

Invited Paper

Educating T-shaped Design, Business and Engineering Professionals

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Abstract

The paper provides an insight into the International Design Business Management Program (IDBM), an attempt to educate T-shaped professionals who can combine design, business and technology knowledge. IDBM is creating a new master program, in which solid theoretical basis, delivery methods, and structure are being developed to improve both coherence and relevance within the curriculum. To contribute to the coherence of systemic competence development, a model of five major dimensions – tools, environment, management, process, organisation (TEMPO) – is proposed. To ensure the relevance of the program, four professional orientation tracks are built into the curriculum; research, management, consulting and entrepreneurship.

Keywords:

Multidisciplinary Education, Systemic Competence, Curriculum Development, Design Strategy

1 INTRODUCTION

Design, business and technology form a combination that is increasingly sought after in the contemporary business environment. Strategic management of modern companies and brands, linked to NPD and innovation activities of the company, is a complex endeavor and requires multitalented development teams. To get designers, marketers, strategists and engineers to work effectively in the joint process is, however, not always easy. If communication can create a severe obstacle for effective team work alone within specific disciplinary areas with consistent knowledge bases, difficulties are multiplied within larger multidisciplinary groups [1]. The global operation context of many companies even adds the communicative friction created by different cultural backgrounds to the picture. It is assumed that most challenges result from poor understanding of the languages, tools, practices, thinking models that the team members with different backgrounds possess.

Moreover, effective product development teams and organizational structures are prerequisites for innovation and creativity that are increasingly sought after in many companies. The more innovative the product is, the more creativity is required and the greater the need for different kinds of expertise in the team [2]. Innovative teams are constructed of members who hold not only disciplinary expertise but also strong multidisciplinary knowledge and experience. Well-functioning product development teams need experts of design, technology, and business who can master their discipline-specific tasks and, in addition to this, are able to work effectively with the representatives of other disciplines.

2 IDBM PROGRAM

In order to provide students with practical and realistic team work experiences already during their studies, industry collaboration and project-based learning are becoming increasingly important topics in education.

International Design Business Management Program (IDBM) is an example of an educational attempt tailored to meet the expectations of the modern business field. IDBM educates future professionals by preparing them to work in multidisciplinary teams and providing them with a strategic view into design management and, more precisely, management of international design-intensive businesses, operations, and NPD.

IDBM is a joint teaching and research program of three leading Finnish universities: the Helsinki School of Economics (HSE), University of Art and Design Helsinki (TAIK), and Helsinki University of Technology (TKK). Since its establishment in 1995, over 450 students have done the program, many of whom work today in high positions in the industry. IDBM also has established contacts with the industry. About 150 company projects have been executed with some 70 Finnish and foreign companies.

The purpose of the Program is to bring together students from the key disciplines within the concept of design business management. IDBM trains skilled professionals for key roles in international design business by underscoring the importance of design as a competitive factor in different industries. Arising particularly from the needs of companies, the program provides business, design and engineering students with an opportunity to practice interdisciplinary and interpersonal skills through shared projects and courses.

Multidisciplinary approach, international context, strategic view, and hands-on company collaboration are the cornerstones of the IDBM Program. Eight months long industry projects form the core of the program. The multidisciplinary knowledge that students gain from theory courses is applied into practice particularly through these projects.

A typical IDBM industry project is completed in teams of 3 to 5 students, representing students and the different knowledge areas of HSE, TAIK and TKK. Moreover, 2-3

project tutors are selected for each team both from the participating universities and the industries to supervise the progress of the project. The projects have dealt with new product concepts (design and user interface issues), the definition of customer needs and the future environment of a product, the analysis of markets and customer feedback, and the examination of corporate identity, communications and design management, among other things.

Through these projects, IDBM is not only able to provide students with practical coaching in real-life corporate and NPD environment, but also gained a wide experience of the challenges and functioning forms of industry-university collaboration. The projects have been well-appreciated by companies who are able to come into contact with creative and innovative students and to obtain first-hand information on the most recent research and training in the field. During the course of the project, the company also has an opportunity to evaluate the students in view of possible future collaboration.

