

**USING MULTIDISCIPLINARY EDUCATION TO CROSS ORGANIZATIONAL
BORDERS – A FINNISH EXAMPLE**

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Abstract

There is a European trend in education to emphasize crossing boundaries in higher education. Degree programs increasingly cross disciplines while company recruiters search for multitalented graduates. Mixing discipline content requires crossing intra-university borders as well as borders of organizations within and between universities. Many of the problems with this come from organizational structures being typically hierarchical within universities, and co-operation in a university or even a discipline can be even more difficult than is normally anticipated in social organizations. This situation poses significant dilemmas for change.

Universities are being challenged to become more open to their surrounding societies, including industries that rely on the graduates. While industry-university co-operation is widely supported by authorities in both kinds of organizations, and is taking place in both M.Sc. and Ph.D. degree education program, it faces many impediments. Life-long-learning ideology has further complicated the situation by bringing more adult learners with widely varying needs to universities. In some ways this helps change because it is clear that structures need to be modified to accommodate more mature students with extensive knowledge in various subject areas. In addition, new learning technologies have provided an impetus for change via their role as new tools that allow greater efficiencies in certain activities. In summary the challenge for university change is great.

This paper is about a research project that involves two multidisciplinary university units. Both are somewhat unique in that they have a history of constantly crossing organizational borders within and outside their universities. Both feel this has been essential. Their activities have become fragmented over the past seven years thus there is a call for a different form of organization to avoid returning to historic structures. They have many common educational programs with other programs and universities but this has resulted in a quite complicated structure. The result is a design based on emergent activities rather than any use of systematic planning. Both departments now faced common and serious management challenges. Each sees a need to now conceptualize, describe a model their operating system. The project focuses the Department of Music Education at the Sibelius Academy (a Finnish university of music) and the Department of

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Industrial Engineering and Management at the Helsinki University of Technology (a Finnish technology university).

Keywords: multidisciplinary, higher education, quality management, organizational design, management philosophy.

1. Introduction

As a part of a national education system, universities contribute to knowledge creation and dissemination in two ways: through education and research. Research information is expected to be transferred into the educational process, and multidisciplinary collaboration in joint research projects is considered to be one of the essential areas for knowledge creation and transfer. Over the decades the importance of striving for more multidisciplinary approaches to education has been discussed, it has not been easy. Many have commented on the need as well as the obstacles of interdisciplinary work in research and education but the need and difficulties continue. (e.g. Koestler 1964, Emery & Trist 1973, Mistra 1998, Service 1999, Gallegher et al 1999). Koestler comments on both in the following statement: (1964, 238)

In the healthy evolution of a science, we observe a branching out of specialized, relatively autonomous lines of research; and parallel process of confluences and integrations mediated by discovery of universal principles underlying variety. But we also find pathological developments of a rather drastic and persistent kind of history of scientific thought - collective mental blockages which keep apart what belong together, and lead to the segregation of "closed systems".

Koestler (1964, 241-253) compared the development of science in the nineteenth century to a majestic river-delta with the great metaphorical confluence of previously separate branches of knowledge. This is consistent with the history of science, where there have been recurrent cycles of differentiation and specialization followed by reintegrations, hopefully at a higher level. There is the move from unity to variety, then to more generalized patterns of unity-in-variety. Thus, according to Koestler (1964, 252) the progress of science is neither continuous, nor cumulative in any strict sense of either. Its discoveries are often forgotten or ignored, but then recovered once again. In a similar manner science and its disciplines are in constant motion, thus the various disciplines need also to be interconnected in their research and in education.

Crossing different discipline boundaries in education requires changing current attitudes towards formal education, but this challenges the entire system upon which disciplines are built. Emery and Trist (1973, 164) pointed to the importance of finding a way to shift from the concept of a "working force" to that of a "learning force". When life-long-learning is valued, new ways of thinking are valued, and needed. The concept of educational life cycle must come to include several different individual phases, careers, and personal styles. Gardiner (1996, 60 and 1998, 26) claims that in the future

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unemployment should be turned into “educational leave” and demand for “on-the-job training up” will increase.

The success of nations is supposed to be linked to their educational system. It is widely argued that there is a strong connection between public support for science and technology and industrial productivity and competitiveness (e.g. OECD 1997 and Raymond 1996). According to critics of research there is a lack of clear empirical evidence linking science and technology development to short-term economic growth. None-the-less, all appear to agree on the importance of having strong science and technology development at all levels of public education. Investment in education is acknowledged to provide a steady stream of benefits over long periods of time by assisting in direct improvement of the efficiency and the productivity of the economy, and thus raising the standard of living (Raymond 1996). Herein a dilemma emerges.

