS) Program followed at the MIT School of Chemical Engineering Practice emphasize:

(a) development of a plan of attack on real technical problems and implementation within a carefully defined time schedule;

(b) responsibility for group organization and action on solution of problems;

(c) effective oral and written presentation of ideas;

(d) exposure to a wide range of chemical engineering operations and close control with industrial personnel; and

(e) definition and establishment of economic and technical feasibility.

In case of BITS, Pilani, Practice School method of education aims at cultivating in students appropriate

attitudes towards, and analytical skills of, decision making and team spirit, sense of responsibility, leadership, industry, importance of time schedule and regularity, self-reliance, skills of written and oral communication, initiative, organizational ability, creativity, social sense, etc., so necessary to respond to open-ended situations, more often than not, characterized by insufficient data, uncertainties of events, and unfamiliarity with the environment.

3.3 Levels

In the American context, there have been Under-graduate and Graduate Coop Programs since, almost, the beginnings - 1906, Cincinnati University (Under-graduate) and 1917 MIT (Graduate). But, in the British context, it can be noted that till 1975 there had been sandwich courses only at the Undergraduate level. In 1975, Salford University and General Electric Company, came out with 'Teaching Company' at the Graduate level. Professor A.W.J. Chisholin at Salford University is given credit for this pioneering achievement. The basic concepts in Graduate cooperative education are very similar to those of Undergraduate cooperative education.

At BITS, Pilani, the UIL program is offered in the name of Practice School (PS) (since 1973), at the First Degree level; M.E. (Collaborative)(since 1979)/M.Phil. (Applied) Program (since 1985), at the Higher Degree

level; and, also, offers the facility for the pursuit of Ph.D. at its PS and ME (Collaborative) stations, called Off-campus Ph.D. Program (since 1982), wherein the research problems are the real-life problems drawn from the ongoing activities of industry.

The Practice School (PS) Program, as operative at BITS, Pilani, is an integral part of the First Degree Program which is of 4-year duration.

The M.E. (Collaborative) Programmes, which are run at the Institute's round - the-year PS Centers, are offered in functional and multidisciplinary areas, e.g., Project Engineering, instead of the conventional disciplines, like Chemical, Mechanical, etc. Each program is of two years' duration, comprising first year of eight courses and second year of two internship courses.

3.4 Structure of Operation

In American institutions, the completion of a normal four-year college program takes five years under the cooperative plan-a year comprising two terms : Fall and Spring. And, summer-term is also used in the plan. The five years are termed as the Freshman year, the Sophomore year, the Junior year, the Presenior year, and the Senior year. A student remains in school, i.e., on-campus, in his first year. In the remaining four years, the student alternates between the school and the work for ten terms -

five on-campus and five off-campus. But, if a student begins his Sophomore year in work, he completes his five terms of work by the end of his Presenior year and spends the last two terms of his (final) Senior year on-campus, in school. It happens so because at the beginning of the second (Sophomore) year students are divided into two halves and one group stays at school, whereas an equal number of students goes to work. This system is called pairing. This pairing makes alternate use of the college plant and the work training stations.

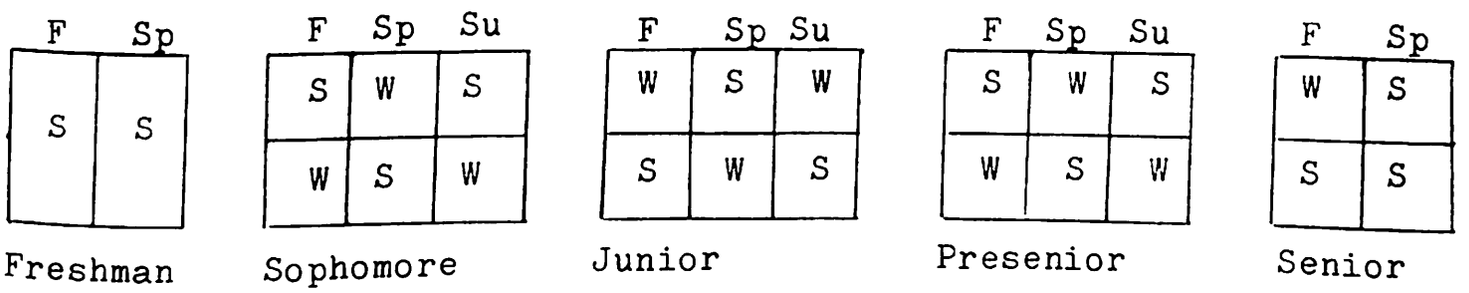
A sample of cooperative education schedule is given in Figure 3.4(a).[2]

This model of operation may require adjustment to accord with universities operating on the trimester, quarter, or some other less common method of dividing the academic year, in America. But, these adjustments would simply reflect changes in the structure of the schedule rather than any fundamental conceptual changes in the basic ideas.

Coming to specific cases, Table 3.4(a) gives Professional Practice Program of University of Cincinnati and Table 3.4 (b) gives the structures of cooperative - plan as operative in some of the American universities/colleges[3]. Here, a year comprises four terms.

Figure 3.4 (a)

A Sample Cooperative Education Schedule



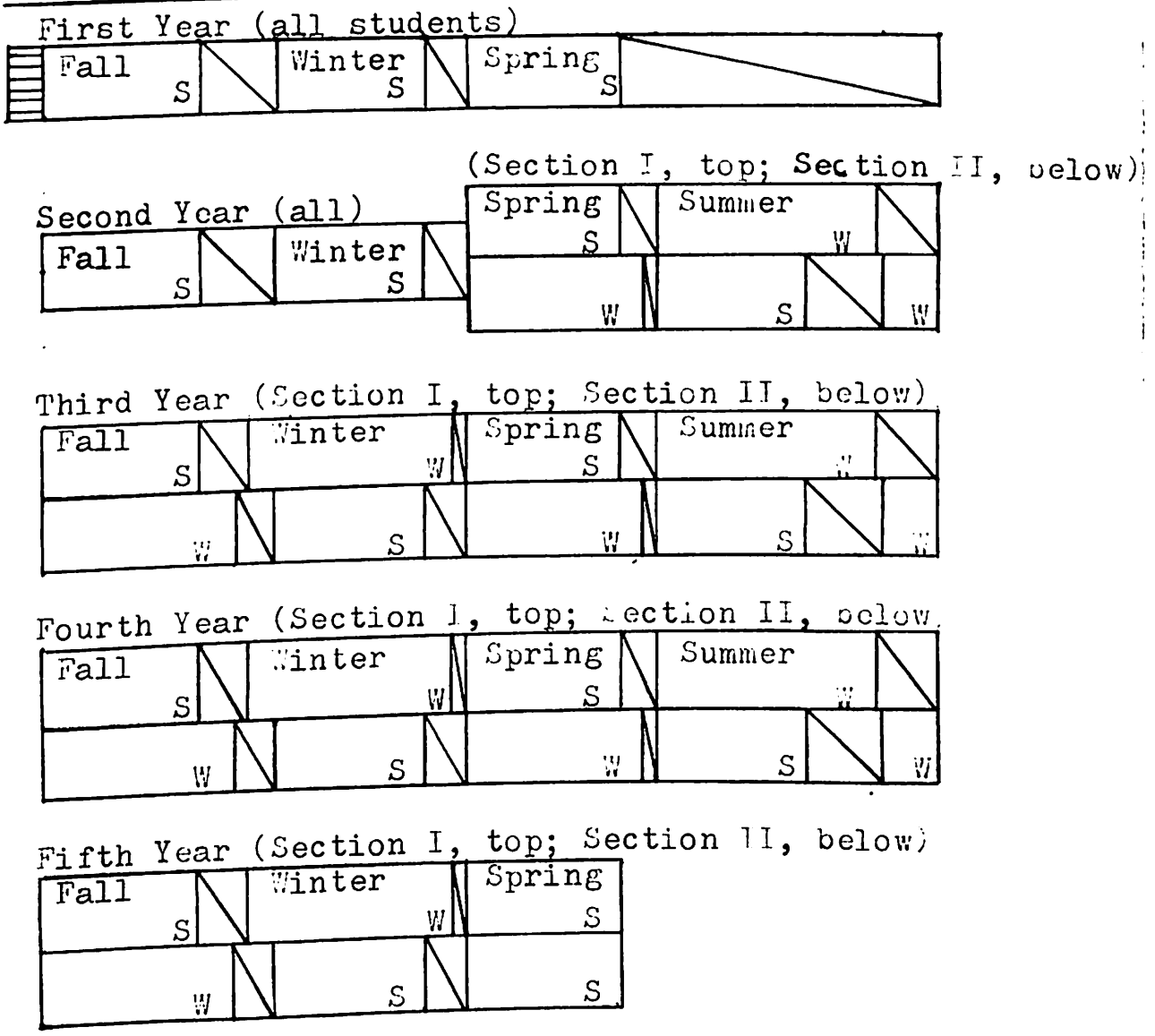
Abbreviations :

F=Fall, Sp=Spring, Su=Summer, W=Work, S=School

Table 3.4 (a)

University of Cincinnati Professional Practice Program

Five-Year Degree Program



Period of orientation

S Period of school

W Period of work

Period of vacation

Table 5.1 (b)

Structures of Cooperative-Plan as Operative in Some of the American Universities/Colleges

Sl.	Year	1				2				3				4				5			
	Term	F	Wi	Sp	Su	F	Wi	Sp	Su	F	Wi	Sp	Su	F	Wi	Sp	Su		Wi	Sp	Su
1.	Northwestern University Technological Institute	S	S	S	V	S	S	S	W	S	S	W	W	S	W	S	W	W	S	S	
2.	Tennessee Technological University	S				W				S				W				S			
3.	Drexel University	S	S	S	S	S	S	W	S	S	W	S	S	W	S	S*					
4.	Alderson-Broaddus College	S	S	S	W	S	S	W	S	S	W	S	S	W	S	S*					
5.	Wilberforce University	S		S	W	S		W	S	W		S	W	S		S	S*				
6.	Northeastern University A	S	S	S	V	S	W	S	W	W	S	W	S	S	W	S	W	W	S	S	
	B	S	S	S	V	W	S	W	S	S	W	S	W	W	S	W	S	S	W	S	
7.	Georgia Institute of Technology A				S-																
	A	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	S	S	S	
	B	S--	W	S	W	S	W	S	W	S	W	S	W	S	W	S	S	S	S	S	

F=Fall, Wi=Winter, Sp=Spring, Su=Summer, S=School, W=Work, V=Vacation

* The cooperative-plan does not lengthen the degree duration

\- June registration

\-\- September registration

A survey of cooperative institutions in America showed that 14 were conducting graduate cooperative programs in the fall of 1970. An additional 6 institutions reported that programswere in existence but no students were enrolled. Table 3.4(c) gives typical graduate cooperative plans in America.[3]

Coming to the British context, currently there are atleast 37 different types of sandwich course pattern operative.[4] The emergence of various patterns is perhaps due to the consideration of operational, teaching, and industrial aspects. The patterns mainly operative since the beginning are given below.[5]

Pattern A:

This is the original pattern. It is popularly called "6 months/6 months" as there are two equal parts (of about 6 months each) of Study and Training in each year. A student alternates between the Study and the Training for four years. Normal summer vacation between two years is reduced to half (approximately).

Pattern B:

This pattern is known as "End-on", or "2 Groups", or "Box and Cox" Pattern. Students are divided into two halves, in the very first year. While one section attends Study, the other goes off-campus for Training. Sections keep exchanging places every 6 months. In this pattern

Table 3.4 (c)

Typical Graduate Cooperative-Plan Calendars, in America

Year	1				2				3			
Term	Su	F	Wi	Sp	Su	F	Wi	Sp	Su	F	Wi	Sp
Engineering with alternate divisions												
Division A	W*	S	W	S	W	W	S	X				
Division B	W*	W	S	W	W	S	W	S				
Engineering - one division	W*	S	W	S	W	W	S	X				
Mechanical Engineering	W*	S	S	W	W	S	S	X				
Business Administration		S	S	W	S	W	W	S				
Professional Accounting	S	S	W	S	S							
Law		S	S	S	W	S	W	S	W	S	W	S

W: Professional-experience period.

S: Academic period.

X: Period in which academic requirements have been completed but formal degree-granting exercises have not yet taken place. Student is normally on full-time employment.

* Optional employment period.

Su=Summer, F=Fall, Wi=Winter, Sp=Spring

also the normal summer vacation between two years gets reduced to (approximately) half.

Pattern C:

In this pattern, the first year and the fourth year are of Study, and both the second and third years are a mix of Study and Training. Symbolically, it is written as 1 (year of Study), 2 (years of mix of Study and Training), 1 (year of Study), which in short is "1.2 mixed .1".

This pattern has three main variations termed as C.1, C.2, and C.3.

In C.1, both the second year and the third year have more of Training (about 6 months) than Study (about 3 months). The summer vacation between two years is normal (about 3 months).

In C.2, both the second and the third years have two equal parts (of about six months each) of Study and Training. As a result, the summer vacations between the second and the third, and the third and the fourth years get reduced.

In C.3, the pattern of second year is as in C.2 and that of the third year as in C.1. In other words, C.3 is a mxiture of C.2 and C.1, in a way. Thus, the normal summer vacation gets reduced only between the second and the third years.

Pattern D:

This is, perhaps, the simplest possible pattern, with the first, second and the fourth years of Study and only the third year of Training. Symbolically, it is written as 2.1.1, i.e., first 2 years of Study, then one (third) year of Training, and, then, again, one (fourth) year of Study. The summer vacation is normal between the first and the second years, and the second and the third years, but gets reduced between the third and the fourth years. This pattern fits neatly into the traditional university setting (normal academic year).

Pattern E:

This pattern of training was favoured by some traditional University Engineering Departments in the post-war periods, and when sandwich courses were successfully established in the 1950s and 60s, this pattern was considered to be yet another plan. This is the only pattern which lengthens the duration of the degree program. The first year and nearly half of the adjoining summer vacation are of Training. The next three years are of Study. Nearly half of the summer vacations after both the second and third years of Study are "Summer Vacation Experience" periods. The fifth year, called the Graduation year, is of Training which begins during the summer preceding it. This pattern is referred to as 1.3.1.

Refer Figure 3.4 (b).

Figure 3.4 (b)
Sandwich Courses

SANDWICH COURSES: PATTERNS OF STUDY AND TRAINING

S=Full-time study, T=Full-time training, vac=Normal summer vacation
en two years, Red vac=Reduced vacation, sve=Summer vacation experience

It can be seen that Pattern A allows time for substantial effort to be made in each period of Study and Training and, also, fosters competence, maturity and motivation through the sequence of training periods in a cumulative way which is not possible in a single period of training as in pattern D. But, six-month term in classes could be too short a period before being placed at industry. Also, it can be felt that the final year be one of full-time Study only, like in pattern C.

Pattern B ensures full use of capacity in university and in industry throughout the year. But, there should certainly be the most careful appraisal of the effects on the work and life of the universities concerned, before cost-benefit considerations are pressed very strongly in favour of this pattern.

Coming to Pattern C, it can be noted that C.2 and C.3 have the longest initial period of study which is advantageous for acquiring competence in certain inter-disciplinary courses and to attain the necessary minimum level in scientific subjects for profitable training in science-based industries. But, the total time for training is halved as compared to in patterns A and B. In C.3, one year of continuous training is a big gap from campus. Big industrial organizations may like it, but, what if misplacements are there.

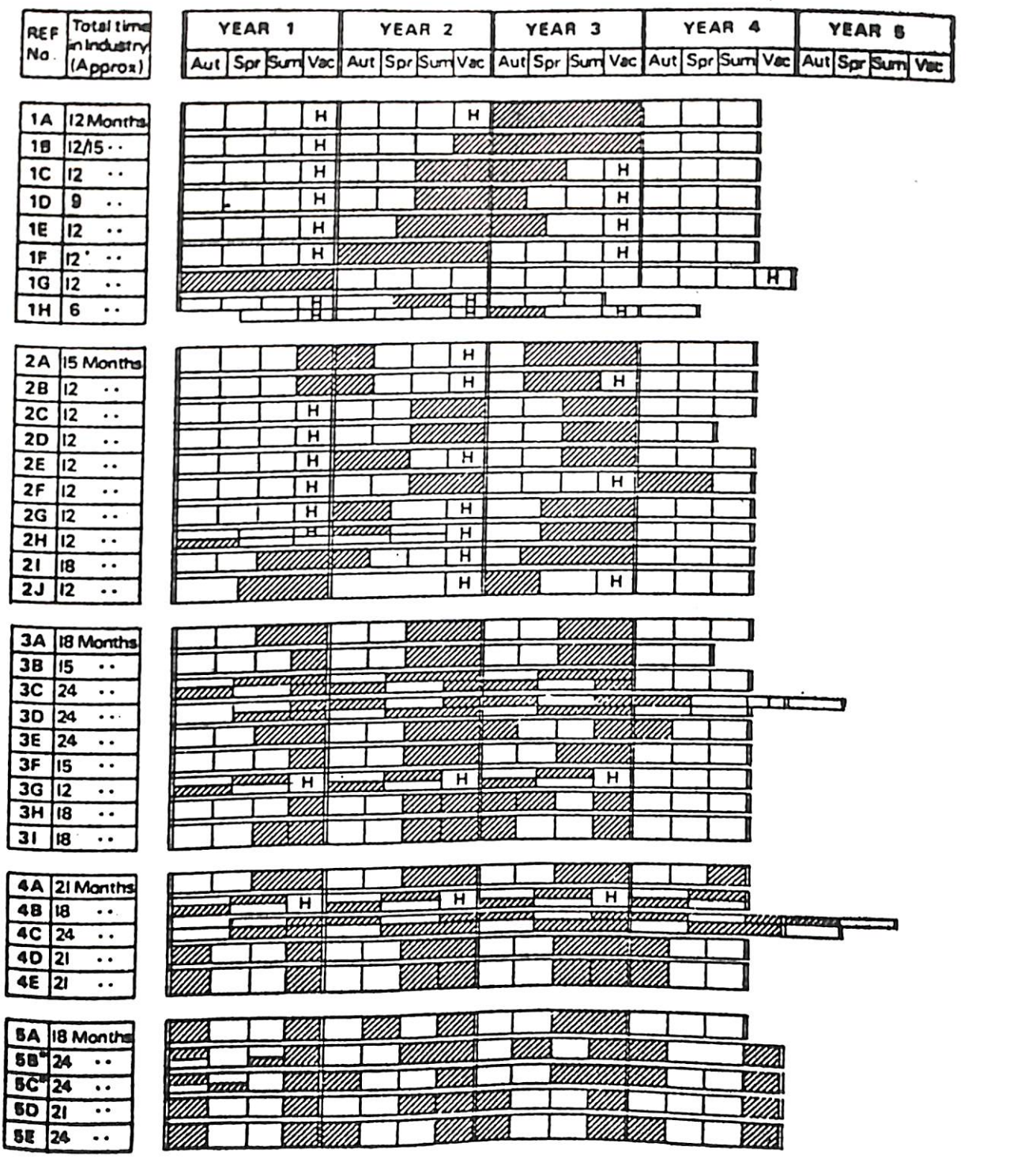
The 37 different types of sandwich course pattern, mentioned as before, are shown in Figure 3.4(c). They are classified into 5 groups depending upon the number of industrial periods. The first character of the reference number is the number of industrial periods in a plan. There are 8 patterns with 1 industrial period in each; 10 with 2 in each; 9 with 3 in each; 5 with 4 in each; and, again, 5 patterns with 5 industrial periods in each. Training and total time in industry range from a minimum of 6 months to a maximum of 24 months. 'A' level entrants are the High School Graduates, Other National Certificates and Ordinary National Diploma holders.

These patterns can be viewed from a different angle also. The patterns that involve full-time training for a complete year once, or more than once, in a program, are called "Thick Sandwich Courses". The patterns involving training periods of 6 months, or less, in a year are called "Thin Sandwich Courses". In Figure 3.4(c), patterns 1A, 1B, 1C, 1E, 1F, 1G, and 3 H are "Thick" and the rest all are "Thin".

In the Indian context, Sandwich Courses are operative in polytechnics. In spite of the recommendations of AICTE and approval of the Central Government (1969-70), nothing significant could take place in the universities. Therefore, the structures of the sandwich program operative in polytechnics only are available[6] and are given in Figure 3.4(d).

Figure 3.4(c)

Sandwich Patterns Operative in U.K.

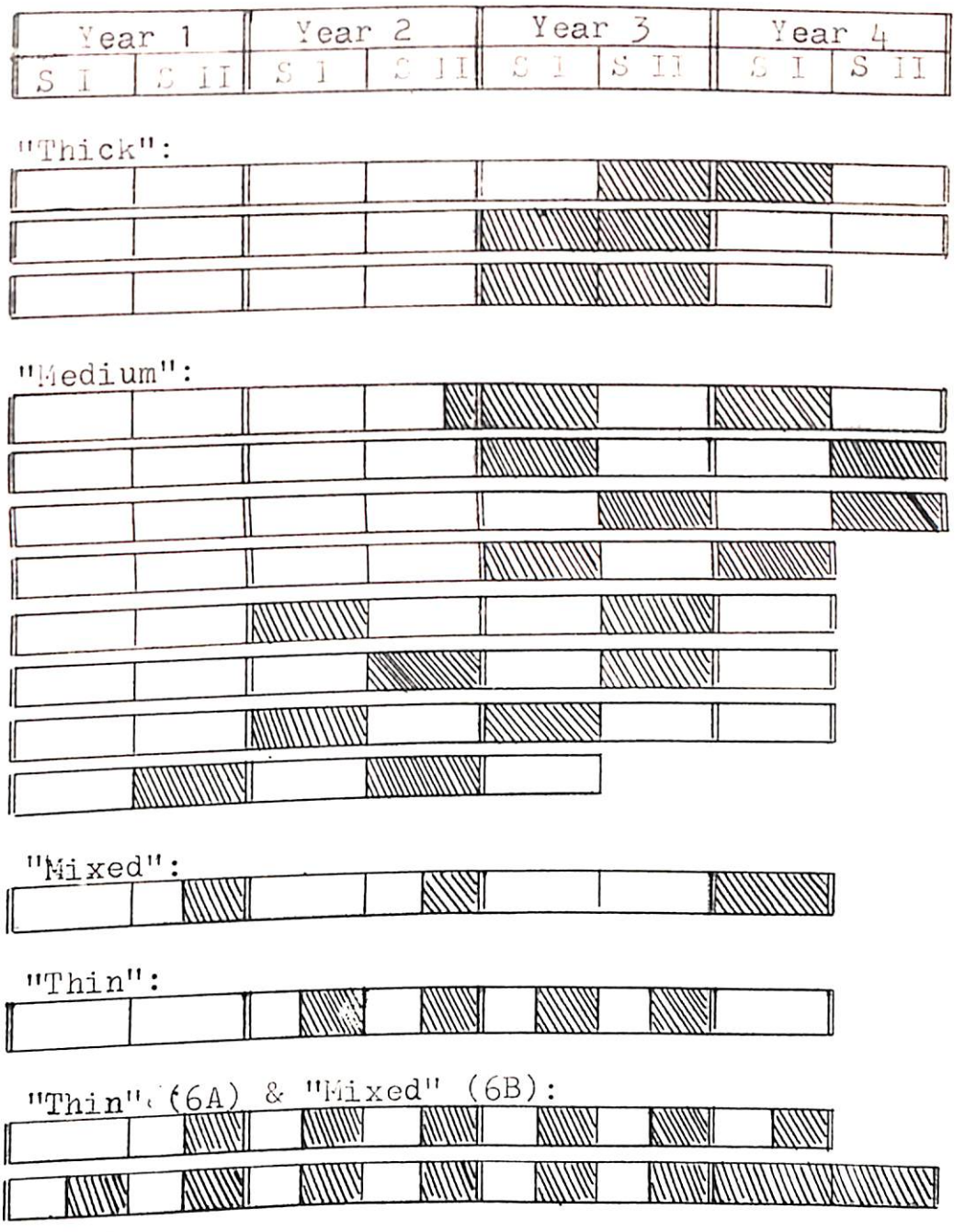


* In the first year, 'A' level entrants take the upper alternative and OND/OND entrants take the lower.

Figure 3.4 (a)

Sandwich Patterns Operative in Indian Polytechnics

Ref. No.	Training Time
1A	12 months
1B	12 months
1C	12 months
2A	15 months
2B	12 months
2C	12 months
2D	12 months
2E	12 months
2F	12 months
2G	12 months
2H	12 months
3A	12 months
4A	12 months
6A	18 months
6B	30 months



Academic Term/Semester

Industrial Period

S I : I Semester

S II : II Semester

The first figure of the Reference Number is the number of Industrial Periods.

L.S. Chandrakant[7] also calls a pattern a "Thick Sandwich Course" if it involves continuous training for one year. But, the "Thin Sandwich Courses" are further subcategorized as "Thin" and "Medium". A pattern involving training periods of 3 months or less in a year is called "Thin Sandwich Course". And, if a pattern involves training periods of more than 6 months but less than 12 in a year, it is called a "Medium Sandwich Course".

Further, he has termed a pattern containing a mix of "Thin" and "Medium" or "Medium" and "Thick" patterns as a "Mixed Sandwich Course".

In the Practice School (PS) model of cooperative education, at BITS, Pilani, all students spend the first two years on-campus, in classes, studying the foundation-year courses comprising science, mathematics, humanities, and technical arts.

The first component of the PS Program, PS-I, falls during the summer vacation after the second year, and is of 2 - month duration.

The third year is, again, on-campus, studying the professional courses.

In the fourth year, rather in the final year of a program, students are divided into two halves (approximately). One group attends courses on-campus, in the

first semester, and goes to industry, for the second component of the PS Program, PS-II, in the second semester; while, the other group goes to industry, for PS-II, in the first semester and attends courses on-campus, in the second semester (Refer Figure 3.4(e)). The semester of PS-II component is longer than that of study on-campus by a month (about half the duration of summer vacations) which is added to the left or the right (as the case may be) of the semester of the component. Thus, this work-period is of 5½-month duration instead of normal semester duration of 4½ months.

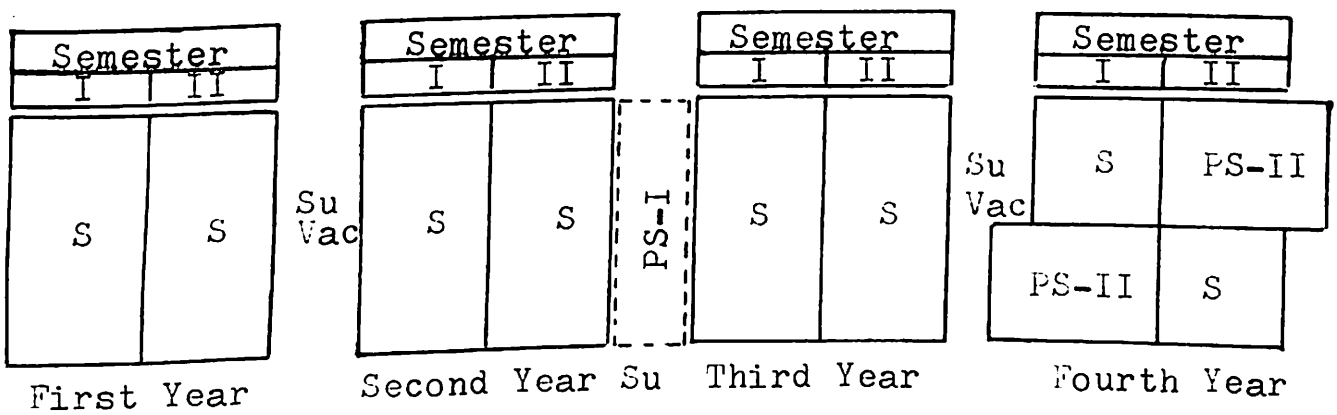
3.5 Evaluation

In American Cooperative Education model, the coordinator makes regular visits to industry to determine how well a student is performing and to determine if he has any unsettled grievances or dissatisfaction which he wishes to voice to the coordinator. The coordinator discusses the students' progress with his supervisor.

During each cooperative work-period, industry evaluates a student for the following traits : judgement, ability to learn, attitude toward work, dependability, quality of work, punctuality, attendance, and, also, overall performance. This evaluation after the conclusion of the work-period, is passed on to the coordinator of the program. A student also provides his perception of the work assignments he was given.

Figure 3.4(c)

Practice School Schedule, BITS, Pilani



S=Study on-campus, PS-I= Practice School I, PS-II= Practice School II, Su Vac=Summer Vacation, Su=Summer.

With this information, coordinator is able to obtain a measure of the student's progress on the job as well as his scholastic attainment. Comparing this with his academic grades, the coordinator can judge, at least grossly, whether the student has successfully combined the theory of the class room with the practical experience of the professional world.

Some universities, one such is Northeastern University, require that the student periodically complete project reports on their cooperative work experience. These reports provide the coordinator with additional information to make certain that the student is advancing in line with his ability.

No academic credit is given for cooperative work. Only satisfactory performance on the job is considered a requirement for the degree. Every cooperative work period must be completed to the satisfaction of the university.

In the British context too, faculty from institution visits industry twice/thrice in each industrial period. The students are assessed by institution and industry. Reports by the employer, academic staff, and by the student himself are usually integral parts of the total assessment. To give one example, allocation of marks can be :

extramural course work	10%
written report	30%
oral report	10%
employer's report and training	30%
visiting tutor's report	20%

No student is permitted to proceed with the course if unsatisfactory reports are received on his training. These reports are put in the examiners' meeting. The gradings are mostly qualitative in nature.

Numerical gradings have also been tried at Salford, and were readily accepted by industry. Academics has a feeling that it is impossible to assess different students doing different work in different places. Numerical assessment does exist in some departments of Bradford, Loughborough and Surrey. In some universities the assessment is one element in deciding the level of degree awarded; passing leads to an award additional to the degree. Universities Committee on Integrated Sandwich Courses (UCISC) produced a detailed qualitative assessment model, and also made proposals for a five-grade quantitative assessment over eight parameters of student performance. The latter, however, led to simple pass/fail judgement. Experience during the Salford trials indicated that the very great majority of students (perhaps all) pass on this UCISC scheme. UCISC concluded that quantitative assessment presents certain (not insuperable) difficulties, but, that, in any case

assessment of industrial training is to make clear to all concerned that the universities do take industrial training seriously.[8]

Coming to the Indian context, in Practice School, at BITS, Pilani, the PS courses seek out and focus attention on many latent attributes which do not surface in the normal class-room situations but at the same time which are a must for survival and growth in the real-life work-situations, e.g., intellectual ability, team work, leadership, initiative, professional judgement, common sense, problem-solving ability, punctuality, ability to meet deadlines, ability to communicate through oral and written presentations, etc. These personality traits are evaluated with the help of various components of evaluation written as well as oral, viz., Quiz, Viva, Seminar, Group Discussion, Project Report, Observation and Technical Diary.

In PS too, the BITS concept of internal and continuous evaluation is followed and at the end of PS courses the students are awarded grades based on their total performance and these grades are directly incorporated in their CGPA and respective transcripts.

The students' evaluation is done by the Institute faculty who is permanently resident at industry (as in PS-II) or the one who accompanies students for the total

duration of PS Program (as in PS-I). The supervisors/ professional experts from the host organizations also participate in evaluation.

The Institute also issues an additional PS Transcript which gives grades, the details of the work carried out at industry during PS-I and PS-II and, also, qualitative rating of various personality traits.

At BITS, Practice School is optional to all students of integrated first degree programs (but almost all students opt for it). The work-periods do not increase the length of a program. Also, the evaluation in PS is continuous and internal and directly incorporated in the passing out scores of students. It is in this sense that PS constitutes an integral part of education at BITS.

3.6 An Appropriate Model of UIL Program

Value-systems, Techno-economic environments, Social norms and characteristics, problems and needs are different from country to country. Thus, different countries develop or adopt different models of UIL.

In a developing country like India the resources are scarce and, thus, to be optimized. Education needs to be relevant as lots of time, money and effort are involved and cannot be wasted away. UIL is one of the answers. Some principal objectives of such a program are to be:

(1) To help students gain practical experience.

(2) To enable students to develop knowledge and skills beyond those available in the classroom.

