

Implementation of a dual-mode course of study at a Thai university

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Summary

The dual-mode of vocational study, a form of study that links academic studies at a university with practical training or qualification measures in an enterprise, has become more important in recent years, not only in Germany but also internationally. Within the last 10 years, the number of students in Germany has risen from just under 40,000 to more than 84,000². More and more enterprises appreciate this study model and view it as a good opportunity to recruit high achievers or future managers for the enterprise and retain them in the long term. Enterprises see the clear practical orientation amongst the top achievers and future managers as a crucial factor for their long-term business success.

During the course of the project entitled “Implementation of a Dual-Mode System of Courses at a Thai university, Jan./Feb. 2015/2016” we were able to observe that managers, and hence the decision-makers in enterprises, were fundamentally interested in participating in and promoting dual-mode models of higher education, which in this particular case concern courses integrating work experience and cooperative courses. The introduction of dual-mode courses of study, which guarantee a higher level of practical relevance for students, represents an attractive option for many countries as a means of achieving a better coordination between university education and the needs of the labour market, and hence the enterprises.

To be precise, this article will present the approach and the experiences in the project development and implementation of a dual-mode course of study at a Thai university.

The special feature of this project was the field of conflict in which the project was developed at a Thai university. In the process, it was important to determine the needs for expertise, identify any obstacles or barriers and verify any potential within the enterprises for a course integrating work experience or a cooperative dual-mode course of study, i.e. to achieve closer links between professional qualification and academic higher education.

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² Statistisches Bundesamt (Federal Statistical Office, dual-mode students winter semester 2014/2015)

Introduction

In autumn 2014, an order was placed by the “Senior Experten Service” (SES)³ aimed at defining and planning a project for a dual-mode course of study⁴ at University of Technology in Thailand.

The consultancy was provided in Thailand in two sections: from 5 January to 12 February 2015 and for the continuation of the project in January 2016.

To the best of my knowledge, no project handbook for the implementation of a dual-mode course of study presently exists in Germany and was also lacking in 2014/2015/2016 during the definition, planning and implementation of the project for a dual-mode course of study at the University of Technology in Thailand.

The project to establish a dual-mode course of study was defined and planned

- with the experience of the project preparation in 2014 in Germany,
- with the advice from several enterprises in Hamburg and its surroundings,
- with systematic documentation of the respective infrastructure, organisation and documentation of dual-mode courses of study within the enterprises,
- through the cooperation with various coordinators for the dual-mode form of study at universities,
- in particular, however, with Mr Box of the University of Applied Sciences, Hamburg (HAW) and
- Mr Marx of the South East European University in Tetovo, Republic of Macedonia.

Our focus was directed particularly towards the systematic documentation of the respective infrastructure and organisation⁵ for dual-mode courses of study within enterprises in the Hamburg area, with the training and qualification concept⁶ that we developed being organised

³ Senior Experten Service (SES), the Foundation of German Industry for International Cooperation (Stiftung der deutschen Wirtschaft für internationale Zusammenarbeit GmbH), a non-profit organisation

⁴ The aim was to implement a course of study integrating work experience. In dual-mode course of study integrating work experience or a cooperative course students undergo training in practical phases of differing lengths within an enterprise on the basis of a qualification concept.

⁵ Infrastructure is the necessary economic and organisational unit as a prerequisite for the supervision and support of dual-mode students by providing all the tangible and intangible resources of an enterprise, such as information and communication facilities. Organisation is taken to mean all the regulations that relate to the distribution of tasks and responsibilities as well as the management of work processes. Infrastructure and organisation are the foundations for dual-mode students to efficiently fulfil their obligations. See WIKI, <https://de.wikipedia.org/wiki/>

⁶ Qualification concept: In dual-mode course of study integrating work experience or a cooperative course, students undergo training in practical phases of differing lengths within an enterprise on the basis of a qualification concept. A distinction needs to be made between this and a dual-mode course integrating professional training. A dual-mode course of study integrating professional training contains an officially

in several phases over a period of three and a half years. The enterprises provided the documentation required for this. A further preparatory step involved the analysis of various web platforms of “Berufsakademien” (vocational colleges) and universities that offer dual-mode courses of study. Even during the first approach, clear differences were found in the presentation and orientation of the courses of study offered. Furthermore, the research also revealed very significant differences in the course models in terms of the respective time, training and qualification models established within the enterprises.