Efficiency and productivity are terms that stem from “Machine Age” education (Ackoff, 1998). He and others ask, “should there be something beyond these measures?” In his article, Kenneth Boulding articulates the question in the following way: (1998, 353)

“How do we create a learning society, in which there is widespread love of learning, in which large numbers of people continue the learning process long after formal education is over for them, in which they raise questions and use encyclopedias, read books, form discussions groups, question authority; and in which formal education is seen just as a part of a much larger learning process?”

1.1 From Machine Age education to Systems Age education

Ackoff is also helpful in answering his own question. He (1999, 147-167) describes a paradigm shift within the educational system, where Machine Age education is contrasted to Systems Age education. See Table 1. Machine Age education disintegrates, and gives emphasis to separateness of subjects, courses and disciplines. The focus is on teaching, where students are treated as passive machines. The educational structure is organized around rigidly-scheduled, quantitized units.

**Table 1: From Machine Age Education to Systems Age Education,
(applied from Ackoff 1998)**

Machine Age education	Systems Age education
Disintegrating – emphasis on separateness of subjects	Integrating – emphasis on relationships and interactions
Focus on teaching process	Focus on learning process
Mechanistic input-output orientation -> treatment of students as though they were machines	Education should individualize students and preserve their uniqueness by tailoring itself to fit to them, not by requiring them to fit it
Organized around rigidly scheduled Quantitized units of classified subject matter	Organized around development of the desire to learn and the ability to satisfy this desire

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The Systems Age education aims at integration and gives emphasize to relationships and interactions. The focus is on the learning process and the individual student. The educational content is organized around development of the desire to learn, and the ability to satisfy this desire. Education should be organized as a continuing, if not a continuous, process. It should be carried out by educational systems that can and do learn and adapt. Disciplinary departments and bounded subjects are antithetical to Systems Age education.

Koestler (1964, 238-239) criticized existing structures, as he saw them as creating impediments for change. He saw the corporate aspect as a conspicuous handicap. The collective matrix of a science, at any given time, is determined by a kind of establishment, which includes universities, learned societies, and the editorial offices of scientific journals, and accreditation institutions. Like other establishments, they are consciously or unconsciously bent on preserving a status quo. Similar remarks are still being made by others such as Pines (1998), Crainer and Dearlove (1998) and Wind (1998).

Pines (1998, 6-7) describes ideal universities as a complex adaptive systems, which are student-based learning communities, see Figure 1. Creating knowledge is a shared responsibility of faculty and students. The students are coupled to teachers, other students, the real world, and eventual employers. Students naturally cut across departmental lines and make novel connections. In addition, Pines (1998, 9) also claims that departments should be treated as dynamic entities which can both be formed and be disbanded.

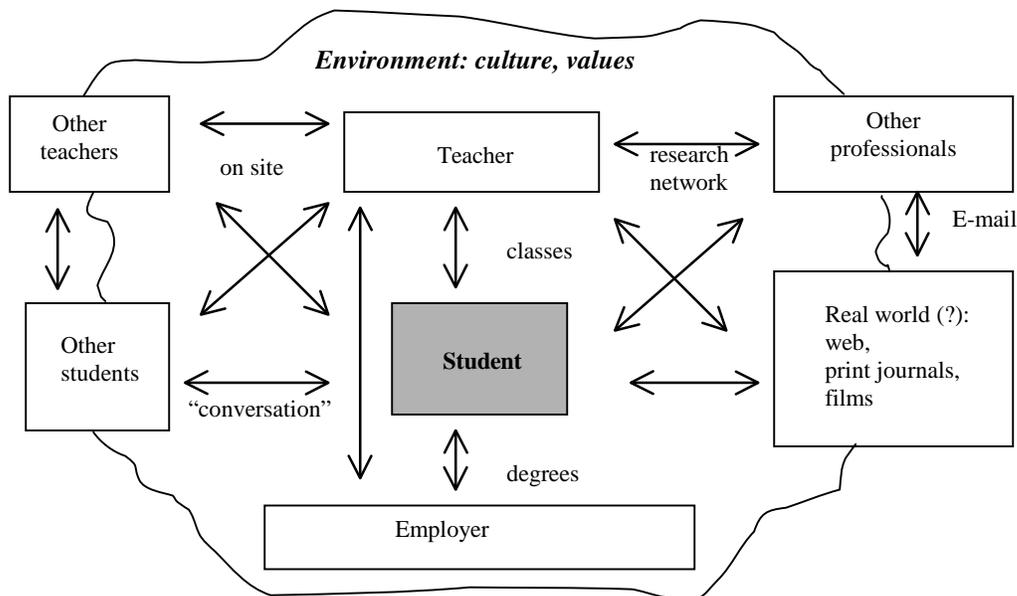


Figure 1. The University As A Student-Based Complex Adaptive Learning Community, Adapted From Pines (1998)

