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ABSTRACT

A project management design for modularizing higher education at open universities was developed and tested. Literature in the fields of project management and development of modular curriculum materials was reviewed and used as a basis for developing a project-based approach to the process of developing modules for self-instruction. According to the model developed, project management should be regarded as a combination of planning control techniques requiring systematic planning and control of time, quality, information, organization, and money. The module development process consists of the following activities: development of an overall course description; development of a course plan; production and testing of written, audiovisual, and software course materials, readers, and test/examination instruments and harmonization of the materials/course with study support requirements; development of a draft course; development of a finalized version of the course; and publication and distribution of the learning modules. The proposed modularization method has several advantages: it permits optimal use of staff capacity and material resources; it provides a better overview of the various projects involved in the modularization process; and it allows better subsequent costing of each module. (Contains 28 references.) (MN)

# Project-based module development



R.M. van Meel

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RESEARCH PROJECT 'PROJECT MANAGEMENT IN INNOVATION OF HIGHER EDUCATION'.

The main purpose of this study is to devise and to test a project management design for the modularization in higher education. Modularization is regarded as the educational adaptation of curicula in order to meet new demands for education. This study seeks to contribute to the adaptation process of educational organizations, by providing a design allowing institutes for higher education to organize their courseware production in a feasible way.

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# Content

## Abstract

The present report describes how the process of module development can be organized in an effective way. It is based on literature in the field of project management, supplemented with Open University publications on the development and production of modular study material. Extensive modularization programmes require an accepted procedure to allow the various activities and the use of staff capacity to be as efficient as possible. In this report, a project-based approach is proposed for the third stage of the modularization process (the development of modules for self-instruction). Relatively simple methods and techniques have proved sufficient for developing modules in an efficient and controllable way. The transparency created by this method of working offers advantages for all parties involved.

# 1 Introduction

The literature on project management is relatively young because interest in these techniques did not really begin to arise until the beginning of the 1950s. Various types of projects can be distinguished. Traditionally, project management has been concerned with one-off large-scale projects, e.g. public works projects such as the construction of a bridge, or the construction of the Channel tunnel or an oil platform in the North Sea. The second type to be distinguished involves projects carried out only once within an organization, such as the launching of a new product, the introduction of a computerized information system or a reorganization. The third type of project can be found in the industrial production of bulk goods. Under the influence of continuously increasing international competition and shortening product life cycles, companies are forced to renew their range of products more frequently. By systematically applying project management techniques, many enterprises have already managed to reduce the period between a concept and the introduction on the market of a new product, thus, at the same time improving cost and quality control. Finally, project management techniques have been applied for a long time now in the accomplishment of aid programmes in developing countries (Giard, 1991:7-8).

The application of project management techniques in a variety of situations has caused many different definitions of project management to come to circulate (Chvidchenko, 1974; Barnes, 1985; Meredith & Mantel, 1989; Wijnen, Renes & Storm, 1990; Giard, 1991). Given the setup and aim of this study, the definition proposed by Cleland (1990:18) is the most useful one. According to this definition, project management is:

> "The creation and delivery of something that did not previously exist, on an ad hoc basis, so that the project meets cost and schedule objectives. Projects are building blocks in the strategy of an enterprise that facilitates that organization's growth and survival. More broadly, a project is something that brings about change in an organization and has:
> - time, cost and technical performance requirements (or objectives);
> - complexity, scope, or innovation beyond the operational work of the enterprise;
> - a key role in preparing the organization for its future;
> - significant contributions by two or more functional units of the organization;
> - a direct contribution to the success or failure of the enterprise."

In the literature on project management, the classical management functions (planning, organization, coordination, control and evaluation) are elaborated systematically for the operational level. Maximum advantages of efficiency and scale - the classical advantages of specialization - are partly sacrificed to achieve a higher degree of purposiveness. Very little attention is usually devoted to the question of which factors are of special importance in this context in a particular organization (Mintzberg, 1979) or in a particular type of project. According to Kerzner (1982:7), project management has come into existence as a result of an increasing need for new management techniques. In practice, project-based structures are generally adopted when there is a high degree of complexity of tasks. If, in addition, this high degree of complexity is accompanied by a dynamic environment, project management techniques can be considered as a way to continue to function effectively in a period of increasing insecurity (Stinchcombe, 1985; Kerzner, 1982). However, detecting the environment in which project management is most likely to occur does not provide a solution to the problem of harmonization of a project and its environment, which is generally acknowledged to be an essential problem. Attempts to develop a systematic approach to or a general view on this issue have never been made. Organization theory is apparently not very interested in this approach. Stinchcombe (1985:25) considers this to be a symptomatic effect of the fact that organization theory has mainly focused on the study of permanent and stable characteristics of organizations, such as their structure and related variables. Theoretical considerations, therefore, devote more attention to routine activities within a more crystallized environment. The lack of well-defined theoretical frameworks might also explain the highly normative nature of the literature on project management.