3 MULTIDISCIPLINARY KNOWLEDGE

IDBM is not only about developing students' practical team work skills and affinity towards different mental models and disciplinary practices. It is suggested that multidisciplinary exposure has potential to create novel knowledge that would not occur in a sheer disciplinary context. In other words, well-functioning teams not only get along in daily activities but can also create a shared body of knowledge that is more than the sum of individual members' own knowledge and skills. This concerns creation and sharing of explicit and tacit knowledge, but especially so-called "embedded knowledge" within the teams [2]. Embedded knowledge can be defined as a result of combination of team members' tacit knowledge that is potentially created as soon as team members get together. This is type of knowledge is inherent in well-functioning teams, collective knowledge that cannot be held efficiently by individual members.

It is proposed that the better the team members' recognize and acknowledge the roles, strengths and limitations as well as their practices and thinking models of their team mates, the more purposeful embedded knowledge is created. This is also the fundamental ground of the IDBM Program. Sensitivity to generate embedded team-specific knowledge, or what could also be called multidisciplinary knowledge, can be nurtured through project-based learning.

Embedded knowledge that a team possesses is transferred to "embodied knowledge" in the new product that the team develops [2]. How successfully the embedded knowledge transfers to embodied knowledge, in other words, how well the product meets the intended goals, is a central challenge in multidisciplinary team work.

4 T-SHAPED

Successful and effective embodiment of knowledge is the fundamental goal of the IDBM Program. It aims at creating trust between different disciplines and boosting hands-on interaction through project-based learning and. Through this, information redundancy is being enabled, meaning that a minimal amount of (formal) information sharing would be required within teams. These aspects are all important characteristic of knowledge embodiment [2].

These "exogenous" aspects thus contribute to the construction of the multidisciplinary knowledge base. This

base can be characterized by the concept of "T-shaped" skill profile. The concept of persons with T-shaped skills was originally proposed by lansiti [3]. T-shaped persons are experts in specific areas (T's vertical stroke) and know how their discipline interacts with others (horizontal stroke). In addition to their specific disciplinary knowledge, they exposed to experience and knowledge of other disciplines.

T-shaped approach generates shared mental models, prior knowledge of how things are supposed to be, as well as NPD routines, concretized in the form of regular and predictable patterns of organizational behavior, and inherent innovativeness within product teams [2]. Even though the composition of teams and professional tasks that the students will face in their future careers differ from those constructed in the study phase, they will supposedly be better prepared and more sensitive to work effectively and efficiently in different teams and contexts.

Before entering the IDBM Program, these students have been taught within their respective disciplines to receive the level of expertise and knowledge that suffices for performing their disciplinary tasks in a good manner. Then, IDBM develops their multidisciplinary skills, thus forms the horizontal stroke of the T-shaped skill set, which enables team members to interact with one another.

T-shaped approach proposes that students' vertical skills are a prerequisite for creation of new embedded knowledge within the teams. Interaction of different knowledge sets can result in creativity and new ideas [2, 4]. It is assumed that higher the disciplinary knowledge level of individual members, the greater is the potential for creative ideas within the team. Multidisciplinary interaction can create "creative abrasion", a deliberate conflict of different ideas at a cognitive level that leads to increased effectiveness and efficiency, as well as innovativeness of NPD [2]. This remark is important. Without T-shaped skills, teams may end up in a state of abrasion that is not creative but destructive.

Tim Brown, CEO and President of IDEO who has a profound experience in innovative processes and multidisciplinary team work, states that T-shaped people work, and need to work, in a highly experiential manner [5]. Innovative products are created through error and trial. Multidisciplinary education also must take place through structures and practices that allow and develop the creative teamwork skills of students and also comprise challenges that are great enough and implied from the real-life context. This approach is embraced in the IDBM Program specifically through the industry projects that the students execute for the industry under senior supervision.

5 STRATEGIC VIEW

T-shaped professionals possess knowledge both on the practical (or operational) level and on the strategic level. In addition to practical skills, the focus of the IDBM Program is to improve the strategic knowledge base of the participants. In a multidisciplinary context, this knowledge is often tacit. Students have acquired the main body of their disciplinary knowledge and skills, that is, their practical abilities and expertise as professionals, in their own universities. The idea of IDBM is not to educate a business graduate to become a designer, or an engineer to learn an array of marketing tools, but to get them acknowledge the existence and profiles of the tools,

practices, and mental models employed by other professions.

This conceptual notion, however, escapes the fact that the multidisciplinary team work naturally involves a variety of practical and operational skills that the team members incorporate in interaction, whether explicitly or tacitly. When entering the Program, students have employed different professional profiles. Business and often also technology students are usually better educated to strategic thinking than design students who typically master better the practical skills linked to design processes and NPD. In this situation, the greatest outcome of the IDBM program for the design student is to get more accustomed to strategic thinking and planning processes, while the business students learn about product development practices.