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Basarab (1997, 5) describes another challenge for the universities. He believes the break between science and culture, which manifested itself over three centuries ago, is most dangerous. On the one hand, there are the holders of pure, hard knowledge. On the other, there are the practitioners of ambiguous, soft knowledge. To deal with this we need to instilling complex, trans-disciplinary thought into the structures and programs of the universities. This will allow their evolution towards a somewhat forgotten mission today – supporting a study of the universal. In addition, the universities could become the privileged place of apprenticeship in the trans-cultural, trans-religious, trans-political and trans-national attitude of the dialogue between art and science. This can be an axis of reunification between scientific culture and artistic culture. In Basarab's (1997) visions, renewed universities would thus become the places for welcoming a new kind of humanism.

1.2 Trends In European University Education

According to the president of the CRE¹, Joseph Bricall, the following developments in current social and economic demands will have a bearing upon the institution of higher education (Bricall 1995):

- a reduction of the time spent at universities, particularly in many European countries,
- a system curriculum and diploma that is more oriented towards vocational training,
- the use of the new information and communication technologies, which will facilitate access to higher education for groups that would otherwise lack such opportunities,
- an increase of part-time studies, which allows higher education to be combined with paid employment, and
- an augmentation of retraining, recurrent education, “education permanente,” as it affects larger parts of the workforce, and will frequently take place throughout an individual's career.

So far Europe has not had a common accreditation or evaluation process for its universities. However, because of the global educational market the role of national and international evaluation and accreditation is increasing (Vroeijenstijn 1995). There are new European-wide activities around business and engineering education and some European magazines have started European-wide rankings.

Cooperation and networking with industry and within society is increasing. In Europe a pedagogical shift is taking place from teaching to learning, and with a stronger emphasis on life-long learning. This has brought new customer groups into university education. Along with this there had been a strong push for use of more information and

¹ CRE - Conférence Permanente des Recteurs, Presidents et Vice-Chancelliers des Universités Européenes

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communication technology. The idea is to make universities more open and more flexible in their educational process. Meanwhile, efficiency and results are given more emphasis in university management. There is a management shift from bureaucratic and hierarchical administration to service and customer-orientated processes. The role of universities is changing via the emergence of: “Virtual Universities”, “Global Open Universities”, “Network Universities”, “Mega Universities”, “Company Specific Universities,” etc.

In Finland, the Ministry of Education has implemented the principles of management by objectives for the universities since the 1980's. The objectives, e.g. the number of degrees produced, have been given emphasis. Within the universities the responsibility for effectiveness has been passed on to the managers of the internal units. At the same time the importance of the external and internal educational evaluation of the universities has increased (Hölttä 1995). In general, paradigms of industrial management e.g. quality management, benchmarking, process management have gained a foothold within university management.

1.3 Methods

This paper presents preliminary results of research into the issues outlined above. A case study framework is used to examine the development, implementation and evaluation of the activities within two multidisciplinary university units: Department of Industrial Management and Engineering at the Helsinki University of Technology and Department of Music Education at the Sibelius Academy. The case study approach is expected to create a better understanding of new methods for developing the management of universities to be more efficient and customer-oriented. The research involves other examples from Europe and the USA that have something to say about the management of multidisciplinary units within universities. The case studies that have been used are described in a way that allows the research to retain the more holistic and meaningful characteristics of complex real life events (Eisenhardt 1989, Yin 1989).

A variety of both qualitative and quantitative data collection methods were used during the case studies. Many development meetings were held with the case organizations. Research instruments have included: interviews, questionnaires, collection and analysis of the internal documents, observation and statistical information.

