RESEARCH EDUCATION BY DESIGN: ASSESSING THE IMPACT OF PEDAGOGY ON PRACTICE

Bruce M. Hanington, Carnegie Mellon University, USA

Introduction

The value of research is increasingly recognized by the professional design world. However, despite the more prominent role of research in recent years, many common perceptions still exist that impede the complete integration of research into the creative design process in practice. Many of these perceptions are well founded in the practical realities of business, including severe limitations on time, human and financial resources. Others, however, are based on skepticism of the true need or value of research activities, a lack of knowledge of appropriate methods, or the fear of employing inappropriate methods.

Critical to the progress of design research in industry is the education of emerging designers. At the undergraduate level, there are opportunities to infuse the creative design process with integrated research activities, instilling a fundamental core of human centeredness in the approach to design. At the graduate level, education in specific methodologies and effective communication provides tools for strategic planning and the implementation of research into the design process, often reinforced by past professional experiences of the student.

This paper will present a pedagogical model for research education in design at both undergraduate and graduate levels. Graduate thesis projects that exemplify a human centered process will be discussed, along with those that propose specific concepts as persuasive arguments for building research into the professional design process. The critical impact of a research-based education is then examined, through reflective insights provided by former students now in practice, and from professionals, who hire and work with these students educated in human centered research and design.

Pedagogical Model

The School of Design at Carnegie Mellon University offers undergraduate, graduate, and doctoral degrees. The Bachelor of Fine Arts undergraduate curriculum consists of a foundation year in design, followed by options for majoring in Industrial Design, or Communication Design. Two Master of Design graduate programs are offered, in Interaction Design, and a joint program with the department of English in Communication Planning and Information Design. Additionally, there is a joint masters program between Industrial Design and Mechanical Engineering, leading to the Master of Product Development degree. There is a new doctoral program in design with a specific emphasis on research.

Carnegie Mellon University is a research institution, and the School of Design operates under a human centered research and design philosophy. Specifically, students are exposed to an integrated process of research for the early-phase collection of information, ongoing concept development, and the testing of responsive design outcomes. Although some human and product use information may be collected from research literature and existing standards, there is an emphasis on direct interaction with people throughout the creative process using various research methods. Students are exposed to a human centered research and design approach in at least two ways, through specific content courses, and through reinforcement in complementary classes, studios, and projects throughout the curriculum.

Additionally, students may gain exposure to research-based design projects through sponsored client work in the faculty. For example, a multi-year project completed for the United States Postal Service (USPS) inspired organizational change through the redesign of the Do-
Domestic Mail Manual (DMM), using an explicit human-centered design process (Hanington, 2003). The project involved the transformation of complex information documents into accessible language and visualizations, in a new set of documents for use by postal employees, the public, and business customers. Students have also been involved with such human-centered research and design projects as appliance design for the elderly, packaging design for medication compliance, and the design of truck cabs for improved driver lifestyle.

At the undergraduate level, a required introduction to human factors is presented in the course How People Work. Previously required of industrial design students only, a significant shift in curriculum thinking now requires the course of communication design students as well. Clearly, the dimension of design should not be a barrier to addressing human need and desire. All students may also elect to take an advanced human factors project course, How People Work with Things. Together, these courses introduce a perspective on human centered research and design, with methods for the collection and translation of human information into creative solutions. The perspective and methods offered in these courses is complemented in several other courses, including design studies classes such as Human Experience in Design, studios such as The Meaning of Form, and several topic-specific seminars and senior projects, the latter often completed with industry sponsorship.

Introductory courses provide exposure to fundamental things that are necessary to know about human beings when designing for them, including physical ergonomics, sensation, perception and cognition in information processing, and personal, social, emotional and cultural factors. Projects in advanced courses and studios have explored such complex and diverse topics in research and design as mobile homes, footwear, recycling, public restrooms, grocery shopping, museum exhibits, learning tools, and emotional responses to product forms and operation. While many of these projects have an industrial design emphasis, communication designers are gradually integrating human centered research and design into newly revised curriculum as well. Recent elective courses offered in the communication design curriculum include Understanding Perception through Design, with an explicit connection to human design criteria.