As we discovered, there are also outstanding web platforms such as **hochschule dual**, an initiative by Hochschule Bayern e.V., and the web platform of the **Baden-Wuerttemberg Cooperative State University** (DHBW), which is partly also provided in English.

The objective of this analysis was to record structures and documents on

- establishing a dual-mode course of study for universities and on the
- organisation of a dual-mode course of study at universities and vocational colleges.

A further step involved conducting interviews with coordinators (approx. 10 interviews) at vocational colleges and universities with the aim of establishing and documenting the infrastructure and organisation of dual-mode courses of study.

The overall results were defined at the end of 2014 on the basis of a discussion with various coordinators for dual-mode courses of study in a project plan with approx. 30 subprojects. During this process, all the subprojects were described in detail in terms of their content and according to personnel capacity and duration.

Introduction to the dual-mode programme of study.

The introduction to the “Dual-mode programme of study” at the Rajamangala University of Technology Isan took the following form: at the start of the consultancy assignment in the year 2015, an overview of the entire assignment was provided on the basis of the Description of Task and presented for discussion.

In detail, this involved performing presentations and supplying documents on the topics listed below and then submitting them to the project team for discussion.

- 1 History of dual-mode studies in Germany
- 2 What is the content of a dual-mode course of study?
- 3 Benefits of a dual-mode course of study
 - 3.1 Benefits for the university
 - 3.2 Benefits for the students

recognised apprenticeship in which a qualification from the Chamber of Industry and Commerce is integrated into the course.

- 3.3 Benefits for the enterprise
- 4 Implementation of a dual-mode course of study
 - 4.2 Legal framework
 - 4.3 Organisational form
 - 4.4 Recommendations of the German Council of Sciences
 - 4.5 Presentation for the university management
 - 4.6 Presentation for the industrial associations
- 5 Article:
 - 5.1 The dual-mode of vocational study – An introduction
 - 5.2 Quality standards for the dual-mode courses of study
 - 5.3 Organisation for a dual-mode course of study
 - 5.4 Explanatory notes on establishing a dual-mode course of study for universities
 - 5.5 How is a dual-mode course of study organised and what structural features exist?
 - 5.6 On the infrastructure of a dual-mode course of study

With hindsight, this overview acquired a special status, firstly in relation to the following project discussion but also and especially with reference to qualification of the project participants. The decision to develop a dual-mode course of study is of strategic importance for the university and was taken by the management. The team members mainly had no experience of organising a dual-mode course of study, meaning that qualification was therefore a matter of priority. The language barriers, in this case English and German, presented a further challenge.

The aims of project planning were to define the scope of the project and the subprojects resulting from this and to draw up plans for the time, costs and resources. In large projects, there is also a need to produce communication, quality and risk management plans.

In practice, the aims of a project are only roughly outlined after the initiation phase. These aims undergo further subdivision and precise definition during the project planning stage.

As described above, this preliminary work was carried out in Hamburg in autumn 2014 with various partners by drawing up a project plan with approximately 30 subprojects that were intended to provide the team members in Thailand with a basis for discussing the establishment of a dual-mode course of study.

After the team members had been introduced to the assignment, the next step was to conduct a workshop, beginning with a presentation on the management, planning, organisation and control of the project, including aspects such as terminology. During the following days, this knowledge base together with a common and uniform idea of the project planning resulted in a lively and informative discussion on the subprojects and the associated individual assignments, such as capacities and duration of activities as well as responsibilities and results.

At the close of the discussion, there was agreement on the fact that introducing a dual-mode course of study in autumn 2016 would represent a challenge for the team and particularly for the project management as well.