2. Crossing The Borders

Although the content of the education in the Department of Industrial Engineering and Management and the Department of Music Education is very different, the departments have many similarities. The education in both areas began near the beginning of the 1900's. Their degree programs were established after 1950's, but it was only in the beginning of 1990's when the independent departments were established. Both units are multidisciplinary and have considerable interaction with other units in their university and

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with other universities. They also co-operate in their educational process with future employers of the graduates. Various horizontal and vertical borders are described in Appendix 1.

The students are regarded as active partners of the departments and they participate in development activities and official decision-making meetings. Feedback information is gathered regularly and students do internal development projects as part of their studies. For example, within both units there have been several Master's thesis done by students in relation to internal development activities. Students of both departments often work part-time in their areas of their own interest, especially during the last years of their studies.

Both departments have subjected themselves to national evaluation projects. The Department of Industrial Engineering and Management did so in 1997-1998. The Department of Music Education did this in 1998-1999. They also take an active part in different development projects within their universities. Both have faced serious challenges from changes in their educational systems that have increased their collaboration with different partners. Within both units there is a feeling of inadequate appreciation of their subject areas within their home universities. From time to time discussion has arisen as whether or not these programs should even be within their universities. Music education could be moved to either lower level institutions or to Helsinki University. Industrial engineering and management could be moved to the Helsinki School of Business Administration. Critics from traditional disciplines claim that the area's subject matters are "not difficult enough, nor sufficiently rigorous, technical, or artistic".

2.1 Changes In The Educational System

There are two major changes that have effected the educational systems of both units. Firstly the structure of the degree program has widened. The curriculum is become more flexible and thus there are more choices for students to make. For example, within the Industrial Engineering degree program a student can in the beginning of their studies choose from seven alternatives, instead of one technical option (~25 credits). In the degree program of Music Education, students can choose instrument education from jazz music and folk music, as well as the earlier option that was restricted to only classical instrument education. The variety of courses has also increased because of collaboration with other universities. During the past years the educational activities of the both departments has fragmented. In addition to the traditional degree program, new study programs have emerged. Also the customers are more heterogeneous. The demand for personal service is high among some groups. The experience base and knowledge base of students varies. The time devoted to studies can also vary from taking one individual course to taking a degree. In the Department of Industrial Engineering and Management there are now over 15 different study programs with more being planning. The over-all situation is described in Appendix 2. In the Department of Music Education the

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fragmentation is not so wide, yet the same phenomena can be found there as well. For example, new study programs in the areas of music technology and art's management have been established.

2.2 Increased Collaboration

The departments continue to increase the collaboration within their own universities and also other universities and organizations. Three different examples of collaboration are presented. The first one is an example of inter-university collaboration in the International Design Business Management program. The second describes the internal markets in instrument education. And the third example includes intra-university collaboration, industry-university collaboration and inter-university collaboration. A descriptive table of the holistic situation of internal and external networking is presented in the Appendix 2.

2.2.1 *Inter-university collaboration – IDBM -program*

International Design Business Management (IDBM) is a joint program of three universities: Helsinki School of Economics and Business Administration (HSEBA), Helsinki University of Technology (HUT) and University of Art and Design Helsinki (UIAH). The aim of the program is to bring together students from different backgrounds and give them the possibility to train for professional skills in multidisciplinary teams. The focus of the IDBM program is the international design industry, particularly the role of design as a competitive factor.

In the program the future business and engineering graduates as well as designers practice teamwork skills in the form of courses and projects. The students become acquainted with each others' way of working and way of thinking in practice. The duration of the IDBM program is approximately two years. The students obtain their Master's degrees from their own universities, although the courses selected from the other universities give them an understanding about the strengths and possibilities of other disciplines.

The first IDBM students began their studies in autumn 1995. Every year ten students from each of the three IDBM universities are selected to enter into the program. The prerequisites for entering is completion of 100-120 credits, an ability to cope with an intensive program, and an interest in multidisciplinary teamwork. Students choose courses from all three IDBM universities, resulting in approximately 20 additional credits on top of the studies required by their own respective universities.

An essential part of the IDBM studies is an industry project. The project lasts one academic year and is conducted by a group of three students, with one from each participating university. The lines of business of the client companies have varied from engineering industry to companies with design as a main competitive factor. The task areas of the projects have comprised the exploration new market areas in Europe, the launching of new products, brand creation, image surveys and the re-examination of the

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possible realignment of a company's products/image. In the industry project the client companies get to meet and watch young innovative students and obtain information about changes in research and teaching in the field. It is also an opportunity to evaluate potential future employees.