This may be illustrated by the following quotation, whose message and tone may be called representatively of a large number of textbooks in this field:

> "Because a project has a relatively short time duration, decision-making must be rapid and effective. Managers must be alert and quick in their ability to perceive "red flags" that can eventually lead to serious problems. They must demonstrate their versatility and toughness in order to keep subordinates dedicated to goal accomplishment. Executives must realize that the project manager's objectives during staffing are:
> - acquire the best available assets and try to improve them;
> - provide a good working environment for all personnel;
> - make sure that all resources are applied effectively and efficiently so that all constraints are met, if possible (Kerzner 1982:204)."

The following sections will present a systematic method for developing modules for higher professional education in a project-based manner. Such a system is useful for a number of reasons. First, it allows every project team to begin its work on the basis of an accepted strategy, which means that certain procedures need not be devised for each project individually. In addition this approach allows to achieve a higher degree of efficiency due to the experience effect. Finally, it increases the controllability of the individual projects and provides a better overview of the overall development work. The starting points are the principles formulated within the framework of project management and experience acquired in course development at the Dutch Open University.

# 2 Principles of project management

Project management consists of three core activities:
- planning
- project control
- staffing management.

*Project planning* includes all activities necessary to carry out a project, specifically activities with respect to:
- the content-related programming of the activities to be performed;
- the financial resources;
- the information and monitoring systems;
- the relationship between the project and the parent organization;
- the use of staff capacity.

In more concrete terms, the aspects to be planned and controlled are time, money, quality, information and organization. Specific tasks and techniques have been developed for each of these aspects, as is shown in the diagram below. Those elements which may play a role in the development of modules will be discussed in greater detail below.

Table 1: An overview of objects, specific tasks and techniques for the five control aspects. Adapted from: Wijnen, Renes & Storm, 1990:76-100.

| Aspect | Objects | Specific tasks | Techniques |
|---|---|---|---|
| Time | - content-related project activities<br>- interim results ('milestones')<br>- relationship between these two | - normative activities in all stages<br>- progress control in all stages | - 'scheduling'<br>- network planning<br>- Bar charts<br>- capacity planning |
| Money | - costs<br>- results<br>- returns | - normative activities in all stages<br>- progress control in all stages | - measuring and estimating outgoing and incoming cash flows<br>- classification of costs<br>- difference analysis<br>- estimating the costs, budgeting, signalling<br>- financial project evaluation etc. |
| Quality | - quantified requirements with margins<br>- systems, procedures and techniques | - normative activities in initiative and definition stages<br>- progress control activities in design, preparation, implementation and follow-up stages | - standardization<br>- quality/costs analysis<br>- quality engineering<br>- failure mode effect<br>- criticality analyses |
| Information | - content-related project data on identification, registration and monitoring<br>- modification in these data | - normative activities in initiative and definition stages<br>- progress control activities in design, preparation, implementation and follow-up stages | - application of computer and automation techniques<br>- configuration management<br>- information by exception<br>- project documentation and filing |
| Organization | - relationship between project organization and parent organization<br>- internal project organization:<br>♦ distribution of tasks, powers and responsibilities<br>♦ general management tasks | - normative activities at start of the project, start of implementation and rounding off of the project<br>- progress control activities in intermediate stages | - important techniques from organization theory and behavioural science<br>- analysis of objectives and task allocation<br>- decision-making<br>- team development<br>- social skills<br>- conference techniques<br>- conflict management |

With regard to the choice of planning and control techniques, the size and complexity of the projects concerned are of major importance. Specific techniques have been developed for dealing with complex projects which may last a few years and involve hundreds of different subactivities and dozens of staff members per subactivity. Other techniques are available which are more suitable for simple projects with limited scope. The development of modules, or of course material in general, can be classified among the relatively simple projects. We will therefore focus in particular on those techniques and methods which are useful in this context.