A further step raised the issue of priority for the individual subprojects as part of a workshop, and drew up a list of priorities with 13 (weighted) subprojects with the aid of metaplan techniques:

- Design and authorize – project plan, milestone plan, capacity plan (32)
- Design and authorize a marketing concept or advertising strategy (14, 15, 16)
- Design and authorize - assessment procedure - in cooperation with companies (18)
- Define evaluation form for enterprises (24)
- Design and authorize - cooperation agreement for university – enterprises; students – enterprises (12)
- Establish a centre for dual-mode study (DS); Development of an organisational structure for the dual mode study programme; (31)
- Draw up a training plan for the enterprises (19)
- Examine the curriculum for mechanical engineering (07)
- Specify funding model (27)
- Plan course procedure for a DS at the RMUTI Khon Kaen campus (08)
- Draw up course and examination regulations for DS (11)
- Specify quality assurance (26)
- Specify quality assurance for course (25)

A further classification was carried out to distinguish between the most important and riskiest projects.

The subprojects were additionally designated according to the priorities of the project sections into

- short-term project plan
- medium-term project plan
- long-term project plan.

Here, too, lively and informative discussions on the priority of individual subprojects took place, with one example being “Design and authorize a marketing concept or advertising strategy”. One of the points raised in this discussion concerned which section was to include implementation of the marketing project in order to achieve the correct positioning.

The results produced, which were clearly documented for all concerned on metaplan boards, supplied a good basis for preparing a milestone plan. A milestone plan marks the beginning of a project phase, the phase release / project release or the end of a project phase. The milestone plan allows those working on the project to remain continuously involved, offers

experiences of success and synchronises cooperation within the team. It is therefore also a means of leading and motivating the team members. At the same time, the milestone plan can be used for examining the project objectives, with the inspection criteria often being recorded as checklists or forms.

Project planning began, as already outlined previously, with a presentation on project management. This simultaneously acted as a knowledge base for a common and uniform conception of project planning and also contained a section on the milestone plan.

A lively and informative discussion took place during the following days on the development of a milestone plan and the positioning of the individual subprojects with their respective priorities: short-term project, medium-term project or long-term project.

Project management software would definitely have made project planning easier because it would then have been possible to display a critical project path. Unfortunately, neither the personnel nor the corresponding software was available.

This does not in any way detract from the result of the project planning, particularly because a major common consensus was achieved within the team.

Phases of the dual-mode course of study – preliminary work in Germany

On the basis of the project plan, the subproject “Development of a training/qualification plan for dual-mode students in enterprises” was adopted at Thai university. Preliminary work was also carried out in this connection with the support of Hamburg enterprises. The preliminary work involved compiling a collection of documents over the entire course duration of three and a half years (the Bachelor course has at least 7 semesters) together with the coordinators within the enterprises and with several coordinators for the dual-mode course of study at universities.

However, first of all we return to the preliminary work performed in Hamburg.

On the basis of the web analysis, we established that some universities and vocational colleges have a test on the homepage entitled: Am I a suitable candidate for the dual-mode course of study?

We took the test as the starting point and defined the phases 0 to 7.

Phase 0 contains tests on the Internet with more general socially oriented questions but also tests with mathematical, physical, technical, linguistic and psychological contents – in other words, tests for self-assessment or as a requirement for gaining a personal invitation to interview at the university, and here in particular to private universities.

In Phase 1 documents were assembled for use as part of an in-company assessment procedure (in some cases over two to three days). Starting with psychological, technical and English-language tests, these also included a test of group-dynamics extending to a comprehensive test for the dual-mode course in engineering sciences.

As a supplement in this Phase 1, tests were also compiled in mathematics and mechanics for the preliminary studies or even entry tests (various universities examine the engineering science students in a comprehensive test during the first week of studies) from various universities and colleges.

With Phase 2, students have successfully completed the assessment, are matriculated at the university and are spending the first day in their enterprise.

This is when the introductory phase or induction plan begins. In two to ten days, depending on the enterprise, students are instructed in the essential basic rules of the company. This starts with the general safety regulations and data security requirements and extends all the way to telephone training. In addition, enterprises train the students in Excel, PowerPoint, Word, SharePoint for project and resources management as well as in the company's specific IT technology. However, the enterprises also invest time in telling students about the company history as well as providing them with in-depth product information. Communication training and team-building measures have also taken place in the initial weeks.