2.2.2 Intra-university collaboration – instrument education

The Sibelius Academy began to implement its customer-supplier model in 1994. The first was in the field of administrative and support services and in classical instrument education management. The aim was to give more responsibility for study programs to individual departments. In 1997 the Department of Music Education had paid FIM 4.8 million to the Department of Solo Performance in order to explore this idea. In return it got about 10 000 hours of classical instrument education for the students.

The customer-supplier -management process was divided into four partly overlapping phases: preparations, negotiation, operation & feedback and evaluation & development. The internal support group focused on each of these phases in its meetings. The timetable and the tasks of each phase were described. During the preparation phase, the annual budget is decided and customer departments discuss quality criteria for classical instrument education. In the negotiations phase, customer and supplier departments negotiate with each other and sign a contract about the amount and quality of studies and the finance. During the operation and feedback phase, professors, lecturers and students are working and feedback information is collected. In the evaluation and development phase, departments and administrative support teams evaluate how everything has happened and how to develop better co-operation. This last phase partly overlaps into preparation phase for the next year.

The customer-supplier activity has accomplished the aims that were set for 1994. The co-operation between the departments has increased and so has the discussion of quality issues. This has resulted in innovative experiments in education. Customers, both the department and the students, are taken more into account when the quality and the quantity issues in the instrument education are decided. The implementation of the new procedure was carried out rapidly. More feedback data, e.g. about group education hours, is needed for the follow-up of the process. The support of the financial and information systems continues to be inadequate. Better financial management is needed.

Between the years 1994-1996 the amount of the classical instrument education for the customer departments has decreased about 3,900 hours. This represented a 22% reduction. There are several reasons for this: the personal quota for the instrument education decreased hours per student. There was a decrease in the yearly intake of new students. In addition, departments bought instrument education from other departments, or directly from part-time lecturers. The popularity of group education has increased. The use of the customer-supplier model increased both cost awareness and cost efficiency.

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2.2.3 Industry-university collaboration – SimLab project

The SimLab project is an on-going research and development project at the Helsinki University of Technology. This innovative project aims to support the interaction and shared learning through the creative combination of existing enterprise simulation games, dynamic mathematical models, and virtual reality. The SimLab is being developed during a three year project 1997-2000. It is located in Spectri Business Park, in Espoo, on the outskirts of HUT campus area. The laboratory provides environment for technology supported, action based learning, where participants instead of trial and error in real-life organizations are prototyping of business processes in the enterprise simulation laboratory (Smeds, 1998).

SimLab aims at creating a user-friendly learning environment for company personnel as well as to students at HUT and students in distant locations. In SimLab, learning is based on action and real or generic business problems. The use of simulation models in process development allows demonstration and investigation of processes that would otherwise prove difficult to present to participants due to complexity, unfeasibility, ethics or cost. The use of simulations allows participants to execute multiple scenarios and hence various opportunities for testing processes under investigation which enables constructive and experimental learning. The following Table 2 will summarize the features of SimLab as a learning environment.

Table 2 SimLab as a learning environment

	The SimLab as a learning environment
Participants	<input type="checkbox"/> company personnel from different organizational units and different organizational levels <input type="checkbox"/> students (M.Sc. and Ph.D. levels)
Aim	<input type="checkbox"/> deep understanding of business process structure, interconnections and development <input type="checkbox"/> shared understanding <input type="checkbox"/> constant discussion and feedback
Tools	<input type="checkbox"/> simulation models: business simulations, social simulation games, etc. <ul style="list-style-type: none"> <input type="checkbox"/> tailored according to companies own processes <input type="checkbox"/> tailored according to company's generic needs <input type="checkbox"/> generic games <input type="checkbox"/> virtual wall and Internet connections
Role of the game leader / lecturer	<input type="checkbox"/> facilitator <input type="checkbox"/> tutor
Pedagogical approach	<input type="checkbox"/> Action Learning <input type="checkbox"/> Problem-based Learning <input type="checkbox"/> Collaborative Learning
Infrastructure	<input type="checkbox"/> flexible facilities, movable furniture and computers

One of the important elements in the SimLab is crossing different organizational and mental borders by building a better environment for interaction and shared understanding.

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This challenge is encountered in multiple levels. Crossing the borders is important not only in joint development projects with different organizational units from pilot companies, but also in co-operation between independent academic units within the Helsinki University of Technology in their education and research. SimLab will also provide a shared learning environment for academy and industry.