(3) To develop students' abilities to work with others and their leadership quality.

(4) To allow students to improve working habits and behaviour patterns essential to the world of work.

(5) To help students develop accountability for their decisions and actions.

(6) To allow students to apply previously learned knowledge and skills to the job.

(7) To foster students' decision making ability.

(8) To foster students' abilities to work independently.

(9) To further the development of students' oral and written communication skills.

(10) To increase students' analytical skills.

Almost all the models of UIL discussed hitherto have most of the aforesaid points as their objectives. They also have "To provide a source of financial aid for students" as one more objective which cannot be considered as an objective as the work-periods are aimed to be an integral part of the total education. However, if industry pays, it should be welcome for students work

on real-life problems of industry and contribute in its activities.

The development of stated skills and traits in a student cannot be achieved in the normal classroom situations whereas they can easily and more readily be developed while they work on open-ended problems in industry's uncertain situations. Students would feel more responsible if their working contributed in the on-going, real-life activities of industry, rather than if they worked on the projects of no significant bearings on the working of industry.

In order to minimize the wastage of time, money and effort involved in education, there is a need of a model which does not lengthen the duration of a degree program significantly and incorporates work-period within the duration of the degree without sacrificing much of class-room time needed to impart the adequate quantum of knowledge required for a degree.

Thus, the first thing to look into is the time-period, in the degree duration, which needs to be earmarked for the work-period in industry.

A look at the patterns discussed in Article 3.4 shows that, in sandwich courses, the minimum of 6 months and the maximum of 24 months are spent, by students, in

industry, in 4 year programs, i.e., about 13% to 50% of the total degree duration. And, in cooperative education structures, in which work-periods do not lengthen the 4 year duration, 9 to 12 months are for industry, i.e., 19% to 25% of the total degree duration. Whereas, the patterns in which the total time, because of the cooperative education program, is increased to 5 years, 18 to 24 months are spent in industry i.e., about 30% to 40%.

The total course requirement of a broad-based degree program would include core science courses; core mathematics courses; core engineering science courses; core technical arts courses, like graphics, workshop practice, computation techniques, etc.; core application oriented courses, like optimization techniques, operations research, etc.; some humanities courses; discipline courses; and some of the (optional) specialization courses. To impart the minimum amount of knowledge necessary, it is visualized that, the study on-campus will consume almost all the time available. So, in order to incorporate an industry-period, in this total duration of 4 years, the study-time on-campus has to be squeezed. But this squeezing does have a limit.

Thus, in order to arrive at a judicious mix of study and work-periods, it is estimated that, it may not be possible to snatch, for work-period, more than 15% to 20% off the total duration of degree available. So, it seems that about 7 to 9 months' time in industry would be adequate.

As a student would be working on real-life problems, in industry, it is expected that he joins a work-bench after completing his total course-requirement, or atleast all courses but a few optionals. Therefore, the assigning of work-period at the end of the program seems to be more appropriate.

While at industry, to enable a student to devote all his time to problem solving, it is necessary that he is familiarized with or given an idea of or exposure to industry or a real-life work-situation before hand. Therefore, it seems appropriate to expose students to industry atleast once before the final placement for the development of problem-solving behaviour. Certainly, the first placement would be of shorter duration than the final.

Further, for this first exposure to industry, a student would be required to have basic knowledge of science, mathematics, technical arts, computation, etc. in order to be able to understand and appreciate the industrial activities and, also to be able to participate in some of the on-going activities. Thus, it is visualized that this placement to industry takes place after, say, the first two years, for about two months. By this time it is expected that his study program would take care of the core science, mathematics, engineering science courses. For this, the time of summer vacation after the second

year could well be utilized without affecting the normal academic schedule.

The second placement in industry would fall in the final year, toward the end, for about 6 months.

Keeping in mind the advantages like better utilization of facilities both at institution and industry, continuity of the work-force (students) at the work-bench, optimal utilization of faculty both on-campus as well as off-campus, etc., the concept of pairing seems to be the best suited for the final placement. So, in the first half of the final, i.e., 4th year, one half of students attends study on-campus, while the other half goes to work-bench. And, in the second half of the year, these two groups exchange places.

These two components of UIL program would be called as Work-Period I (WP-I) and Work-Period II (WP-II).

Thus, the Practice School model followed by BITS, Pilani seems to be quite an appropriate model of UIL program.

CHAPTER 4

UIL EDUCATIONAL STRUCTURE

4.1 Introduction

This chapter attempts to present an educational structure for UIL in terms of process of education in UIL, the subject matter of education in UIL, i.e., the content, and the mode of operation in UIL education.

At the end, the chapter attempts a model of structure of education in UIL.

4.2 Educational Process in UIL

The educational process, in UIL method of education, would be different from the narrative approach followed within the four walls of classrooms on-campus. It would be experience-based cognitive process of learning and teaching operative in the very way of life, thus, making education student - centred, as well as environment - and circumstance - oriented. The attempt would not merely be to further student knowledge in a given codified orthodoxy (as in the classroom). It would not be only the development of certain specific skills but to train him in the art of participating and effectively contributing in the on-going activities of industry through the real-life problem - solving effort.

Basically, process of education in UIL is cultivating in students appropriate attitudes and analytical skills by pursuing project method of education and using the contemporary, day-to-day developmental activities of direct interest to the professional world.

In this process, the essence of the academic regulations and the details of education and research at university will have to be amplified in classrooms and at industry. Experiences gained at industry can be abstracted to improve upon the classroom education in university as also the structure of programs.

The first component of the work-period (WP-I, as abstracted in Article 3.6) be used to introduce students to various topics/concepts which need application of fundamentals and analytical tools acquired by them during foundation years. In the process, they would also get to know the profile of the host organization in terms of scientific, technological, managerial, economic and communication aspects.

This component constitutes students' first exposure to real-life situations so necessary for subsequent problem-solving experience in the second component of work-period (WP-II, as abstracted in Article 3.6). During the first component, students are first initiated and oriented toward professional activity.

For Engineering students, this would mean detailed understanding of vast engineering operation as well as introduction to the theme of industrial infrastructure and development defined in terms of problems such as inventory, productivity, management, industrial relations, information systems, wage administration, etc.

For Science students, this would mean exposing them to the integrated theme of science in terms of how science aids man, and, at the same time, provides them with an excellent opportunity to study science in action. Further, it creates an awareness amongst students about the method of scientific experimentation and study, and handle some of the costliest scientific equipment which a university cannot normally possess.

Management and Economics students could utilize this period for the study of technological operations, and, during the process, expose themselves to the problems of industrial management. Further, students could get an opportunity to observe groups of management, economics, operations research, statistics, and engineering experts working on economic problems at micro as well as macro levels.

For Language and Communication students, the educational process would be providing an opportunity to study various facets of modern journalism (sub-editing, writing

news items and editorials, etc.), text-book writing, scientific report writing, display of exhibits, audio-visual medium, etc. In other words, the emphasis would be on application of language.

The students would attend WP-I during summer after 2 years of classroom studies when they are supposed to have completed the fundamental core courses of science, mathematics, thermodynamics, language, optimization techniques, workshop, graphics, computer programming, operations research, etc., and possibly have not started their discipline courses. Therefore, it is not expected that they participate actively with total imvolvement in the problem-solving effort. Thus, this period can best be utilized by exposing the students to the entire activity of the organization and small assignments can be given, may be, in terms of documentation, collection of data, study of organization structure, and production process, etc.

The student's education in the second component, WP-II, would be in terms of his involvement in the problem solving efforts of direct interest to the host organization. The process of education during this work-period is to be in terms of working on the real-life problems of industry. Such problems, in any industrial unit, are not, normally, confined to a particular discipline but they are multi-disciplinary in nature. Some of these problems are the ones

on which teams from the organization are already working and some of the problems could be the ones which are of immense use to the organization but are not taken-up. Students could be attached to the teams already working on some problem or a team of students from various disciplines could be formed depending upon the nature and requirements of a problem, in consultation with the organization. The problems assigned to students should be such that they can be completed during the work-period. In case the problems need a longer duration than that of a work-period, they can be divided into sub-problems and assigned to successive teams from successive batches.

These problems, or sub-problems, henceforth, will be referred to as projects/assignments.

In concrete terms, the UIL process of education establishes so called classrooms in the professional world-production and manufacturing units; engineering design, development and consultancy agencies; national research laboratories; social science planning cells; banks; centres for science communication; science and technology museums; publishing houses; the rural backdrop as represented through a village; etc. The immediate locale in and around the campus could also be used for the purpose, in order to make education more fruitful to society.

Organizations like National Cadet Corps, National Service Scheme, etc., can too be used for such linkages.

4.3 Contents

The subject matter of education in WP-I of UTL can, essentially, be in terms of assignments/lead questions/ tasks providing students the first exposure to the activities of the professional world and then systematically studying the nature of real-life-problem complexes. The WP-I should normally be conducted in large units.

The students attending WP-I are supposed to be unaware of industry and the activities thereof and probably are going to it for the first time. They have no idea of where to go, what to see, what to know, how to know, etc.

So, the objectives of 'information collection ' and this ' first exposure to the professional world ' can best be achieved by giving students some lead questions, e.g., What are the various products of the unit ? Who are the customers of these products ? What are the future estimates of demand ? What are the various raw materials used ? What are the sources of raw materials ? Manufacturing process ? What is the capacity of the plant ? What equipment breaks down the most frequently and why ? How many work shifts are there ? How is the inventory managed ? Is there any quality control? What is the structure of the organization ? How effective is the information system of the management ? How active is the Research & Development department/section in the unit ? Is there any concept

of waste management also existent ? And many more.

The study questions can be classified broadly in various areas, say:

Product survey; Product specifications; Raw materials; Production plant and equipment; Piping, valves, pumps and motors; Capacity utilization; Inventory control/management; Quality control; Organizational structure; Management information system; Business communication; Research and development; Materials of construction, Instrumentation and control; Waste management; Engineering design and development consultancy; Design decisions (regarding, say, plant size, site location, transportation route, site layout, basic plant design, plant site, plot plan, plant layout, township, foundation, superstructure, etc.); Design calculations; Utilities; Drawing and map reading; Project engineering; Infrastructural facilities; Plant economy; etc.

Some significant lead questions, identified under various areas described above, are given in Appendix II.* These lead questions are mainly for production and engineering design and development consultancy types of organization. Similar lead questions can be developed for other types of organization also.

Students should collect answers to these questions which would ensure a good exposure to the organization.

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* P.S.I Check List: Booklet given to each student going for his PS-I Programme.

This would constitute a part of WP-I. For the remaining period, students can work on some small, specific assignments of direct interest to the host organization.

In WP-II, the students are engaged in the problem-solving effort. The collection of assignments which change from organization to organization, student to student (in an organization), and semester to semester (in an organization) would make up the contents of this work-period.

4.4 Educational Structure

Keeping in mind the nature of the linkage and its requirements, it is visualized that a broad-based, interdisciplinary, integrated, and flexible system of education would be the most appropriate to achieve the stated objectives. This broad-based, interdisciplinary and integrated knowledge would prepare a student adequately for, firstly, gaining a good exposure of industry and its complex activities and, secondly, contributing, in his own way, to the ongoing activities of the host organization.

The semester-system, in education, over the traditional yearly - system, has its own advantages, in general, and, also, it will be advantageous in UIL, as the duration of WP-II would be about the duration of a semester.

The internal system of evaluation, in education, is more realistic as a teacher only can be the best judge of his students. The academicians, from time-to-time, also

have been advocating this point. In UIL, where students are continuously working on the ongoing activities of industry, the internal system of evaluation only would meet the requirement of evaluating students in terms of their personality traits.

Continuous evaluation gives the student a large number of opportunities to exhibit himself and be evaluated. It encourages and rewards continuous and systematic study. It provides a continuous feedback to the student as to where he stands, thus, enabling him to cultivate regular habits of study and learning and correct himself for the future. Therefore, in UIL, the evaluation is required to be continuous also.

Thus, the system of education for UIL is visualized as broad-based, inter-disciplinary and flexible having an organic and a highly purposeful linkage with the professional world. Studies would be based on the principle that a series of courses make up the hierarchy of the structure where each course is self-contained but nevertheless acts as a bridge between what precedes and what comes after. The attempt would be to awaken curiosity in the mind of the student and train him to think rationally and scientifically and enable him to face the unfamiliar. Through the work-periods at industry, the flavour of the professional world would be sought to be imbibed by the

student.

Coming to the structure of education, for WTL, it is visualized that the first two years (of a 4 - year degree program) are spent by all students on-campus, in classes, studying the foundation-year courses comprising science, mathematics, humanities, technical arts, engineering science, etc.

The third year is also to be on-campus for professional departmental courses and application oriented courses.

In the fourth, i.e. the final year, students will spend one semester on-campus studying some specialization courses.

The work periods (WP-I and WP-II, as described in Article 3.6) are incorporated, in the aforesaid program, after the second year during the summer vacation (WP-I) and in the final year for one semester (WP-II).

To avail of the advantages of 'pairing' (as already discussed in Article 3.6), in the first semester of the 4th year, one half of students be assigned to work-bench while the other half to study on-campus. And, in the second semester, these two groups exchange places.

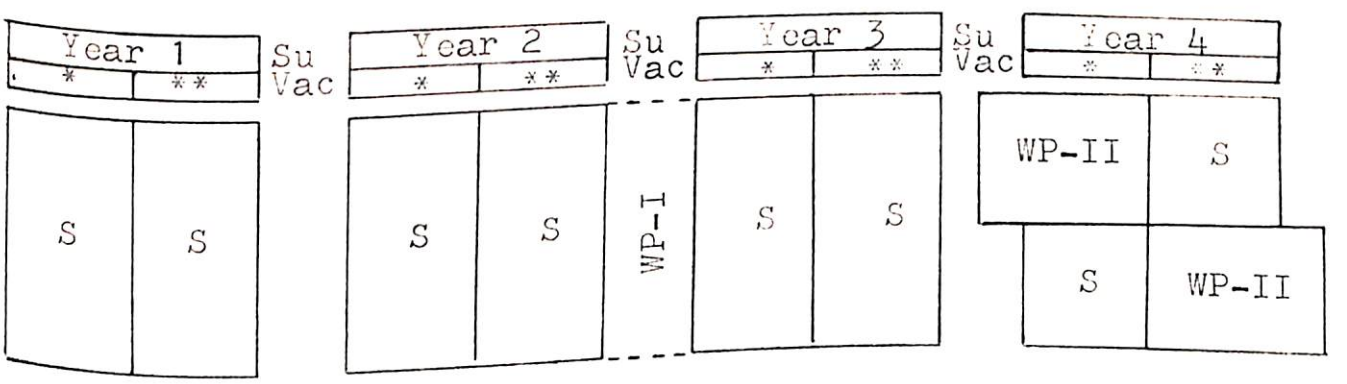
As already discussed, this work-period is to be of 5½ months' duration and, therefore, it will spill over

(for about a month) into the adjoining summer.

The structure as abstracted from above is given in Figure 4.4.

Figure 4.4

Operational Structure of UIL Education



* I Semester, ** II Semester, Su Vac= Summer Vacation, S= Study, WP-I= The first component of the work-period, WP-II= The second component of the work-period.

CHAPTER 5

PLANNING FOR UIL INSTRUCTION

5.1 Introduction

Planning is the most basic of all managerial functions. Since the future is uncertain, without planning things are left to chance. Changes-economic, technological, social, etc.- bring opportunities, but, at the same time, they bring risks too. Planning minimizes risks.

This chapter attempts to present a planning mechanism for UIL instruction, starting with a conceptual idea of the planning process. The concept of planning for UIL instruction is contained in deciding in advance, that is, looking into the future, anticipating it, and attempting to influence it through anticipatory decisions so that the desired objectives are achieved with maximum possible efficiency and effectiveness.

5.2 Process of Planning

The process of planning requires selecting institutional objectives and divisional goals and determining ways of achieving them. Plans, the results of planning, thus, provide a rational approach to the set objectives and goals.

Conceptually, planning is simply a rational approach

to the future. Harold Koontz and Cyril O' Donnell[1] have described this process graphically as in Figure 5.2.

In the figure, progress is taken along the Y-axis and time along the X - axis. The point A indicates where we are at time t_o, initially, and point B indicates where we wish to be at time t_f, finally. Since we should study where we are in advance of t_o, we may actually have to start our study of the future at A_1 (at time t_s, i.e., at some point of time before t_o). The fitting line AB indicates the decision path, i.e., the plan of action, which will take us from A to B.

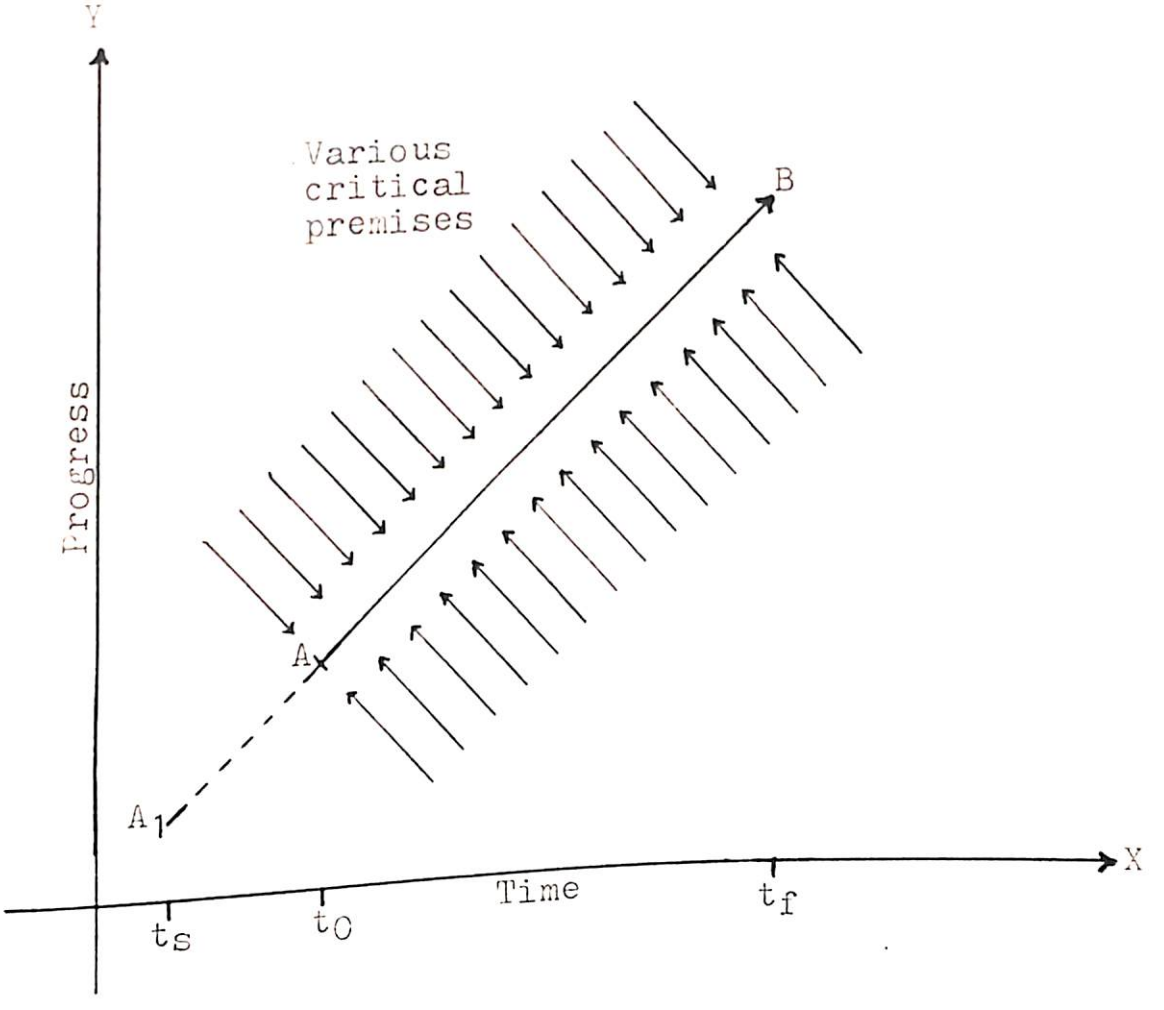
If the future were completely certain, the plan of action would be relatively easy to fit. However, in reality, a myriad of factors in the environment in which a plan is to operate may push events away from the desired goal. Further, because it is not easy to forecast or consider every aspect, we try to develop our path from A to B in the light of the most critical premises.

The essential logic of planning applies regardless of the time interval between t_o and t_f. However, the clarity of premises, the attainability of goals and the lessening of other planning complexities are almost certain to be inversely related to the time span.

In the planning process, normally the following steps are followed:

Figure 1.2

Process of Planning



(a) Forecasting - an intelligent and informed estimating or predicting of the future (internal and external) environments.

(b) Establishing objectives - stating what/where one intends to be in the future.

(c) Determining alternative courses of action - in terms of strategies, policies, procedures, schedules, methods, standards, budgets, programs, and projects - instruments and content of planning. This step is also called "Determining means for achieving the stated objectives".

(d) Evaluating alternative courses of action - analyzing alternative means and weighing various factors.

(e) Selecting a course of action - adopting a suitable plan.

(f) Formulating derivative plans - developing supportive plans required, e.g., manpower plan, finance plan, communication plan, etc.

5.3 Planning for UIL

Planning is a continuous process. In University - Industry Linkage Program, planning, in a university, begins with the admission of the student to the university, his study on-campus, placement of the student in industry and his education and learning there. This

planning ends only with student passing out of the university. Basically, planning revolves around the student.

Planning for UIL would basically mean planning for Work-Period I and Work-Period II which would include planning for placement of students at the work-benches, implementation of UIL instruction, evaluation of students, and, also, for monitoring of all the activities and the progress made at the work-stations.

5.4 Planning for Placement of Students at Industry

To impart education in UIL, with the set objectives and goals, the first task is to place students at the work-benches, which needs a tremendous amount of planning, whether it is WP-I or WP-II. Ofcourse, some of the requirements and constraints for placement, in these two work-periods may be totally different but, basically, the premises remain the same.

The placement of students at industry would include the following main activities:

* identification and finalization of the eligible students;
* identification and finalization of organizations to hold work-periods;
* identification and finalization of faculty to conduct the program;
* allotment of students to various organizations; etc.

5.4.1 Identification of eligible students

The task of identification of eligible students is to be performed as per the academic rules and regulations of a university. In case UIL Program is made optional, the first task would be to enroll students, in the program, who would be opting for it. Otherwise, the whole population of students of the second year is the probable group who would be attending the first component of the program, viz., Work-Period I (WP-I). This group of probable students should now be checked for their eligibility, as per the academic rules and regulations of the university, to attend WP-I. These rules and regulations would be spelling out the prerequisites or conditions to be fulfilled for attending WP-I. After checking the eligibility, a list of eligible students, who would be attending WP-I during a particular summer, be finalized.

Work-Period I is exposure oriented while Work-Period II is oriented towards problem-solving efforts. Therefore, the eligibility criteria for WP-II would be more demanding. As mentioned in Article 3.6, the appropriate time for WP-II is in the second semester of the final year, i.e., after the completion of all the course work.But, as further mentioned therein, half of the students would be attending WP-II in the first-semester and half in the second. Thus, keeping

the set objectives of WP-II, as well as the aforesaid, in mind, it is natural to conclude that the minimum eligibility for attending WP-II has to be that a student has completed his WP-I and, also, all the course-requirement except, possibly, a set of electives, whereas, for WP-I, a student should complete the foundation-year courses.

The point of eligibility checking for WP-II will come-up only after the identification of the group of students who would be attending WP-II in I or II semester of their final year. And, therefore, the planning process for placement of students in WP-II has to start well in advance, say, when a student is in his 3rd year itself.

The steps in that direction would be identification of students who would be eligible to attend WP-II in the next year; dividing the students into two groups to attend WP-II in I and II semesters, respectively, as per their choice, physical facilities available at stations and the university system, their convenience & resources; updating the eligibility of students, who have been earmarked for WP-II in the first semester of their 4th year, in their second semester of 3rd year; and, finally, again checking the eligibility of this group after the declaration of their result of second semester of 3rd year.

5.4.2 Identification of work-benches

Another step towards the placement of students is the identification of the industrial organizations and the numbers of students that can be accommodated by each of them.

For WP-I, a university has to first make a list of suitable industrial units. These organizations should be contacted for providing facilities required for conducting WP-I for a desired number of students. A host organization should be so chosen that the philosophy and the rigour of the program can be maintained.

On receipt of approval from the organizations contacted, keeping in mind factors like overall economy of operation, facilities provided by organizations, number of students to attend WP-I, number of faculty members available to conduct the program, an apt faculty - student ratio, etc., the list of stations be finalized.

Coming to WP-II, it may be noted that these stations are to run round the year with students changing after every six months. Therefore, these stations should be so chosen that they have project-based work semester-after-semester, for years to come. And, also, they are able to accommodate an adequate number of students. It is expected that

these organizations would also be having multidisciplinary projects and they would be able to accommodate students of more than one discipline.

The organizations should have a clear understanding of the philosophy and objectives of the program and their decision to hold the program be a long-term decision so that the program runs continuously with full cooperation from all quarters.

As mentioned earlier, since the students would be working on the projects in the organization and contributing in their activities and growth, it is natural to expect that they will reciprocate by offering certain basic facilities of desks, stationery, office-help, also, some stipend, and/or accommodation. The payment of stipend would not only motivate but also bring a sense of responsibility and commitment as well as give a feel of professionalism.

Keeping the aforesaid points in mind and, also, an average number of students going to WP-II each semester, the stations are to be identified and finalized.

5.4.3 Allotment of students

The step of actual placement of students at industry would take place after the finalization of list of eligible students to attend work-periods and also that of industrial organizations to host

the program.

The allotment of students is not a random process but it is the matching of students' disciplines; their academic performance; their professional interests; physical facilities available at the stations; the academic needs and requirements of the projects at the stations; and, ofcourse, students' preferences for the stations. Certain genuine, personal problems of the students may also be considered.

Matching of a challenging and need satisfying experience for students and the satisfaction of industry need for capable workers to work on their assignments would be a successful placement.

Thus, this allotment (the so called matching) would be quite a detailed process and would require various sub-activities to be undertaken before coming to the actual placement.

Coming to allotment in Work-Period I, it is required that information on the following be collected from the students and/or students' record files : total academic performance upto the end of second year, discipline, extra-academic work done, preference for each station, (whether they have their own accommodation or can arrange one at the stations (i.e., in the cities where the work-stations are situated) and also their genuine problems,

if any.

After collection of information, an analysis of preferences for each station be made. This analysis would be in terms of number of students from a particular discipline giving a particular preference to that station. This would generate a "preference-discipline matrix" for each station.

Quota fixation

Considering this "matrix", as well as, the requirement of a station in terms of the number of students and disciplines which can be accommodated at that station and, also, the number of students from each discipline available, the number of students from each discipline to be alloted to that station be fixed. This step shall be referred to as "quota fixation".

The process of actual allotment would come after quota fixation. For this purpose, a discipline-wise list of students in descending order of their academic performance (upto that point of time) be prepared and the station allotment be made as per their preferences and quota fixed for that discipline.

The genuine, personal problems be then looked into and be accommodated, if possible, and necessary modification(s) in the allotment(s) be made.

The student allotment in the second work-period

would be much more elaborate as the educational requirement is much more demanding and the students' backgrounds (in terms of courses done) are different which is not the case in the first work-period. Also, in this work-period, the so called matching would be basically the matching of students' academic profiles with the projects available at the stations. Therefore, in addition to the sub-activities defined in WP-I placement, there would be two more major sub-activities herein, viz, preparation of students profiles and the collection of projects from stations on which students would be working.

After the completion of WP-I during the summer after the second year, the students would be attending minimum of two study periods on-campus, in their third year and, in the fourth year, half of the students would be going for WP-II in the first semester and the rest in the second. Therefore, immediately on returning from WP-I and joining studies in the first semester of the third year, the students be asked to furnish Bio-data in terms of age, discipline, permanent address, academic performance (i.e. latest percentage/grade point average), course-wise performance, WP-I (performance and project done), languages known, extra-curricular activities, professional interests and aspirations, and, also, the semester-preference for WP-II. Some of this information could be easily obtained from the students' records.

Semester allotment

This set of students can be divided into three mutually exclusive sub-sets : (i) students who can go to WP-II only in the second semester; (ii) students who can, or have to, go to WP-II only in the first semester; and, (iii) students who can go in either semester. It is possible that the first or the second, or both the sub-sets are empty.

The first sub-set of students is to be alloted the second semester and the second sub-set the first. Now, based on the university's convenience of course-offering, students' preferences, and the expected requirements of stations, the third sub-set of students could be alloted either of the two semesters so that about 50% of the total population of students is in the first semester and about 50% in the second. It may also be seen that, in each semester, as far as possible, there are about 50% of students from each discipline. This step would be referred to as "semester allotment".

Profile preparation

The group of students who are alloted the first semester should be checked for their eligibility after the start of the second semester of the third year. Using the information collected, profile of each eligible student be prepared. This profile normally should have information in terms of : name, address, latest

percentage/grade point average, course-wise performance, performance and work done in WP-I, languages known, extra-curricular activities and professional interests.

This profile is a unique attempt and would serve many purposes. Firstly, it would help the organizations in knowing the type of input available for the ensuing semester so that they can identify projects. Secondly, it would also help the faculty stationed at the organizations to know academic background, professional interests and the permanent addresses of the coming batch of students. This will further help the faculty to identify and allot the projects related to their professional interests. Thirdly, at the university, it would help authorities to properly match the students with various projects and, thus, allot them the stations.

The compiled profiles of the students be then sent to the organizations and also the faculty stationed there so that they can properly identify the projects for the coming batch of students.

Problem Bank

The details of the projects, so identified, in terms of title, objective, nature, number of students and the type of input required and the expected duration (a PERT chart would be helpful) be collected from the station by the university through the faculty.

This set of projects so collected would be referred to as "Problem bank of (name of station)". And, the union of problem banks of all stations would be referred to as "Problem Bank" for that semester.

An abridged version of this Problem Bank containing titles, objectives, and natures of the projects be either distributed or displayed to the students earmarked for WP-II in the coming semester. Also, the students be given a preference form for indicating their preferences for each station, as well as, preferences for projects at each station, discipline, latest academic score and details of extra-academic work done. The personal problems, if any, may also be furnished by the students.

In addition to the display of Problem Bank, certain pertinent information about the organisations be also displayed. This information should contain addresses of organizations; library facilities there; accommodation facilities there; and facilities like subsidised lunch/ tea, out-of-pocket allowance (if any), etc. This general information would help students decide their preferences.

The 'analysis of preferences' and 'quota fixation' for stations be then made in the same way as described in context of 'allotment for WP-I'.

Allotment of students for WP-II is to be done as per their preferences, but, after seeing critically if

a student is fitting in a project at the station. This matching will take care of students' preferences as well as the requirements of the projects.

Accommodation

Universities are likely to face the problem of lodging and boarding of students at work-stations as all the work-stations will not be in close proximity of campus. And, the students will not always be having accommodation in work-station cities. Therefore, the universities will have to decide about their approach to this problem.

There seem to be 3 possible solutions to this problem. Firstly, the universities take full responsibility for providing accommodation at work-stations and, of course, students bear expenses. Secondly, the universities do not take responsibility for arranging accommodation but assist those students who are not able to arrange any. Thirdly, and lastly, the students are left to arrange their own accommodation.

The first solution is possible in one of the following ways:

(a) There are many organizations which run their training programs, so, they might be having some hostel facility for the trainees. Some organizations also have staff quarters. In this case, universities can have an

arrangement with the host organizations for accommodating students in either the hostel or one/two of the staff quarters. These accommodations may be free of cost or on rent, as per the organizations' norms.

(b) Universities construct hostels in the cities of work-stations. It seems to be a good idea but economically not feasible as, in case of WP-I students, they will be occupied only for two months in a year and, secondly, the work-stations are temporary in nature (they may continue next year, they may not). In case of WP-II, the stations may be more permanent in continuity but the students at a particular station may have their own accommodation. Therefore, this way also does not seem to be economically feasible.