After a project has effectively started, *project control* becomes the main function of project management. The control tasks take relatively more time and require a larger investment than the activities involved in project planning. On the basis of experience data, Harrison (1985:xv) concludes that the planning of projects takes up approximately 20 per cent of the time, whereas control activities take up the remaining portion.

The essence of project control is concerned with signalling problem areas and/or delays as early as possible in order to take the measures necessary to reduce delays and costs before they get out of hand (Harrison, 1985:57). Cost accounting is only one element of the entire project control system. Yet, the monitoring function is sometimes wrongly restricted to this aspect. The project managers are not only responsible for financial management, but also for the planning and control of the project as a whole. If a project involves various objectives to be pursued simultaneously, these objectives cannot be maximized or minimized all at the same time. It will be inevitable to work out a number of compromises, usually with regard to the duration or the costs of the project. In general, it may be said that the project manager is responsible for reducing costs and duration to a minimum while at the same time ensuring an acceptable level of quality (Harrison, 1985:55-65).

Summarizing, it may be stated with regard to project management that a clear distinction is apparently made between the planning of content-related activities aimed at the project result and the control activities aimed at effectiveness. Following on from this, Wijnen, Renes & Storm (1990:53) put forward that the cornerstones of project management are:

- phasing and decision-making with regard to the content-related aspects of the work;
- integrated control of project management aspects.

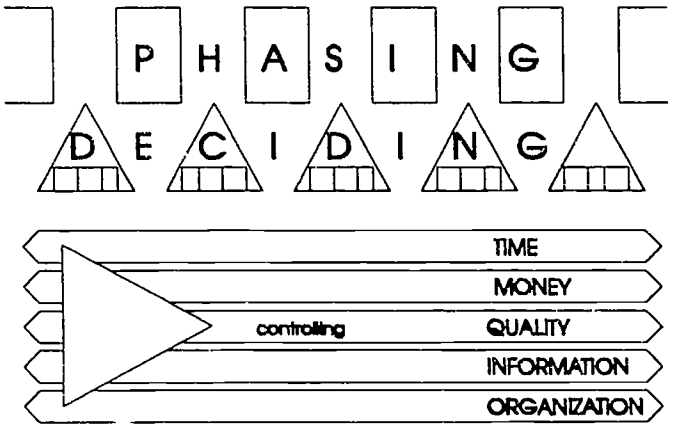


Figure 1: Project phasing, decision-making and control
Adapted from: Wijnen, Renes & Storm, 1990:52.

Institutes for higher education were elaborately described by Mintzberg (1979) as professional organizations for which the major design variables are recruitment and selection. Experience acquired in actual practice points in the same direction. The success of projects appears to be determined to a large extent by *staffing management*, in which selection and training of project team members are important factors for success (Pinto & Prescott, 1988:7). The introduction of project management requires due attention to the training of team members and project managers. A number of problems occurring in relation to modularization clearly point in this direction. Investigations into the need for professionalization (Weijenberg, 1992) have shown that institutes for higher professional education are faced with a number of educational and organizational difficulties which could be resolved by means of a suitable training programme.

Educational problems most frequently encountered during the development work are:
- insufficient ability to formulate learning objectives;
- insufficient ability to compose self-study material;
- insufficient ability to offer the material in a well-structured way;
- insufficient ability to test the usefulness of existing materials;
- inability to develop test items which are consistent with the learning objectives;
- lack of experience with regard to developing written materials.

Organizational problems are usually attributed to:
- lack of time for the development work
- underestimation of the amount of time required for gaining experience with regard to developing material for self-instruction;
- inability to convey the material to the students;
- inability to explain to the teachers the usefulness for them of working with self-study materials.

In accordance with the above-mentioned studies, the conclusion may be drawn that a number of teachers evidently feel the need for professionalization with regard to the knowledge elements and skills which they consider necessary for developing modules of a self-instructional nature (Weijenberg, 1992:20). For large-scale modularization projects, a systematic approach is required with regard to the professionalization of the project team members, requiring coordinated cooperation between all hierarchical levels. The approach proposed earlier in this chapter allows a systematic elaboration of the training policy.