6 IDBM TOMORROW

IDBM has generated a convincing track record in terms of company collaboration and positive experiences of the participating students as well as developed a widely acclaimed image in the international context through project collaboration with a number of foreign universities. The IDBM program has also functioned as one of the forerunners of the forthcoming Aalto University that is forming in the Helsinki Area. Aalto University, starting operating in 2009, merges HSE, TAIK and TKK together to form one high-quality university that applies the IDBM approach into a larger context. Within the Aalto initiative, IDBM is currently undergoing drastic development towards increased activities. The aim is to further foster multidisciplinary education and research in close collaboration with companies, and more strongly on the global context.

Thus the successful program is facing new challenges; in many ways, the achievements of the IDBM program have paved the way for this integration process, and the initiative is now in danger of being overtaken by its own success. To maintain itself in the forefront on innovative knowledge delivery, the IDBM program is currently developing a new 2-year master program that would start at HSE in 2010. In addition, there is an increased emphasis on doctoral education as well as forming a global research alliance with a number of international partner universities to support IDBM education and research.

The new joint Masters program in IDBM has the objective of educating world-class multidisciplinary professionals in global business development with design and technology. This will be achieved through upgrading current IDBM program into a full M.Sc., developing further the theoretical grounding, reviewing the course structure for coherence and relevance, while adding and trimming course offering to suit the new needs, and by developing further the appropriate teaching methods for the multidisciplinary and cross-cultural content in global setting. Furthermore, the program is creating a strong research structure that is able to cross fertilize to offering through an enhanced knowledge base.

7 SYSTEMIC THINKING

Several key elements underpin the thinking behind the new program. In the first place, the program is seen to be highly *multidisciplinary*, which is understood as different disciplines addressing common challenges as equal stakeholders, creating new knowledge and aiming at increasing integration.

The program is also *cross-cultural*, as it is based on the interactivity and exchanges of individuals that act beyond and above national and cultural groups. This is closely linked with the *global perspective*, which is understood to contain the idea of blending and transformation of local and supranational into a single system built on harmonious co-existence and diversity. Furthermore the program has a *future orientation*, as it seeks to develop capabilities that reach for the future in new business, product and service development.

All of the above elements have been present in the program already to date, explicitly or implicitly, either as named objectives or as assumed and emergent phenomena. The review and verification process for the upgraded program has, however, led to an additional need to make explicit the systemic nature of the IDBM.

Systemic thinking is seen to be based on holistic, synthetic views that replace the traditional reductionist, and analytic perspectives [7].

Systemic thinking builds on the observation that the whole cannot be always reduced to its parts without loss of knowledge. Understanding the system requires a holistic view of the systems itself, and in many cases, interactive participation within the system itself. The study of holistic systems emerges from the systems theory, cybernetics, engineering, and is linked intelligence research, philosophy and complexity. The key link to the program is derived from the perception that multidisciplinary, cross-cultural, global and future-oriented undertakings are complex and require highly developed systemic competences from those individuals that intend to operate in the said context (See Figure 1).

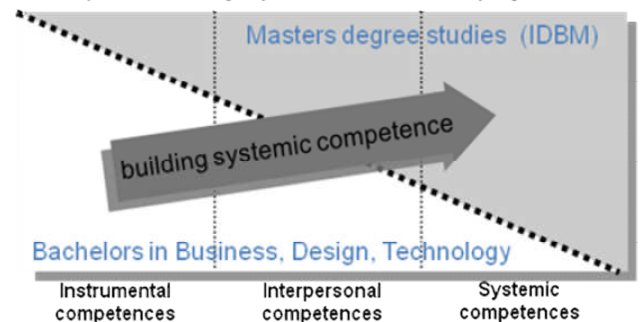


Figure 1: Competence building objectives in the IDBM master program.

Systemic competences have been defined in this context as the abilities related to whole systems. This is generally seen to include the diffusion and transferability of skills, combinations of knowledge and understanding. While many of the first cycle degree (BA/B.Sc.) holders possess viable and adequate instrumental and interpersonal skills and competence, according to our experience, they often lack systemic, integrative competences.