At the graduate level, all first year students of the two-year program are required to take Research Methods for Human Centered Design. This course was introduced in Spring 2000 as an elective, and became required in 2002. A more recent change making the course unique is its integration with a required design studio taught in parallel. Students engaged in a semester-long team design project are exposed to “just-in-time” research methods, which are employed in exploratory investigations of people and products, co-design activities aimed at concept generation, and testing of emerging design ideas leading to final proposals. These methods range from ethnographic observation and immersive techniques, to participatory activities, to rigorous testing protocols.

Within the earlier model of Research Methods, students experimented with various methods through short research and design exercises, to gain experience in survey design, ethnography and observation, collaborative design activities, and prototype and product testing. The integrated studio model of the course incorporates a thorough research and design process, using flexible methods explored through application projects such as ubiquitous computing devices, and online learning. Many of these projects are client sponsored, or have participation from interested clients.

Following their first year and the required methods course and studio, graduate students engage in a thesis essay and project conducted in their second year. Self-defined projects are guided in consultation with an advisor, and typically follow a pattern similar to that described for studio, with phases of exploratory, generative, and evaluative research and design.
Graduate Thesis Projects

Graduate thesis projects serve to demonstrate the human centered research and design perspective in two ways. First, the nature of thesis investigations reflects the integration of human research in the design process. For example, a thesis working with the elderly to empower individual and social well being throughout aging revealed several design opportunities, and ultimately resulted in a web-based volunteer network among seniors (Whitlock, 2003). Other projects have a more stated product focus at the fore, such as a digital interface for collecting information in nature, including the identification of plants and animals (Kang, 2003). Both of these design projects were grounded in human and product research exploration, creative exercises with participants, and testing of emerging concepts with potential users.

Second, certain thesis projects have been developed for the express purpose of communicating research information to professionals in practice. Such projects are often inspired by the frustration experienced by students returning to school from industry, where they have been unable to make convincing arguments for integrating research into the design process. For example, An Introduction to User-Centered Research: A Decision-making Toolkit for Your Organization is a reference booklet containing text discussion, a glossary, method information cards, and interactive “decision wheels” (Rockwell, 2004). The tools provided in the book are intended to provide help in overcoming barriers associated with design research, to reduce uncertainty, provide opportunities for decision-making, and facilitate conversations with end-users. For example, one of the “decision wheels” helps to isolate methods appropriate for exploring or evaluating design ideas based on defined criteria, while another wheel suggests methods appropriate for selling points of research, and overcoming obstacles at various phases.

In another project, a student developed interactive software for understanding culture through exploratory research methods, facilitating the selection of appropriate methods for design investigations, and collecting notes and images (Weber, 2005). Multiple screens under topic areas of environment, economy, ideas and information, social structure, and technology provide basic definitions, questions to consider in research, and method descriptions. Interactive screens allow for building a research plan, and collecting research “assets”. While both these projects would need further development to gain contextual feedback in long-term use, anecdotally, preliminary responses from practice have been positive.

Reflections from Practice

While certainly there is a compelling argument for research education in design, evidence of its impact ultimately needs to be witnessed in practice. To begin that process, in June 2005, two online surveys were distributed on surveymonkey.com. These surveys targeted School of Design alumni, and employers of design students and graduates, particularly those who have recruited and worked with Carnegie Mellon design students. Alumni returned 14 surveys; employers returned seven (it should be noted that some employers were also alumni of the program, and in some instances answered both surveys). A series of eight open-ended questions were aimed at identifying key strengths and weaknesses of a research-based curriculum in design education, and the impact of research education and experience as evident in current practice. The surveys were intended to elicit reflective insight, rather than scientific or quantifiable data.

Research is my current work. My design research education gave me a good base of knowledge and experience in different established research methods and approaches, as well as
exposure to cutting-edge professionals. With this basis, I can help plan programs and select appropriate methods for each.