In addition, working together with colleagues in a team and dealing systematically with the available time and resources make an appeal to social skills other than those normally called for in a "traditional" educational institute. New forms of interdependence, inexperience and frictions due to competition between colleagues are problems which are recognized as such by most authors (Cleland, 1990; Volpp, 1989; Kerzner, 1982; Knight, 1979). As early as in 1967, Argyris (1967:34) pointed out that problems in matrix structures - organizations in which all activities are project-based - are caused in particular by the fact that the management style and the functioning of the project team members are more attuned to traditional organizations and the accompanying power relations and specialization. In line with Mintzberg (1979), Argyris considers training to be the most appropriate way to solve this type of problem. To be effective, an important requirement is that this training is adjusted to the daily work as much as possible, or, as formulated by Argyris (1967:52):

"The matrix organization requires education that
- focuses on individuals in team systems
- occurs where the problem is located
- is learned by the use of actual problems
- is tested by the effectiveness of the actual results
- is controlled by those participating in the problem."

# 3 Project-based development of modules

In every course, a number of dimensions with regard to curriculum design can be distinguished. A formal training course leads to an officially recognized qualification or diploma. This diploma may be a combination of a number of certificate units which can be obtained separately, and which may each be subdivided into smaller units. The modular structure is concerned with the composition of the curriculum in standard units and with the learning paths which may be taken through the curriculum. A particular educational method is selected for each module. Normally, the sequence of the modules in combination with a number of educational methods should enable the students to satisfy the final requirements of the course. As far as content is concerned, a curriculum is composed of a number of subjects in which a number of main areas and a number of themes can be distinguished. The degree of coherence and consistency of the way in which the three above-mentioned dimensions have been carried out determines the effectiveness of the course to a large extent.

The following diagram provides an overview:

Table 2: Distinguishable levels of modularization

| Curriculum design | Educational programme | | |
|---|---|---|---|
| Qualification structure | Diploma | Certificate units | Parts of certificate units |
| Modular structure | Curriculum / final requirements | Standard units | Educational methods |
| Subject structure | Subjects | Main areas | Themes |

The project-based approach outlined below aims to develop a standard unit into a module for self-instruction as effectively as possible.

## 3.1 Phasing

The first step divides the whole project into a number of phases, listing the accompanying activities and explaining the nature of each activity. Such content-related programming of activities is not too time-consuming for smaller projects such as the development of a module. A formal method for making a ground plan of the work to be carried out during the project is the so-called work breakdown structure (WBS). It divides each phase into content-related subactivities, each with their interim results (Kerzner, 1982). By means of a WBS, the work can be subdivided into controllable packages of tasks for which individual staff members may be appointed (Harrison, 1985:121).
In accordance with this general principle, it is possible to distinguish a number of phases and corresponding activities in the development and production of course material. The following phasing is applied by the Dutch Open University:

Table 3: Course development manual 1983

| |
|---|
| Step 1 Overall course description |
| Step 2 Course plan |
| Step 3 Start of parallel phases<br>3.1 Production of the materials<br>- written materials<br>- written visual materials<br>- audiovisual materials<br>- software materials<br>- reader<br>- test/examination instruments<br>3.2 Evaluation of the course<br>3.3 Harmonization of the course with study support requirements |
| Step 4 Draft course |
| Step 5 Definite course |
| Step 6 Material production/publication and distribution |

In Research & Development departments with university-educated project team members, the objectives for planning and control are usually determined in consultation (Dunne, 1983:35). In the process of module development the attainability of the project aims can be increased by deciding both these objectives and the criteria for planning and control by mutual agreement between teachers, project management and the study programme director.

## 3.2 Milestones or decision points

The end of each phase is followed by a so-called milestone, i.e. an interim result and simultaneously a formal decision point which serves to initiate the next phase. At these milestones, a variety of content- or management-related decisions may be taken with regard to the activities in the following phase. On the basis of the proposed phasing for course development, the following diagram shows the accompanying decision documents and indicates for each milestone what must be on the table before the next phase can start.

Table 4: Decision documents and activities involved in module development

| | |
|---|---|
| Decision document 1: Course plan<br>- blueprint of the course<br>- didactic concept<br>- media mix<br>- contracting | Decision document 2: Draft course<br>- date of transfer of copy to production department<br>- transfer of other materials<br>- implementation plan<br>- evaluation by study programme director |
| Decision document 3: Finished course material<br>- delivery of course materials to dispatch department<br>- transfer of examination items<br>- dispatch plan | Decision document 4: Subsequent costing and evaluation of the project |

The various stages in the development process of a module are represented in the following network diagram. The starting date indicated at the top left of each activity is 1/1/93 because no time planning was made.