Phase 3 has as its basis the planning of work experience at the university. Its contents depend on the specific course in the engineering sciences (mechanical engineering, automotive engineering, shipbuilding, information technology, etc.). A distinction should be made here between the preliminary placement with a duration of 12 or 13 weeks and the main placement of approx. 14 weeks' duration. The requirements are recorded in writing in the curriculum but are in some cases implemented within the enterprises in very different ways and also documented by students in different ways. As a minimum standard, the university expects a written confirmation of the achievement on a form.

Phase 4 describes the further qualification of the students in the course with extended practical component in the **first year of study** within the enterprises investigated. The enterprises largely had a training or qualification plan for the first year, which essentially comprises a departmental plan for each individual student, in some cases one year in advance. The departments describe the objectives and contents of the training and qualification measures in a training profile or even a summary for the department. Here it should be pointed out that the students are largely not free to choose certain departments. After each period spent in a department, the student attends an assessment interview or prepares a work experience or project report.

Phases 5 and 6 are combined. Students are in their second year of study and are deployed in the normal daily operations of the enterprise in accordance with the departmental plan, but also take on small projects for which they are personally responsible. The further qualification of the students within the course of study with extended practical component takes place in a very individual manner, according to the course specialisation and the interests of the enterprise. The foundation for the qualification of the students is essentially the project work in

the various departments, which students carry out within the team with a greater or lesser degree of independence, according to the progress of their studies.

Phase 7 is when the decision on the Bachelor thesis takes place. This decision is taken in consultation with the enterprise. The Bachelor thesis is often carried out in the department in which the student has been taken on.

It is important to point out that in Germany, although recommendations for structuring the practical phases within the dual-mode course of study with extended practical component do exist between the university and the enterprise, no binding framework plans for qualification of the students are stipulated. The qualification measures for the students are largely structured at the discretion of the enterprises. This means that 84,000 (in 2014/2015) dual-mode students (if the students with integrated professional training are included after completion of their apprenticeship) undergo individual qualification measures carried out by the enterprises. It is therefore considered absolutely essential to specify minimum standards for the in-company learning and working phases (e.g. by prescribing learning objectives, drawing up a flowchart for the student's progress through the company, specifying contacts, qualifying the training personnel).⁷

The description provided above gives an abridged and general overview of the practical phases within the course with extended practical component for a dual-mode student within a German enterprise. As a result of the collaboration with the enterprises, it has been possible to compile a collection of documents covering phases 0 to 7.

Structuring of the practical phases within the dual-mode study programme at Thai university of Technology

At the Thai university of Technology, this collection of documents was used as the basis for presenting the dual-mode course of study with extended practical component. Starting from general information, this involved explaining the necessary documents for phases 0 to 7 individually and in detail over a period of several days. As the documents available in German have not been translated into either English or Thai, a special challenge was involved in conveying the core of their subject matter and describing how each individual document is applied. Very interesting discussions arose in connection with the respective phases and on the structuring of the practical phases within the dual-mode programme of study.

One result of the discussions was the recommendation of a curricular development of "practical modules" for a qualification concept for the practical phases in the dual-mode programme of study. In the basic and main stages of the dual-mode course of study, practical modules (PMs)

⁷ Faßhauer, Uwe; Severing, Eckert; Verzahnung beruflicher und akademischer Bildung [Interlinking of vocational training and academic education]. BIBB 2016, S.30-31.

take on the function of a didactically coordinated and integrated scenario for the course venues of enterprise and university. They are oriented towards the process structure of an enterprise and in terms of course duration are based on the university course and its strategic direction in relation to the combination of subjects in the basic and main stages of the course.

At the Thai University of Technology, a course of study with extended practical component is being developed for the subject of Manufacturing Engineering. Possible practical modules (PMs) might cover: production technology, materials management, logistics, production planning and control, company management, controlling, marketing, etc.⁸ See example in Annex.

The curricular development of practical modules into a qualification concept requires close cooperation between the enterprises and the university.