Research education and experience are important to both employers and alumni in their current work. On a four-point scale, of 14 alumni participants, five rated both research education and experience as “absolutely critical” (score = 4), five rated education and six rated experience as “very important” (3), and three each rated education and experience as “somewhat important” (2). Only one rated research education as “not important” (1). Among seven employers, three rated research education and three rated experience as “very important” (3), two rated education and three rated experience as “somewhat important” (2), and only one rated research education as “not important” (1) (one respondent answered both as “N/A”). Employers responding to the survey characterized research as playing a large role in their organizations, in some cases equal with design.

I do not believe I would have gotten this job without an education from a human-centered research and design program. A very important part element for a new hire here is a focus on human centered design.

Among alumni, many felt that their education at a research institution, and in a human-centered research and design program, played a primary role in securing their jobs. Specific courses and experiences mentioned as having an impact on their research education, primarily at the graduate level, included the Research Methods course, Integrated Product Development, thesis projects, and studio. They also believed that the research reputation of the University and program was instrumental in drawing employers to the campus for active recruiting of students. Employers confirmed this attraction to the School, and in one case stated that they did not look at designers from other programs because they could not guarantee that they would have “the necessary understanding and appreciation for research that CMU designers have.” They felt that students hired from the program were able to participate in conducting research and apply it to design solutions, make arguments to program management and developers, and enhance client confidence in smart solutions.

Every member of our design team is expected to participate in conducting research. A student that lacked a strong understanding of research would have a very difficult time succeeding on the team.

The specific role played by research in current work of alumni included the design and execution of research studies, interpreting and applying research findings, using research to inform and validate designs, relying on feedback and inspiration from the user to guide ideas and processes, helping clients to “see the forest for the trees”, helping clients listen and learn from their users, and studying, learning, or analyzing a new organization. When asked what skills, knowledge, methods or processes are looked for when hiring or working with design students or graduates, employers mentioned similar attributes, including a passion for advocating real people’s needs when designing solutions, a strong understanding and some experience with different research methodologies, articulation of research process, and expressing how tangible insights from research were applied to create effective design solutions appropriate to particular audiences.

User studies, personas, product prototyping, affinity exercises, heuristic evaluation, and, most importantly, failure.

Among respondents, there was a clear consensus on the specific value of a research-based education in design. From both alumni and employers, it was indicated that strengths included a solid understanding of the human-centered design process, user empathy, recognition of the
importance of research in understanding products, culture and society, approaching, researching and structuring problems, and finding connections. Specific mention of research methods evident in practice included user studies, interviews, surveys, immersive research, ethnography, observation, narrative tours, emotive inquiry, speculative scenarios, personas, participatory design, affinity exercises, card sorting, user reviews and tests, usability studies, focus groups, think-aloud protocols, and heuristic evaluation. General comments were also included that placed high value on the ability to avoid bias, putting research participants at ease, and evaluating and communicating findings.

One needs to be able to justify design decisions with criteria that [are] established within the design field itself. DR [Design Research] is one way to explain what one's design decisions are and why they are legitimate. There is nothing worse, as a designer, than being perceived as someone that makes things pretty or nice once the real design decisions on a project have been made.

Even among those who experienced less research emphasis in their education, and those who are working for companies that do not have a strong research history, expressed an appreciation for the value of research in education and practice. For example, a communication designer wrote that although human factors was not an explicit component of the curriculum at the time, it was learned “quickly and repeatedly that the user was the main ‘target’. That we should always design for the user, not for ourselves.” Another graduate of the program adds, “The application of research was almost nonexistent here at X. It’s taken years to get them up to speed on how important research is to the design process.”

Education deficiencies: Better understanding of how to process the raw data that comes from research and use it to both support the design process but also presenting the research for a business (non-designer) audience.

Comments were also elicited on the deficiencies of design research education and practice, coupled with constructive input for improvements. First, both alumni and employers were critical of a less than complete understanding of the realities of business that sometimes dictate the need for research information to be acquired quickly and accurately, often not accounted for in tight budgets and timeframes. This was in some cases paired with a suggestion for more “real world” experience for students. Second, several comments were made suggesting that a gap still remains in the transition from research collection to critical analysis for design application, that a better understanding of specific and pragmatic processes used in research, would be valued. At least one suggestion was made for more quantitative research. Third, research qualifications among students in many cases were perceived to come at the expense of more proficient design work, although one employer qualified this as a preference, stating that technical proficiency can be developed on the job.