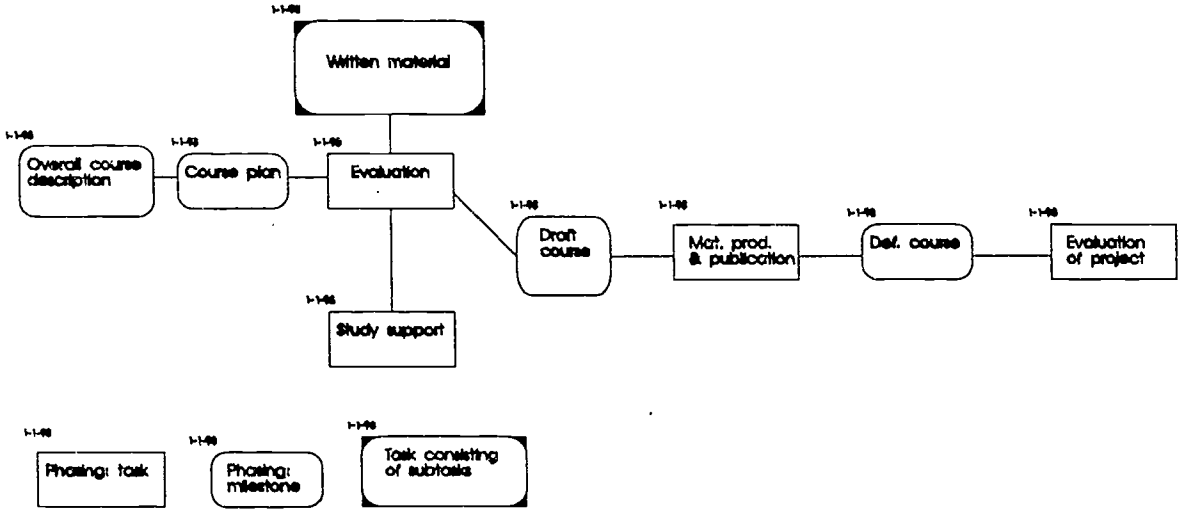


Figure 2: Network planning of subactivities involved in module development

## 3.3 Time planning and staffing

The next step involves finding the most logical order for carrying out the activities required for drawing up a time planning. Bar and Gantt charts are the most simple techniques for producing the basic time planning and both are helpful as communication instruments for increasing the manageability of projects. "One of the major advantages of Bar charting is that it is a relatively simple technique, requiring little training and the individual manager or engineer can construct his own with little difficulty and everyone involved can understand them." (Harrison, 1985:144). On the basis of the time planning, arrangements can be made concerning staffing, the allocation of financial resources and other material provisions. A study on the use of management techniques in Research & Development departments showed that the Bar chart is the most frequently applied technique (Dunne, 1983:37). A shortcoming of this method is that it cannot show relationships between activities. This problem can be solved, however, by using a Bar chart in combination with an arrow diagram. A second drawback of the Bar chart method arises when a subactivity overruns the foreseen period. In that case, the entire diagram must be adjusted to represent the actual state of affairs (Harrison, 1985:130-136), although this should not be too much of a problem with the software applications currently available. More sophisticated techniques such as the Critical Path Method and the Program Evaluation and Review Technique do not have these shortcomings. They are therefore more appropriate for large-scale projects but require more knowledge and experience if they are to be applied properly. For modularization in higher education, it is recommended to work with visual techniques such as Bar charts, arrow diagrams and simple software applications because of the relative simplicity of the projects and the opposition to paperwork and a higher degree of dependence on technology (Van Meel, 1992).

There are various methods to estimate the time required for developing a module, with different results. To work effectively it has prooven to be absolutely necessary that the teachers are able to work without interruption for a particular period of time. Ideally, teachers should be relieved of their teaching tasks for 3 to 4 weeks to work on module development (Hover, 1990:55). The standard for the amount of time required for development is based on study hours, i.e. the number of hours spent by students on learning or studying. Or, formulated in other words the total amount of instruction time plus the time for self-study or homework. Hover (1991:10) estimates the development time at 3 to 5 times the study hours.

Because developing course material is a new task for teachers, we assume that an average of 4 development hours per study hour is a realistic standard. It goes without saying that the development of entirely teacher-independent modules requires greater care than the development of modules in which particular educational tasks are carried out in a more traditional way in a classroom situation.