As such, the perspective of businesses as complex social systems has been around for a while [8][9], and especially business schools have addressed the issues through their offerings. That being said, the complexity of the IDBM context is seen to warrant special and explicit attention to the issue. To diffuse systemic thinking within the program, two specific key issues have been taken up in a comprehensive manner: coherence and relevance. Through addressing these two issues in a holistic and integrated fashion, the IDBM program is seen to be able to start on the journey towards a systemic thinking platform that will enable the participants to gain real and tangible advantage in their future activities.

8 PROGRAM COHERENCE

In the development of the new IDBM Program and similar educational approaches, there exist a number of practical challenges and fundamental decisions to be made. One of them is linked to the internal coherence of the program offering.

To address the issues of internal coherence the program has developed a series of *cross-cutting competence dimensions*. Through the TEMPO dimensions (*Tools, Environment, Management, Processes, Organization*), the program intends to ensure that cross-cutting issues are addressed in a holistic fashion throughout. The identified dimensions underpin the development of systemic competence, and enable coherence in the educational delivery.

The TEMPO dimensions chosen are seen to cut across all business, design and technology activity. These dimensions are used throughout as the key content evaluation criteria for the course and project offering in the program. Having such criteria is critical in an environment that cuts across various institutions with differing worldviews and backgrounds. On another level, TEMPO not only enables the rapid verification of the offering but also of the demand; in other words, it serves also to evaluate the choices of participants. In order to achieve balanced learning profiles, the crosscutting dimensions can be used to verify the balance of the personal study planning (See Figure 2).

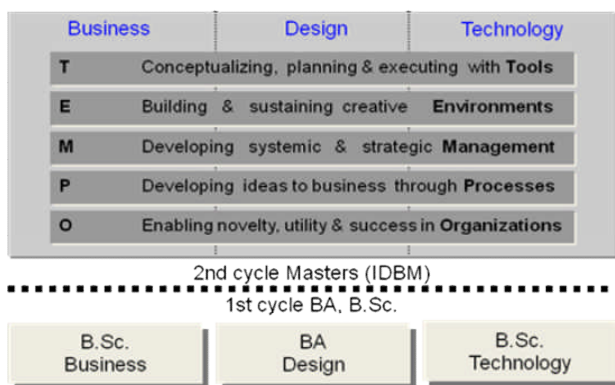


Figure 2: Cross-cutting dimensions in systemic competence building.

The dimensions above are not presented in an order of importance; they are all important in terms of achieving systemic competences. There is, however, a time-linked causality between the *Tools* dimension and the others. The Tools dimension is incorporated in the very first activities that are undertaken in the program by the participants. This is due to the need to develop complementary instrumental competences that enable the subsequent development of more systemic thinking. Tools include, among other things, developing skills in project management, design audits, qualitative and quantitative methods. These enable higher level processes of conceptualizing, planning and executing especially in the interactive project work of the program. In many ways, the Tools respond to the need of learning *how to* undertake activities.

The TEMPO dimensions include building and sustaining *Environments* that enables creativity in global, cross-cultural and multidisciplinary contexts. The importance of conducive physical and virtual environments to successful operations is well-established. What is not so clear is how these environments can be built up and sustained in the types of complex environments that the future IDBM professionals can be seen to be operating in. This is also

a clear point of reflection for the program itself; how to go about establishing best practice in this area appears to be quite challenging. Undoubtedly, cognitive psychology, the study of work, innovations in space, work, living, are all issues to be considered in this context. The environment dimension is all about the *place* where things happen.

Thirdly, TEMPO includes consideration for developing systemic and strategic *Management* (of and in) design business. There is a wide range of issues that need to be covered under this heading, specifically seen to be related to business management. Starting from functional issues in HR, marketing, finance, and including the management of entre- (and intra-) preneurship, the dimension can also cover aspects related to, say, managing continuous innovation in administration. Widely speaking, the management dimension is understood as the *driver* of business.

Key activities of the IDBM program are related to the *Process* of developing new business, product or service concepts. These involve a clear future orientation, through developing new ideas to business, incubation, growth through design, re-invention, NPD, and technological and service innovations. In many cases the operational forum is linked to the categories of firms aptly named "Born Globals" [10]. Processes are at the very core of the IDBM essence, the *what* dimension of the whole program.