(c) Universities hire some houses/flats in various cities. But, then, the same reasons as given in (b) hold good in this case also and this also may not be economically feasible.

Thus, it seems that the idea of universities taking full responsibility for providing accommodation to students at work-stations is not viable for all stations. It is very much possible only where the host organizations have and can be requested to provide accommodation to students.

If we look at the nature of WP-II and, also, note the fact that, except for this period, the students have almost graduated and after a few months they will be

leaving universities to join the professional world, it seems logical that the students are left to search for their own accommodation. But, in case of WP-I, this argument does not hold good and, therefore, it is not desirable that the universities take the approach of 'no responsibility'.

Thus, even the third solution seems to be impractical and, hence, not adoptable.

So, it seems logical that there be different approaches, to the problem of accommodation, in WP-I and WP-II. For WP-II, the approach would be to ask students to arrange their own accommodation and, certainly, if possible, the university helps them in this venture but it is to be entirely students' responsibility. It would be a bonus that the students of some organizations, which provide accommodation, will not have to bother for it.

In WP-I, it should be ensured that students have accommodation at work-stations. It can be easily done, by universities, without any financial burden on them, by considering it as one of the variables at the time of allotment. Firstly, only those stations which have provided accommodation or are ready to help in arranging it should be shortlisted. Secondly, the students should be asked to specify in their preference forms if they have their own accommodation or if it can be arranged by them, at each station. The allotment then

can be done, as per the preferences, subject to the condition that a student has either his own accommodation or provided/arranged by the host organization.

In this process, two things may happen:

(1) An organization may not get alloted to any student for neither the organization provides or is able to arrange any accommodation facility nor the students have or can arrange. In such a case the organization may be dropped.

From this, it emerges that, at the time of deciding the number of WP-I stations and the seats therein, the seats should be about 5% more than the number of students for WP-I. So that some stations can be dropped easily.

(2) A student may not get alloted to any station because of his preferences and the accommodation factor. Such cases, hopefully would not be large in number and could be decided on a case-by-case basis and, by relaxing some of the constraints, could be accommodated in organizations which have accommodation.

In order to take care of some unforeseen situations like strike and lockout at some organizations, it is desirable that some organizations (especially those providing accommodation) are not fully alloted and the affected student are shifted to them, if the need be.

5.4.4 Identification of faculty

As mentioned in Article 4.4, the evaluation of students in work-periods would be done on a continuous, as well as, internal basis. Also, in order that the day-to-day, routine matters of the program do not become a burden to the host organization, it is necessary that evaluation and other routine matters are the responsibilities of the university faculty which, now, would be referred to as "work-period faculty" (WP-faculty). Therefore, a member of faculty is to be associated to each organization.

For this purpose, faculty members are to be identified and matched with the organizations. In order to attempt this exercise, what is expected from the faculty accompanying the students is to be seen and decided first. In other words, the role of a work-period faculty is to be defined.

Role of faculty

The role of a work-period faculty (WP-faculty) is seen as multidimensional. Apart from the job of liaison between the university and the host organization, the major tasks of the faculty would include:

(a) To conduct the UIL program, as per the academic rules and regulations and execute day-to-day tasks.

(b) To ensure that students work sincerely, to the best of their capacity and to the satisfaction of the organization.

(c) To maintain students' attendance.

(d) To ensure that students do not unnecessarily take professionals' precious time.

(e) To arrange a meeting of students with the professionals when they are in dire need of consultation.

(f) To send periodic progress/information as per the requirements of the university.

(g) To help students with their projects in whatever way he can.

(h) To evaluate students for their personality traits through various components.

(i) To see that students maintain discipline and follow the rules of host organization.

(j) To act as local guardian of students at the work-station.

The role of faculty as conceived above clearly indicates that the faculty would not be fully involved in the actual guiding of the projects. Also, the evaluation of students for their personality traits does not require the faculty to have complete knowledge

of the projects or the related topics except when he is evaluating depth of knowledge in projects or the related areas as well as credibility of the projects. The actual guiding of the projects as also evaluation of students' depth of knowledge and credibility of work are expected to be done by the professional experts. The other tasks of the faculty can be performed by a faculty member irrespective of his own discipline.

This suggests that it is not necessary to attach a faculty of a particular discipline to a particular organization. But, if possible, it would be more advantageous.

The faculty, in general, do not have any assignment at the university and are on vacation, during summer. Therefore, a university will not have any difficulty in identifying faculty for WP-I. For this purpose, the university can enquire availability, from each member of faculty, during the coming summer.

The university can then identify the required number of faculty members either by dropping some of the willing, or by exploring again or detaining some members, as the case may be.

The nature of work to be done by WP-faculty, at a station, does not demand daily presence of the faculty at the station. Therefore, if the number of students is small (say, 5 to 10), a single faculty can easily manage two such stations in the same center by attending them on

alternate days.

Therefore, if the need be, a faculty may be assigned two work-stations with small numbers of students. In such a case, it is suggested that the faculty be provided with an assistant to take care of daily, routine tasks, at a station, during his absence. So, the faculty and his assistant will be sharing the two stations between them by alternating.

This assistant could be easily chosen from among the final year students who are through with WP-I and are willing and capable of doing the job. This would also help these students gain some experience and earn some money.

Then, each member of faculty will be assigned WP-I station(s). This assigning may be done in the manner as decided by a university.

In order to take care of certain needs of faculty during summer, it is suggested that the preferences of faculty may also be considered. It is further suggested that since a university has to bear the expenses of his accommodation, as he is on duty, it will be economic to assign a member of faculty a station where he has his own accommodation and the university will not have to bear this expense.

The assignment of faculty to WP-II stations is not

all that simple for WP-II runs throughout the year, semester-after-semester and the faculty deputed there is not available on-campus for teaching. Also, the faculty who is going for WP-II, i.e., for a semester, would be normally taking his family along. Therefore, because of his children's education, his assignment has to be for the duration(s) of academic year(s).

So, the university has to identify a number of faculty members who can be easily relieved from the teaching assignment on-campus. This should not be a problem to a university because if the WP-II students were to remain on-campus, it would require some faculty to take their courses. Therefore, the university should identify the required number of faculty members from different disciplines and depute them to different stations. In this case, if possible, university can consider the faculty's preferences for stations. It is appropriate that a faculty be associated with a station where the activities are close to his discipline, however.

If a university is unable to identify the required number of faculty, from among the existing, for WP-II, then it has to either recruit faculty for on-campus and place them at the work-stations or recruit them locally. This local appointment could be either regular or term-appointment.

5.5 Major activities for WP-I and WP-II Planning

This section identifies the set of major activities involved in the planning for placement of students in WP-I and WP-II. Also, an attempt is made to present them in networks. The time of each activity given in Tables 5.5(a) and 5.5(b) is an intelligent guess and is the most liekly time.

By fixing the last dates for the 10th event for WP-I (in Figure 5.5(a)) and the 12th event for WP-II (in Figure 5.5(b)), as the last date of each semester is known, a suitable date for starting the placement process can be traced back.

In order to allow sufficient time to students and faculty to make the required arrangements for travel accommodation, etc., it is desired that the events 10th (Figure 5.5(a)) and 12th (Figure 5.5(b)) are accomplished about 3 to 4 weeks before the semester closes.

Major activities for WP-I planning

A. Identification of eligible students:
   1. Enrollment of students, if required.
   2. Checking of eligibility.
   3. Finalization of list of eligible students.

B. Identification of work-benches:
   1. Contacting suitable organizations.
   2. Finalization of the host organizations.

C. Allotment of students:
   1. Collection of information and preferences from students.
   2. Analysis of preferences for each station.

Table 2.2(a)

Interdependence and Time Estimates of Major Activities for Job Placement Planning

Activity	Depends upon	Activity-time *
A_1	-	1
A_2	A_1	1½
A_3	A_2	1
B_1	-	14
B_2	A_3, B_1	1
C_1	A_3, B_2	2
C_2	C_1	4
C_3	B_2 , C_2	1
C_4	C_3	2
D_1	B_2	1
D_2	D_1	1
E_1	C_4, D_2	½
E_2	C_4, D_2	½
E_3	C_4, D_2	1
E_4	C_4, D_2	1
E_5	C_4, D_2	1

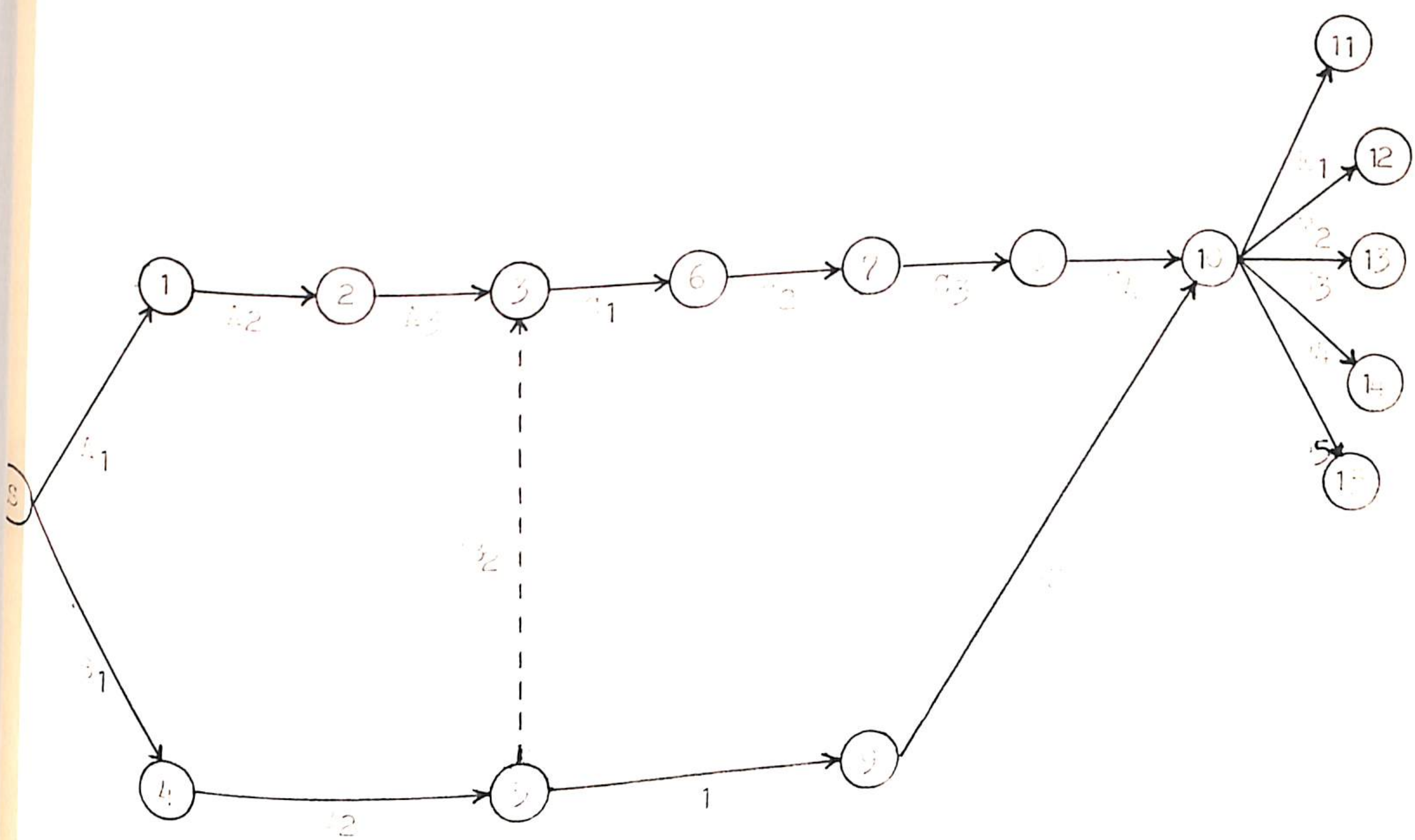
* Most likely time, in weeks (Depends on number of students which is taken as 500 here).

Table [illegible] (b)

Interdependence and Time Estimates of Major Activities for M-[illegible] Placement Planning

Acitivity	Depends upon	Activity-time *
A_1	-	1½
A_2	A_1	2
A_3	A_2	1½
B_1	A_2	½
C_1	B_1	1
C_2	A_3	1½
C_3	C_2, B_1	1
C_4	C_1, C_3	4
C_5	C_4, A_3	1
C_6	C_5	1
C_7	C_6	1
C_8	B_1, C_7	½
C_9	C_8	2
D_1	B_1	1
E_1	C_9, D_1	½
E_2	C_9, D_1	½
E_3	C_9, D_1	1
E_4	C_9, D_1	1
E_5	C_9, D_1	1

* Most likely time, in weeks (Depends on number of students which is taken as 250 here).



1
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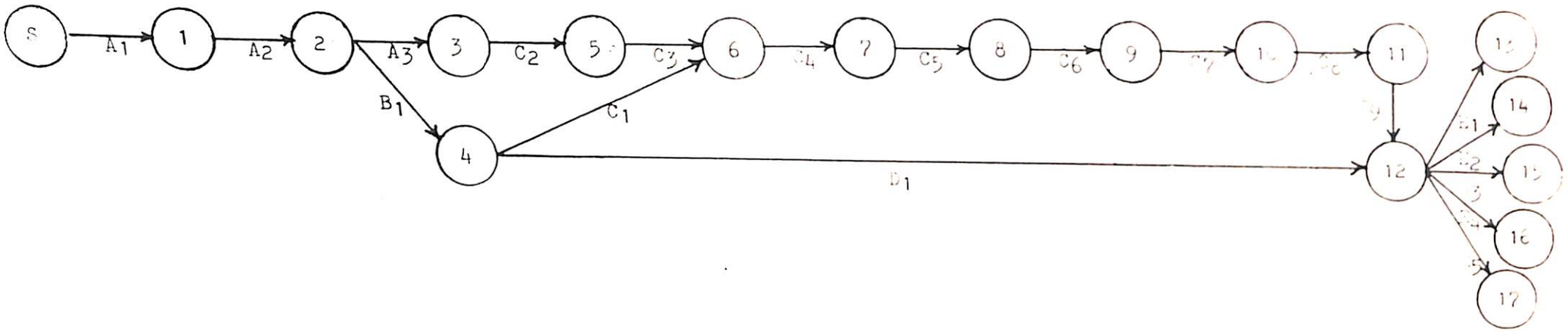
4

Figure 5.5(c)

Network of ajor [illegible] for [illegible]



3. Quota fixation.

4. Allotment of students to stations.

D. Identification of faculty:

1. Enquiring of availability and preferences.

2. Allotment of faculty to stations.

E. Information to all concerned:

1. Information to students regarding their allotment and accompanying faculty.

2. Information to the concerned university authorities for necessary action.

3. Information to faculty regarding their stations and students.

4. Information to stations regarding students and faculty alloted.

5. Information to the concerned persons for accommodation at the stations.

Major activities for WP-II planning

A. Identification of eligible students:

1. Identification of students and collection of information and semester preferences.

2. Semester allotment.

3. Checking of eligibility of the next batch of students and finalization of the list of eligible students.

B. Identification of work-benches:

1. Finalization of list of stations.

C. Allotment of students:

1. Initiation of Problem Bank.
2. Preparation of profile of each eligible student.
3. Sending of compiled profiles to organizations.
4. Compilation of Problem Bank.
5. Distribution of Problem Bank and preference forms to students.
6. Collection of preferences for projects and stations.
7. Analysis of preferences.
8. Quota fixation.
9. Allotment of students to stations.

D. Identification of faculty:

1. Checking of faculty requirement at stations and deputing of the required faculty.

E. Information to all concerned:

1. Information to students regarding their allotment and accompanying faculty.
2. Information to the concerned university authorities for necessary action.
3. Information to faculty regarding their stations and students.
4. Information to stations regarding students and faculty alloted.

5. Information to the concerned persons for accommodation at the stations.

Tables 5.5(a) and 5.5(b) give the major activities, their interdependence and their time estimates for WP-I and WP-II placement planning, respectively.

To facilitate a quick understanding of step-by-step procedure of the job being performed and to provide a general symbolic overview of the entire operation, flow-charts of process of planning for placement of students are given in Figures 5.5(c) and 5.5(c). The flow-chart for semester allotment is given in Figure 5.5(d).

CHAPTER 6

UIL INSTRUCTION: IMPLEMENTATION

6.1 Introduction

The student, after receiving information about his station allotment, is required to acquaint himself with the details of the host organization, activities of the organization, projects done by the previous batches, if any, etc., and also to arrange accommodation at the station before-hand so that on his arrival at the scene he can devote the whole of his time and effort to the program.

This chapter attempts to develop and present certain operation details of UIL program at industry. The implementing of UIL instruction would require certain essential activities taking place during the semester. Some of these activities are university - requirement and some are required for execution at the station, such as Registration, Project Assignments, Student Evaluation, Students' Progress Monitoring, Monitoring of Students' Attendance, etc.*

6.2 General Information

Soon after the allotment and before the students leave for work-period, the students are to be given general information about their work-stations. The information

* BITS Cooperative Education Programmes (University-Industry Linkage) Operation's Manual, Pilani, P.S. Division, BITS, 1983.

provided should be such that it helps students reach the stations comfortably. So, it is required that at least the following information be incorporated in 'General Information' (for both WP-I and WP-II):

(a) Names, addresses and telephone numbers of the host organizations.

(b) Contact points, i.e., names and designations of coordinators of the program from the organizations.

(c) Names, residential addresses and telephone numbers of the faculty.

(d) Stipend/Out-of-pocket allowance offered.

(e) Other facilities provided by the organizations, like accommodation, transportation, subsidised meals, etc.

A copy of this General Information be also sent to all the respective WP-faculty to apprise them of the information provided to the students.

6.3 Registration

Every university charges fee from students for the education it imparts. Some universities collect fee every month and some only once, in the beginning, for the whole academic year/semester and enroll students in their register. This process of enrollment and collection

of fee will now be referred to as 'Registration'. Registration of students for the work-period is to be the first activity when a semester opens. It is a sort of stamp for the student to start with a semester.

This Registration, in some universities, also includes registration in a prescribed set of courses, if they are following semester-wise/year-wise passing system. And, in some universities Registration includes registration for different courses which a student offers for the semester/year, in case they are following course-wise passing system.

Since, the work-periods are operative at industry, there would be problems if the fee is charged every month. Therefore, it would be appropriate if the fee is charged once, i.e., in the beginning of the semester, for the whole duration of the program.

It is obvious that Registration in work-periods would be on the very first day of the semester and it would be unnecessary and taxing the students if they are first called to the university for this purpose and then asked to proceed to stations and, thus, lose 2 to 3 days of the semester, in turn. Therefore, the Registration be held at work-stations which will not be a problem atleast in WP-II as the faculty is permanently stationed at industry and the necessary infrastructure also exists.

The summer-semester would normally be starting within a week of the closing of the II semester and by the day of

start of WP-I, it is visualized that, the results would not be available. Therefore, Registration for the summer-term will have to be done without them. In WP-I, faculty is not permanently stationed at stations; they proceed for conducting the work-period after the close of the second semester. Therefore, the Registration, which also includes collection of fee and its remittance to the university, would be a problem for the faculty who would himself be new to that place and the station would not have the required infrastructure.

On looking into all these points, it would be convenient if Registration, in WP-I, be held on-campus before the closing of the second semester, in good faith.

In order to avoid cash handling at work-stations, it is required that, in WP-II, students pay the fee, at the stations, through Demand Draft only.

6.4 Orientation

The next step, after Registration, is to familiarize the students with the organization, its functions, activities, personnel, rules, regulations, and the environment. Also, the students are to be familiarized with the work done by the previous batches of students.

In order to achieve this, it is required that each work-period start with an 'orientation program'. This program will help the students have a clear picture of

the organization before they start working on the projects. The program is, again, very essential as the students have to spend 2/5½ months there. Therefore, the orientation program be made part and parcel of a work-period.

The orientation program can be conducted by holding students' meetings with the people from the host organization, through lectures and by taking students around various divisions/departments/sections/shops/cells. While on the rounds, the students would get familiarized with the working of various shops/departments and also with the various persons working therein. In the meetings with, or the lectures by the people from the organization, the students would be familiarized with the functions, activities, executives, organization structure, timings, weekly working days, rules, regulations, etc. The faculty should inform about all the facilities provided by the organization. Also, inform about the tentative evaluation schedule, attendance, leaves, holidays, as well as, the discipline and code of conduct.

Since this orientation program is to be part and parcel of a work-period, like an introductory chapter in a Text-Book, it is expected that the students are also evaluated on this program of 'know your organization' through one or more components of evaluation.

The duration of orientation program will vary from

station to station depending upon their nature and size. It can be of any duration between 3 days and a month.

Since WP-I is basically exposure-oriented and is conducted at big industrial units like steel plants, cement plants, chemical and fertilizer plants, heavy engineering plants, it is visualized that the orientation would be of a longer duration, say, of about a month.

Course-Handout

The WP-faculty would have normally told the students regarding certain important points connected with the academics of the program like objective(s) of the program, evaluation scheme, etc., during the orientation program. But, it is advisable that the faculty distribute a handout to students for their ready reference. This handout will now be referred to as Course-Handout. It should contain atleast the following information:

(a) Name of the organization with address and phone number(s)

(b) Name and designation of the Head of the organization with phone number(s)

(c) Name and designation of the Coordinator from the organization with phone number(s)

(d) Name and residential address of the faculty with phone number(s)

(e) Objective(s) of the program

(f) A brief description of the organization and its activities

(g) Tentative evaluation schedule

(h) Make-up policy, if there is any

(i) Timings, working days, holidays, and certain norms of discipline to be followed by the students

This Course-Handout should normally be prepared and distributed within 2/3 days of the start of the program.

6.5 Work-Period Assignments

As envisaged in Article 1.3, the concept of UIL Program is that the students practice their profession before graduating. For this purpose, they are required to work on some real-life problems of industry. These real-life problems are transformed into projects and assigned to students to work on during their work-period. By working on these projects, it is aimed that the students not only gain experience of solving that particular problem but also, in general, learn the art of problem-solving in terms of analysing a problem, collecting and processing of relevant data, deciding on a methodology, developing alternative solutions, evaluating alternative solutions and choosing the most suitable course of action; application of concepts; creativity and originality; documentation; sense of responsibility;etc.

Therefore, these assignments become vehicles for learning various skills and developing personality traits which are needed in any problem-solving situation.

These projects may be mission/goal-oriented or open-ended problems where the students would be working under uncertainity and, thus, would also be gaining experience of working under uncertainity.

Some of the projects may be of longer duration than the duration of a work-period. Such projects could be divided into smaller projects which can be completed during a work-period and the students can have satisfaction of doing something substantial.

During the orientation program, the WP-faculty, in consultation with the Coordinator from the host organization, would be identifying the projects to be assigned to students. The faculty already has the list of projects that was communicated to the university for Problem Bank. On looking into the priorities of the host organization, some projects can be added to or deleted from the Problem Bank. It may be noted that these projects would essentially be drawn from the ongoing activities of the organizations.

Just before the end of the Orientation, based upon students' capabilities, interests, and preferences, the projects would be assigned to students.

These projects would be normally inter-disciplinary in nature. Therefore, some projects may require students from more than one discipline, to work on them. So, the assigning of more than one student on a given project is also not ruled out. Thus, in general, a group of students may be assigned one project, with one student as leader of the group. Also, an expert from the organization should be identified and associated with each project to supervise the students. This expert would normally be called "Professional Expert".

On completion of the orientation program, the students are required to start working on their projects. Before starting the project work, they should discuss their projects with the professional experts and try to understand them in terms of

(a) what the project is,
(b) its goals, applications, and uses,
(c) methodology,
(d) action-plan,
(e) literature to be surveyed,
(f) previous work done, if any, in this direction, on a similar/related project, etc.

On completion of a project, student(s) are required to submit a report. After the submission of the report, they should be assigned another project, in consultation with the Coordinator from the organization.

Sometimes, a situation which cannot be predicted may arise, when the progress in a particular project would be hampered due to some unforeseen reasons. In such cases, the faculty may use his discretion and change the project if the factors hampering the work take a long time in getting sorted. In no case the students be allowed to change projects on their own.

6.6 Gap-Lectures

To fill the gap that students may find between the education they have had in classrooms and the education which is required to pursue their project work at industry, they may have to learn on their own from the relevant literature.

Another novel way to fill this gap can be through Gap-Lectures. The faculty may arrange these Gap-Lectures by professional experts or by himself. Gap-Lectures can also be arranged in some specific areas of general interest to all students.

The students may be evaluated on these Gap-Lectures also.

6.7 Field Trips

In some organizations, the nature of some of the project(s) may require that student(s) go out for field surveys. In such cases the students are to be treated as on work.

The field-work may be of a short duration, or of a long duration. If the field-trip be of a long duration, the faculty may find it a problem to monitor the progress of these students.

This monitoring can be made possible by getting the periodic reports from the students on the field trips and discussing them with the concerned professional experts for their comments. If some mid-course correction is required, the students be informed accordingly.

6.8 Roles and Interactions of Students, Faculty and Professionals

During a work-period, at a station, it is visualized that there are three main actors who play the major roles. These are the students, the faculty, and the professional experts. In addition to them, to coordinate work at a station, there is to be a person who would be referred to as the Coordinator.

A student is expected to play a dual role, i.e., of a learner as well as of an understudy. While both the faculty and the experts are expected to act as consultants and guides to the students. These actors in their roles provide the much needed link between theory and practice.

The students, on the one hand, would work like employees of the organization and, thus, abide by its rules and regulations, maintain discipline as desired by it, follow

timings of work, do all the jobs assigned sincerely, etc., while on the other hand, they, as students doing a course, would abide by the academic rules and regulations of the university and maintain discipline as prescribed by the faculty. Since, in UIL program, a university interfaces with the outside world, it is natural to expect that the academic rules and regulations of the university, for work-periods, would be more demanding.

The students are required to work on their projects and approach the experts only for guidance and further direction, after taking appointment, as the experts are supposed to be busy with their own routine. In case of any routine matter, they are to approach their faculty only.

As envisaged in Article 5.4.4, the faculty, at work-stations, on the one hand, would be guiding and supervising the project work of students and, on the other, would be evaluating the students, monitoring their progress, participating in planning of the next work-period, maintaining discipline, acting as a link between the university and the organization, etc.

The students and the faculty at work-stations are ambassadors of the university to an industrial organization. Therefore, they are to maintain cordial and harmonious relations.

The professional experts would primarily supervise the work of students on their projects and guide them from time to time. They are also supposed to participate in evaluation of students, like in seminars, vivas, group-discussions, which would also help them know progress made by students in their projects. The experts are also supposed to comment on and give their assessment of the reports submitted by the students for their credibility.

To be able to carry out these roles and responsibilities effectively, students, faculty and professionals, at industry, would be required to interact among themselves regularly/periodically. The faculty would interact with students to inform, evaluate, and counsel them. The students would interact with the faculty to get clarifications, guidance, advice, and feed-back on their progress. The faculty would interact with the professional experts to seek information for monitoring of students' progress, comments on and assessment of reports submitted by students, and to discuss the projects for next work-period. The students would interact with the professional experts to apprise them of the progress made on the projects, to discuss problems faced and to seek further direction. The professional experts would interact with the students to know the progress made by them on their projects. And, the professional experts would interact with the faculty to apprise them of students' achievements and lackings in

their work behaviour so that the faculty takes corrective action(s).

6.9 Attendance

As mentioned earlier, education in UIL is practice-oriented. Therefore, the students are required to attend work daily except on holidays. They should follow the timings of the organization as decided by the faculty in consultation with the Coordinator. The students are not, as a right, entitled for any leave. But, in order to take care of certain unavoidable needs, the students may be granted leave by the faculty. In no circumstances, long absence from work can be permitted. Long absences from work may even lead to dropping of the work-period for that semester, as it is a practice-oriented program and long absence would lessen the participation and the required amount of practice to be gained.

6.10 Evaluation

As mentioned earlier, education in UIL is a vehicle through which one can meaningfully innovate in the methods of student education and evaluation so as to bring them closer to the real-life situations. Students get a different type of education in work-periods.

To impart education is not the only role of university. It is also to evaluate students for the knowledge acquired by them. The education that students get in work-

periods is of a totally different nature and, therefore, there is a need of a different type of evaluation system. The students, during their work-periods, attend work at industry and, therefore, it is logical that the evaluation system is a judicious mix of methods followed at university and that followed at industry. In university, the evaluation system mostly revolves around a few aspects of student learning, like, depth of knowledge, understanding of concepts and theory, application of fundamentals (in a controlled situation), memorizing (to a great extent), etc. These are the aspects which are evaluated in a classroom situation with the help of the traditional component of evaluation, the written examination, or, at the most, viva-voce. On the other hand, the real-life situation, that the students are going to face after graduation, would demand, in addition to depth of knowledge, understanding of concepts and theory, etc., other skills and professional traits like professional judgement and decision-making ability, skills for data handling, initiative, team spirit, leadership quality, ability to apply fundamentals in open-ended situations, creativity, sense of responsibility, etc. These attributes cannot be measured in a classroom situation but the method of education in UIL makes it possible and feasible.

The aim of evaluation should not be only to evaluate

a student but it should also be to provide an opportunity to improve upon his various attributes, in both the classroom and real-life situations. And, therefore, as emphasised earlier, the evaluation should be continuous as well as internal.

This section deals with evaluation of students in work-periods of UIL program.

6.10.1 Skills and traits

In real life, a profession demands certain skills and traits in a person to be able to "practise his profession", effectively and efficiently. Important ones are the following:

1. Knowledge of concepts
2. Ability to apply principles
3. Intellectual ability
4. Creativity and originality
5. Professional judgement and decision-making ability
6. Ability to adopt an interdisciplinary approach
7. Data handling skills
8. Documentation ability
9. Ability to communicate effectively
10. Initiative
11. Self-reliance

12. Ability to cooperate with others

13. Leadership

14. Industry

15. Sense of responsibility

16. Social sense

These skills and traits, which are broad in meaning, are further sub-divided, as presented below:

1. Knowledge of concepts

   1.1 With which he is already familiar

   1.2 Newly introduced at work-period

   1.3 Depth of knowledge

2. Ability to apply principles

   2.1 In a given situation

3. Intellectual ability

   3.1 To comprehend and act in new situations

   3.2 To follow logical path in problem solving

4. Creativity and Originality

   4.1 Conceiving new and unusual ideas

   4.2 Suggesting practical and good solutions

5. Professional judgement and decision-making ability.

   5.1 Ability in evaluating alternatives

6. Ability to adopt an inter-disciplinary approach

   6.1 Broad-based knowledge

   6.2 Interdisciplinary approach in problem solving

7. Data handling skills

   7.1 Understanding of data gathering/processing techniques

   7.2 Choice of measurement tools

   7.3 Skills for hardware implementation

8. Documentation ability

   8.1 Review of literature

   8.2 Organizing the material

9. Ability to communicate effectively

   9.1 Conveying ideas clearly

   9.2 Delivery and style of presentation

   9.3 Language

   9.4 Black-board presentation

   9.5 Platform manners

   9.6 Introducing and ending of the presentation

10. Initiative

   10.1 Taking lead in problem-solving situations

11. Self-reliance

   11.1 Confidence in one's own abilities

12. Ability to cooperate with others

   12.1 Cooperation with group/instructor and organization

13. Leadership

13.1 Organizing the efforts of the group

13.2 Moderating discussions

13.3 Inspiring the group members

14. Industry

14.1 Making forceful efforts to know more

14.2 Desire to exceed minimum effort expectation

15. Sense of responsibility

15.1 Reliability in meeting problem objectives

15.2 Planning and meeting deadlines

15.3 Punctuality

16. Social Sense

16.1 Ability to create good impression and to act accordingly

It is obvious that all of these skills and traits cannot be evaluated by the traditional component of evaluation, the written examination. Therefore, there is a need to employ other modes of examination.

These attributes can be easily and effectively evaluated with the help of the following 7 components of evaluation:

(1) Quiz

(2) Viva

(3) Seminar

(4) Group Discussion

(5) Project Report

(6) Observation

(7) Diary

Some of these components are normally used even in industry.