To illustrate the above, the project-based method for module development will now be elaborated in greater detail. According to the above-mentioned ratio of 4 development hours per study hour, a module of 40 study hours requires a development time of 160 hours. Starting from the following estimate of the amount of time required for the various activities, it is possible to make a planning for the project. It is based on the assumption that a teacher is relieved of his teaching duties in order to work on module development for 2 days per week (Mondays and Tuesdays):

Table 5: Example of a planning scheme

| Name | Earliest start | Latest finish | Actual start | Days |
|---|---|---|---|---|
| Overall course description | 04/01/93 | 04/01/93 | 04/01/93 | 0.50 |
| Course plan | 04/01/93 | 11/01/93 | 04/01/93 | 2.00 |
| Written material | 11/01/93 | 01/03/93 | 11/01/93 | 14.00 |
| Evaluation | 01/03/93 | 02/03/93 | 01/03/93 | 1.00 |
| Study support | 02/03/93 | 02/03/93 | 02/03/93 | 0.50 |
| Draft course | 08/03/93 | 08/03/93 | 08/03/93 | 0.50 |
| Mat.prod. & publication | 08/03/93 | 08/03/93 | 08/03/93 | 0.50 |
| Def. course | 09/03/93 | 09/03/93 | 09/03/93 | 0.50 |
| Project evaluation | 09/03/93 | 09/03/93 | 09/03/93 | 0.50 |

This planning scheme shows that if the teacher had started to work on the module on 4 January 1993, he would normally have finished it on 9 March. The order and duration of the activities are represented by the following Bar chart:

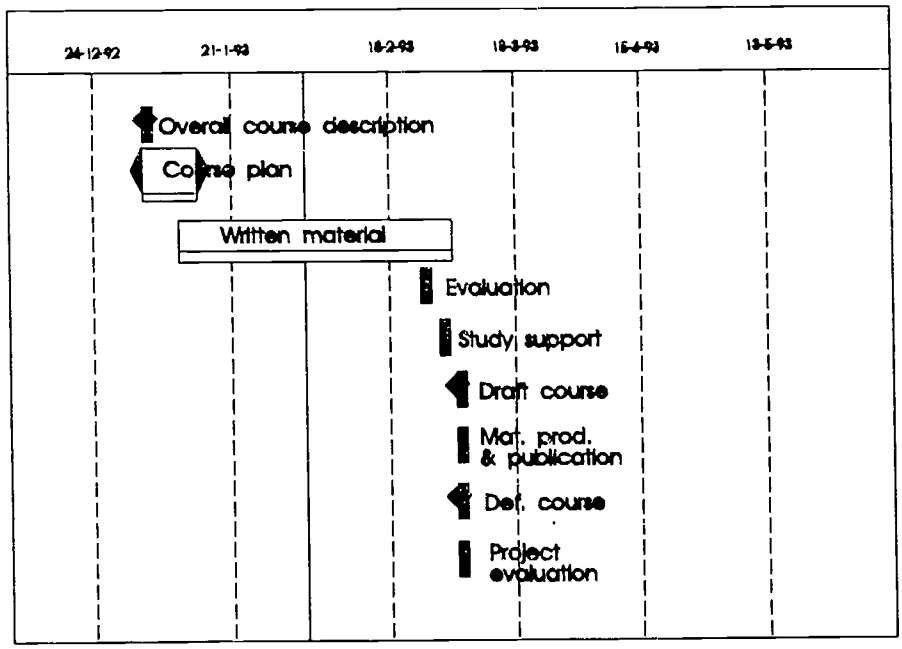


Figure 3: Bar chart of the various activities involved in module development

### 3.4 Budgeting

The aim of the planning and control of the incoming and outgoing flows of money is to make sure that the returns of a project exceed its costs. The continuity of commercial organizations depends to a great extent on their ability to make correct assessments of these two flows of money. In higher education, a system of normative budgeting tends to be used. This implies that the entire project is budgeted at the start and that the financial means required are subsequently supplied at the start of each successive phase of the project. The WBS provides good guidelines for the budgeting of each phase of the project (Storm, Blom, Claessen, 1991:195-198). Most software applications provide simple means to obtain an overview of the total budget available for a project and to figure out for each phase of the project how much money has so far been spent.