In addition, a time-consuming process was also arranged to present the documents and discuss their contents, such as

- Course and trainee contract for the dual-mode course of study integrating work experience in Mechanical Engineering / Production Engineering / Development and Design, Mechatronics.
- Contract for a course of study with extended practical component (Master's course) between enterprise and student.
- Contract for a course of study with extended practical component (Bachelor's course) between enterprise and student.
- Cooperation agreement on a course of study with extended practical component between university and enterprise⁹.
- Guidelines for companies on involvement in a dual-mode course of study¹⁰.

Organisation and curriculum of the dual-mode course of study

A further focus of the consultancy was concerned with development of the curriculum for the course in Manufacturing Engineering. In this case, preliminary work had already been carried out by the project partners in relation to the curriculum itself and to the module manual.

Curricula from various courses with extended practical components at universities in Germany were presented and discussed intensively. Examples included:

8 BERWALD, ULRICH; WALTER, HERMANN; Meisterbrief und Diplom im dualen Studium simultan erwerben [Simultaneously acquiring master craftsman's certificate and university degree in the dual-mode programme of study] Weiterbildung am Studienort Betrieb; Fachliche Betreuung: [Further education in the company as learning venue; technical supervision:] BIBB (Dr. Dorothea Schemme, Kerstin Mucke). BIBB, BWP 2/2006 S.40-41

9 The above-mentioned contracts and cooperation agreements are available on the Internet in various versions from different universities

10 Duale Hochschule Rheinland-Pfalz [Rhineland-Palatinate University of Cooperative Education]

- Hochschule für Angewandte Wissenschaften Hamburg (University of Applied Sciences, Hamburg),
- South East European University
- FH Aachen (University of Applied Sciences) - Fachbereich Maschinenbau und Mechatronik (Faculty of Mechanical Engineering and Mechatronics)
- FH Lübeck (University of Applied Sciences, Lübeck)
- FH Kiel (University of Applied Sciences, Kiel)
- hochschule dual, Bavaria
- Duale Hochschule Baden-Württemberg (Baden-Wuerttemberg; Cooperative State University (DHBW)
- ASW – Berufsakademie Saarland (University of cooperative education) but also curricula from
- TU Darmstadt
- RWTH Aachen University and the
- KIT Karlsruhe Institute of Technology.

Unfortunately, only very limited information is available in English on the dual-mode form of study at universities, so that it was necessary to use the module manuals of TU Darmstadt, RWTH Aachen and the Karlsruhe Institute of Technology (KIT).

The recommendations have been organised as follows:

Development of a

- vocational profile and qualification framework,
- structure of the course,
- course contents.

The course has a modular structure. A module is one teaching or course unit, which is generally concluded in one semester by means of an examination. Successful completion of the course leads to the acquisition of credits (ECTS).

In-depth discussion concerned subjects in the basic stage of the course, such as mathematics, mechanics, the requirements placed on students and hence indirectly on the quality of the lectures as well. For this purpose, various written examinations from German universities were presented and the level to which they aspire was discussed as a prerequisite for subjects such as thermodynamics and fluid mechanics.

The result was a high level of expertise in the team for drawing up a curriculum. However, the practical phases were repeatedly the subject of various discussions.

The organisational structure, administration and funding of a dual-mode programme of study were the next focal point of the consultancy.

Here too, it was possible to use preliminary work that had been drawn up in Germany with coordinators of various universities. Details included discussions of the various organisational

structures of dual-mode universities and vocational colleges. In the initial step, this concerned explaining the various fundamental models, e.g.

- Universities with **integrated dual-mode courses of study**. In this case, the dual-mode students are part of the regular courses of study.
- Universities with **independent dual-mode courses of study**. In this case, there are independent organisational and course structures for the dual-mode programme of study.
- **Dual-mode universities and vocational colleges** with organisational and course structures as well as a study programme that is concentrated on the dual-mode form of study.