6.10.2 Components of evaluation

The components of evaluation, mentioned in the preceding article, are highly prone to subjectivity. In order to reduce this subjectivity and bring uniformity in evaluation at all work-stations supervised by different members of faculty, there is a need to develop a rational and unified system of evaluation. Therefore, the faculty at work-stations should be guided as to what skills and traits are to be evaluated in each component of evaluation. The subjectivity would further be reduced if the weightage of each component of evaluation as well as trait/skill, to be evaluated in each component, is pre-assigned.

Looking into the importance of each component of evaluation and traits/skills to be evaluated by them, the weightage of each component could be decided.

Looking into the components, it may be noted that these can be put in three categories,

(i) written (Quiz, Project Report), (ii) oral (Viva, Seminar, Group Discussion), and (iii) observation (Observation, Diary). Further, it may also be noted that the third type is normally evaluated in a continuous manner. Weightages to these three types of components are assigned in the ratio of 2:2:1, that is, 40% for Quiz and Project Report; 40% for Viva, Seminar and Group Discussion and 20% for Observation and Diary. Keeping in view the significance of each component, they are further broken up and assigned weightages as follows:

Quiz	15%
Project Report	25%
Viva	5%
Seminar	20%
Group Discussion	15%
Observation	15%
Diary	5%

An attempt is made here to identify the skills and traits to be evaluated by each component. A reasonable weightage for each of the skills and traits to be evaluated in each component is also mentioned. The serial numbers herein refer to the serial numbers as given in Article 6.10.1.

Quiz :

1.1 Knowledge of concepts with which he is already familiar (3)

1.2 Knowledge of concepts newly introduced at work-period. (4)

2.1 Application of principles in a given situation (5)

3.1 Ability to comprehend and act in new situations (1)

3.2 Ability to follow logical path in problem solving (1)

4.1 Conceiving new and unusual ideas (1)

Viva :

1.1 Knowledge of concepts with which he is already familiar (1)

1.3 Depth of knowledge (1)

3.2 Ability to follow logical path in problem solving (1)

4.1 Conceiving new and unusual ideas (1)

9.1 Conveying ideas clearly (1)

Seminar :

1.1 Knowledge of concepts with which he is already familiar (3)

2.1 Application of principles in a given situation (2)

3.1 Ability to comprehend and act in new situations (1)

5.1 Ability in evaluating alternatives (2)

6.1 Broad-based knowledge (1)

8.1 Review of literature (1)

8.2 Organizing the material (1)

9.2 Delivery and style of presentation (2)

9.3 Language (2)

9.4 Black-board presentation (1)

9.5 Platform manners (1)

9.6 Introducing and ending of the presentation (1)

13.1 Leadership-organizing the efforts of the group (1)

13.2 Moderating discussion (1)

Group discussion :

3.1 Ability to comprehend and act in new situations (2)

4.1 Conceiving new and unusual ideas (2)

4.2 Suggesting practical and good solutions (1)

7.1 Understanding of data gathering/ processing techniques (1)

7.2 Choice of measurement tools (1)

10.1 Initiative - taking lead in problem solving situations (2)

12.1 Cooperation with group/instructor (2)

13.2 Moderating discussions (2)

16.1 Ability to create good impression and to act accordingly. (2)

Project Report :

1.1 Knowledge of concepts with which he is already familiar (2)

1.2 Depth of knowledge (1)

3.2 Ability to follow logical path in problem solving (3)

4.1 Conceiving new and unusual ideas (2)

4.2 Suggesting practical and good solutions (2)

5.1 Ability in evaluating alternatives (3)

6.1 Broad-based knowledge (1)

6.2 Interdisciplinary approach in problem solving (2)

7.1 Understanding of data gathering/ processing techniques (1)

7.2 Choice of measurement tools (1)

8.1 Review of literature (2)

8.2 Organizing the material (2)

9.3 Language (2)

15.1 Reliability in meeting problem objectives (1)

Observation :

6.1 Broad-based knowledge (1)

6.2 Interdisciplinary approach in problem solving (1)

7.3 Skills for hardware implementation (1)

10.1 Initiative-taking lead in problem solving (1)

11.1 Confidence in one's own ability (3)

12.1 Cooperation with group/instructor/ organization (1)

13.1 Leadership-organizing the efforts of the group (2)

13.3 Leadership-inspiring the group members (1)

14.1 Making forceful attempts to know more (1)

15.2 Planning and meeting the deadlines (1)

15.3 Punctuality (1)

16.1 Ability to create good impression and to act accordingly (1)

Diary :

8.2 Organizing the material (1)

14.2 Desire to exceed minimum effort expectation (2)

15.2 Planning and meeting the deadlines (1)

15.3 Punctuality (1)

Table 6.10.2 is a matrix giving the weightages of different characteristics as evaluated by different components of evaluation.

This evaluation system allows evaluation of various personality traits, that is the total personality, of a student which is not possible to evaluate in a classroom situation.

The sole objective of this evaluation system is not only to evaluate the students' personality traits but also to impart training for their improvement. Thus, it is very essential that the students are evaluated more than just once through each component of evaluation which is possible only in an internal and a continuous system.

After conducting of each component, it is also necessary that the students are informed about their performance. In other words, the students be given feedback on their performance both quantitatively as well as qualiatively, i.e., the marks obtained and their drawbacks as well as suggestions on how to improve.

Taking into consideration the duration of WP-I and WP-II, the optimum feasible frequency of the components of evaluation comes out to be as given below.

Sl	Component	Suggested Frequency	
		In WP-I	In WP-II
1.	Quiz	2	3
2.	Seminar	2	3
3.	Viva	2	3
4.	Group discussion	2	3
5.	Project report	2	3
6.	Observation	Continuous**	
7.	Technical Diary	Continuous**	

* Will depend on number of projects done.

** Even though these are on a continuous basis, it is desirable that the credits be given atleast twice thrice during a work-period.

In a system of continuous evaluation, it is always required that the students are evaluated continuously throughout the semester instead of one examination at the end. Therefore, in the present context, each component of evaluation would be held more than once and thus, the students would be evaluated atleast 12 times during a work-period. Therefore, it is required that these components be scheduled equally spaced, during a work-period.

The quizzes and vivas could also be based on Gap-Lectures, Orientation Program, and how much the students are able to appreciate in terms of each others' projects at conceptual level as well as knowledge and understanding of their own projects.

The seminars are to be held on the project/assignment work done by students upto a point of time. In case more than one student are working on a project, students may be asked to divide the project into small topics to be presented in seminars. A repetition of topics could be avoided.

Group discussions are to be based on the topics related to the activities of the host organization or the projects/problems assigned to students.

Each project assignment would be required to have a separate report. In case a group of students is working on a project, the work is to be documented and presented in a joint report.

Observation is to be related with various facets of the program. This is a channel for evaluating students' performance in terms of their day to day behaviour at work stations. This is also one of the appropriate methods of continuous evaluation.

Technical diary will provide a wonderful opportunity for the faculty to study and evaluate information gathering as well as analysing techniques possessed by the students. It would be an attempt to cultivate the habit of documentation and the students should be encouraged to search for details. It should not mean simply recording routine activities/factual observations

only but also should include students' thought process and reasoning.

The participation and presence of professional experts in evaluation through quizzes, viva , seminars and group discussions will help in evaluating the credibility of the work/report/answers. Thus, their participation is desirable but optional.

6.10.3 Multivariate Evaluation System (MES)

Keeping in mind the various characteristics to be evaluated and the components of evaluation, the system of evaluation discussed above can be termed as a 'Multivariate Evaluation System' (MES). This system of examination would evaluate traits/skills much needed by the professional world. Also, this system is capable of removing the subjectivity and bringing uniformity to a great extent. It is a well tested system and has been followed by BITS, Pilani for its Practice School Program.

6.10.4 Rating of personality traits

The entire evaluation of students in work periods, as arrived at through the aforesaid system, is in terms of marks which can be converted into letter grades, in case a university follows the system of letter grading, and can make a part of their total performance.

The students, in the process, may also be evaluated

qualitatively for various personality traits and professional skills, namely, (1) knowledge and application of fundamental principles, (2) intellectual ability, (3) creativity and art of guestimation, (4) professional judgement, (5) problem-solving ability, (6) decision-making ability (7) ability to communicate, (8) initiative and self-reliance, (9) team work, (10) leadership, (11) punctuality and ability to meet deadlines, and (12) sense of responsibility and common sense.

These traits and skills are very much those that are needed in any profession. They can also be rated qualitatively on a 4 to 5-point scale, viz., (1) Excellent (2) Good (3) Average (4) Poor (5) Very poor. These ratings can also be provided to students alongwith their marksheet/degree diploma/transcript.

CHAPTER 7

MONITORING OF UIL INSTRUCTION

7.1 Introduction

The UIL Program would be conducted at the work-benches, in industry, located at various centers most of which would be in cities/towns away from campus. Therefore, it will be necessary to coordinate the work at all stations and, also, to monitor the progress of students and the program as a whole so as to make the program effective. For this purpose, it is required to develop an efficient monitoring system.

Any monitoring system, to be efficient, would need a regular flow of information. Therefore, for monitoring of UIL program, there should be a regular flow of information from the stations to the university and feedback to the stations from the university. In order to achieve this objective, it is essential to develop an information system.

In this chapter, an attempt has been made to develop a viable information system for monitoring UIL instruction, using the concept of Management Information System (MIS).

7.2 Process of Monitoring

The basic process of monitoring involves three steps:

(a) Establishing standards

Standards (Norms) are established criteria against which actual results can be measured. They are usually stated in specific terms. In our context, the standards would be objectives of the program, policies, academic rules and regulations, plans and guidelines, etc.

(b) Measuring performance against standards

If the standards are appropriately drawn and if means are available for determining exactly what is being done, appraisal of actual or expected performance if fairly easy. But, in the less technical kinds of work, not only may standards be difficult to develop and establish but appraisal may also be exceedingly difficult.

Whatever be the standards, objective or subjective, the actual results are put against them and seen if there is any gap between the desired and the actual results. Deviations are to be analysed and corrected, if necessary, as early as possible.

(c) Taking corrective actions on deviations from standards

The controller may take corrective steps by pointing out the deviations and further instructing; by further clarifying the objectives, plans and guidelines; by better directing - fuller explanation; by excercising its administrative functions like

permitting the deviations or refusing the deviations; etc.

7.3 Management Information System for UIL Instruction - A conceptual frame-work

7.3.1 Concept of MIS

In order to keep track of day-to-day monitoring of UIL instruction, the progress made at work-stations and to get necessary data required for keeping the record and for other purposes, various types of information from the station, at different points of time, are required to be collected and processed.

This leads to the idea of 'Information System for UIL'.

Conceptually, an information system provides information to the decision-maker to make, carryout and control decisions.

7.3.2 Elements of MIS

There are three elements of an information system, viz.,

(1) Management - the decision-makers,

(2) Information - orderly selected data for making decisions, and

(3) System - an input device which receives collected data and feeds that into the processor which

processes them, and an output device which produces information ready for use.

These also explain the basic meaning of Management Information System (MIS).

Figure 7.3.2 shows this MIS pictorially.

In an MIS for UIL instruction, 'Management' is the university that would design, implement and control the UIL program.

'Information' is the data required and collected from work-stations.

'System' is the ways of collection, processing of data and their presentation in a usable form.

7.3.3 Steps for developing MIS

In order to develop an MIS for UIL instruction, first of all, the study needs to spell out the procedure for designing an MIS, conceptually.

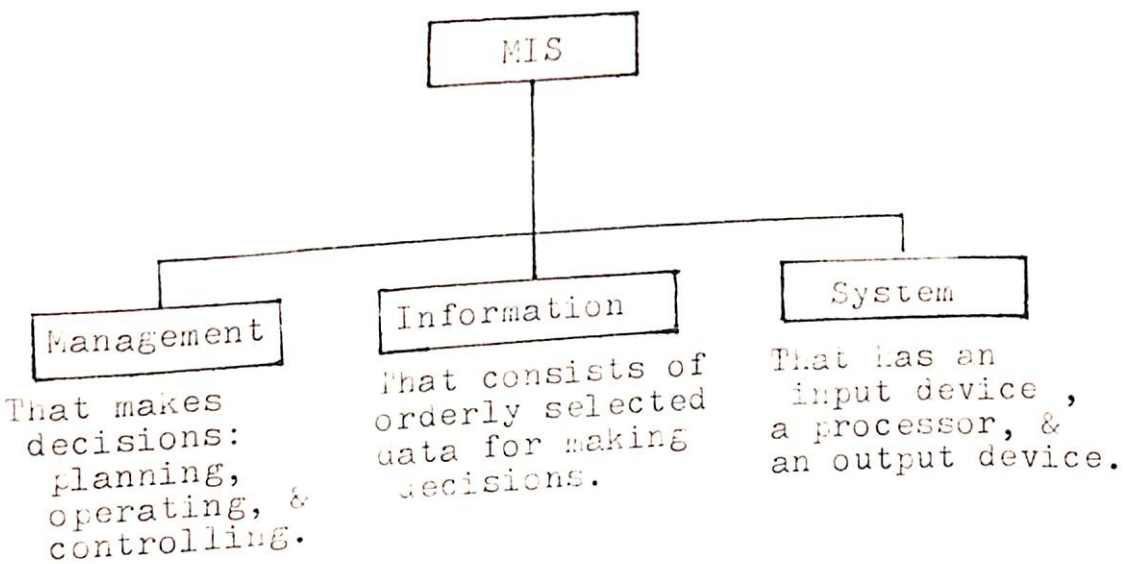
The following steps are followed for designing an MIS:[1]

(a) Setting of objectives for the MIS

This step would mean considering the

Figure 7.3.2

Meaning of MIS



following:

(i) need for MIS,

(ii) purpose of MIS,

(iii) expectations from MIS, and

(iv) the users and their objectives

(b) Identification of system constraints

Constraints are limitations of the organization or requirements of the MIS. Constraints are usually policy considerations, manpower needs and personnel availability, cost and resources, etc.

(c) Determination of information needs

Information that can increase the perception of decision-makers in critical areas such as problems, alternatives, opportunities, and plans.

(d) Determination of information sources

The needed information can be collected from various sources. These sources may be external as well as internal.

(e) Development of MIS design

Deciding on major decision centers, patterns of information flow, channels of information, etc., and, further, making an information flow chart.

7.4 Information System for Monitoring UIL Instruction

In this section, an information system for monitoring UIL instruction is designed drawing heavily from the concepts outlined in the preceding articles.

7.4.1 Setting objectives

The need for an efficient information system in UIL instruction arises from the fact that the UIL program is conducted at off-campus centers and the university needs certain information from all the work-stations, for apprising itself of the conduct of the program and controlling it. While, the purpose of an information system is to monitor the activities and to collect necessary data for records.

During the conducting of the program at the work-stations, there would be a variety of activities falling under the jurisdiction of different administrators and, therefore, they would be monitored by the respective administrators. So, the MIS, to be developed here, would be such that the information reaches the respective decision-makers.

7.4.2 System constraints

The design of MIS for UIL instruction would depend upon various limitations and constraints, normally of two types.

The first type, which will affect the implementation of the MIS, e.g., manpower availability at

source for providing data; manpower availability for processing data; whether the process is manual or computerized; cost and other resources; etc.

The other type of constraints are those which are imposed by the university, e.g., the collection of data on various items to be regulated by the academic rules and regulations of the university as also certain guidelines to bring uniformity and reduce subjectivity at all work-stations; and, also, constraints imposed by users/decision-makers, e.g., the format in which information is required by them.

7.4.3 Information needs

From monitoring point of view, information on the following items would be necessary:

A1 Registration
A1* Reporting by students at stations
A2 Orientation
A3 Project allotment
A4 Evaluation schedule
A5 Residential addresses of students
A6 Progress in evaluation components
A7 Progress on projects
A8 Evaluation components held
A9 Attendance
A10 Field trips

A11 Problems of indiscipline

A12 Quiz

A13 Seminars

A14 Group discussions

A15 Projects completed/abandoned

A16 New projects assigned

A17 Gap-Lectures

A18 Change(s) in facilities by organization

A19 Change(s) in the host organization

A20 Total evaluation of students and the recommended grades

A21 Projects done

There would be some more information - material coming in from the work-station through:

A22 A copy of handout

A23 Rating sheets

A24 Abstracts of project reports

A25 Project reports

For conducting the program and, also, to seek information on activities for monitoring, the university would be required to send the following material to work-stations:

B1 Registration material

B2 Dues/Fees list

B3 Forms in which the information is required to be provided from the stations

Besides the information needed for monitoring UIL instruction, some more information would be needed to flow between university and work-stations, for planning the next semester's program, such as :

C1 Problem banks from stations

C2 Student profiles to stations

In case the university has a placement service operating to help students seek employment, there would be a need to inform the off-campus students about the opportunities available, from time-to-time, and seek applications from them for forwarding to the concerned employers. Therefore, the following information will be flowing between the work-stations and the placement service of the university:

D1 Employment opportunities

D2 Applications for employment

The following information would also be flowing between the UIL Planner and Controller which would be needed for the next semester's planning :

E1 Station-wise students and faculty allotment

E2 Students who did not complete the work-period

7.4.4 Information sources

In the above context, the primary source of information is the work-station at which the program is conducted. The other sources, from where also the information will generate, are the Registration Officer, Placement Service Officer, UIL Planners and Policy makers, as well as, Controller.

7.4.5 The MIS design

In the context of monitoring UIL instruction, the design of MIS would involve deciding on who all are the decision-makers, what all information is needed by the decision-makers, from where the needed information is to flow to the decision-makers, what are the decisions taken and conveyed to who all, the interactional relationships among the decision-makers and the timing and frequency of information.

The decision-makers/users of information, in this context, will be the Registration Officer, the Accounts Officer, Planners and Controller of UIL program, Placement Service Officer, faculty and students at work-stations, and the work-station.

Similarly, the sources from which the information will flow to the decision-makers/users will be the faculty at work-station, Registration Officer, Controller of UIL program, Accounts Officer, Planners

of UIL program, and the Placement Service Officer.

These sources and decision-makers/users, alongwith the information needed (as identified in Article 7.4.3), timing and frequency of information are shown in Table 7.4.5.

The flow of information, as identified in Table 7.4.5, has been shown in Figure 7.4.5 where the double headed arrows show interaction/consultation and the number on an arrow corresponds to the item in Table 7.4.5. This figure can be referred to as the MIS flow chart.

7.5 Monitoring of the Activities

As already mentioned in Article 7.4, in order to keep track of the progress made at various work-stations and to get necessary data which would be required for keeping the record, various types of information from industry, at different points of time, will need to be collected and processed. To collect the required information, there is a need to develop the format in which the information will come in so as to be of direct use to the decision-makers/users. These formats have been developed here and are explained below. This leads to generation of a set of forms. These forms would be referred to as Reports (RI-1, RI-2, RI-3, ..., for WP-I and RII-1, RII-2, RII-3, ..., for WP-II).

Table 7.4.5

Information Flow Calendar

Assumptions:

WP-I duration = 55 days
WP-II duration = 165 days

Sl. (1)	Information on/Material/Item (2)	Frequency (3)	Last date of receipt from work-station (4)		Source (5)	Destination (6)
			WP-I	WP-II		
A1	Registration	Once	-	15th day	WP-faculty	Registration Officer
A1*	Reporting by students at stations	Once	7th day	"	WP-faculty	UIL Controller
A2	Orientation	Once	-	15th day	WP-faculty	UIL Controller
A3	Project allotment	Once	-	15th day	WP-faculty	UIL Controller
A4	Evaluation Schedule	Once	7th day	15th day	WP-faculty	UIL Controller
A5	Residential addresses of students	Once	-	15th day	WP-faculty	UIL Controller
A6	Progress in evaluation components	Once	28th day	82nd day	WP-faculty	UIL Controller
A7	Progress on projects	Once	-	82nd day	WP-faculty	UIL Controller
A8	Evaluation components held	Monthly	-	Last day of every calendar month. Also, at the end of the work-period.	WP-faculty	UIL Controller
A9	Attendance - WP-I	Once	At the end of the work-period.	-	WP-faculty	UIL Controller
	WP-II	Monthly	-	Last day of every calendar month. Also, at the end of the work-period.	WP-faculty	UIL Controller
A10	Field trips	Monthly	-	Last day of every calendar month.	WP-faculty	UIL Controller

Table 7.4.5(Contd.)

(1)	(2)	(3)	(4)		(5)	(6)
A11	Problems of indiscipline	-	As and when the need be	Last day of every calendar month.	WP-faculty	UIL Controller
A12	Quiz	Once	At the end of the work-period.	At the end of the work-period.	WP-faculty	UIL Controller
A13	Seminars	Once	At the end of the work-period	At the end of the work-period.	WP-faculty	UIL Controller
A14	Group discussions	Once	At the end of the work-period.	At the end of the work-period.	WP-faculty	UIL Controller
A15	Projects completed/ abandoned.	Monthly	-	Last day of every calendar month.	WP-faculty	UIL Controller
A16	New projects assigned	Monthly	-	Last day of every calendar month.	WP-faculty	UIL Controller
A17	Gap-Lectures - WP-I	Once	At the end of the work-period	-	WP-faculty	UIL Controller
	- WP-II	Monthly	-	Last day of every calendar month. Also, at the end of the work-period.	WP-faculty	UIL Controller
A18	Change(s) in facilities by organization	Monthly	-	Last day of every calendar month. Also, at the end of the work-period.	WP-faculty	UIL Controller (UIL Planner)
A19	Change(s) in the host organization	Monthly	-	Last day of every calendar month.	WP-faculty	UIL Controller (UIL Planner)
A20	Total evaluation of students and the recommended grades.	Once	At the end of the work-period	At the end of the work-period.	WP-faculty	UIL Controller (Examination Committee)
A21	Projects done	Once	At the end of the work-period.	At the end of the work-period.	WP-faculty	UIL Controller

Table 7.4.5(Contd.)

(1)	(2)	(3)	(4)		(5)	(6)
A22	A copy of handout	Once	7th day	15th day	WP-faculty	UIL Controller
A23	Rating sheets	Once	-	At the end of the work-period.	WP-faculty	UIL Controller
A24	Abstracts of project reports	Once	At the end of the work-period.	At the end of the work-period.	WP-faculty	UIL Controller
A25	Project reports	Once	At the end of the work-period.	At the end of the work-period.	WP-faculty	(Through) UIL Controller(to Library).
B1	Registration material	Once	-	7 days before the start of the work-period.	Registration Officer	WP-faculty
B2	Dues/Fees list	Once	-	7 days before the start of the work-period.	Accounts Officer	WP-faculty
B3	Forms of various reports	Once	7 days before the start of the work-period.	7 days before the start of the work-period.	UIL Controller	WP-faculty
C1	Problem banks from stations	Once	-	7/8 weeks before the end of the work-period.	Work-station	UIL Planner
C2	Student profiles to stations	Once	-	8/10 weeks before the end of the work-period.	UIL Planner	Work-station
D1	Employment opportunities	-	-	As and when required.	Placement Officer	Students at work-station
D2	Applications for employment	-	-	As and when required.	Students at work-station	Placement Officer.
E1	Station-wise students and faculty allotment	Once	15 days before start of the work-period.	15 days before the start of the work-period.	UIL Planner	UIL Controller, Accounts Officer, Registration Officer, Placement Officer, Coordinator at the work-station.

Table 7.4.5 (Contd.)

(1)	(2)	(3)	(4)		(5)	(6)
E_2	Students who did not complete the work-period.	Once	At the end of the work-period.**	At the end of the work-period.**	UIL Controller	UIL Planner.

** Though this would be communicated at the end of the work-period, whatever information is available on UIL Controller by the time UIL Planner starts planning for the next semester it should be passed on to the Planner.

RI-1:

It is to be recalled that the Registration in WP-I would be done at the university before the students leave for the work-station. Therefore, this form is designed to collect information on the reporting of students at the station. A copy of Handout is expected to accompany it, the format of which is given in Appendix III.

RI-2:

This form is designed to collect information on the progress made by students in different components of evaluation during the first half of the work-period.

RI-3:

This form is designed to collect information on attendance of each student.

RI-4:

This form is designed to collect total evaluation of each student.

RI-5:

This form is designed to collect topics of seminars and titles of projects done by each student.

RI-6:

This form is designed to collect information on the host organization (name, address, phone numbers and the facilities provided, etc.).

RI-7:

This form is designed to collect information on the projects done at the organization (student's name, title, supervisor's name).

RI-8:

This form is designed to collect information on Gap-lectures arranged (topics and speakers) and the topics of group discussions.

RI-9:

This form is designed to collect the abstract of project done.

RI-10:

This form is designed to collect important dates of activities in work-period.

The following reports are designed for monitoring WP-II activities:

RII-1:

This form is desigmed to collect information on Registration, Orientation, project allotment, etc. The design of this report takes care of the need that

different items of information are to be passed on to the respective decision-makers/users. A copy of Handout is expected to accompany it, the format of which is given in Appendix III.

RII-2:

This form is designed to collect information on the progress made by students in different components of evaluation during the first half of the work-period.

RII-3:

This form is designed to collect information on the progress made by students on their projects during the first half of the work-period.

RII-4:

This form is designed to collect information like projects completed/abandoned; new projects assigned, along-with names of students and supervisors;evaluation components held (with dates and weightages); attendance of students; students' field-trip (with purpose, place and duration); changes in the host organization (administrative/organizational setup, address, phone(s), telex, cable, etc., facilities provided); Gap-Lecture(s) held (with topic(s) and speaker(s)), if any; any problem of indiscipline; and any academic/non-academic news of university's interest. As can be seen from Table 7.5.4, this information is to be provided on the last day of

each calendar month. Thus, this report can be called "Monthly Report."

RII-5:

This form is designed to collect topics of seminars and titles of projects by each student.

RII-6:

This form is designed to collect total evaluation and attendance of each student.

RII-7:

This form is designed to collect information on the projects done at the organization - student's name, supervisor's name, related university-based research areas and related university-based courses in case of each project.

RII-8:

This form is designed to collect information on the host organization (name, address, phone numbers and the facilities provided, etc.).

RII-9:

This form is designed to collect the abstract of project done.

RII-10:

This form is designed to collect important dates of

the activities in work-period and the topics of group discussions held. Copies of Quiz papers are also expected to accompany this report.

RII-11:

This form is designed to collect ratings of students' skills and personality traits.

These reports are to be submitted by the faculty at specified times, as mentioned in Table 7.4.5. But, any unforeseen events that need immediate attention should be reported immediately for which, obviously, no report-format can be visualized. In WP-I, information on problems of indiscipline is not collected through any proforma on a regular basis because of small duration. Therefore, the faculty is expected to inform the same as and when the need be.

The formats of the various reports, RI-1 to RI-10 and RII-1 to RII-11, developed are presented in Appendices III to XVII.

7.6 Major Activities for Implementing and Monitoring UIL Instruction

This section identifies and presents the set of major activities involved in the implementing of UIL instruction and facilitating monitoring by the university. Also, an attempt is made to present them in networks in Figures 7.6(a) and 7.6(b).

Major activities for WP-I implementation and monitoring

A : Registration (at the university)

B : Reporting, at the station, by the students

C : Orientation

D : Assignment of projects

Ev_1 : Evaluation during the first half of the program.

Ev_2 : Evaluation during the second half of the program.

F_X : Information to university on activity X (for monitoring by the university).

F : Final reporting.

Major activities for WP-II implementation and monitoring

A : Registration (at work-station).

C : Orientation

D : Assignment of projects

Ev_1 : Evaluation during the first half of the program.

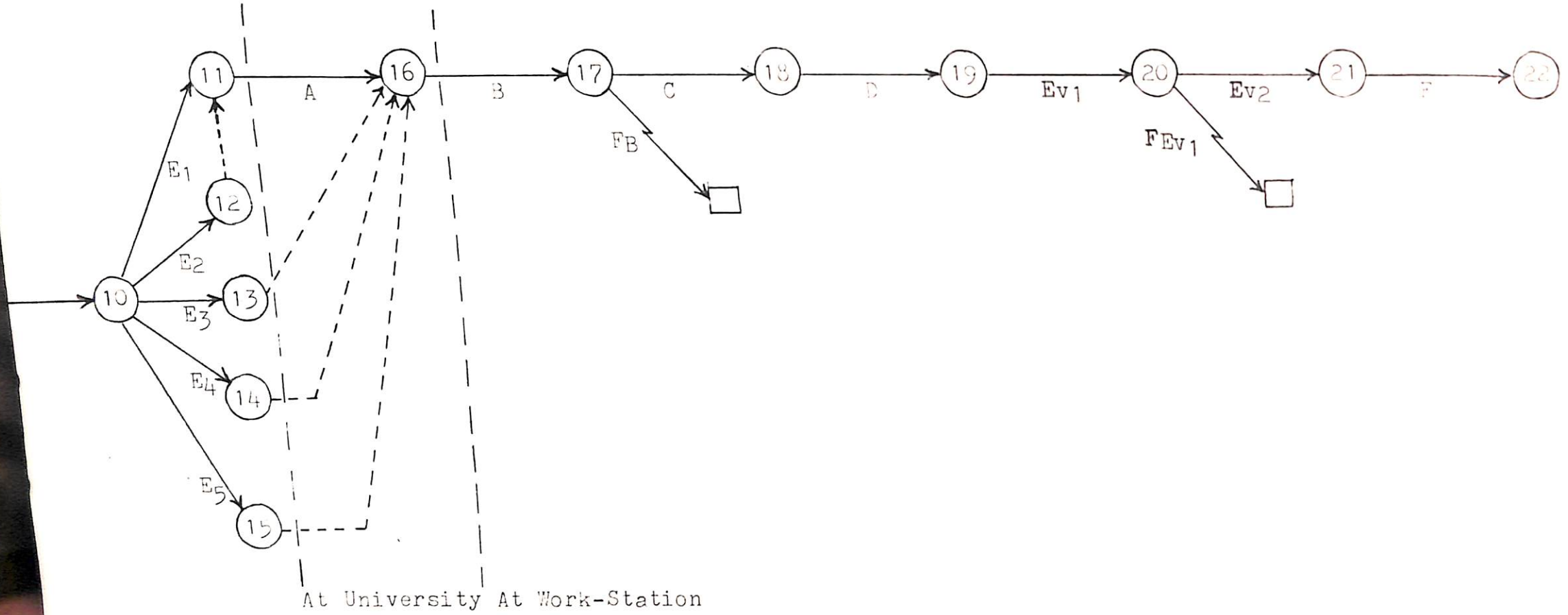
Ev_2 : Evaluation during the second half of the program.

F_X : Information to university on activity X (for monitoring by the university).

(Continued from Figure 5.5(a))

Figure 7.6(a)

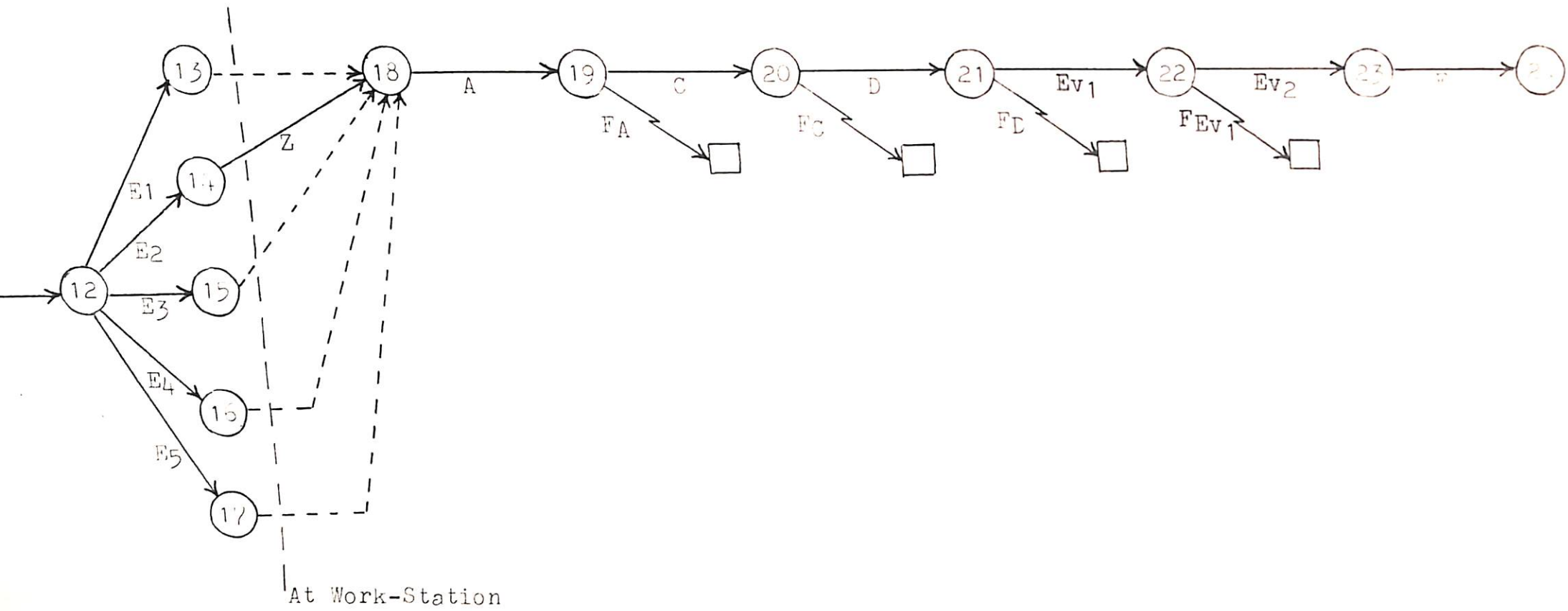
Network of Major Activities in
Implementing and Monitoring of UIL Instruction in WP-I



ued from Figure 5.5(b))

Figure 7.6(b)

Network of Major Activities in
Implementing and Monitoring of UIL Instruction in WP-II



F : Final reporting.