### 3.5 Quality control

Control of the quality of the products and services provided by an institute for higher education relates to the quality of the individual courses at the micro-level of that institute. A distinction can be made between subject-specific and didactic qualities. In line with the proposed policy framework for modularization, it is possible too organise the quality control for each module in two different ways. One way is to make use of developmental testing, which means that the suitability of the educational material is tested as it is being developed. For this purpose, some students are asked to study the material and to comment on it, after which adjustments may be made. This allows shortcomings to be corrected before the course material is presented to large groups of students. Another way of evaluating the quality of courses is by systematically gathering information in day-to-day educational practice at an institute. It may be clear that these two methods can in principle be used side by side. An institute may also opt for a differentiated approach. This implies submitting parts of modules for self-instruction to a small group of students beforehand and evaluating other parts of the curriculum on the basis of information gathered in day-to-day practice at the institute.

### 3.6 Information management

Adequate control requires an information system that can provide information on at least the following aspects:
- basic data on performance in relation to the planning and the allocated budget;
- the actual state of affairs, more specifically, data on the progress made, the costs and the resources already used;
- this information should be available shortly after the conclusion of a period (Harrison, 1985:76).

### 3.7 The relationship between the parent organization and the project

Institutes for higher education can be described as professional service organizations specialized in the execution of complex, though fairly stable activities (Mintzberg, 1979:367). The strength of these organizations lies in their ability to solve new problems by applying a number of problem-solving methods learnt in advance. Innovation is generally considered to be one of the greatest challenges to professional organizations. In relation to higher education in particular, the traditional autonomy of teachers and the lack of coordination between teachers are often pointed out as structural barriers to innovation (Easterby-Smith, 1987; Meacham, 1982; Becher & Kogan, 1980; Weick, 1976). Against this should be stated that institutes for higher professional education in the Netherlands, which have recently undergone large-scale fusion operations, have proven themselves capable of effecting important organizational changes (Van Meel & Jansen, 1992). As was stated before, modularization is an educational innovation which affects all aspects of education. The advantages of the top-down approach outlined above are that it guarantees sufficient clarity and that it aligns sufficiently with the educational policy at the project level.

The elaboration at the macro, meso and micro levels consists in a phased accomplishment, making the successive phases controllable. One should not, however, lose sight of the adjustments and alterations inherent to modularization. By opting for modularization, an institute for higher professional education becomes a hybrid organization where products and services are being produced simultaneously and side by side. Because of the great organizational consequences of such a choice, a good harmonization of the projects and the rest of the organization is essential. The following figure gives a schematic overview of the differences between of a conventional educational institute and an institute only producing modules for self-instruction. It may be clear that if both processes take place within one educational institute, this will make great demands on all those involved.

Table 6: A conventional institute for higher education compared with an institute only producing producing modules for self-instruction.
Adapted from: Van Meel, 1992.

| Dimensions | Conventional organization for higher education | Institute for higher education producing modules |
|---|---|---|
| **Output** | Classroom teaching | Modules<br>- print<br>- computer assisted learning<br>- additional teaching |
| **Target(s)** | Regular students | Regular students +<br>Specific target group(s) |
| **Organization** | Service-oriented | Product-oriented |
| **Operational core** | Professionals<br>Role-oriented (idiosyncratic)<br>Autonomous | Professionals<br>Task-oriented<br>Interdependent |
| **Quality control** | Difficult (intangible good) | Essential |
| **Coordination** | Standardization of<br>- knowledge<br>- output | Standardization of<br>- knowledge<br>- output (production plan)<br>- process skills |
| **Design parameters** | Selection & training | Selection & training |
| **Administration** | Loosely coupled | Coordination of linkages |
| **Technology** | Simple | Information technology<br>- production<br>- administration<br>- courseware |
| **Environment** | Complex, stable | Complex, niches with varying stability |

Another important difference within this context concerns the organizational structure. In a number of institutes for Higher Commercial Education in the Netherlands (HEAOs), study programmes have taken the place of discipline-related departments.

Although the department principle guaranteed an optimal harmonization of the departments with the related academic disciplines, it was substituted for the study programme principle to allow a better adjustment to the needs of the labour market. In this set up, the discipline related units must align the content of the modules with the requirement of the study programme involved. Before a project is started, the study programme director and the various department coordinators must have reached a sufficient level of agreement with respect to the composition of the project team and the responsibilities of the team members, to allow optimal harmonization of the project with the rest of the organization.

This requires a systematic approach. A number of projects in the field of information technology have been structured according to a steering committee/project team organization, a setup which is also very suitable for modularization.