3. Administrative Challenges

As the activities of the departments become more complex the existing management systems fail to offer helpful support. On the contrary, the departments often face difficulties with central administration units because their current activities do not fit into centralized systems that were designed for control instead of innovation. They arose mainly from the needs of the Ministry of Education. The current systems do not provide just-in-time information for the use of the departments, nor do they help run and develop new activities. Existing problems in management include a very slow response time, inadequate or wrong content, vertical integration of information and an emphasis on post-active data collection. Institutional challenges include multiple organization with overlapping authority and disparate mandates, uneven leadership and resistance to change. The role of support services is challenged at least as much as central administration in changing from a “bureaucratic” culture, which aims to control, to a “support service” culture which aims to negotiated order and transparency and support internal partnerships.

The new ways of organizing and managing activities and resources are needed. However, there is a severe dichotomy related to changes in the management systems. There is a danger that control-oriented people try to set up management systems, which are too complicated and too time consuming to operate. Those systems would not be enough flexible to foster the continuous change emerging within departments. Few essential and basic rules would be needed for and different management systems, e.g. decision making process, financial information system, performance measurement system, rewarding systems and customer feedback and organizational climate measurements systems should be balanced and not be contradictory to each other. At the moment there is a ongoing development project with both of the departments to development their management systems according to balanced scorecard ideology (Kaplan et al 1996).

The challenge is to create an agile management system, which would foster the change, learning and enthusiasm within the departments. The system should also enhance both internal and external interactions and provide holistic view of the current situation for the personnel and students.

4. Conclusions and Discussion

The both departments seem to work as Pines (1998) described. He argued that students should be considered as important partners in education and should participate in the management and development activities of the departments. Their access to the real world is genuine. They have lots of contacts with surrounding society, e.g. with industrial companies and orchestras. Many students work part-time within their area and often make special projects related to their work. They learn to combine studies and work already during their degree studies within university. Combining studies and work during the degree studies could encourage graduates to combine work, studies and life also after graduation in a way that Boulding (1998) had desired.

The activities of the both departments resemble Ackoff's Systems Age education model more than his Machine Age education (Ackoff, 1999). The departments are open to surrounding society, there has been development activities aimed at changing a focus from teaching to learning. At the Department of Music Education students are served individually. There is a plan to create personal curriculum structures for individual students in the future. However, the internal interaction within the Department of Industrial Engineering and Management seems to have become more difficult due to the extensive growth of the department and the fragmentation of the its study programs. Also openness to the other universities within Helsinki area and the company personnel has brought a lot of students to the classes but the resulting educational system has become very complex. More will be required to achieve and maintain a holistic view of all of its activities.

According to Emery and Trist (1973) when the sub-systems of the society were less interdependent, policies could be more discrete, and separate agencies could administer their own programs with a minimum of reference to each other. Greater interdependence changes the situation. Diffuse problems arise affecting several organizations that are in some way linked and the problems tend themselves to also become interconnected. When a university unit operates in several different study programs at the same time the result can become a quite complex organizational system. It requires different levels of service for students in different programs. The new programs also raise new demands for standardized credit transfer and evaluation systems. The modular structure of education system thus creates new challenges for the management and the services of the universities. Employers also make requirements for more professional educational services and more customization of educational products and processes. In technical fields industry is looking for profitable, sustaining and result-oriented degree programs for their employees. Some require new pedagogical aspects of use of telematics in education. Performance measurement and evaluation then is brought in for further development and to guide means of general assessment. The challenge is significant. The objective is to create a management system for a Systems Age education that avoids the administrative tendency to slide back into a structure for Machine Age education.

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The real world does not fit into the boxes we've constructed for education. Disciplines such as math, chemistry, physics, business administration and communications don't, by themselves, prepare us adequately for an interdisciplinary world. Today and tomorrow, corporations and other organizations need people who understand science, technology and art. Graduates need to communicate effectively and quickly grasp changing business and management principles. In addition, OECD ethical guidelines caution that there should be clear guidelines for interaction between the public and private sectors. Increasing interaction between the public and private sectors demand that more attention should be paid to public service values and thus require external partners to respect the same values (OECD 1998). It is essential that these questions be respected, as well as the respective cultures, motivations and missions of each partner whether they are an industrial company or public organization. Successful partnerships are built on respect, trust and shared goals, but this is not easy to attain or sustain.