Z : Despatch of registration material.

To facilitate a quick understanding of step-by-step procedure of the job being performed and to provide an overview of the entire operation, flow-charts of activities at the station and monitoring by the university (in WP-I and WP-II) are also developed. (See Figures 7.6(c) and 7.6(d).

CHAPTER 8

ORGANIZATION STRUCTURE FOR UIL EDUCATION

8.1 Introduction

The effective management of work in any system needs a viable and an efficient organizational set-up to make activities more productive and less costly.

An organization is built to conduct and control planning activities, to conduct and control instruction activities at work-stations, to conduct liason work, to coordinate between various organizational functions, for day-to-day administration, etc.

Coming to the word 'organization', it can be seen as a 'formal' structure of roles. For an organization to be meaningful, it must incorporate, as per Harold Koontz and Cyril O'Donnell[1], verifiable objectives, a clear concept of the major duties or activities involved and an understood area of discretion, or authority, so that the persons in it know what they can do to accomplish results.

This chapter presents an organization structure to conduct UIL program in a university.

8.2 University Organization Structure

A university, while executing its function, performs a variety of activities in the following areas : teaching,

i.e., instruction; examination; research; curriculum development; registration and student welfare.

Apart from these primary areas of activities, some activities, in order to support the primary, are also performed in the areas of general administration, recruitment, library, information processing, purchase, accounment, and maintenance.

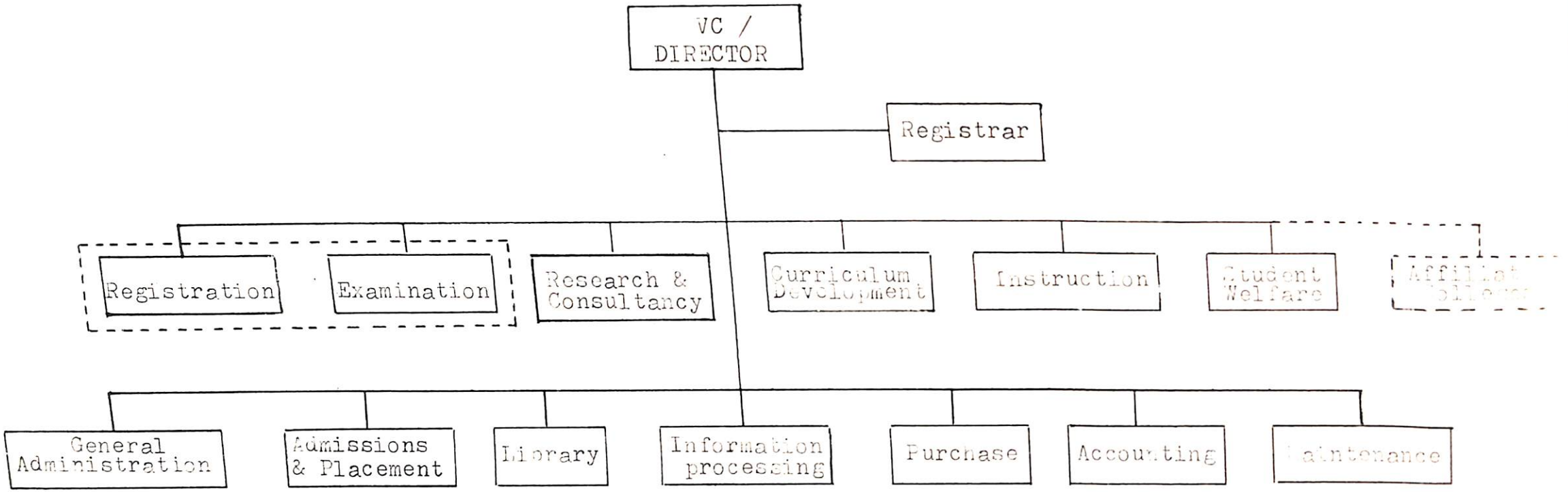
These areas of activities are handled by separate sections/divisions/cells/departments/units/groups which come directly under the head, i.e., the Vice-Chancellor/ Director of the university/institute.

Thus, the organization structure of a university would normally be as shown in Figure 8.2(a). There-in, the areas of activities are seen as separate sub-systems for effective planning and execution of each of them. Areas of Examination and Registration would be depending upon each other to a great extent for students' records. Therefore, they can also be seen as parts of one sub-system.

The 'affiliated colleges', though mentioned in the Figure 8.2(a) do not seem to be within the purview of this study. Implementation of UIL Education will require a wide range of activities in areas of planning for the placement of students at industry, planning and implementing UIL instruction; monitoring; managing finances and personnel; documentation; educational study and

Figure 8.2 (a)

University Organization Structure



research; etc. Areas of these activities are visualized to be almost as large and as varied as that of the university itself.

Therefore, there is a need to have a separate sub-system, in the university, for managing the UIL program. Thus, the emerging organization structure would be as shown in Figure 8.2(b). In this figure, a sub-system is referred to as 'Division'.

8.3 Activities in a UIL Program

The major activities, as identified in earlier chapters, basically fall under the main areas of Planning for placement of students at industry, Implementing UIL instruction, Monitoring of UIL instruction, Accounts and Administration, Documentation, and Educational study and research. The major activities in these areas are:

A. Planning for placement of students at industry

(1) Work-Period I

(a) Identification of eligible students

(b) Identification and finalization of work-benches

(c) Allotment of students

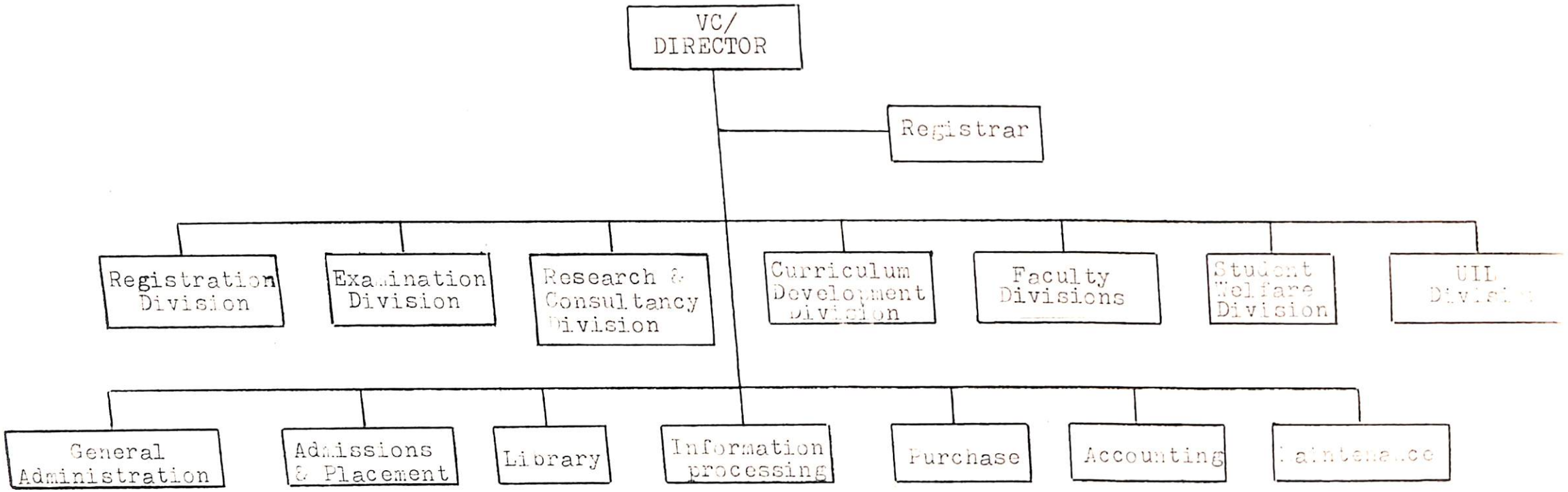
(d) Identification and finalization of faculty

(e) To provide allotment information to all concerned

(f) To plan for student accommodation, if the need be

Figure 3.2 (b)

University Organization Structure with UIL Division



(2) Work-Period II

(a) Semester allotment

(b) Identification of eligible students

(c) Identification and finalization of work-benches

(d) Profile preparation

(e) Compilation of Problem Bank

(f) Finalization of allotment of students to stations

(g) Identification and finalization of faculty needs

(h) To provide allotment information to all concerned

(i) To plan for student accommodation, if the need be

B. Implementing and monitoring of UIL instruction

(1) Planning for and monitoring of

(a) Registration of students in WP-I and WP-II

(b) Orientation Program

(c) Course-Handout

(d) Evaluation of students

(2) Monitoring of various activities at industry through various reports - initial, monthly, mid-term and final, as mentioned in chapter 7.

(3) Preparation of Activity-Calendar for the Division.

(4) Receiving of various progress reports, final grades, project reports, rating sheets, etc., from work-stations.

(5) Analysis of grades and submission of them to the Examination Committee.

(6) Monitoring of feedback from work-period students.

(7) Identification of library, equipment, as well as, other needs at work stations in terms of, say, space for seminars and group discussions, accommodation, etc., and accordingly working out details of operation.

(8) Arrangement of orientation for WP-faculty.

(9) Maintaining of records.

C. Accounts and Administration

(1) Maintenance of the entire Division's accounts.

(2) To workout accommodation requirement of WP-faculty.

(3) Providing for office facilities at work stations as well as at the Division.

(4) Providing finance to faculty at stations for all the facilities for which they are entitled.

(5) Despatch of salary to WP-faculty.

(6) Printing jobs and purchases.

(7) Student scholarships.

(8) Clearance of student dues.

(9) Administrative jobs.

(10) Recruitment of office staff.

D. Documentation

(1) Documentation of project reports submitted by students.

(2) Classification of WP assignments in terms of their usefulness in enriching teaching and research efforts at the university.

(3) Preparation of various reports and monographs based on the work done at work-stations.

E. Educational study and research

(1) To carry out research on the effectiveness of UIL program in order to input information into the organization of work-placement.

(2) Educational research based on the data generated at the Division.

Besides these activities, there would also be certain activities of coordination, organization, development, etc.

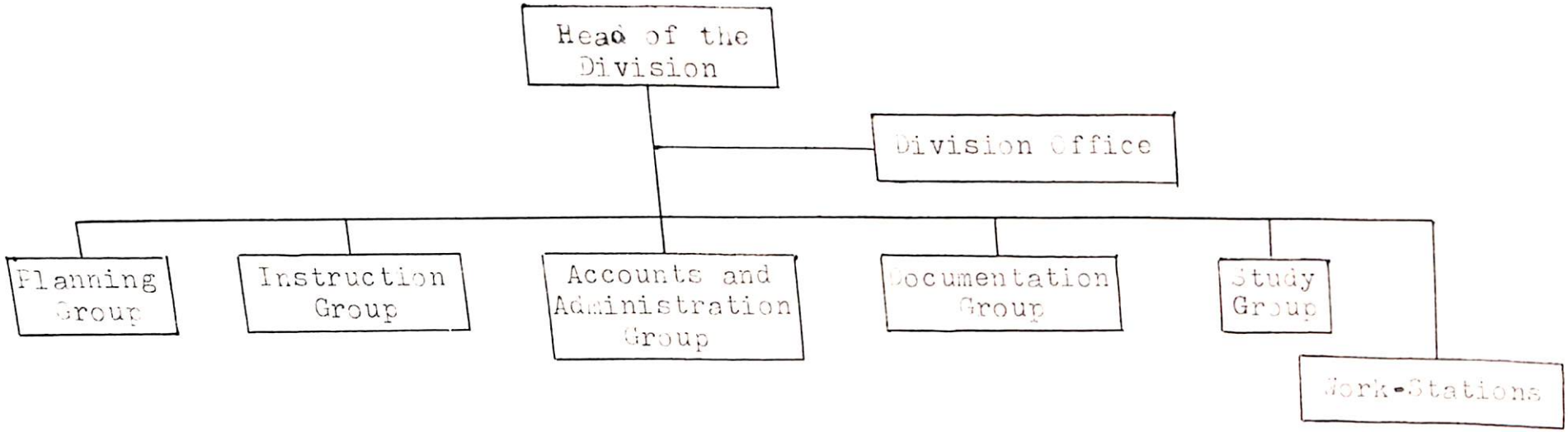
8.4 UIL Division Organization Structure

Looking into the above classification of UIL activities, it is required to further sub-divide the UIL Division into 5 Groups, viz., the Planning Group, the Instruction Group, the Accounts and Administration Group, the Documentation Group, and the Study Group. Thus, the organization structure of UIL Division would be as shown in Figure 8.4.

The Institute of Industrial Training at Brunel University, U.K., which conducts sandwich courses, has 4 service sections, viz., Placement Service,

Figure 8.4

UIL Division Organization Structure



Careers Advisory Service, Training Advisory Service and Research dealing with:(Placement Service -) maintaining contacts with organizations, placement of students, periodic visits of faculty to work places, maintaining students' records; (Careers Advisory Service -)advising students on their careers; (Training Advisory Service-) liaison with Industrial Training Boards, Training Service Agency, Individual Boards, etc., running courses for training officers when requested by the Individual Boards; (Research-)liaison between the Institute and academic departments of the University so that students can be supervised on research work in industrial training, study on the effectiveness of sandwich courses[2].

At BITS, Pilani, India, also the conducting of UIL program is managed by a separate division, viz., Practice School Division, which has 6 cells, viz., Planning & Development Cell; Organization and Coordination Cell; Instruction Cell, Accounts and Administration Cell; Publications, Documentation, Liaison and Welfare Cell; and Educational Study and Research Cell.[3]

The functions of Development, Organization, and Coordination are normally performed by a person looking after the activities of the Division. Therefore, it ia logical to conclude that these would be the responsibility of the Head of the Division. However, if there is

a need to provide a separate position for these functions, then, logically, it would fall between the Head and the Incharges of various Groups.

In the structure developed here, these activities have been considered to be the responsibility of the Head of the UIL Division.

CHAPTER 9

PERSONNEL MANAGEMENT FOR UIL PROGRAM

9.1 Introduction

The need of university faculty to conduct the program has already been established in Article 5.4.4. Therefore, the university has to place its faculty at each work-station. For this purpose, the number and type of faculty are to be determined; the availability is to be looked into; and the gap between the needs and availability, if any, is to be filled in by fresh recruitment and selection. Therefore, there is a need for manpower management in UIL program.

This chapter deals with managing of human factor, in a UIL program, in terms of estimation of faculty requirements, recruitment and selection, interpersonal relations, performance appraisal, etc.

9.2 Personnel Management

Management is the process of utilizing material and human resources to accomplish set objectives. Manpower or personnel management or management of human resource involves organization, direction, coordination, and evaluation of people to achieve the stated goals.

The primary objective of the personnel function is to maintain an adequate working force. To be able to do so, the

following activities are required:

(a) Preparing job description

This means that information about the job is recorded in a systematic form.

(b) Establishing job specifications

It is distilling the specific qualifications/ skills required of the faculty at a station.

(c) Estimating faculty needs

This is the step of defining and specifying current manpower requirements on the basis of the number of work-stations and the strength of students at each of them.

(d) Identifying faculty sources and recruiting faculty

This means that the faculty may be identified from within or recruited from without, if the need be.

(e) Selecting and placing faculty

This step is primarily concerned with deciding who, from among the available faculty members, should go to which work-station.

(f) Initiating/Managing faculty development programs

It is providing the individual faculty with opportunities for their growth, e.g., higher degrees, etc.

(g) Appraising faculty

Performance appraisal is the systematic evaluation

of each faculty member with respect to his performance on the job and his potential for development.

These activities are performed in all types of organization, generally. They constitute the framework of personnel management. This framework is further used here to develop the system of personnel management for a UIL program.

9.3 Job Description

The job of a work-period faculty is of a multi-dimensional nature. Since he will be the only faculty from university (in case there is not more than one faculty) at the station, along with the group of students, he, on one hand, has to act as a teacher/supervisor-cum-administrator and, on the ohter, has to act as students' local guardian. Apart from these two facets of the job, the faculty has to form a link between the university and industry.

On the academic and administrative sides, the job demands conducting of the program as per the academic rules and regulations; evaluating the students; helping them with their projects; reporting to the university about the progress of the program periodically; maintaining discipline; etc. The detailed job description is already given in Article 5.4.4 as 'Role of faculty'.

9.4 Estimation of Faculty Requirements

A faculty member would be attached with each work-station to conduct the program, as mentioned earlier also, in Article 5.4.4. Therefore, the apparent number of faculty required is the number of work-stations. But, if the university is unable to meet the required number of faculty, because of any reason, a single faculty can be attached with two work-stations in the same center if the number of students in them is small. The faculty can supervise the program by attending them on alternate days.

This means that the number of faculty members required, in WP-I, can be determined by looking into the number of students at each work-station. If, at a particular work-station, the number of students is between 5 and 10 and there is another work-station, in the same center, with number of students again between 5 and 10, both the stations can be alloted to one faculty. If a station has 10 to 20 students, it can be alloted to one faculty member. The allotment of students will be available before the stage of identification of faculty and, therefore, the number of students at a work-station can be readily used to get the optimum number of faculty required for WP-I.

A WP-II station would either be a running one or a new one. That is to say, for estimating faculty requirements, in WP-II, there is a need to review if some existent faculty is to come back on campus as well as to

decide if the existent faculty at the work-station would be continuing or not. This would give an idea of number of faculty members required for the already running WP-II stations.

For new WP-II stations, first, it is to be decided whether the existing WP-faculty can handle any extra load. For this purpose, a review of all, the existing work-stations, as well as new, and the existing faculty at that work-center is to be made and, then, the allotment of new stations to the existing faculty be made. If needed, new faculty can be recruited for that center.

9.5 Recruitment and Selection

During summer, the faculty, in general, do not have any assignment at the university and are on vacation. Therefore, a university will not have any difficulty in identifying and placing the faculty for WP-I. For this purpose, the university can seek availability, from each member of faculty, during the coming summer. The university can then select the required number of faculty members either by dropping some of the willing, or by exploring again, or by detaining some members, as the case may be.

For WP-II, the university has to identify faculty members who can be easily relieved from the teaching assignment on campus. If this is not possible then the university has to either recruit faculty for on-campus and place them

at the work-stations or recruit them locally, at the work-centers. This local appointment could be either regular or term-appointment.

For recruitment from outside, the university would advertise giving job description, the required qualifications and the terms and conditions. The university can also request the host organizations to suggest and permit someone from among their employees who can be taken for the job on part time basis. Those who are desirous and suitable for the job should be selected. In special cases, experience can substitute for academic qualifications.

9.6 Faculty Development Programs

The placement of a faculty member at industry gives him a chance to gain an industry-orientation, a real-life outlook which enhances his own experience. This experience can be used by him fruitfully while back on-campus. Apart from this, the university can provide an off-campus faculty with opportunities to pursue higher degrees.

9.7 Interpersonal Relations

Interpersonal relations, in the educational context, emphasizes university relationships with individual faculty members, or ways of treating and thinking about each other.

As mentioned in Article 5.4 also, the work-period faculty is a link between the university and industry.

Further, in Article 9.3 it is also mentioned, maintaining of harmonious relations between the university and industry is a part of his job.

Here, in the context of interpersonal relations, this part of WP-faculty's job is seen as one of the objectives to be achieved. The university wishes to achieve and maintain harmonious relations with the students and industry, as this will also serve as an indicator of successful implementation of the UIL program. This objective can be achieved only through a good, healthy and harmonious relationship between the university and the faculty at work-stations. And, the key to perfect relationship between the faculty and the university is a great deal of understanding about the goals- how far the goals of the individual faculty member at a work-station are compatible with the objectives of the university's UIL program.

For this purpose, the university has to make efforts to convince the individual faculty members that the university is aware of their needs and that the achievement of the objectives of university would mean, in turn, fulfillment of their needs. Specially, the university can do the following:

(a) It should make clear to the off-campus faculty the reasons behind each of its actions and steps. The

purpose should be clear.

(b) It should convince the faculty at work-stations that, he is not out of mind, even though out of sight.

(c) It should take care of off-campus faculty's personal problems immediately.

(d) It should provide the faculty at work-stations with all facilities that he is entitled for.

(e) It should keep in mind the limitations of WP-faculty and the circumstances in which he is working.

(f) It should provide the faculty at work-stations with appropriate levels of authority for various aspects of the job.

9.8 Performance Appraisal

A university's most valuable asset is its faculty. Employment usually begins with an appraisal and evaluation continues throughout the working life. The term 'Performance Appraisal' refers to the formal procedures used in working organizations to evaluate the performances, personalities, contributions and potential of employees.

The basic purpose of performance appraisal is to aid the employer in assessing the working and progress of employees for making decisions regarding their future, i.e., for promotions, transfers, re-appointments, increments, etc., as well as for their development and growth.

9.8.1 The appraisal program

In UIL program, as already mentioned in previous chapter(s), the university faculty would be involved in a multi-dimensional job. Therefore, in case of a work-period faculty, the appraisal program would have to be different from that for on-campus faculty. It should evaluate conducting of the program in terms of implementing UIL instruction as per the set objectives, guidelines and academic rules and regulations; plann-ing for the next work-period; liaison between the university and the host organization; acting as local guardian of students at the work-station; etc. Imple-menting UIL instruction includes, as already given in chapter 7, conducting Orientation, assigning projects, holding Gap-Lectures; conducting components of evalu-ation; sending periodic progress/information as per the requirements of the university; etc.

9.8.2 Items for appraisal

Looking into the operation and various important aspects of the program, the items for appraisal have been identified and are given below. Also, since the performance of a faculty in conducting the program would heavily depend upon his various, inherent traits and skills, the traits and skills essential for successful conducting of a work-period have also been identified.

Items 1 to 14 are common to both WP-I and WP-II faculty while items 15 to 19 are exclusively for WP-II faculty. Items 1 to 19 are for evaluating performance and 20 to 38 are for evaluating the traits and skills.

1. Conducting of Orientation
2. Placement of students on assignments
3. Guidance in Report preparation
4. Conducting of evaluation
5. Reporting
6. Involving of professional experts in the program
7. Maintaining of students' discipline
8. Following of all administrative procedures
9. Motivation towards the program
10. Constructive suggestions
11. Timely submission of documents
12. Overall performance in terms of planning, operating, monitoring, and controlling of the working period
13. **Liaison between university and station(s)**
14. Reporting of student dues
15. Collecting of problems for Problem Bank
16. Conducting of Registration
17. Managing of infrastructural needs
18. Timely submission of bills
19. Maintaining of records at the station(s)
20. Knowledge of the job assigned

21. Clarity of task/purpose
22. Communication skills
23. Leadership qualities
24. Ability to work under pressure
25. Ability to rise above personal relationships
26. Ability to work in unknown/uncertain/difficult situations
27. Decision-making ability
28. Ability to work with others
29. Cooperation
30. Self-reliance and confidence
31. Ability to meet deadlines
32. Sense of responsibility
33. Self-discipline
34. Ability to work hard
35. Productivity
36. Sincerity
37. Intuitiveness
38. Adaptability to the real-life situation

9.8.3 <u>The assessment</u>

The items, as identified in Article 9.8.2, can be evaluated qualitatively. Here, in this section, an attempt is made to develop a 5-point scale to evaluate them. These 5 'points' are Excellent, Very Good, Good, Average, and Poor for all the items but for a few for which separate sets of 'points' have

been identified. They are all given in Table 9.8.3. This table can be taken as a proforma for performance appraisal of a WP-faculty.

The table, as it is, may not give the complete, overall picture of the WP-faculty, in totality. It can give his performance in major activities and an idea about his traits and skills. Therefore, there is a need to devise a method to have an overall picture of the faculty in totality.

For this purpose, there is a need to quantify the qualitative assessment by assigning a fixed weightage to each level of performance. Since these levels, Excellent, Very Good, Good, Average, Poor are in a descending order, the weightages are assigned as follows:

Excellent	10
Very Good	8
Good	6
Average	4
Poor	2

Similarly, for other sets of levels, the following weightages can be assigned:

Always	10
Often	8
Sometimes	6

Table 9.8.3

Performance of a WP-Faculty

Name of Faculty :

Designation :

Center :

Session :

No. of stations supervised :

No. of students supervised :

Sl	Performance	Levels of Performance				
	(Part A1)					
1	Conducting of Orientation Program	Excellent	V.Good	Good	Average	Poor
2	Placement of students on projects	Excellent	V.Good	Good	Average	Poor
3	Guidance in Report preparation	Painstaking	Sufficient	Little	Indifferent	Nil
4	Conducting of evaluation	Reasonable	Strict	Lenient	Casual	Inconsistent
5	Reporting	Excellent	V.Good	Good	Average	Poor
6	Involving of Professional Experts in the program	Deep	Sufficient	Superficial	Indifferent	Nil
7	Maintaining of students' discipline	Excellent	V.Good	Good	Average	Poor
8	Following of all administrative procedure	Always	Often	Sometimes	Rarely	Never
9	Motivation towards the program	Excellent	V.Good	Good	Average	Poor
10	Constructive suggestions	Excellent	V.Good	Good	Average	Poor
11	Timely submission of documents	Always	Often	Sometimes	Rarely	Never
12	Overall performance	Excellent	V.Good	Good	Average	Poor

Table 9.8.3(Contd.)

Sl	Performance	Levels of Performance				
13	Liaison between university and station(s)	Excellent	V.Good	Good	Average	Poor
14	Reporting of student dues	Reliable	Methodical	Timely	Late	Unreliable
	(Part A2)					
1	Collecting of problems for Problem Bank	Painstaking	Methodical	Timely	Late	Unconcerned
2	Conducting of Registration	Excellent	V. Good	Good	Average	Poor
3	Managing of infrastructural needs	Excellent	V.Good	Good	Average	Poor
4	Timely submission of bills	Always	Often	Sometimes	Rarely	Never
5	Maintaining of records at the station(s)	Excellent	V. Good	Good	Average	Poor
	Traits and Skills	Excellent	V.Good	Good	Average	Poor
	(Part B)					
1	Knowledge of the job assigned					
2	Clarity of task/purpose					
3	Communication skills					
4	Leadership qualities					
5	Ability to work under pressure					

Table 9.8.3(Contd.)

Sl	Traits and Skills	Excellent	V.Good	Good	Average	Poor
6	Ability to rise above personal relationships					
7	Ability to work in unknown/uncertain/ difficult situations					
8	Decision-making ability					
9	Ability to work with others					
10	Cooperation					
11	Self-reliance and confidence					
12	Ability to meet deadlines					
13	Sense of responsibility					
14	Self-discipline					
15	Ability to work hard					
16	Productivity					
17	Sincerity					
18	Intuitiveness					
19	Adaptability to the real-life situation					

Seldom	4
Never	2
Painstaking	10
Sufficient	8
Little	6
Indifferent	4
Nil	2
Reasonable	10
Strict	8
Lenient	6
Casual	4
Inconsistent	2
Deep	10
Sufficient	8
Superficial	6
Indifferent	4
Nil	2
Painstaking	10
Methodical	8
Timely	6
Late	4
Unconcerned	2

Reliable	10
Methodical	8
Timely	6
Late	4
Unreliable	2

Thus, the evaluation of each item would yield qualitative, as well as quantitative, evaluation. The total marks obtained when divided by total number of items evaluated will give a score between 2 and 10. This score is defined as "Mean Performance Value" (MPV). Mathematically,

$$MPV = \frac{(\text{No.of I levels}) \times (10) + \ldots + (\text{No.of V levels}) \times (2)}{\text{Total number of items evaluated}}$$

This MPV gives the overall performance of a WP-faculty quantitatively, which can be translated back into an overall qualitative appraisal of the faculty, like Excellent, Very Good, Good, Average, Poor, with the help of the following grading:

MPV	
> 9.0,	Excellent
7.5 to 9.0,	Very Good
5.5 to 7.5,	Good
4.0 to 5.5,	Average
< 4.0,	Poor

CHAPTER 10

FINANCIAL MANAGEMENT FOR UIL PROGRAM

10.1 Introduction

If evolution of financial management be the guide, it can be seen that it has changed from an area that was mainly concerned with procurement of funds to one that also includes the management of assets and allocation of capital.

Financial management, today, is best characterized as ever changing, with new ideas and techniques. The role of the financial controller, today, is considerably different from what it was yesterday and the financial controllers have to accept the changing environment and master its challenge. In this regard, they have to thoroughly understand the underlying objectives of the system.

In educational administration, financial management would normally mean identification and definition of financial needs; determination of sources of funds; procurement of funds; allocation of funds; and control of utilization of funds.

This chapter, basically, deals with financial management, in the context of a UIL program, in terms of the aforesaid tasks.

10.2 Expenditures and Sources of Funds in a UIL Program

The expenditure on the implementation of UIL program would be, basically, on the work-period faculty, on office and administrative facilities both off-campus and on-campus, and on students.

The expenditure on work-period faculty, as obvious, would be in terms of salary, various allowances, various facilities which are permissible to on-campus faculty, and travel expenses (to and from the city of work-station(s)), etc.

Looking at the expenditure on office and administrative facilities, it is clear that this would be in terms of officers, administrative staff, stationery, postage, etc., on-campus and, similarly, off-campus, it would be in terms of office-space, stationery, postage, secretarial assistance, entertainment, etc.

Coming to expenditure on students, it seems that there will not be any direct expenditure required. But, indirectly, going in depth, it can be seen that the students would need accommodation, some room to themselves in the organization, etc.

The question is not whether the expenditure would be borne by university or students or industry. The point is that these expenses are the financial implications of a UIL program. Therefore, one has to keep in mind the

expenses on these items while estimating the total expenditure on UIL program.

10.2.1 Expenditure on UIL program as met by industry

Looking once again at the expenditure on students, it is clear that the expenditure on accommodation, meals, and other personal needs, though to be borne by the students themselves, would definitely be more than what it would be on-campus. This difference can certainly be regarded as a part of expenditure on the UIL program.

Obviously, university cannot take it upon themselves. This has to come either from students or industry or partly from both. It is in this context that industry could be persuaded to provide certain facilities, in kind and/or cash, to students. These facilities, in kind, could be in terms of free/concessional accommodation, subsidised meals - at least during work hours, medical facilities, etc., which are normally extended to the regular employees, and, also, some stipend.

As envisaged in Article 5.4.2, this will not be a problem to industry as students would be working on projects drawn from their on-going/planned activities and they would be the end-users of the results. In some sense, students would be working in the organization for the organization like other regular employees.

The expenditure incurred by the organization on this count is an expenditure on the UIL program which is met by industry. Further, students would also be needing some space to sit and work in the organization. Needless to say that an organization optimizes the utilization of space because of its high cost but, since the students would be working in the organization, the organization would definitely be providing some space to students for their working. This space, in terms of money, is to be considered as an expenditure on UIL program which is also met by industry.