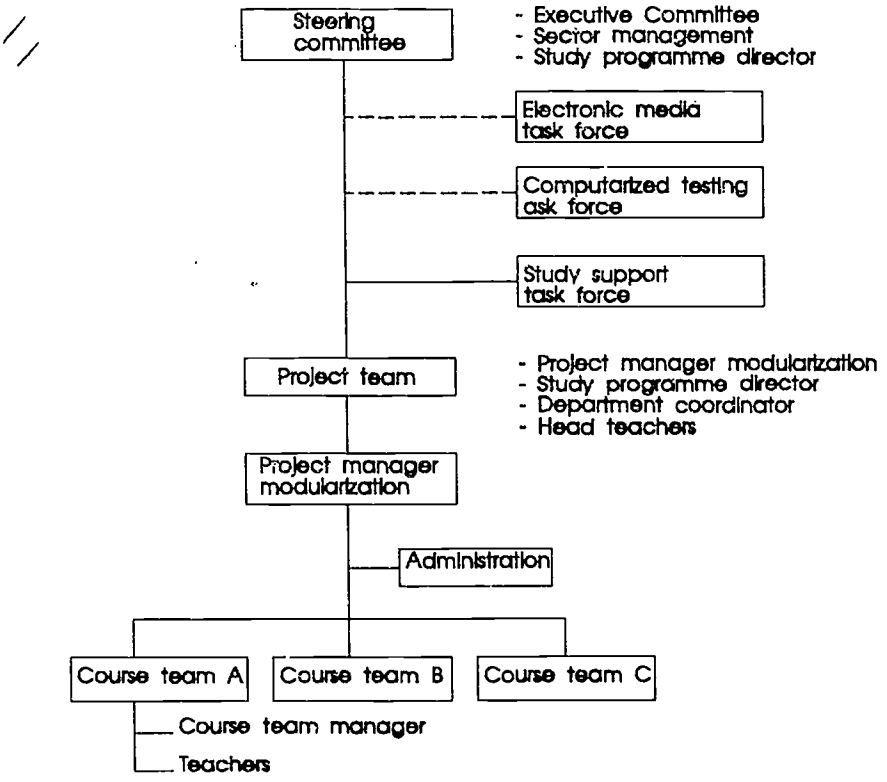


Figure 4: Project structure for modularization in higher professional education
Adapted from: Verreck, 1991:12b.

In particular in the case of extensive modularization programmes, it is important to appoint a project manager. The person in question may be a member of the project team, but not necessarily so. The proposed approach is based on the assumption that the teachers making up the course team are responsible for the didactic and the content-related elaboration of the modules. In practice, this means that the course team submits a proposal concerning the modular model, media mix, study support, study guide and the examination procedure related to a specific module to the project team. After it has been approved by the project team, this proposal will be further elaborated by the course team.

## 3.8 Control activities

The major factors to be controlled in a modularization programme are the progress of individual projects, the information with respect to the individual modules and the overall annual programme, and the quality of the study material produced. Most software applications allow data on an individual project to be collected progressively, so that an annual overview can be obtained. In order to allow regular updating of the overviews of the state of affairs, it is necessary to make certain arrangements beforehand. This becomes increasingly important as the number of projects involved and the number of persons working on these projects increase. Various software packages are available by means of which this type of administrative work can be done.

# 4 Conclusions

Project management can be regarded as a combination of planning and control techniques which have proven their worth in some organizations in which a great degree of complexity of the tasks to be performed goes hand in hand with a dynamic environment. Starting from the assumption that it is worthwhile to develop a method for carrying out the various activities involved in extensive modularization programmes, a project-based approach has been developed for the development of modules for self-instruction. An efficient and effective method of module development requires a systematic planning and control of time, quality, information, organization and money. In accordance with these generally accepted basic principles of project management, these techniques were explained in this report and translated into the terms of an educational environment. The module development process was divided into a number of different activities forming the basis of project planning. The distinguished activities are: overall course discription, course plan, production of course materials, draft course and publication. A striking aspect is that quite simple techniques, such as Bar and Chantt charts, are available for the progressive production of an annual production table. The advantages of this method are that it allows optimal utilization of staff capacity and material resources, that it provides a better overview of the various projects and that it allows better subsequent costing of each module. Most teachers, however, do not have any experience in working with these techniques. In numerous studies, teachers have explicitly expressed their need for professionalization in a number of fields. This applies, for example, to the specific skills required for the development of modules and the knowledge and techniques required for active project management. It may be concluded from this that active human resources management is required to create the conditions which will allow teachers in a modular learning environment to fulfil their new tasks adequately.

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