At a general level, it was also pointed out that designers continue to struggle with a clear explanation of what ‘design research’ is to other researchers. There was at least some advocacy for even more research foundation, with additional focus on the design of research itself, knowing how to make it effective, and using it as a tool for innovation. It is particularly interesting that both employers and alumni made most of the foregoing comments in equal measure.

Remaining for future research and discussion to complement these results is to gain further input from employers who have not hired designers with a research-based education, along with students who do not have this component to their education, and students who experience frustration working in environments that do not support a research emphasis. To supplement the foregoing discussion that provides compelling evidence for the recognized value
of research in design education and practice, additional knowledge of where research is missing in organizations may reveal reasons for its absence, and provide opportunities for continued expansion.

Conclusions

There is indeed a positive outlook for the integration of research into design practice. The increased recognition of design in business may go hand-in-hand with an evident research core at the heart of the creative process, further counteracting the outdated reputation of design as styling. The convincing presentation of research as a necessary component of design that ultimately contributes to its value will be a key factor in building it into the business of organizations, even while recognizing the real constraints of time and resources.

Education has a critical role to play in this continued integration of research in design practice. Pedagogical models that introduce and reinforce a research component in design curriculum, and that respect the needs of practice, will benefit from the reward of well-employed students. In turn, graduates of research-based programs will contribute to the thoughtful design of products and services. Through exposure to research methods and processes in design, and concept exploration that may help foster the understanding and application of design research, we can equip our current and future designers with the necessary tools for balanced, creative, and human-centered design outcomes in practice.

References:

DESIGN RESEARCH AROUND DESIGN SEARCH
Héctor Flores Magón y Jiménez, Alberto Rosa Sierra, Universidad de Guadalajara, México

Abstract

Design research around design search

Trying to find out what is needed to impulse design research, we decided to search around the final project of the students of degree and postgraduate studios of design discipline as a reference. From there, we may establish different conditions on the projects and their classification in an interesting typology, such as: the “level” of design research orientation given to the students during the career, so they may be interested in this field in the future; the “quality” and importance of the projects developed around research; the “possibility” of projects oriented to a future development; the “quantity” of products (understudied as the results of the project development) oriented to different goals (market, social aims, self employed, technology based, technology innovation, etc.); the “injection” of motivation to continue with design research and postgraduate studies, taking as a starting point the area and/or project orientation as possible field of self development.

The research is based on the studio of 100 thesis from graduate studies on industrial design of UNAM1, 100 thesis from graduate studies on industrial design of UdeG2, 50 thesis from graduate studies on (integral) design of ITESO3 and 30 thesis from postgraduate studies on Product Development of UdeG.

Introduction

Industrial Design in Mexico, as a University degree formal program, has 37 years at institutions as the Universidad Iberoamericana (1968), the Universidad Nacional Autónoma de México UNAM (1969), and the Universidad Autónoma Metropolitana UAM (1975), to mention 3 of the older ones and most important industrial design careers in Mexico City.

At Guadalajara City the degree program on Industrial Design started 31 years ago at the Universidad Autónoma de Guadalajara (1974) and almost 30 years at the Universidad de Guadalajara (1976) as a degree level in Industrial Design and 15 years as a Design of Graphic Communication. The career as Design degree with an integral perspective started at the Instituto Superior y de Estudios Tecnológicos ITESO 11 years ago (1994).

This short period of time has given the chance to develop teaching-learning experience on the design discipline but very few opportunities to consolidate a design research program.

From our platform of the Universidad de Guadalajara related with the degree programs of Industrial Design and Design of Graphic Communication, we consider that some conditions have been set to impulse effective actions to establish a design research program, such as:

•The Industrial Design degree program have been accredited by the Consejo Mexicano para la Acreditación de los Programas de Diseño COMAPROD (Mexican Council for the Accreditation of the Design Programs)

---

1 Universidad Nacional Autónoma de México
2 Universidad de Guadalajara
3 Instituto Superior y de Estudios Tecnológicos de Occidente
Postgraduate studies in Product Design Development have been held at the Universidad de Guadalajara since 1995.