As the UIL program is to be supervised by the faculty resident at the station, the faculty would also need some space for his sitting and office work and also a room for holding various components of evaluation and for interaction with students, supervisors and others.

Arranging for such accommodation would also be an expenditure on the program. This space can be hired by university but will not be a feasible or workable solution as the faculty would be away from students and the workplace which would certainly affect the smooth running of the program. An organization, familiar with the academic nature of the program, understands the importance of the presence of the WP-faculty at the station throughout the day and, therefore, would definitely provide such a space.

The expenditure on this item would also normally be met by the host organizations.

10.2.2 Expenditure on UIL program as met by university

The mundane tasks of the office as well as academics would need expenditure on typing, cyclo-styling, stationery, despatching, etc. It is clear that expenditure on these items is to be met by university. The said facilities can be had from the outside agencies but it would be time saving and convenient if they can be obtained from within the organization, if they are there, on payment. In case the host organization is willing to extend these facilities without charge, it should be most welcome.

Thus, the expenditure on these items would normally be met by university. In case of any facility extended by the host organization without charge, it can be regarded as expenditure on UIL program as met by industry.

Faculty

The faculty deputed at the work-stations to conduct the program would be paid salary and allowances as per the university rules. These are basic salary, dearness allowance (DA), house-rent allowance, city allowance, conveyance allowance, etc. Apart from these, the faculty would also be given certain facilities which are applicable to faculty on-campus, like medical reimbursement, leave travel concession, children's education, etc.

As far as salary and D.A. are concerned, they are in any case met by university. The city allowance, if not admissible in a university, should also be paid to the WP-faculty, depending upon the city of deputation. Or, the actual expenditure incurred by the faculty on his local conveyance for conducting of the program be paid by the university.

Likewise, if the university does not pay house-rent allowance, then, depending upon the city of deputation, an appropriate allowance be paid. Another way out is that the university hire suitable residential accommodation for the WP-faculty and charge him as per the rules.

There can be certain work-stations where the host organizations have their own campuses or arrangement of residential accommodation for their employees. In such cases, accommodation to WP-faculty can be sought from them, on rent, as per their rules. This would save faculty a lot of time. If the host organization extends this facility without any rent, it should be most welcome and the benefit of it be passed on to the faculty.

Then, all these expenditures would normally be met by university. The industry's contribution,

toward this expenditure, to the extent of free or concessional accommodation can be considered as an expenditure on UIL program which is met by industry.

Needless to say that industry would normally be providing facility of consultation and treatment in their medical center, if there is any, which could be even on payment.

The faculty can get the reimbursement as per the rules of the university and this expenditure can be considered as met by the university.

University has to meet the expenditure on other facilities, that are not covered so far, also, to the WP-faculty, which are normally available to on-campus faculty.

The total expenditure on faculty cannot be regarded as an additional liability on university because of UIL program as in the absence of the program the same number of students would be on-campus and a large percentage of the size of WP-faculty would have to be maintained on-campus for teaching.

UIL Division office

The UIL program, at university, would be

planned, monitored and controlled by a separate office that has been referred to as UIL Division in Chapter 8. This Division will have controlling officers and the subordinate staff. University would have to meet the expenditure on this Division in terms of salary and allowances of the staff, stationery, postage, equipment and other supplies, etc. The controllers of the program would have to be academicians who understand better the nuances of educational administration. Therefore, it seems logical that these controlling officers are drawn from the experienced oncampus faculty and be assigned the additional responsibility of administering the UIL program. They may be given some allowance for the same. This would definitely help university in not incurring a substantial amount on hiring additional persons to control the program.

University would also be meeting the expenses towards the travel of WP-faculty from the university to the city of deputation. As per the rules of a university the WP-faculty on duty would be entitled to travel and daily allowances. Since, in UIL, the period of deputation would be in months, i.e., 2 months for WP-I and a minimum of 12 months for WP-II, the concept of daily allowance may not be applicable.

Therefore, in such situations, it seems logical that the WP-faculty be given a special allowance, say, in the name of deputation/dislocation/monthly/special/work-period allowance. The last one sounds most appropriate.

Miscellaneous

In the subsections 10.2.1 and 10.2.2, an attempt has been made to identify various, obvious items of expenditure and, also, as they would be met by industry and/or university.

Apart from the aforesaid items, there may be certain miscellaneous expenses, e.g., entertainment, telephone bills, visits of UIL planners and controllers to work-stations, etc. These would also be met by university.

10.3 Items of Expenditure

In the previous article, items of expenditure on UIL program and also the sources which are likely to meet them are identified. On summarizing, the following emerge:

A. Items of expenditure on students that are likely to be met by industry

(a) Free/concessional accommodation, if provided

(b) Free/subsidised meals, if provided

(c) Stationery

(d) Medical facility, if free of charge

(e) Stipend/Out-of-pocket allowance

(f) Working space/room/desk

B. Items of expenditure on WP-faculty and office that are likely to be met by industry

(a) Accommodation, if free of charge

(b) Office space

C. Additional facilities likely to be provided by industry

(a) Typing facility

(b) Cyclostyling facility

These facilities would normally be provided by industry which may be on payment or without payment. If they are provided without payment then it is to be regarded as expenditure that is met by industry. Otherwise, by university.

D. Items of expenditure on WP-faculty to be met by university

(a) Salary and allowances

(b) Accommodation

(c) Local conveyance

(d) Medical reimbursement

(e) Travel to and from the city of deputation

(f) Other facilities like leave travel concession and children's education

E. Items of expenditure on office facilities (off-campus) to be met by university

(a) Stationery and typing, cyclostyling, despatching, etc.

(b) Entertainment

(c) Telephone

(d) Supporting staff, if needed

F. Items of expenditure on office facilities (on-campus) to be met by university

(a) Stationery and typing, printing, cyclostyling, despatching, etc

(b) Salary and allowances to officers and the subordinate staff

(c) Travel by officers

(d) Entertainment

(e) Telephone

This gives an idea that the financial implications of implementing a UIL program are to be shared by both industry and university. But, to be able to say more specifically to what extent this burden would be on university/industry, there is a need to look into the case of a particular university implementing UIL program successfully. For this purpose, the 'Sources and Uses of Funds' statement of the Practice School Division of BITS, Pilani, INDIA is examined here.

10.4 The Case Study

BITS has been operating Practice School Program successfully since 1973. The organizations associated with this program fall under the following categories:

(a) Public Sector

(b) Private

(c) Government

(d) Semi-government

Over the years, these organizations have provided various facilities. Almost all of them provide out-of-pocket allowance ranging from Rs.300 to Rs.1200 per month. All of them provide TA/DA for students' field trips. Organizations that have their own canteen provide subsidized lunch, tea, snacks, etc. Some organizations provide accommodation for students either free of charge or on nominal rent. Some have even provided accommodation for faculty. Almost all organizations provide infrastructural facilities.

The facilities provided by different types of organization are shown in Table 10.4 (a).

This is a clear indication of the whole hearted support by industry. Such active support not only indicates the stakes industry has in the program, but also demonstrates the ability of the UIL education to generate its own income and, thus, in turn, creating new directions in economics of education.

Table 10.4(a) *

Various Facilities Provided by Types of Organization

Sl	Type of PS-II Organization	Facilities							
		Free and furnished accommodation for students	Subsidised accommodation for students	Free and furnished accommodation for faculty	Out-of-pocket allowance	Infrastructural facilities	Subsidised lunch	Subsidised boarding arrangement	TA/DA for field trips
1.	Public Sector		✓	✓	✓	✓	✓		✓
2.	Private Sector	✓	✓	✓	✓	✓	✓	✓	✓
3.	Government		✓	✓	✓	✓	✓		✓
4.	Semi-Government				✓	✓	✓	✓	✓

* Data Source: Mandke V.V., et al, Financial Analysis of Cooperative Education Programmes. A conference paper presented at the Fourth World Conference on Cooperative Education held at Napier College, Edinburgh, Sept. 1985.

The Practice School Division of BITS operates the entire Off-Campus Program of the Institute on behalf of the Institute. In this case study, the 'sources and uses of funds' for the Division have been taken for the financial year April 1, 1980 to March 31, 1981 to demonstrate the percentage of financial burden met by university as well as industry.

Table 10.4(b) gives 'sources and uses of funds' for the Division for the financial year 1980-81 and Figure 10.4(a) is a pie-chart showing the percentage of contribution by various sources (as given in Table 10.4(b)).

An examination of this statement shows that the total financial burden of running the program, on the Institute, is only about 40% (39.32%, to be exact) which is shared by the Central/Administrative Office (30.22%), Educational Hardware Division (01.22%) and the Practice School Division (07.88%) of the Institute.

On the other hand, the total contribution from industry is to the extent of 40% (58.67% to be exact) of the total expenditure on the program.

The contribution from the Central/Administrative Office is towards salary, allowances, and

Table 10.4 (b) *

Sources and Uses of Funds for PS Division, BITS, Pilani

(April 1, 1980 to March 31, 1981)

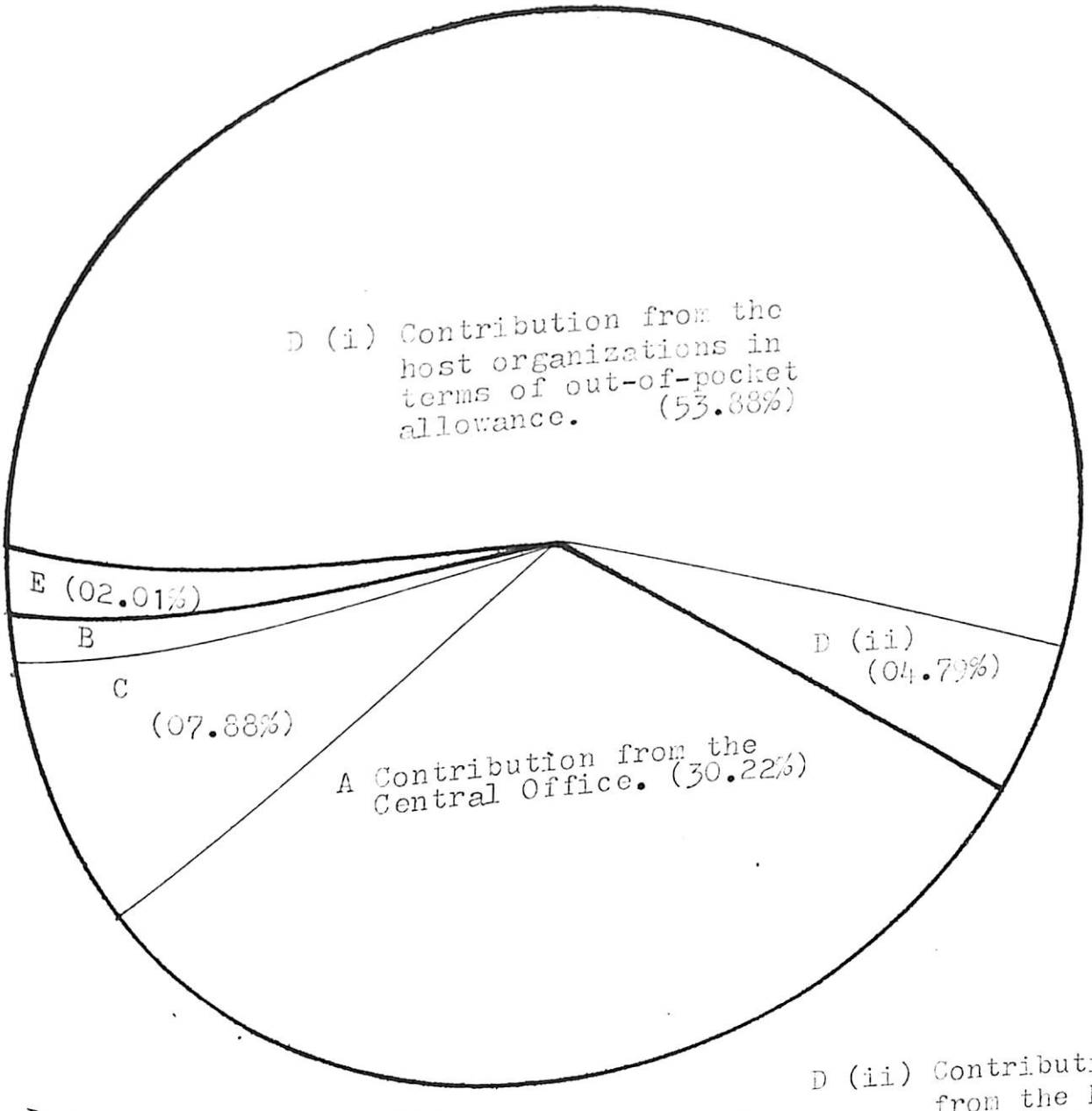
Sources		Uses	
A Contribution from the Central Office	30.22%	1 Salary of Pilani-based PS Division nucleus	09.05%
B Contribution from the Educational Hardware Division	01.22%	2 Annual salary of PS II and M.E. (Coll.) faculty	13.77%
C Contribution from the PS Division	07.88%	3 Annual salary of the supporting staff	02.16%
D Contribution from the host organizations in terms of		4 Annual PS allowance	03.00%
(i) out-of-pocket allowance	53.88%	5 Stationery, printing, and binding	01.97%
(ii) office and housing facility	04.79%	6 Office/classroom/secretarial assistance and typing and other facilities off-campus	01.35%
E Contribution from the other sources such as individuals towards off-campus program especially towards housing.	02.01%	7 House rent for off-campus faculty	05.45%
		8 TA/DA to off-campus faculty	02.24%
		9 Miscellaneous off-campus faculty allowance	01.74%
		10 Out-of-pocket allowance for students	53.88%
		11 Typing, postage, telephone, etc.	05.39%

A = 1+2+3+4+8
B = (in 5)
C = (0.75% in 5)+9+11
D = (03.44% in 7)+6+10
E = (in 7)

*Data ... V., et al, Financial Analysis of Cooperative ... paper presented at the Fourth ... held at Napier College,

Figure 10.1 (a)

Sources of funds with Percentage Contributions
(PS Program, BITS, 1980-81)



D (ii) Contribution from the host organizations in terms of office and housing facility.

E Contribution from the other sources than industry and university.

B Contribution from the Educational Hardware Division. (01.22%)

C Contribution from the PS Division.

other benefits like medical reimbursement, children's education, LTC, etc. While, the contribution from Educational Hardware Division is in terms of stationery for the use of the Practice School Division's office. The expenditure on sationery for the use of work-stations is met by the Practice School Division. The total expenditure met by the Practice School Division is for the following items:

(a) Stationery, printing, and binding
(b) House rent
(c) Local conveyance
(d) TA/DA
(e) Postage
(f) Physical facilities and secretarial assistance.
(g) Honorarium/Stipend
(h) Telephone
(i) Entertainment
(j) (Adhoc) Typing needs at rations
(k) Furniture rent
(l) Miscellaneous

The expenditure on these items as incurred by PS Division is given in Table 10.4(c). The itemwise graphs showing these expenses from 1976-77 to 1986-87 (financial years) are given in Figures from 10.4(b) to 10.4(m).

Table 10.4 (c) *

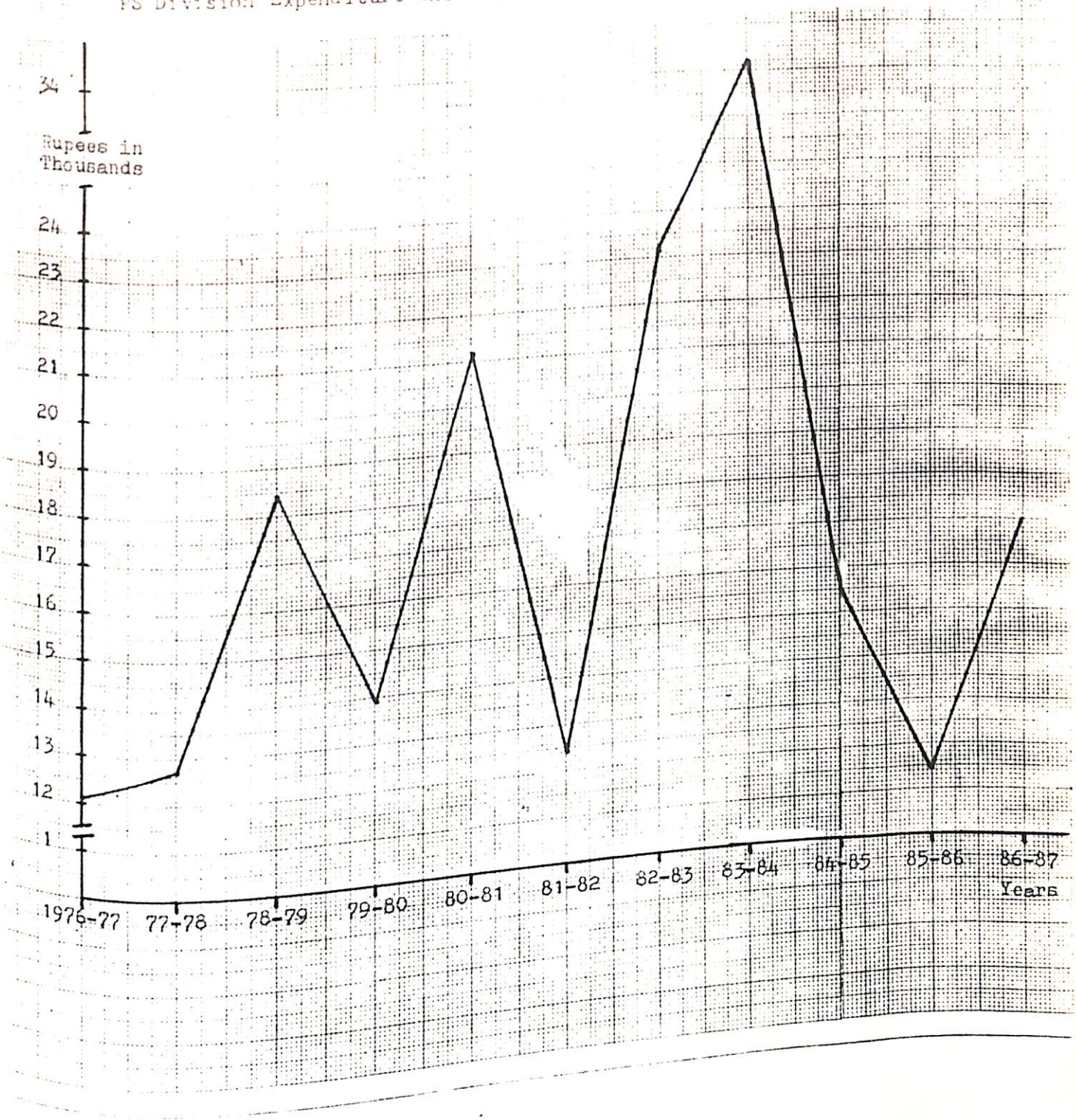
Yearly Itemwise Expenditure as Incurred by the Practice School Division (Percentages are within brackets)

Sl.	Item of Expenditure	1976-77	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87
1.	Stationery, Printing, & Binding	12073.72 (10.70)	12688.15 (12.02)	18389.49 (16.48)	13826.66 (9.22)	21210.77 (9.57)	12426.95 (6.31)	23083.65 (10.6)	34218.96 (13.70)	15488.54 (6.03)	5958.95 (2.10)	16942.28 (4.96)
2.	House rent	19683.10 (17.44)	28883.48 (27.36)	28094.58 (25.19)	39129.50 (26.09)	64131.37 (28.94)	66447.40 (33.76)	67118.57 (30.82)	83587.14 (33.48)	107919.35 (42.03)	122784.89 (43.41)	143072.50 (41.94)
3.	Local conveyance	6918.66 (6.13)	9403.67 (8.91)	13963.44 (12.52)	16664.06 (11.11)	20422.41 (9.22)	21774.50 (11.06)	27171.53 (12.47)	29089.27 (11.65)	41455.25 (16.14)	55837.20 (19.74)	65013.05 (19.06)
4.	TA/DA	59250.15 (52.50)	38724.44 (36.68)	35777.75 (32.08)	57317.71 (38.22)	62552.15 (28.22)	63617.48 (32.32)	57724.65 (26.51)	65905.28 (26.40)	57467.51 (22.38)	59286.00 (20.96)	69685.52 (20.42)
5.	Postage	3097.80 (2.74)	6539.10 (6.20)	4945.81 (4.43)	7092.02 (4.73)	5849.10 (2.64)	4996.93 (2.54)	7967.61 (3.66)	7505.55 (3.00)	8252.95 (3.21)	11452.24 (4.04)	11192.00 (3.28)
6.	Physical Facilities & Secretarial Assistance	0	0	0	0	22920.00 (10.34)	9986.00 (5.07)	9551.00 (4.38)	3000.00 (1.20)	3550.00 (1.38)	2748.00 (0.97)	2994.50 (0.88)
7.	Honorarium/Stipend	0	0	719.90 (0.65)	4839.82 (3.22)	9624.10 (4.34)	1004.18 (0.51)	1683.00 (0.77)	1083.88 (0.43)	-	-	-
8.	Telephone	110.85 (0.10)	2021.00 (1.91)	2383.95 (2.14)	3479.35 (2.32)	6642.74 (3.00)	6038.70 (3.06)	9435.43 (4.33)	5413.70 (2.16)	8814.68 (3.43)	5165.35 (1.82)	6355.30 (1.86)
9.	Entertainment	3411.03 (3.02)	3240.20 (3.07)	3252.39 (2.92)	4783.01 (3.18)	4342.37 (1.96)	4521.00 (2.30)	5461.53 (2.51)	5928.94 (2.38)	5770.47 (2.24)	10494.40 (3.71)	8366.15 (2.45)
10.	(Adhoc)Typing needs at stations	2347.13 (2.08)	2214.47 (2.10)	1822.35 (1.63)	837.08 (0.56)	792.30 (0.36)	729.35 (0.37)	1237.30 (0.56)	607.11 (0.24)	864.40 (0.34)	1958.50 (0.69)	1670.04 (0.48)
11.	Furniture rent	227.00 (0.20)	354.5 (0.34)	194.00 (0.17)	125.00 (0.08)	2062.00 (0.93)	3250.00 (1.65)	2519.20 (1.16)	3081.00 (1.23)	4007.00 (1.56)	2025.17 (0.72)	4068.55 (1.19)
12.	Miscellaneous	5736.77 (5.08)	1481.08 (1.4)	1979.96 (1.78)	1870.46 (1.24)	1061.76 (0.48)	2017.91 (1.03)	4831.94 (2.22)	10203.13 (4.08)	3151.34 (1.22)	5136.97 (1.82)	11807.26 (3.46)
		112856.21	105550.09	111523.62	149964.67	221611.07	196810.40	217785.41	249623.96	256741.49	282847.67	341167.15

*Data Source: Mandke V.V., et al, Financial Analysis of Cooperative Education Programmes, A conference paper presented at the Fourth World Conference on Cooperative Education held at Napier College, Edinburgh, Sept. 1985, and Financial Analysis File from PS Division, BITS. Pilani.

Figure 10.4(b)

PS Division Expenditure Incurred on Stationery, Printing and Binding



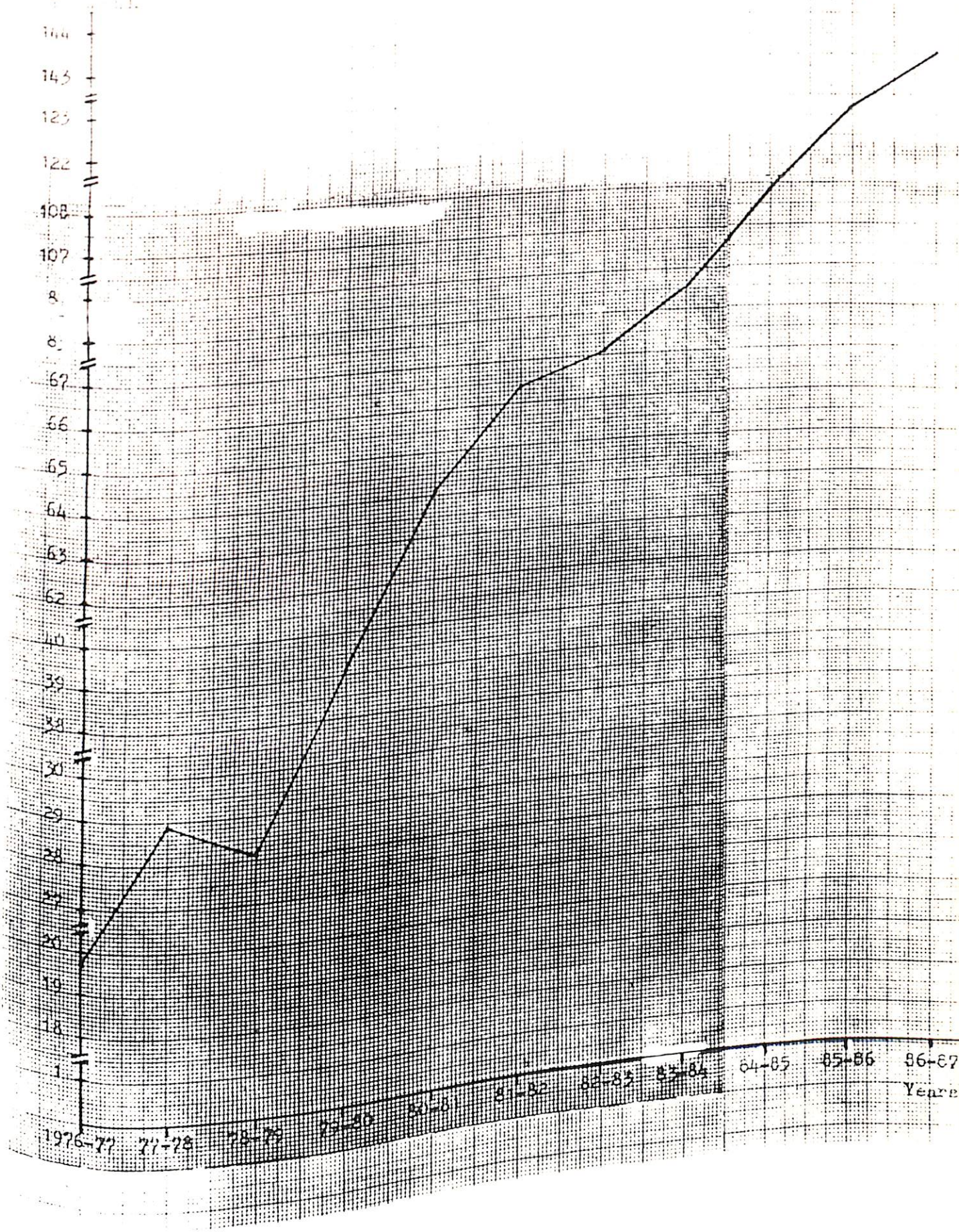

143
123
122
108
107
67
66
65
64
63
62
40
39
30
29
28
20
19
18
1
1976-77
77-78
78-79
79-80
80-81
81-82
82-83
83-84
84-85
85-86
86-87
Years

Figure 10.4(c)

Division Expenditure Incurred on Local Conveyance

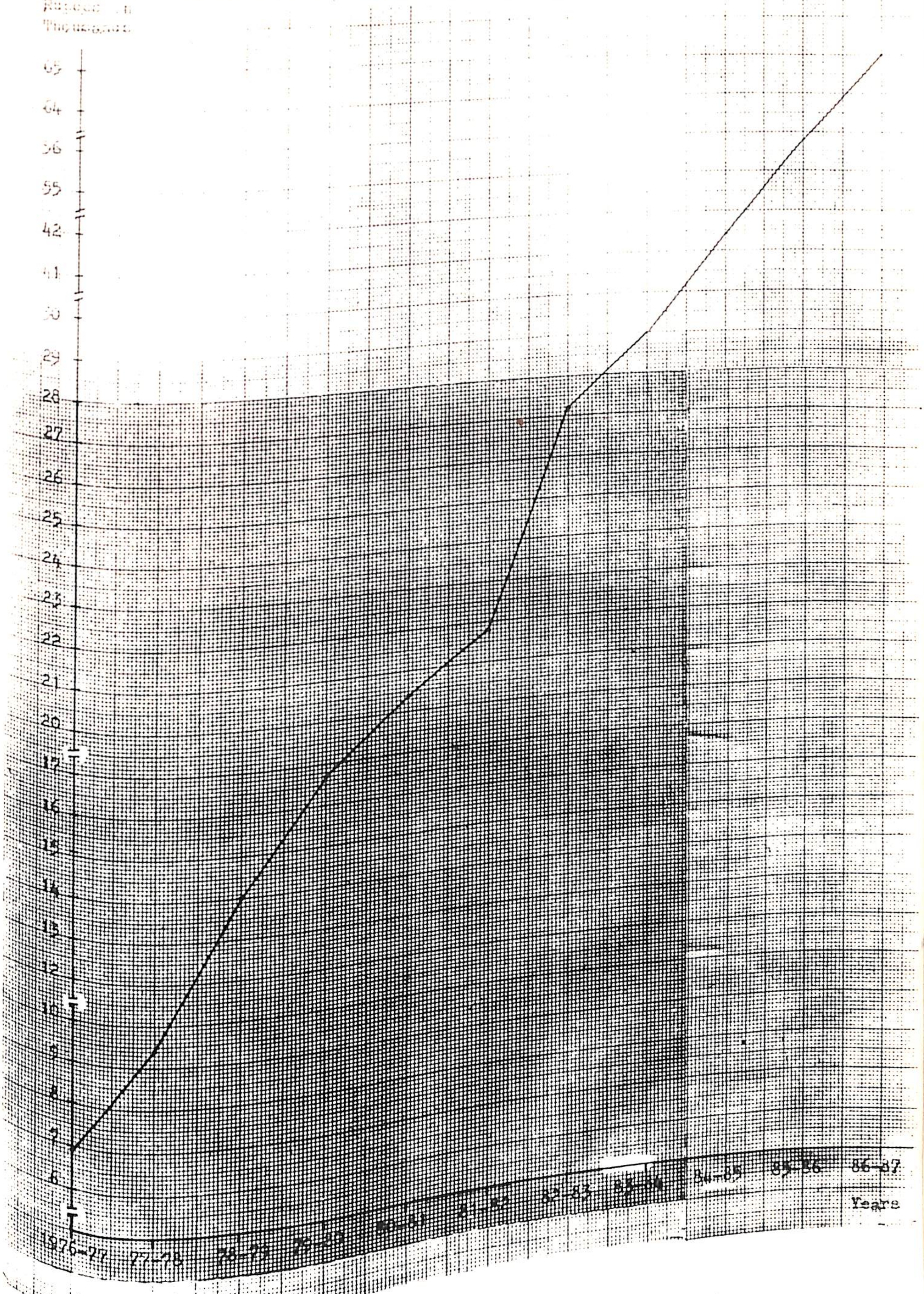


Figure [illegible].4(e)