The examples were as follows:

- Hochschule für Angewandte Wissenschaften Hamburg - University of Applied Sciences
- FH Aachen - University of Applied Sciences
- ASW - Berufsakademie Saarland - ASW – University of cooperative education
- South East European University; Tetovo, Republic of Macedonia
- Technische Hochschule Mittelhessen - University of Applied Sciences
- hochschule dual, an initiative by Hochschule Bayern e.V.
- Duale Hochschule Baden-Württemberg (Baden-Wuerttemberg; Cooperative State University (DHBW)) (some English-language web pages already exist in for this institution)
- etc.

Here too a lively discussion took place, in particular on the legal status and the committee structure of the respective universities and vocational academies.

In a further step, the organisational inclusion of the “coordination offices for the dual-mode study programme” into the university was presented as well as the respective tasks of these offices. To illustrate this, it was possible to present three coordination offices of universities with differing numbers of courses, with different student numbers and differing numbers of cooperation partners/enterprises. Of particular interest here was the task profile of the employees, because this simultaneously made it possible to convey the diversity and complexity of activities in a coordination office.

The question of the funding model for the dual-mode programme of study came somewhat surprisingly but was answered to the satisfaction of all those present.

Initially the funding of universities and vocational academies in Germany was clarified, and at the same time attention was drawn to the federal system, meaning the sovereignty of the federal states, but also to the difference between the funding of state and private institutions. One focus of the discussion evolved in connection with a scholarship model for the dual-mode

students at the Thai University of Technology. Starting from the committee structure presented for the respective universities and vocational colleges in Germany, various scholarship models were developed jointly and discussed.

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Annex: Sample solution for a practical module on “Materials Management/Logistics/PPS” in dual-mode course for industrial engineering sciences

Process-oriented study approach for Materials Management/Logistics, Production Planning System

The module design defines and depicts

- the logistics chain of materials management,
- the function-oriented structure of the enterprise with the business units: procurement, production, sales and
- the options for linking processes of materials logistics and the PPS with the organisational structure.

Materials management covers all corporate policy measures of planning, executing and monitoring the procurement, storage, distribution and disposal of materials.

Logistics is the sum of all activities dealing with the planning, control and monitoring of the entire flow within and between business units. Production planning and control is taken to mean not only the planning, arrangement and supervision of production but also refers these activities to the upstream and downstream areas in terms of quantity and time scheduling.

This approach is based on two corporate decisions:

1. Ordering

The order is placed by the customer on the basis of the quotation. An order is formed and created within the enterprise. This operation triggers a series of activities as rough planning: production programme planning, materials provisioning, capacity planning, lead time scheduling. The order release takes place as a result.

2. Production

The production division has the following tasks:

- specify machine commitments,
- provide complete, technological work documents,
- assume control of the order,
- simulate and implement operations and
- secure the quality.

The model-based relationships are to be reproduced in graphic form.

See: “Berufsbegleitende Weiterbildung zum Industriemeister 2000 und Diplom- Wirtschaftsingenieur (FH) am Studienort Betrieb”; BIBB D 5235.00 und D 5235.00 B

Excerpt from the framework curriculum recommendation for training during the practical module “Materials Management/Logistics/PPS” for the enterprise-based semester in the second year of study

Topic	Study contents	Learning objectives
<p>Completion of an order in the complexity of a process-oriented order flow with focuses on</p> <ul style="list-style-type: none"> – order release – production 	<ul style="list-style-type: none"> – Avoidance of bottlenecks in production by means of optimum material requirements planning, – presentation of material flows, – presentation of information flows between sales, production, procurement, – quality assurance, – present and analyse in-company interrelations and interface relations, - develop sets of documentation, 	<ul style="list-style-type: none"> – Present functional relationships – Define business processes – Structure complex operations – Develop and provide application systems for information processing – Develop data flow plans – Work out data models – Develop databases – Draw up a list of activities for solving the order – Describe the assignments (requirements specification, functional specification) – project management – Define interfaces for the order release and production, – Interface planning: procurement – stock management – present production with the PPS, – Plan, define and describe work processes, – Check set of drawings and design parts list, – Improve and simplify any possible impractical solutions, refinement of functional requirements, – Generate parts lists, – Record throughput times as specifications, – Planning with MS Project, – Develop master data, – Implement requirements coverage, – Record project documents, – Assessment of results, – - Show potential for change in the workflow management,