Academic Bodies (Cuerpos Académicos) are specially organized and registered, implanted by the Mexican Secretariat on Education (SEP) to develop design research around thematic matters such as:
- Design Research Center CID
- Ergonomics Research Center CIE
- Laboratory of Technology Innovation for Design LITED
- Laboratory for Optimisation of Graphic Production LOGRA

The question is, what is needed to impulse a design research program? (and hopefully a national program design based), been aware of the state of the art about the formal education in design disciplines. We decided, among other actions related directly with the research centres, laboratories and the professional field linked to the designers formed in University programs, to search around the final project of the students of degree and postgraduate studios of design discipline as a reference.

This may give us the idea of type of projects, thematic and design fields that have been attended with more frequency and to analyse the possibilities to develop design research projects to support the areas of interest for each institution, and even more, to develop that ones that have not been studied but seems to be potentially important to empower the design career in turn and the research program itself.

**How to organized the work**

The quantity and quality of the projects to be analyse needed to be organized in a way that allowed us to control the information fluidness. So, a technique ficha for each project and a general reference framework had to be constructed as a working tool to contain the information and build the design projects typology, taking elements and characteristics in two ways:

- Authors that have been discussing some guidelines about product and project classification and
- Taking from the projects analysed themselves, characteristics that may conform and define an interesting typology

With this two main streams to follow, the possibilities were such that we decided to conclude a first step, that is what we present today. The final is far away, even so, we are certain that should be kept a permanent effort to feedback the information and the connection between design degree programs and a design research program. So, the design projects typology there is still in construction, but the advances show some very interesting panoramas and to present the advances in the research project we conformed a table of contents that could give us the idea of the whole project and choose only certain characteristics founded based on a “chart of themes” designed especially for this purpose. The chart itself and the design projects typology could be a good reason for another paper to be presented in the future; today we want to concentrate with the general lines of our findings, the tendency of the projects by institution (and an intention to do so as a whole, including the differences) and the potential areas for research development.

We establish a compromise to feedback each design program with the results of the research so they may use them to know what have been observed and make some research planning about, the presentation of some possible actions may settle the conditions for institutional ex-

---

4 Secretaría de Educación Pública through the Professors Improvement Program (Programa para el Mejoramiento del Profesorado PROMEP)
change of efforts around design research, hoping it is possible to consolidate an inter-institutional design research program.

**Analysed universe**

The research is based on the studio of 100 thesis from graduate studies on industrial design of UNAM\(^5\), 150 thesis from graduate studies on industrial design of UdeG\(^6\), 107 final projects from graduate studies on Graphic Design Communication of UdeG; 82 thesis from graduate studies on (integral) design of ITESO\(^7\) and 25 thesis from postgraduate studies on Product Development of UdeG.

The first stage, and included in the actual paper, it is conformed with the ones who represent the Guadalajara City area in a graduate studies: industrial design of UdeG, Graphic Design Communication of UdeG; (integral) design of ITESO. As a second stage it is plan to be included the postgraduate studies of UdeG and the graduate and postgraduate studies which belong to the Universidad Nacional Autónoma de México UNAM at México City.

The research is based on the final project’s characteristics such as: Problem, Context and Solution (results) represented by keywords that allowed them to be classified to build a reference framework that locates diversity, tendency, coincidence and to establish a relationship system to allowed further seeking.

The classification references are taken from the performance areas of industrial and graphic design supported by three main lines:
Authors such as: Bonsiepe, Rodriguez y Magón; Keywords from papers presented at the era05 pre-Congress to be held at Denmark and intervention areas taken from the projects that have been analysed.