[illegible] Division Expenditure Incurred on TA/DA

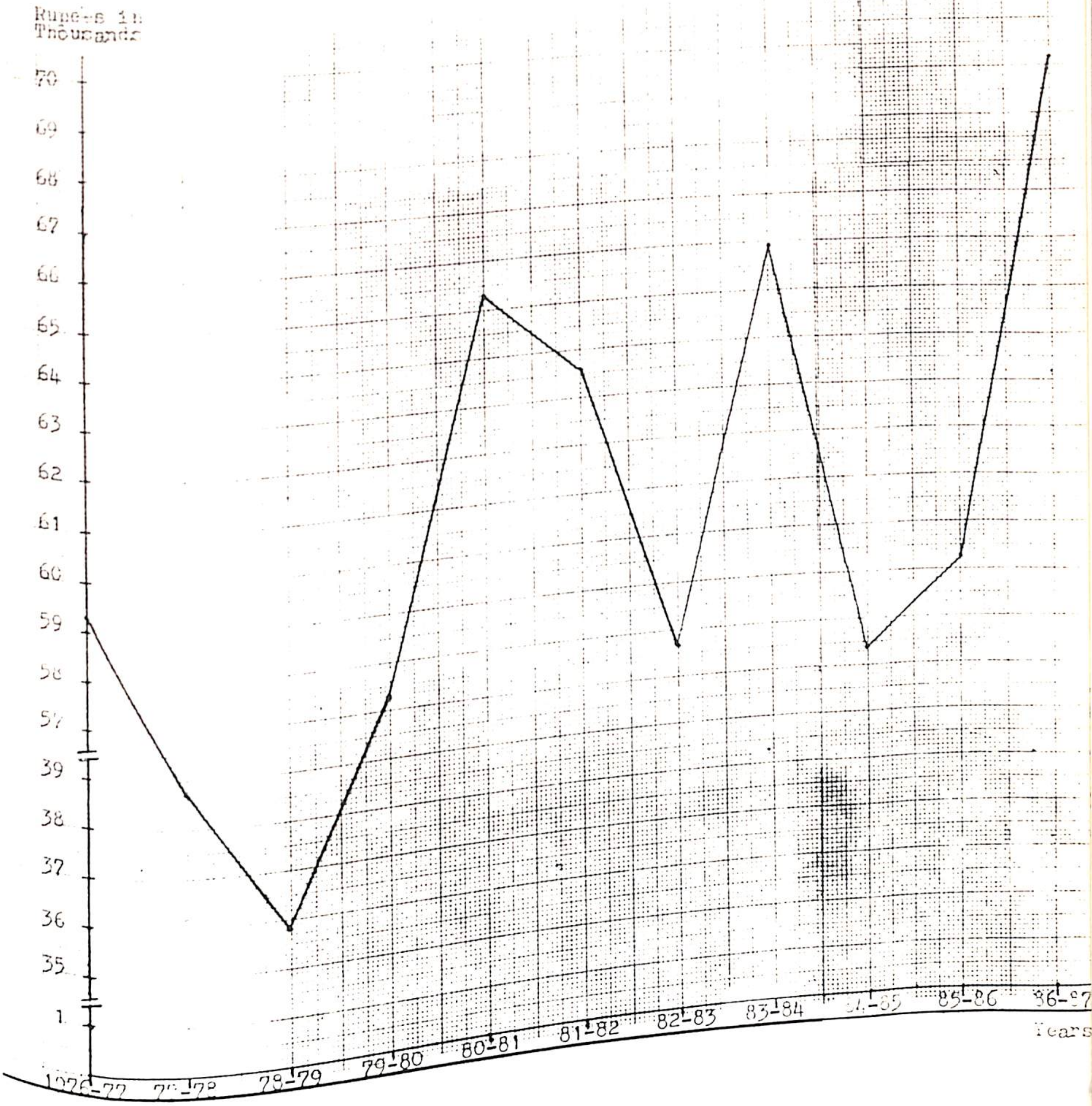
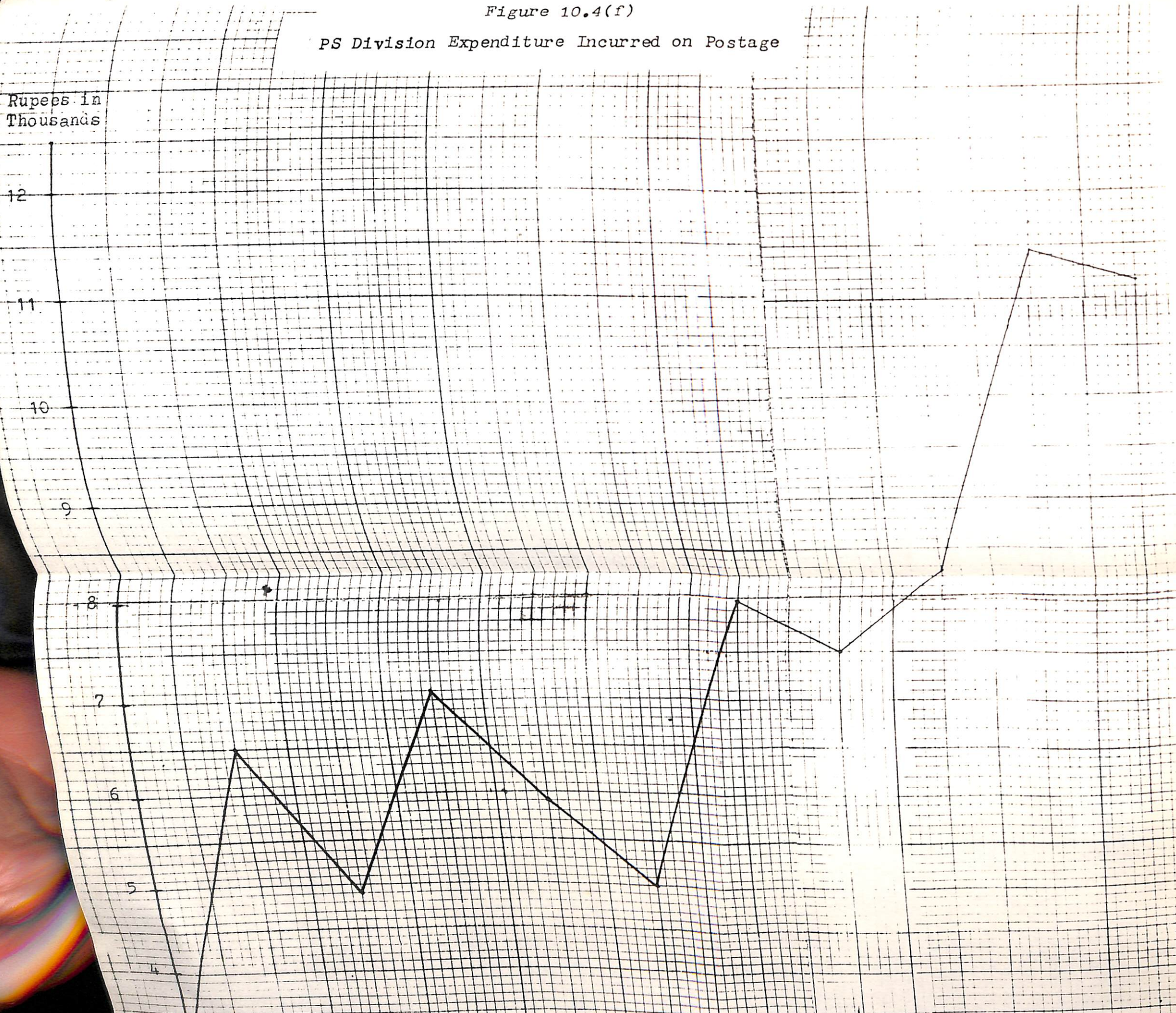
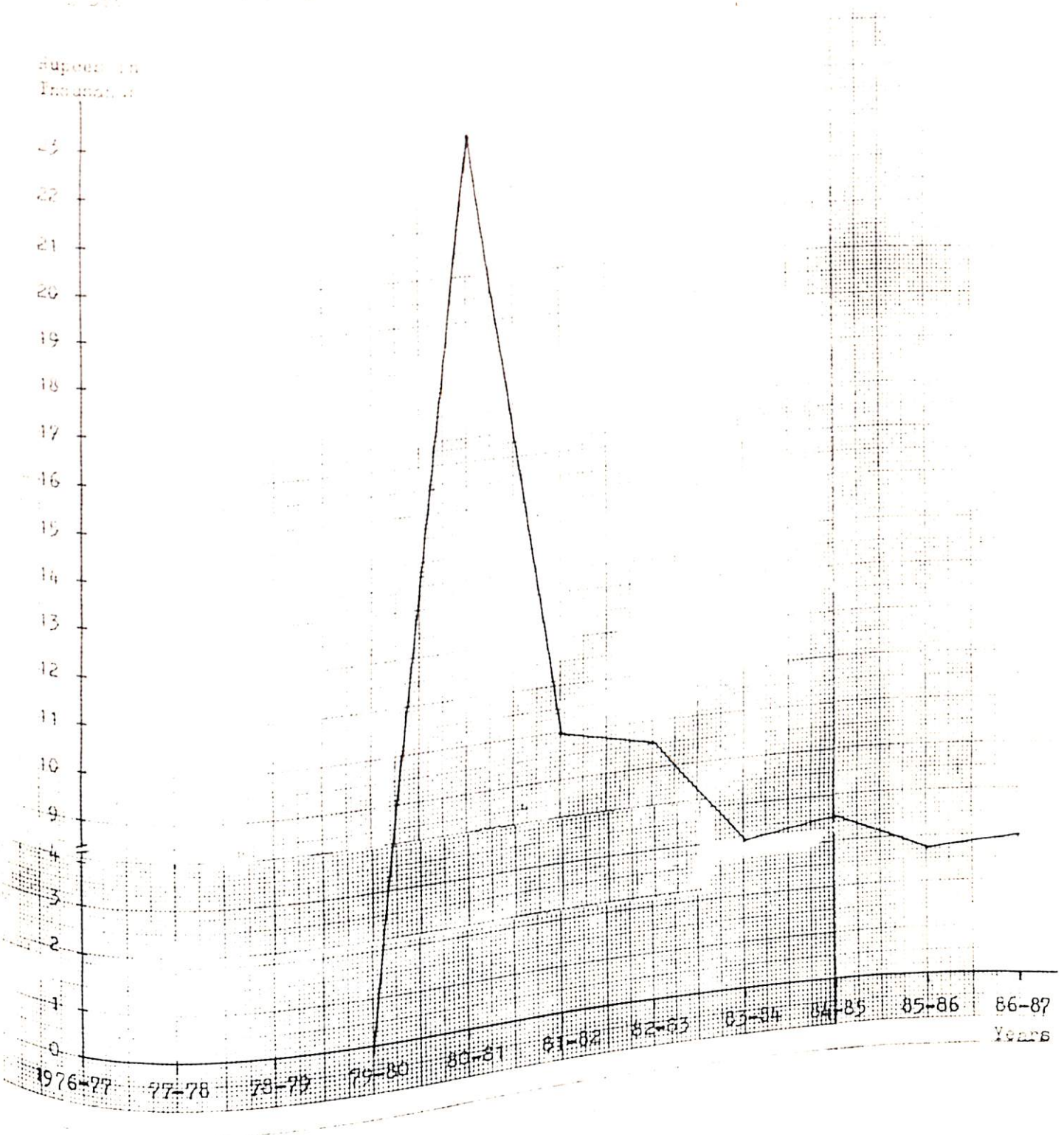


Figure 10.4(f)

PS Division Expenditure Incurred on Postage




Rupees in
Thousand
23
22
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18
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14
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78-79
79-80
80-81
81-82
82-83
83-84
84-85
85-86
86-87
Years

Figure 10.4(b)

Expenditure incurred on honorarium/Stipend

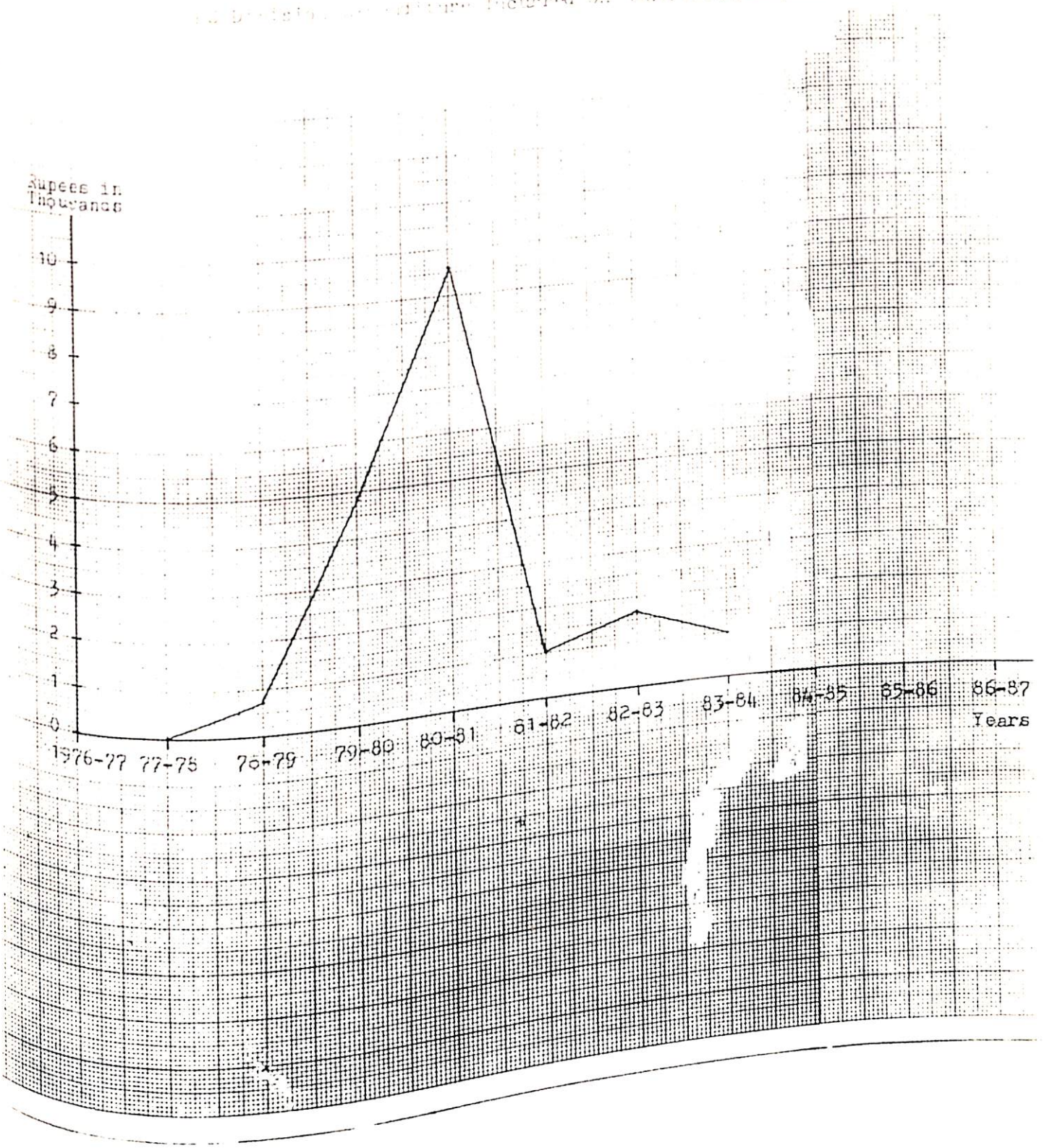


Figure 10.4(i)

PS Division Expenditure Incurred on Telephone Bills

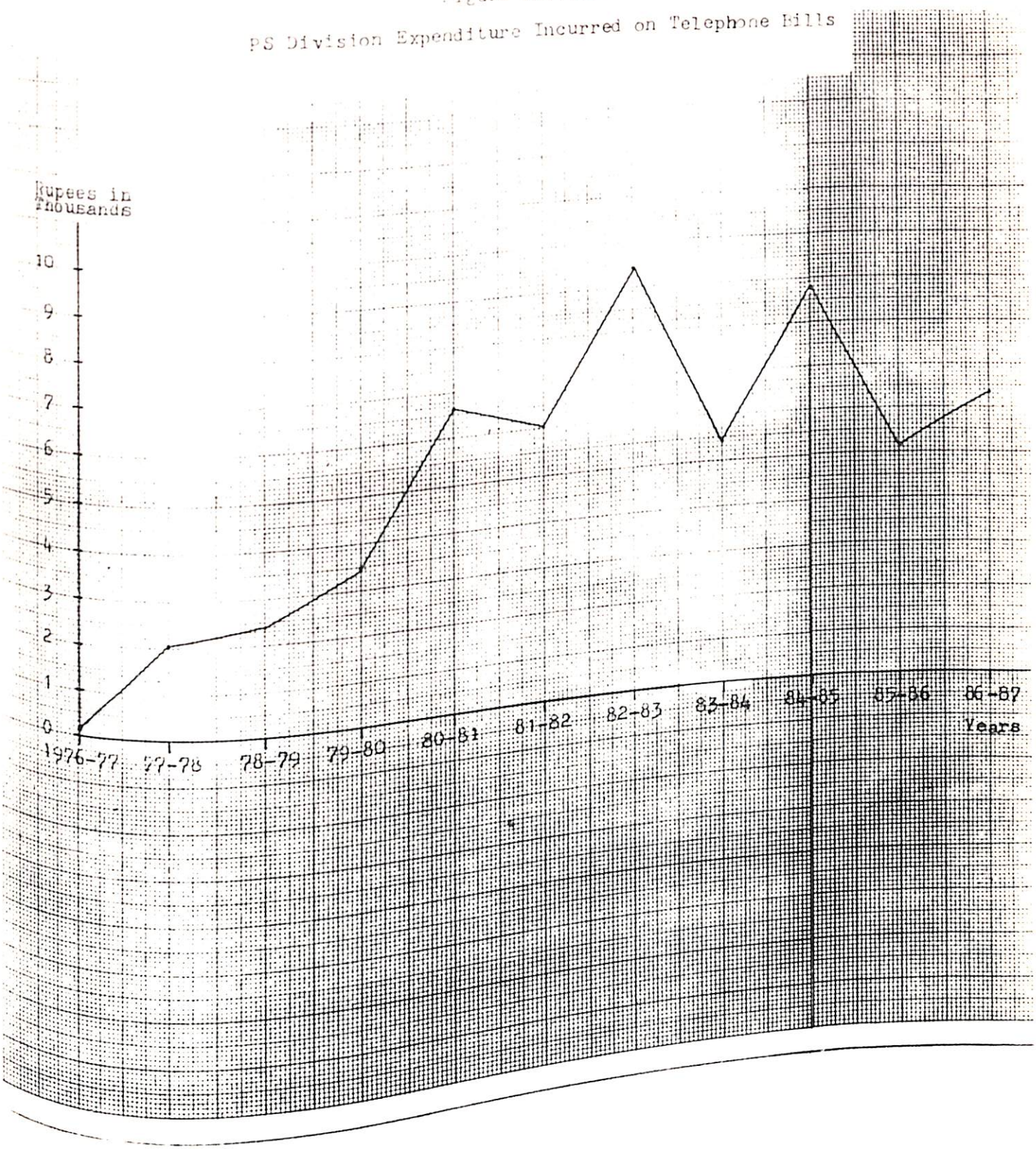


Figure 10.4(j)

PS Division Expenditure Incurred on Entertainment

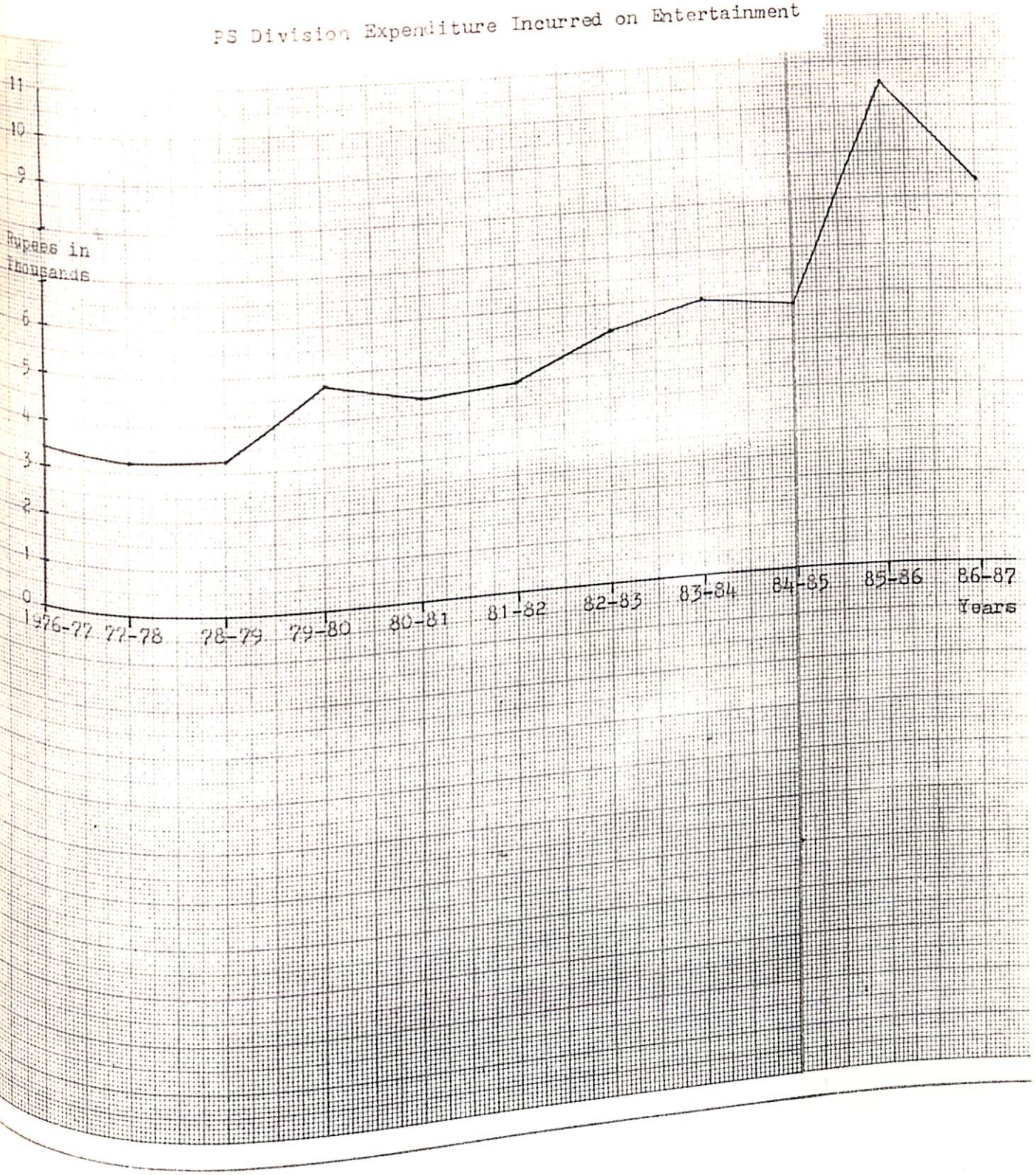


Figure 10.4(k)

PS Division Expenditure Incurred on (Adhoc) Typing Needs at PS Stations

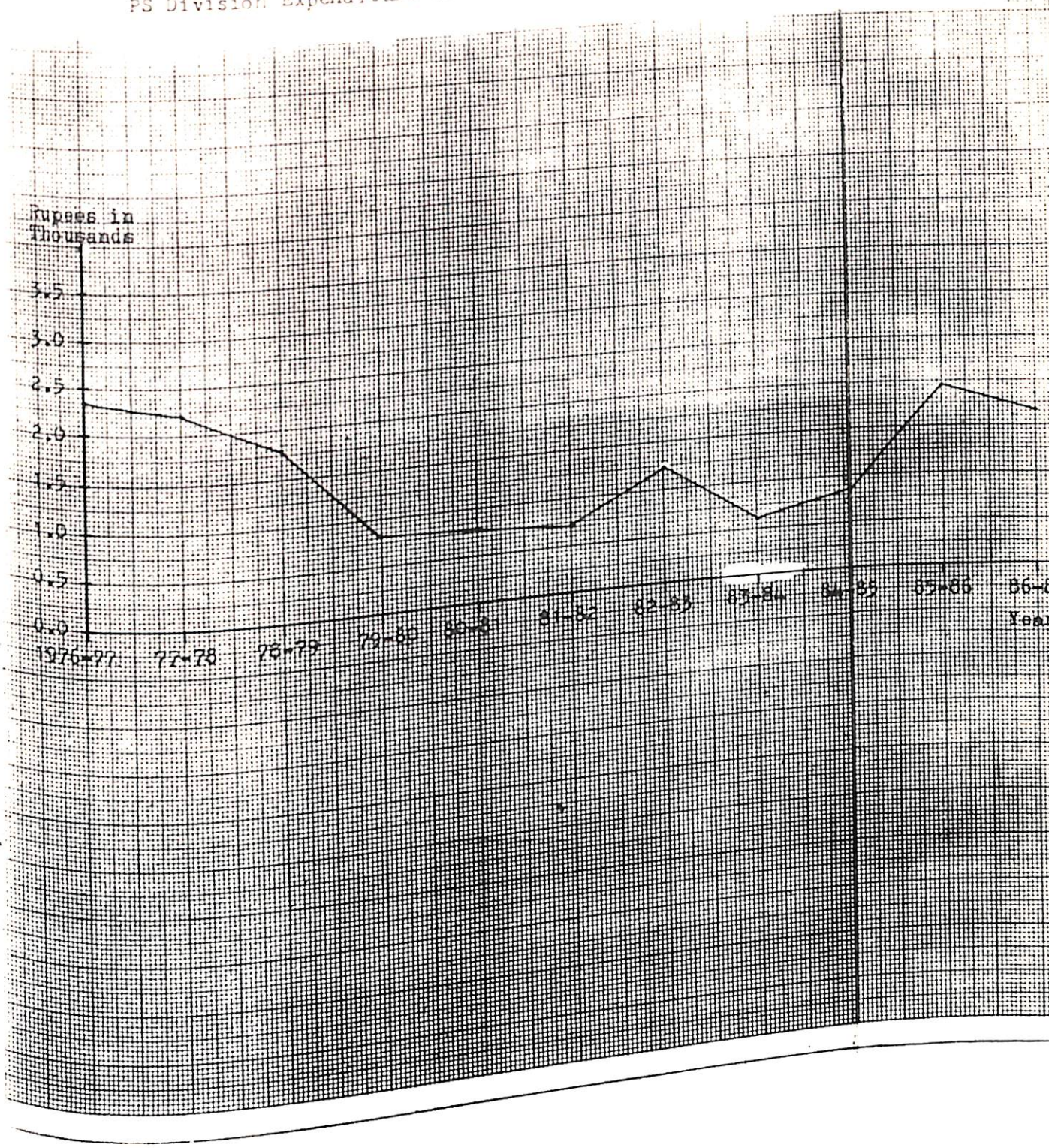


Figure 10.4(1)

Operation Expenditure Incurred on Furniture Rent

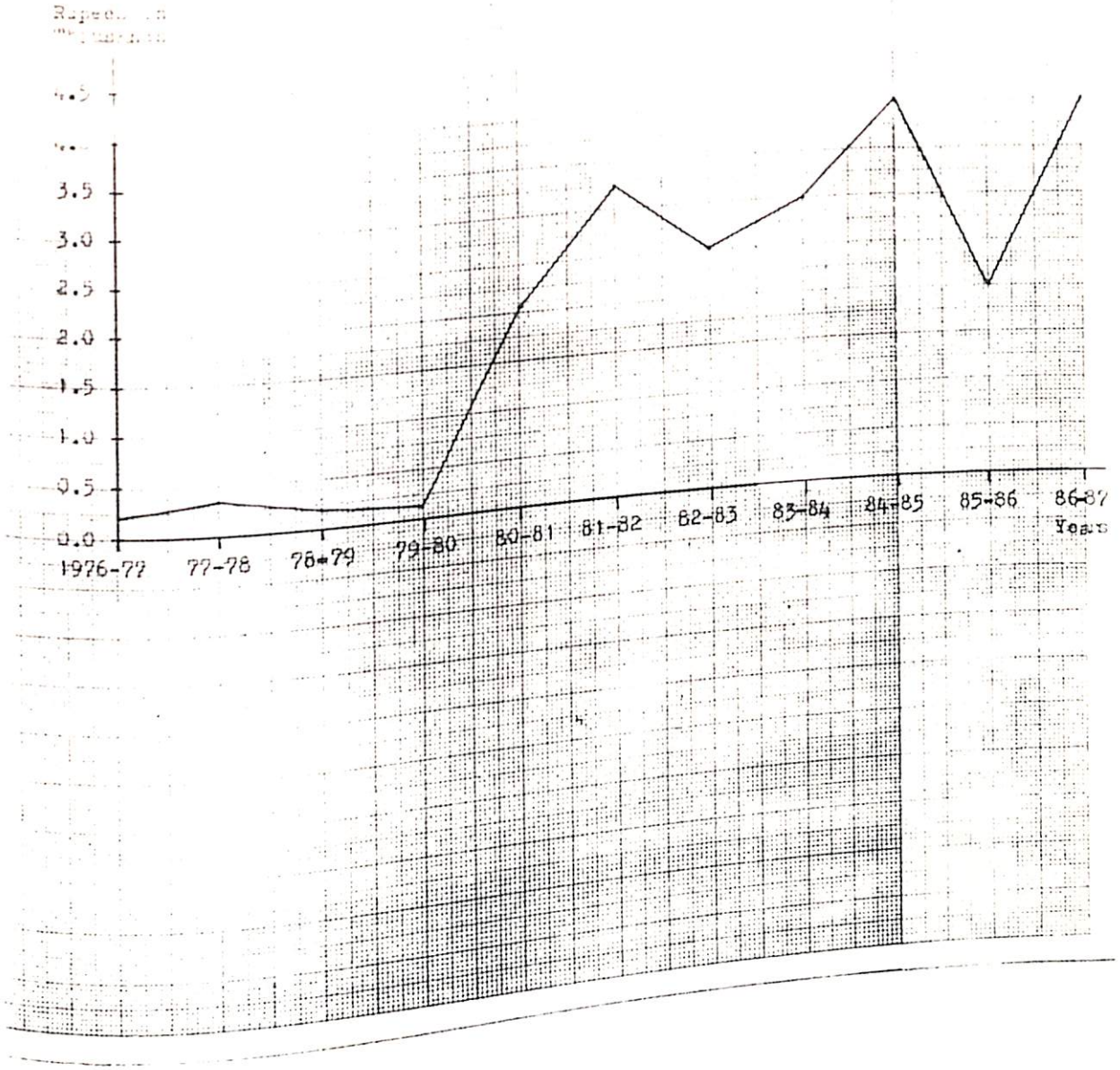
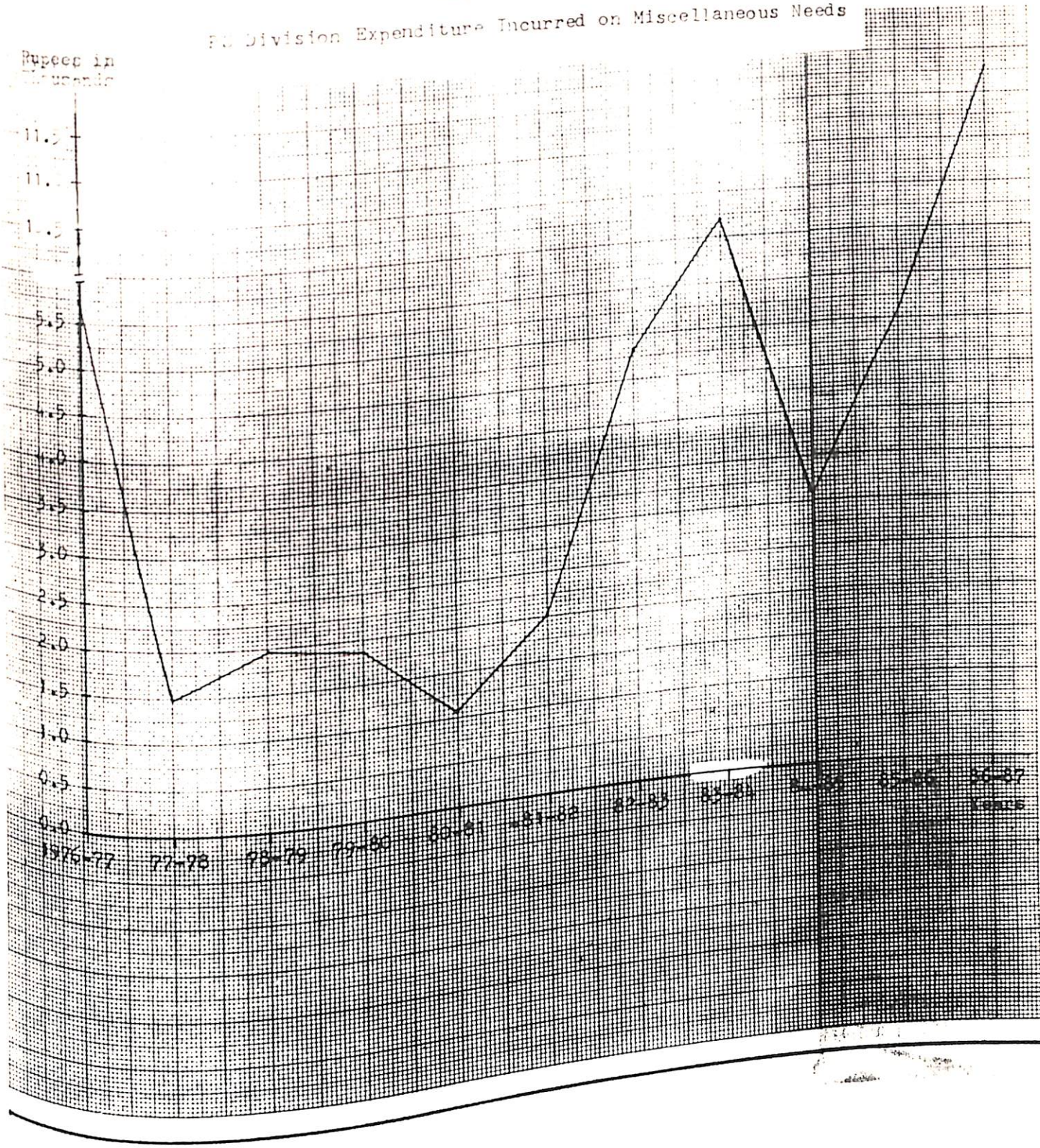


Figure 10.4(m)

F.T. Division Expenditure Incurred on Miscellaneous Needs



It can be seen that the total expenditure is increasing year-after-year. This is due to various factors. Mainly due to (1) inflation and (2) gradual increase in number of students attending the program- from 349 (in 1977) to 502 (in 1987), in PS-I and from 231 (in 1976-77) to 501 (in 1986-87), in PS-II.