According to Koestler (1964, 265-266)

To derive pleasure from the art of discovery, as from the other arts, the consumer - in this case student - must be made to re-live to some extent, the creative process. In other words, he must be induced, with proper aid and guidance, to make some fundamental discoveries of science by himself, to experience in his own mind of some of those flashes of insight which have lightened its path. Education should be regarded as an art, and use the appropriate techniques of art to call forth that echo...

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HORIZONTAL AND VERTICAL BORDERS APPENDIX 1

WITHIN FINNISH UNIVERSITY SYSTEM

VERSION2.0 /MT

Horizontal borders – within own organization	Different levels in university system and vertical borders	Horizontal borders – outside of own organization
	European level – European Community	
Vertical borders – European Community <-> Ministry of Education • directives, rules, recommendations etc.		
Horizontal border: <i>Contacts to other ministries</i> • budget • committees • special development projects	National level- Ministry of Education - ME • budget • strategy for “Information Society”	Horizontal border: <i>Contacts to other national organizations</i> • Academy of Finland • Technical Research Centre of Finland (TEKES) • associations
Vertical border: Ministry of Education <-> Universities • laws and regulations • KOTA-information database • discipline based and university specific evaluations • annual “result” negotiations		
	University level – administration / support services • Strategic plan for the university • Annual activity plan and budget • Self-evaluation of the university	Horizontal border: <i>Contacts to society, industry, other universities and other organizations</i>
	Vertical border: university <-> department • annual “result” negotiations • statistical information	
Horizontal border: <i>Contacts with other department and units within own university</i> • The Sibelius Academy customer-supplier – activities in classical instrument education	Department level –administration / support services • Strategic plan for the dept. • Annual activity plan and budget • Curriculum • Self-evaluation activities	Horizontal border: <i>Strategic partners outside own organization</i> • The HUT/DEIM - Intenational Desing Business Management Program
	Vertical border: department <-> units • statistical information • meetings of management board • meetings of committees	
Horizontal border: <i>Contacts to other units, research projects ...</i> • The SimLab - project	Unit level / Group level • team meetings • results awards	Horizontal border: <i>Partners in education and research</i> • The SimLab - project

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	<p style="text-align: center;">Vertical border:</p> <p>Head of unit <-> personnel Personnel <-> students</p> <ul style="list-style-type: none"> • education and supervision <ul style="list-style-type: none"> • tutoring and mentoring <ul style="list-style-type: none"> • annual discussions • databanks for activities • credit & feedback systems 	
<p>Horizontal border: <i>Contacts to peers, students, staff</i></p>	<p>Individual level</p> <ul style="list-style-type: none"> • time management • career planning • creation of academic portfolio • competence development plan 	<p>Horizontal border: <i>Contacts to other individuals, peers ...</i></p>

	TRADITIONAL OPERATIONS	STRATEGICALLY IMPORTANT, (according to the Ministry of Education, EU, HUT and DIEM) GROWING AREAS IN HIGHER EDUCATION				
	according to which existing structures are built ...	POST GRADUATE EDUCATION	INDUSTRY - UNIVERSITY COLLABORATION	INTERNATIONAL COLLABORATION	INTERNAL COLLABORATION	UNIVERSITY-UNIVERSITY COLLABORATION
CUSTOMERS		heterogeneous customers, the demand for personnel service is higher among some groups, the experience base and knowledge base varies, time devoted to studies varies etc.				
	students of own degree programme	post-graduate students	adult students from industry	international students	students from other degree programmes	students from other universities
OPERATIONS:		heterogeneous programs, in which service level is different according to customer groups, the contact varies from few hours to several years				
Study Programs - parts of educational systems	<ul style="list-style-type: none"> Degree Programme in Industrial Management 	<ul style="list-style-type: none"> IEM Doctoral Programme in Finland ExIMa- InPh.D. 	<ul style="list-style-type: none"> KATE – program EuroMBA CoreMBA Master of Quality Exec. Program for Quality Man. Lahti BSc ->MSc JKL BSc ->MSc 	<ul style="list-style-type: none"> International Business Linkage Framtidens Industri Företag FIF Linkage Telecom. Venturing Linkage 	<ul style="list-style-type: none"> IEM study module for HUT students “communications -engineering“ study programme Tele-communications Venturing Linkage 	<ul style="list-style-type: none"> JOO -programme IDBM programme Vaasa IEM MSc education Lahti BSc ->MSc IEM Doctoral Programme in Finland
PERSONNEL		more and more nonpermanent and part-time workers, with different expectation levels for personnel management, and different goals, a challenge for socialization, internal information systems and commitment to common goals				
	DIEM - background	researchers with external funding	experienced personnel from industry	personnel (visiting or permanent)	other degrees from HUT	other degrees from different universities
FINANCE		funding from various different sources, which have different demands for financial reporting, response time, service level etc. Some activities use funding from various sources, challenge is to create activity based costing systems, etc.				
	state budget	Academy of Finland HUT special funds	industry funding	EU programs HUT special funds	HUT special funds	special funds from the Ministry
ORGANIZATION	similar hierarchical units	Several, different, parallel, independent units, different organizational structures, cultures, and activities; several network - structures, collaboration agreements etc.				
	laboratories	IEM Doctoral Programme network	EuroMBA; ExIMa - Lahti Center	informal co-operation networks	HUT “scientific boards”	IDBM - institute