---

**Proyectual problem classification\(^8\)**

Bonsiepe (1978) declares that a problem is well defined when the variables that integrate it are closed, on the other hand, a problem is not structured when the variables are open. Therefore a proyectual problem may be classified as:

- Defined problems (structured)
- Not defined problems (unstructured)

Another spectrum of options is based on a triple articulation of the problem components:\(^9\)

- Initial situation
- Final situation
- Transformation processes to go from initial situations to final situations

The options may varied depending if the initial and final situations are more or less defined. Four possible combinations:

- Initial situation well defined, final situation bad defined
- Initial situation well defined, final situation well defined

---

\(^5\) Universidad Nacional Autónoma de México
\(^6\) Universidad de Guadalajara
\(^7\) Instituto Superior y de Estudios Tecnológicos de Occidente
Initial situation bad defined, final situation bad defined
Initial situation bad defined, final situation well defined

This taxonomy does not give any clue about the difficult grade of the projectual problems that depend on other factors, such as: the complexity and the knowledge of the problem (preceding experiences to be taken as a reference). On the other hand, the difficult grade can not be related to the social importance of the projectual objective\textsuperscript{10}.

**Design action spheres\textsuperscript{11}**

Among the different possibilities of design intervention it is important to consider the areas in which design has an important impact, specially in the actual times and because of Mexico conditions:

- Physically less favoured groups
- Socially non favoured groups
- Environmental respect
- Life and Health respect
- Alternative technologies generation
- Ancestral technologies rescue (revalue)
- Historic and cultural values impulse (re-semantic)
- Information “translation” (interface)
- Together: Sustainable development impulse

**Form Configurative Schemes\textsuperscript{12}**

Designing product development is essentially a form configuration, and this is the specific (for some authors even an exclusive) area of intervention for an Industrial designer. To accomplish this task Rodriguez (2000) says that it is necessary to consider four vectors that defined the form of the product:

- Technology vector: materials, processes and costs
- Functional vector: mechanisms and ergonomics
- Expressive vector: perceptual and symbolic factors
- Commercial vector: users expectative and commercialisation

Each design product development will have a strong vector to be defined as the essential one and to get special emphasis during the design process and for final evaluation of results.

**Keywords\textsuperscript{13}**

History: History of Mexican design; History of world design
Business: Design law; Design management; Innovation through design; Globalization; Starting a company
Education & career: Career development; Education
Starting a design company: Marketing; Starting manufacturing
Arts & handicrafts: Glass & ceramics; Textiles; Jewellery\textsuperscript{15}

\textsuperscript{10} Gui Bonsiepe, *op. cit.*, pp. 150-151

\textsuperscript{11} Flores Magón, Héctor. Diseño como Estrategia. Tesis de Posgrado: Maestría en Desarrollo de Productos, CUAAD-UdeG, Guadalajara, julio 2003, pp. IV-10 y 11

\textsuperscript{12} Rodríguez, Luis. El tiempo del Diseño. Después de la Modernidad. Editorial UIA, México, 2000

\textsuperscript{13} Taken from the date bases of the Denmark era05 pre-congress to be held at Denmark

\textsuperscript{14} Adapted by the authors

\textsuperscript{15} Added by the authors
City & space: Architecture; City & urbanity; Home; Public space; Scenography & exhibition; Space & interior; Work
Digital design: Games; Interactivity; Web
Experience & communication: Communication design; Experience design; Information design; Play; Storytelling; Usability; User experience
Fashion:
Future & research: Future scenarios; Theory & research
Trends: Holistic approach; Human-centred design; Interdisciplinary approach; Multilateral approach

Graphic design: Branding & corporate identity: Font & Typefaces; Visual identity
Industrial design: Furniture; Industry; Light; Medico; Packaging; Product; Transport
Manufacturing processes: Assembling processes; Cutting; Metal processes; Plastic processes; Powder technology; Rapid prototyping; Surface treatment
Materials: Ceramics; Composites; Glass; Metal; Plastic & rubber; Smart materials; Wood & natural materials
People & ethics: Care design; Design to improve life; Environment; Ergonomics; Social responsibility & ethics; Sustainability
Production & process: Manufacturing; Process; Re-design
Technology: Advanced technology; Traditional technology

Results Classifications

Demand origin: Necessities not satisfied; Association with necessity (user); Association with possibility (producer); Association with market (distributor / purchaser); Direct Demand (by demand); Public problem; Social Problem

Product: Consumer Product; Capital good; Public use good; System-module-line-family; Accessories and complements