Lastly, enabling novelty, utility and success in *Organizations* is a key dimension of the program. From innovative teams to major players, organizations form the institutional setting of all design business effort. In many ways, the organizational settings act as the *enablers* that are needed for successful operations. The IDBM program is therefore widely interested in settings that enable multidisciplinary creativity. Based on organizational studies on project based work, temporary organizations, organizational innovation, mergers and acquisitions, to name a few, the program expects to deliver the updated best practice. As with the environments dimension, significant clarification on the most appropriate knowledge base need to be established; this is recognized as a major undertaking.

9 RELEVANCE OF THE PROGRAM

Another key issue in the development of the new program is linked to the relevance that it has for the participants. In many cases it appears that programs assume the relevance through inference, i.e. that participation is an explicit indicator that the program is relevant in terms of its educational offering.

While this may be so, this approach does not offer active tools to plan, verify and direct the program relevance to the participants. To address this issue, the IDBM program in development has developed the concept of *professional orientation tracks* (See Figure 3).

These orientation tracks consist of a number of possible pathways that future professional might proceed in their future activities. At present, tentatively four tracks have been identified that are highly relevant to the IDBM program: *research, management, consulting, and entrepreneurship*.

The first track, research, forms the key pathway towards future doctoral research and studies. It also is highly relevant to individuals that expect to operate in business intelligence, market research, organizational development and other similar activities that require intimate knowledge of methods, approaches and cross-

disciplinary tools that can be used to make sense out of highly ambiguous and volatile realities.

Secondly, the management track aims to chart the roadmap for future professionals involved in say, design management, NPD and service management, among other such tasks. The key differentiating factor from generic management practice is linked to the need to understand, manage and influence multidisciplinary in complex settings. This is further made more difficult through often global, cross-cultural settings and a high level of ambiguity.

While activities related to consulting are often related to managerial action, the field has specific and exceptional characteristics that warrant a separate track. The delivery environment, often through projects is usually specific, and the temporality of the undertakings is distinct from the ongoing nature of more constant managerial action. The variance in the roles that consultants adopt - or are assigned - in design business are also different from day-to-day managerial action.

Entrepreneurship and intrapreneurship are key features of design business initiatives and are seen to warrant a special orientation track.

The overarching aim of these tracks is to ensure that the program is relevant for the foreseeable future of the participants. The orientation themselves are not set in stone, and a revision is expected to happen over time, and new tracks may be included and other done away with.

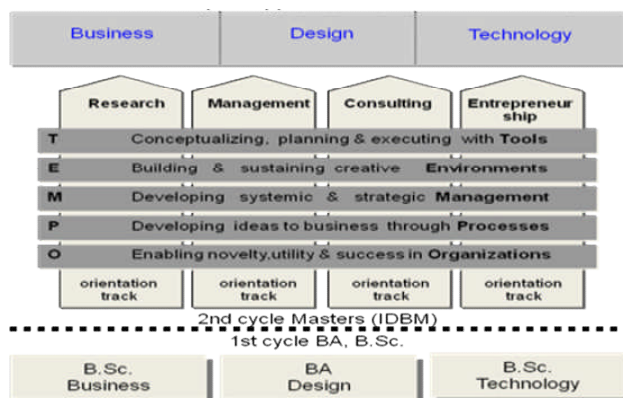


Figure 3: Multidisciplinary professional orientation tracks.

Timing-wise, the orientation tracks are taken onboard at the start of the studies, and developed through the course offering. They are present through the electives courses and projects, and emerge finally at the thesis stage as an orientation track for thesis work. While they form a logical framework.

10 SUMMARY

This paper has reported on key issues related to creating a new cross-institutional masters program combining multidisciplinary, cross-culturalism, and systemic thinking, inside three well-established and fairly traditional institutions that do not fully share a common ethos. Harmonizing the current degree structure and delivery

practices within the three major university players poses significant challenges that are currently being addressed. The approach of the new program has been to build organically on the existing IDBM platform, however developing the theoretical base, delivery methods, and structure to achieve a new, improved coherence and relevance. A central challenge of the IDBM master program is to apply the strategic, goal-oriented, high-level, and long-term approach to the different disciplinary views of the constituent institutions. In order to achieve coherence in systemic competence development, an approach consisting of five major dimensions – tools, environment, management, process, organisation (TEMPO) – was proposed. Furthermore, to ensure the relevance of the program to the participants, four professional orientation tracks are built into the programme; research, management, consulting and entrepreneurship. These perspectives allow the program to ensure that wide systemic competences are built up in a contextually relevant fashion.

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