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NETWORK ANALYSIS	HELSINKI UNIVERSITY OF TECHNOLOGY	THE SIBELIUS ACADEMY	
	Department of Industrial Engineering and Management	Department of Music Education	
INTERNAL NETWORKING/ Partner	Description of activities	Description of activities	INTERNAL NETWORKING/ Partner
Dept. of Information Technology	<ul style="list-style-type: none"> • compulsory courses in information technology • technical majors for MSc • special program: telecommunication venturing • future: new joint degree program • joint research projects 	<ul style="list-style-type: none"> • compulsory courses in instrumental studies 	Dept. of Solo Performance Dept. of Jazz Music Dept. of Folk Music
Dept. of Technical Physics	<ul style="list-style-type: none"> • compulsory courses in mathematics and physics • technical majors for MSc • joint research projects 	<ul style="list-style-type: none"> • compulsory courses in music theory 	Dept. of Composition and Music Theory
Lifelong Learning Centre Dipoli	<ul style="list-style-type: none"> • joint educational programs DEIM • joint courses for IEM-DP • joint projects in developing telematics in education • Open University courses 	<ul style="list-style-type: none"> • joint courses related to music education • Open University courses 	Continuing Education Centre

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EXTERNAL NATIONAL NETWORKING / Partners	Description of activities	Description of activities	EXTERNAL NATIONAL NETWORKING / Partner
	Department of Industrial Engineering and Management	Department of Music Education	
HSBA – Helsinki School of Business Administration	<ul style="list-style-type: none"> • elective courses (MSc and Ph.D.) • International Design Business Management IDBM-programme • joint research projects 	<ul style="list-style-type: none"> • compulsory courses related to subject-teacher’s studies in education (in Finnish) 	Helsinki University, Dept of Education
UIAH – University of Art and Design Helsinki	<ul style="list-style-type: none"> • IDBM-programme • joint research projects 	<ul style="list-style-type: none"> • joint development project • co-operation in Music Technology Programme 	Helsinki University of Technology,
Lappeenranta University of Technology – LUT	<ul style="list-style-type: none"> • IEM Doctoral Programme • joint program from BSc to MSc in Lahti 	<ul style="list-style-type: none"> • joint activity “Youth, Art and Nordic Nature” • multicultural doctoral programme is under development 	UIAH – University of Art and Design Helsinki and The Theater Academy
Tampere University of Technology – TUT	<ul style="list-style-type: none"> • IEM Doctoral Programme 	<ul style="list-style-type: none"> • joint publication Finnish Journal of Music Education 	University of Jyväskylä, Department of Music
Oulu University	<ul style="list-style-type: none"> • IEM Doctoral Programme 	<ul style="list-style-type: none"> • joint publication Finnish Journal of Music Education 	Oulu University, Faculty of Education, Center for Music Education and Research
The Sibelius Academy	<ul style="list-style-type: none"> • joint development project 	<ul style="list-style-type: none"> • compulsory courses related to subject-teacher’s studies in education (Swedish) 	Åbo Akademi University, Faculty of Pedagogy
University of Vaasa	<ul style="list-style-type: none"> • MSc. Level education 1992-1996, intake stopped, still some students in process 		
University of Jyväskylä	<ul style="list-style-type: none"> • courses for BSc -> MSc programme 		
Jyväskylä Polytechnic	<ul style="list-style-type: none"> • BSc->MSc programme • Ph.D. courses in logistics • open university courses 		
Espoo-Vantaa Polytechnic	<ul style="list-style-type: none"> • students taking HUT courses • joint personnel • postgraduate studies for personnel 		
Very active interaction with industry			Active interaction with the Finnish National Opera and a number of orchestras