Fluctuations in the expenditure on stationery, printing and binding is for the printing job is not got done regularly, yearly but after 2/3 years. When- ever something is printed, it is seen that the number printed is sufficient to last 2/3 years. That is why in some particular year the expenditure is more than in some other year(s).

Coming back to Table 10.4.3, it is noted that about 80% of the total expenditure is on only 4 items, viz., Stationery, printing and binding; House rent; Local conveyance; and TA/DA. Thus, it can be said that, in order to economise, a close check is required on spending on these items specially. At the same time, it needs no emphasis that expenditure on faculty could be reduced only by reducing the number of WP-faculty. But, in order to optimize the use of WP-faculty, their number should not be reduced at the cost of the overall objective of the program.

Expenditures under certain heads are decreasing,

over the years, because they are now being met by other divisions of the Institute. For example, till 1983-84, 'Honorarium and stipend' was met by PS Division but, thereafter, this expense is being met by the Central/Administrative Office.

From the data in Table 10.4.1, it clearly emerges that the implementation of UIL program does not involve a huge financial burden on university and this much of expenditure (about 40% of the total) by university, or even more, should be acceptable to university in the interest of UIL education.

For this, university can take necessary steps to economize on other fronts. One way of doing it is by eliminating/reducing the duplication of effort/work across the university, e.g., combining marginally different courses which would avoid wastage in teaching effort and achieve economy in teaching hours and the surplus faculty could be utilized for off-campus placements.

The contribution from industry would come only on their whole hearted involvement in the UIL program. This would need the educating of industry by university about the overall objective of the program, significance of their participation in the national cause of relevant education and, also, the benefits they are liekly to get in terms of the output of the work by students on the projects (problems) of their direct interest.

CHAPTER 11

A MODEL FOR EDUCATIONAL ADMINISTRATION OF UIL PROGRAM

11.1 Introduction

The aim of the present study, as also mentioned in the very beginning, is to develop a system of planning, organizing, staffing, implementing, monitoring, controlling, and financing the UIL education.

The preceding chapters have attempted to bring out the need, meaning and significance of these functions in UIL program. Here, in this chapter, summarizing the findings of the study, a model for educational administration of UIL program is developed and presented.

11.2 Conclusion

The traditional system of, as well as approach to, education are no longer fulfilling the changing needs of society. The society, in general, can no longer afford the irrelevant education. Therefore, there has to be a change in the education system. Or, say, there should be an educational reform by virtue of which the university education comes closer to industry. This has been advocated by various educationists, and education commissions, etc., foreign as well as Indian, from time to time. The UIL program is a concrete step in that direction which bridges the gap between university and industry, at large.

Historically speaking, many countries have made a moderate beginning by launching UIL programs. But, most of them are quite far from the objectives set by the present study (Article 3.6). Only some are successful in implementing the program with the stated goals. These attempts began in as early as 1840. The study is unable to make any trace of existence of such programs before that.

Universities which launched UIL programs adopted or developed their own models as per their countries' techno-economic environments and the social norms, characteristics, programs, and needs. The most commonly prevelant names given to these models are Co-operative Education, Sandwich Course, Work-Study and Practice School. In this study, a more generic name, UIL program, has been adopted. In order to meet the main objective of UIL program, viz., 'professional development as an integral part of the educational progress,' students are to be taken to industry at two points of time, during their degree duration, once, at the end of 2nd year, i.e., after the completion of core courses and, then, in the final year, after the completion of all courses. The periods of education at Industry are termed as Work-Periods. The study takes a world-over view of the various models of UIL program and arrives at the conclusion that the Practice School model as implemented by BITS, Pilani, India is the nearest to meeting the principal objectives of a UIL program.

For a successful implementation of UIL program, it has been identified that various management issues, viz., planning, organizing, staffing, monitoring and budgeting, are to be dealt with effectively and efficiently.

To conduct UIL program, it is needed that there is a separate division/department at the university, for dealing with the day-to-day work of planning, implementation, monitoring, etc.

Planning for UIL comprises planning for work-periods, placement of students, implementation, evaluation of students during work-periods, etc.

The implementation of UIL program will require the continuous presence of faculty at work-stations and, therefore, the faculty would be identified or recruited for the purpose. Thus, a manpower management system is needed in order to take care of deployment of faculty at the work-stations and for a continuous review of the situation and appraisal of the faculty.

After the placement of students, the program at industry begins which comprises various activities as already identified. For a successful implementation, there is to be a continuous flow of information from work-stations and to the work-stations as a part of constant monitoring and feedback.

Apart from the routine information from the stations

to control the program as per the academic rules and regulations of a university, various other types of information are also going to be generated in due course of time regarding, say, the need of modifying some courses, development of new courses, certain research projects, etc. These types of information would also be pouring in regularly and the university has to do the needful to meet the changing needs of industry so that the education they impart remains relevant.

In the process, university would be collecting various types of information and data and, also, feedback from students at industry, in case university cares to ask for it. These data will be able to throw light on various aspects of the program, academic as well as administrative. Also, they will bring out the bottlenecks, if any. Therefore, the university would have to create a cell to analyze all these data and information. This cell will also submit the analyses to the concerned desks. This cell is referred to as Study Group.

Finance is certainly an important factor for launching, keeping alive and the growth of any venture. UIL program also has its own financial requirements. Financial data for universities operating UIL programs were not available. These data could be obtained only from one source, viz., BITS, Pilani, which has been operating Practice School Program since 1973. The data were collected

for the period 1976 to 1987. These data pertain to expenses made on the UIL program, but for the 'salaries'. The total expenditure including salary and, also, the sources meeting these expenses were collected for the year 1980-81. The study made on this clearly speaks that of the total expenses on the program about 40% is met by the university from its coffer. This means that the implementation of UIL program would not be a heavy burden on university whereas its utility to the society would be very high.

11.3 The Model

The whole process of managing a University-Industry Linkage program must begin with a policy decision by the university management. Without the policy statement, it would not be possible to initiate the UIL program.

Once the policy decision has been taken, the first step towards the implementation of the program by university is to plan the 'structure of operation' (Article 3.4), 'instruction system' (Article 4.3) and 'evaluation system' (Article 3.5) for the linkage program.

Then, a management system of planning, organizing, staffing, coordinating, monitoring, and controlling is also to be developed, for the implementing and administration of the linkage program.

Also, industry has to be approached for its participation in the program.

After all this planning for the program, the management system developed would be placing students at industry, executing the instruction, and monitoring and controlling the program at industry. This system would also be looking after the financial and general administration matters.

For monitoring and controlling of the program at industry, a regular reporting from the work-period faculty would be arriving at university, as planned and designed by the management system. Also, other relevant information regarding accounts, administration, planning for future and development, etc., would be coming in. They are to be processed for the use by the management system. Further feedback to work-period faculty is sent on the basis of the processed data.

These processed data would then be subjected to educational research leading to various analyses, like placement analysis, assignments analysis, grading analysis, attendance analysis, and statistical out line- say, discipline-wise distribution of number of WP-I and WP-II students, etc. These analyses are then made available to the planners of various aspects of education and its administration at university and also to the management system to give an idea of performance and growth of the linkage program, for course development activity generation, for research and consultancy activity generation,

for further strengthening/updating/modernizing of teaching program consistent with needs of industrial world.

The model as envisaged above is presented in Figure 11.3 schematically.

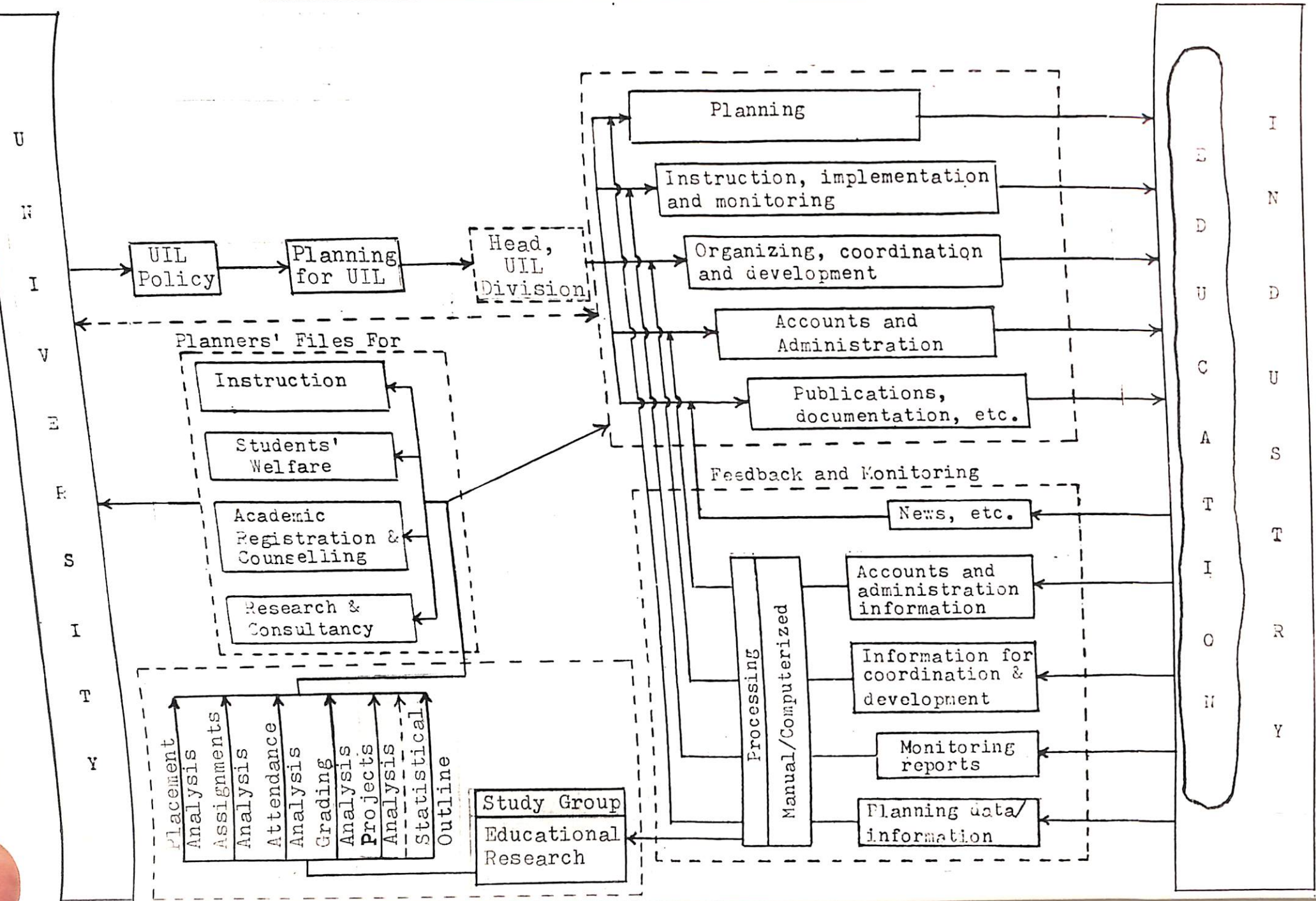
This model for educational administration of UIL program shows the flow of information/decisions for the effective and successful implementation of the program.

It begins with the policy decision of the university management for launching such a program, which will trigger off the initial planning for the linkage with industry. A person is to be named to head the UIL Division who will take care of this planning in terms of identification of work-benches, students' allotment, instruction, evaluation system, etc. His Division would be handling the program. Different desks at the Division would be sending students, faculty, guidelines, instructions, etc., to work-stations.

Information in the form of reports and materials will flow from the stations, through the work-period faculty, to the Division's Information Processing Unit. This Unit, after processing, will pass on the data received to the concerned desks at the Division and, also, to the Study Group for further use. The Study Group will analyse information in order to provide feedback to the various other divisions of the university, which will help the university take corrective steps to ensure that the

Figure 11.3

A Model for Educational Administration of UIL Program



program has the desired impact on the overall education.

The development and presentation of this model for educational administration of UIL program marks the fulfilment of the ultimate aim of this study on some aspects of educational administration for UIL.

APPENDIX I

MAJOR CHANGES REQUIRED FOR EDUCATIONAL REFORM

1. Introduction of the semester system.
2. Semesterwise registration.
3. Massive revision of curricula to changeover from rigid to flexible curriculum.
4. Courses in the entire spectrum of Engineering, Sciences and Liberal Arts made more analytical and mathematics-based.
5. Restructuring of all programs.
6. Internal evaluation.
7. Continuous evaluation.
8. Letter grading system.
9. Year-by-year passing to be replaced by coursewise clearance to assist inter-alia students' own pace in the system.
10. Individualised Time Table for each student.
11. Transfer from one program to another without much time loss for the student.
12. Massive course development activities.
13. Faculty development schemes and also development of infrastructural technical man-power.

APPENDIX II

SOME LEAD QUESTIONS TO ENSURE A GOOD EXPOSURE TO THE ORGANIZATION

1. Product Survey

* What are the various products pursued by the professional/ industrial unit ?

* Describe a short historical sketch of the product(s) pursued by the industrial unit being studied in terms of its (product's) market growth details.

* Who are the customers for the product(s) ?

* Give industrial sectorwise as also geographical province-wise breakdown of total product demand.

* On the basis of the past data and using the technique of the mathematical modelling, obtain the product demand and supply estimates for the coming decade. This exercise can be done at the national, regional, state as well as local levels.

2. Product Specification

* State information pertaining to the form, size, shape, colour, specifications and packaging for each of the products that the industrial unit under reference is producing today.

3. Raw Materials

* Give details pertaining to the various raw materials incorporated in each of the products in terms of source, quantity, specifications, availability, purchasing as also transportation cost, etc.

* If the industrial unit under reference is a mining scheme then study and sketch the geological map of the area from where the raw-material deposits are being obtained.

* What are the various regions in India with known/proven reserves of the raw materials under reference ?

4. Production

* Draw a schematic of the product manufacturing process.

* Briefly describe each stage in the production/manufacturing process.

* For a process plant, study as many 'Piping & Instrumentation (P & I) Diagrams' as possible.

5. Equipment

* Obtain details for as many equipments of the plant as possible.

* If the station happens to be a mining scheme, what are the various equipments needed for the quary operations ?

* Give names of as many manufacturers as possible from whom the industrial production unit can be obtained on a turnkey basis.

* List major mechanical as also electrical equipment in a modern power station.

* At the industrial unit under reference, seek as many opportunities as possible to be exposed to details such as (i) Prepration of tender specification, (ii) Reviewing of a vender's drawings, (iii) Tender evaluation, (iv) The process of inviting and selection of bids, etc.

* Study the process of preparing of specifications for the equipment procurement.

6. Piping, Valves, Pumps & Motors

* In case the industrial unit has piping installations, study and sketch the same.

* What are the types, sizes and applications of various valves that have been used in the industrial unit under reference ?

* Study the electrical connections diagram for a power plant.

* What are the various electric motors and drives used in the plant under consideration ?

* Discuss the types and locations of electrical meters in the plant under reference.

* List various types and sizes of pumps that have been used in the plant under consideration.

* Compare the centrifugal and reciporcating pumps in terms of their applications and describe various factors that must be kept in mind while choosing their sizes and capacities. Illustrate the said factors with the help of examples from the plant.

7. Capacity Utilisation

* What is the capacity of the total plant/shop/section under reference ?

* Obtain the number of shifts worked and the number of staff employed in each shift.

* Is the actual production equal to the plant capacity ? What has been the production over last six months ? Also draw the daily production curve.

* Study the factors behind the over-utilisation or the under-utilisation of the plant capacity.

* Study actions taken in case of an abnormal percentage of idleness and over-utilization of capacity. Were the actions taken of a short-term nature or of a long-term nature ? Which of the factor(s) responsible for the idleness has persisted for a long time ? Discuss how the reasons for idleness on account of this factor(s) weigh with respect to the reasons due to the environmental factors like market changes or shifts in the Govt. policy, etc.

* What equipment is perpetually under-utilised and why ?

Can something be done to improve utilisation of such equipment ?

* What equipment is frequently breaking down and why ?
* Draw the operation vs. idleness graphs for some critical machines and equipment. At what equipment/station/load centre-end the jobs are frequently queuing up ? Why ? Suggest a method to reduce the queue lengths ?

* If the shop is under the incentive scheme, write a short note on the salient features of the scheme.

* Is there any difference in the quality of the work produced in different shifts ?

* Does the payment to workers differ shift-wise?
* Is there a possibility for working more shifts than as of present ?

* Does the demand for the products justify working additional shifts ? If so, what are the obstacles in the way of working additional shifts ?

* Study the methods of preparing the production budgets. Are they prepared yearly, monthly or weekly ? Why ?

* What use is made of capacity utilisation figures by the top management as also by the shop floor management ?

* Are these capacity utilisation statements computerised ? What is the time lag between the reporting time and

availability of these statements ? Is there an excessive delay ? If so, why ? Does this delay affect the validity of using of these statements ?

8. Inventory

* What arrangements exist in the plant for sorting of various materials, goods, components, etc.? Are there sub-stores in addition to the Central Store in the various departments ?

* Study how these stores are arranged and maintained. Further, describe procedures adopted in the stores for the receipt of materials, goods, components, etc., and the documentation of the same.

* Describe the codification and cataloging methods adopted in the stores for different materials, goods, components, etc. Do the stores have any items on a self-replenishment system? What is the system by which the inventory of these items is controlled ?

* Describe the communication system for bringing to the attention of the concerned identors that there is an excess of any particular item. Also, discuss the procedure for the periodic review of inventories.

* What is the procedure for keeping check on consumption and indenting of spares ? Describe the precautions taken to ensure that the individual departments do not indent haphazardly.

* Discuss the methods adopted to check and to control the in-process inventories.

* Give the list of documents/vouchers used during the process of receiving, inspecting and storing the materials, goods, components (spare parts), etc.

* How are the materials, goods, etc., issued ? Who prepares the materials requisition for the production goods, maintenance, sundry materials and for other miscellaneous requirements ?

* What is the procedure for returning by the shops the rejected purchased materials after the issue by stores ? Can these materials be returned to the vendors ?

9. Quality Control

* Describe the routine set-up inside the plant for the quality control and inspection of the manufactured items.

* What do you understand by Statistical Quality Control ? Study its application in the industrial unit under reference.

* Draw an organizational chart of the quality control department and indicate the level at which the quality control and manufacturing departments have a common head. How are problems of quality settled at intermediate levels ?

* Seek opportunities to study and describe the quality assurance techniques in terms of the following:

(i) Chemical analysis, e.g., sand, cement, steel, etc.,

(ii) Physical analysis, e.g., size of grading of aggregates, strength tests on concrete cubes, etc.,

(iii) Dimensional checks, e.g., tolerances, fits, clearences and size, shape, etc.,

(iv) Condition checks, e.g., appearance, checks on completeness, stage checks such as weld preparation or reinforcement positioning,

(v) Radiographic tests, e.g., welds,

(vi) Performance tests, e.g., pressure tests on vessels or pipes, running tests on motors, etc.,

(vii) Special tests for special purposes, e.g., loading tests on driven pipes, noise tests, etc.

10. Organizational Structure

* Draw an organisation chart for the whole organisation.

* In the course of your study, superimpose on the formal organisational chart the informal organisational structure as existing.

* For each sub-system, draw a detailed organisation chart.

* (i) Trace the history of the organisation structure for the last six to seven years and indicate the major changes that have been brought about.

(ii) Study the overall effect of the changes mentioned in (i).

* Taking one of the staff departments, say, personnel, indicate how it influences the working of the line departments in their work.

11. Management Information System

* (i) What are the documents/cards/memos required to be sent whenever a manufacturing order is sent to the

manufacturing shops ?

(ii) What is the purpose of each document/card/memo ?

(iii) Who prepares each of these records ?

(iv) How do they reach the manufacturing shops ? (Indicate the details of persons carrying, handing-over formalities, etc.).

* Study how, at the departmental level, it is ensured that from the heap of data received the relevant ones are screened out.

* Study at various levels the communication network apart from the dak system.

* Study the organisation of co-ordination meetings at the various levels, where the problems are discussed every day, every week, once a month, etc. How are the decisions taken in such meetings communicated to all those who are to take action ?

12. Business Communication

* Study and describe the form and structure of various letters and memos used in the unit.

13. Research & Development (R&D)

* (i) Does the industrial unit under study have/had any foreign collaboration ? If yes, know the name of the foreign collaborating firm.

(ii) What is the proportion of foreign capital ?

(iii) Has there been any exchange of manpower with the foreign collaboration firm ?

* Does the industrial unit under study have its own R & D unit ?

It yes, know the details.

* Know if R&D effort of the industrial unit under study has effected import substitution or export promotion.

* Does the industrial unit have any linkage with the universities and/or national research laboratories ? Give details.

* What percentage of the plant capacity is utilised for the developmental work ?

14. Materials of Construction

* In terms of the industrial unit under reference, describe materials of construction giving details.

15. Instrumentation & Control

* List various measuring instruments and control devices observed in the plant, while mentioning the variables they measure or control as well as describing the principle of operation for each of them.

16. Waste Management

* For the industrial unit under reference, are there any wastes ? Give details.

* What are the sources of pollution because of the industrial unit under reference and what are the measures taken against them ?

17. Engineering Design & Development Consultancy

* What do you understand by the term Project Engineering ?

* Go back to the days when the industrial unit under reference was first initiated by its management as a project. Give names of the engineering design and development consultancy organisations whose services the management had engaged during the project implementation period and further state what type of services each of these consultancy organisations had rendered.

18. Design Decisions

* Critically unfold your understanding of the logic behind the choice of the present plant size of the unit.

* Critically discuss the role that the various parameters played in the choice of plant location.

* Critically study the rationale behind the choice of site for the industrial unit under reference.

* From amongst different alternatives possible, critically discuss the choice of the present transport route(s) between the raw-material availability location(s) and the plant site.

* Read/Sketch and critically analyse the site layout drawing.

* For the industrial production unit under reference critically study the basic plant design or the plant outline design.

* Read and draw a sketh of the 'as is' plot plan drawing for the industrial unit under reference.

* If the industrial unit under reference has its own township, sketch the same from the point of view of an architect.

19. Design Calculations

* Calculate the total water requirement for the plant as well as the township. For the supply of this water quantity, describe the water supply system.

* For the given production capacity, estimate the electrical power demand for the plant. How would this demand be modified if, say, the production capacity is doubled ?

* In case the industrial unit under reference involves piping installations, state various considerations one must adhere to in the design and layout of any piping installations.

20. Utilities

* For the industrial unit under reference, list all the utilities and services needed.

21. Drawing & Map Reading

* Undertake map-reading assigments.

* Study various legends that are used in different drawings.

22. Project Engineering

* What was the year in which the industrial production unit under consideration was commissioned ?

* Critically study the Project Report for industrial unit under consideration.

23. Infrastructural Facilities

* For the industrial unit under study, list and briefly discuss the nature of infrastructural facilities.

24. Plant Economy

* From the study of the Project Report, describe various items that go to define the 'project cost' till the stage of commissioning.

* For the industrial unit under reference, obtain the total production cost.

* For the products pursued by the industrial unit under reference, study the breakup of the total product cost.

* Study and describe accounting procedure used in the organization.

APPENDIX III

(Name of the University)

Work-Period I/II

HANDOUT

Duration : (From) _____ (To) _____

Station : _____

Address : _____

Phone No(s): _____

Name and Designation of the Coordinator from the Organization (with Phone No.): _____

Name and Residential address of the faculty :

A brief about the Organization :

Timings : _____ Weekly offs: _____

Evaluation Scheme:

Component	Frequency	Weightage	Tentative Date

Any other point of relevance, e.g., expected behaviour, discipline, etc.

_____
Signature of WP- faculty

APPENDIX IV

(Name of the University)

RI-1

Last date for submission : _____

Station : _____

Date of commencement of WP-I : _____ Summer, _____(Year)

Sl.	Roll No.	Name	Date of joining

Date : _____

_____
Signature of WP-I faculty.

-APPENDIX V

(Name of the University)

RI-2/RII-2

Last date for submission:_____

Station:_____ No. of working days:_____

I/II Semester/Summer Session/Year: _____

Sl.	Roll No.	Name / Component Marks	Quiz	Group Discussion	Seminar	Viva	Report	Observation	Diary	Total

Date:_____

_____

Signature of WP-faculty

APPENDIX VI

(Name of the University)

RI-3

Last date for submission:_____

Station:_____ Summer,_____(Year)

Sl.	Roll No.	Name	(Month) 1	2	3		31	(Month) 1	2	3		31

Date: _____

_____

Signature of WP-faculty

APPENDIX VII

(Name of the University)

RI-4/RII-6

Last date for submission: _____

Station: _____ No. of working days: _____

I/II Semester/Summer Session/Year: _____

Sl.	Roll No.	Name	Quiz			Group Discussion			Seminar			Viva			Report			Observation		Diary		Total	Attendance
			I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	I	II		

Date: _____

_____
Signature of WP-faculty.

APPENDIX VIII

(Name of the University)

RI-5/RII-5

Last date for submission : _____

Station : _____ Session/Year : _____

I/II Semester/Summer

A.

Sl.	Roll No.	Name	Topic of Seminar		
			I	II	III

B.

Sl.	Roll No.	Name	Title(s) of Project/Assignment

Signature of WP-faculty.

Date: _____

APPENDIX IX

(Name of the University)

RI-6/RII-8

Last date for submission : _____

Station : (Name in Full) : _____

Session/Year :_____

I/II Semester/Summer

1. Classification of the organization (Bank, Research Laboratory/Organization, Manufacturing Unit, Mill, etc.).
2. Address of the organization with phone number(s), gram and telex.
3. Name, designation and address of the Head of the organization.
4. Names and designations of other professionals associated with UIL program.
5. Name and designation of the Coordinator of the program from the organization.
6. Residential address with phone number(s), if any, of the WP-faculty.
7. Facilities provided by the organization.
8. Any other information on the organization deemed necessary by the faculty.

Signature of WP-faculty

Date:_____

* For example, out-of-pocket allowance, accommodation, subsidised meals, office, etc.

APPENDIX X

(Name of the University)

RI-7/RII-7

Last date for submission :_____

Station : _____

I/II Semester/Summer

Session/Year : _____

Sl.	Title of the Project	Roll No(s). & Name(s) of the Student(s)	Professional Expert(s)	Related University-Based Research Areas	Related University-Based Courses.

Date:_____

_____
Signature of WP-faculty.

APPENDIX XI

(Name of the University)

RI-8

Last date for submission: _____

Station: _____ Summer, _____(Year)

A.

Sl.	Topic of Gap-Lecture	Date	Name & Designation of the speaker

B. Topics of Group Discussions:

a)

b)

_____
Signature of WP-faculty

Date:_____

APPENDIX XII

(Name of the University)

RI-9/RII-9

Station: _____

I/II Semester/Summer Session/Year: _____

1. Title of the Project : _____
2. Duration : (from) _____ (to) _____
3. Roll No(s). and Name(s) of the Student(s): _____
4. Name(s) & Designation(s) of the Professional Expert(s) : _____
5. Name of WP-faculty : _____
6. Abstract :

APPENDIX XIII

(Name of the University)

RI-10/RII-10

Last date for submission : _____

Station : _____

I/II Semester/Summer Session/Year: _____

1.

	I		II		III	
					Date of	
					Holding	Feedback
Quiz						
Group Discussion						
Seminar						
. . .						

2. Date of starting the work-period at the station.

3. Date of distributing the Handout.

4. Date of closing the work-period at the station.

Signature of WP-faculty

Date: _____

APPENDIX XIV

(Name of the University)

RII-1

Last date for submission: _____

Station: _____

I/II Semester Session: _____

A. Registration:

Sl.	Roll No.	Name	Date of Registration	Fees(+dues) reported	Amount paid	Draft/ Cheque No.

B. Orientation:

1. Duration
2. Divisions/Departments to which students were exposed.
3. Names & Designations of Professional Experts who participated in the program.
4. Method of assessing students' performance in the program.
5. Method of conducting the program.

C. Project Allotment:

Sl.	Roll No.	Name	Title of the assignment

Signature of WP-faculty

Date: _____

APPENDIX XV

(Name of the University)

RII-3

Last date for submission : _____

Station : _____

I/II Semester Session: _____

Project Title	(a) Student(s) (b) Expert(s) (c) Faculty	Objective(s)	Present Status	Any problems	Is the progress as expected?

Date: _____

_____

Signature of WP-faculty.

APPENDIX XVI

(Name of the University)

RII-4

Last date for submission :_____

Station: _____

I/II Semester Session:_____ Reporting month _____

(Information here should be only for the month of reporting).

1. Titles of the projects completed or abandoned.
2. Titles of new projects (along with the names of the students and supervisors) assigned.
3. Evaluation components (with dates and marks) held.
4. Names of students who were absent/on leave for more than 2 days (with reasons).
5. Names of students who left for/came back from field-trip (with purpose, place and duration).
6. Change(s), if any, in the administrative/organizational structure of the host organization.
7. Changes, if any, in the facilities provided by the host organization.
8. Gap-Lectures (with topics and speakers) arranged, if any,
9. Problems of indiscipline, if any.
10. Any academic/non-academic news of university's interest.
11. Any project done by students (of any batch) implemented by the host organization and its outcome(s).
12. Any other matter which is not covered here.

Signature of WP-faculty

Date:_____

APPENDIX XVII

(Name of the University)

RII-11 Rating Sheet

(This statement summarizes the assessment of student's professional personality as arrived at by the WP-faculty).

Roll No.:_____ Name:_____

Semester:_____ Session:_____ Degree:_____

Station :_____

	Traits and Skills	Excellent	Good	Average	Poor	Very Poor
1.	Knowledge & Application of fundamental principles.	-	-	-	-	-
2.	Intellectual ability	-	-	-	-	-
3.	Creativity & Art of guestimation	-	-	-	-	-
4.	Professional judgement	-	-	-	-	-
5.	Problem solving ability	-	-	-	-	-
6.	Decision-making ability	-	-	-	-	-
7.	Ability to communicate	-	-	-	-	-
8.	Initiative and Self-reliance	-	-	-	-	-
9.	Team work	-	-	-	-	-
10.	Leadership	-	-	-	-	-
11.	Punctuality & Ability to meet deadlines	-	-	-	-	-
12.	Sense of responsibility & Common sense	-	-	-	-	-

☐	☐	☐	☐	☐
Confident, poised and courteous	Should be less aggressive	Pleasant, courteous & forceful	Should be friendlier with group	Should be more aggressive

Additional comments, if any: _____

_____

_____

Name of the WP-faculty: _____

Signature

Date: _____

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