Material: Wood; Metal; Plastic; Ceramic; Glass; Textile; New materials

Sector : Furniture; Vehicles; Communication; Clothing; Packaging; handicrafts

User: Children; Handicapped; Third age, Universal; Specialised

Context: Home; Field; Industry; City; Commerce; Educative; Sportive Public; Services; Construction

Project: Technology development (implementation); Research Equipment; Medical and Health Equipment; Productive Equipment; Commercial Equipment; Specialise Equipment; Technique Instrumental (tools); Designer Formative (complement); Design processes (methods and techniques); Interaction with other disciplines; Applied research; Theory research; Criteria and guidelines; Discipline Manifesto

Tendencies: Enterprise generator; Future bets; New category; From periphery; Local Identity; Sustainable Development; Alternative technologies; Eco-design; New Boundaries; Design management; Design strategies

16 Added by the authors
17 Added by the authors
18 Typology constructed along the research project, with criteria extracted from the analysed final projects
Some approaches

Joining Forces between the different approaches. We developed a framework to manage the project and the products individually and into a typology to may analysed the common factors, the differences, tendencies and potential areas of development. We expose some conclusions concerning each design program and in general, some proposals to consolidate lines and activities to firmly impulse the design research at the University with the intention to initiate a discussion with our pares.

DCG UdeG\textsuperscript{19}

PROJECTS TENDENCIES
107 projects that involves the work of 140 students with 72 projects about visual identity that means the 67.3% and 35 projects about diverse matters, that equals the 32.7%

NOTE: analysis of the communication phenomenon is not treated by any project

POTENTIAL AREAS FOR RESEARCH AND DEVELOPMENT
Some projects have a well connected link with other areas and disciplines that may be improved, such as:

Legal mark protection, authors rights, analysis of Mexican popular object symbolism, some new participation areas (as movie credits), cultural promotion for children, historic documents conservation and didactic material

Feedback of the frequent students participation in projects of visual identity of communities, government institutions and municipalities demands a study of the impact achieve in the State of Jalisco and the theory tools been used, to be completed with a publication with guidelines based on experience recompilation and Case studies.

DI UdeG\textsuperscript{20}

PROJECTS TENDENCIES
(69) Equipment (20) medical, industrial, agriculture, research, transformation processes, tools
(30) Furniture: House, Commercial, urban, education, services, specialised
(15) Product development (3), clothing (2), packaging (3), childhood amusement (6), electro domestic (1)
(14) Disciplinary formation: specialization, theory, design process, intellectual protection, disciplinary interrelation
(13) Transport: service, urban public, work, sportive, aquatic, production, accessories
(7) Work stations: industrial, service, commercial, intellectual
(6) Spatial: temporal space, house construction, house accessories
(5) DCG: signs, typography, identity, interface informatics, promotional

POTENTIAL AREAS FOR RESEARCH AND DEVELOPMENT
Theory research: Disciplinary own language, interdisciplinar Role, Disciplinary theory support
Areas to be develop: intellectual protection, Criteria, guidelines, methodology
Ecological goals: Alternative Technology, renewable energy
Technological innovation: technological transference, technological development

\textsuperscript{19} Graphic Design Communication degree program of Universidad de Guadalajara
\textsuperscript{20} Industrial Design degree program of Universidad de Guadalajara
Research impulse (ergonomics): Implementation of research results; Specialised techniques implementation (object)

Business Generation

**Design-Iteso**

**PROJECTS TENDENCIES**
(40) Communication: editorial, multimedia, visual identity, illustration, Web, campaign, animation, mark, poster, label
(16) Product development: shoes, jewelry, furniture, clothing, transport

6) Environment: commercial spot and store, museum, Scenography
(19) Boundaries: packaging (2), didactic material (8), integral development (4), urban space (1), signs (4)

STRONG AREAS: with the possibility to achieve a publication with the results of the projects concerned with didactic material and the strong interest shown for non favoured social groups (handicaps specially)

**POTENTIAL AREAS FOR RESEARCH AND DEVELOPMENT**
Didactic Material: for children, handicaps and specialised
Business Generation: design, plastic moulding, publicity spaces, home services
Ecological goals: garbage re-use, urban organic agriculture,
Minority groups: Physically and socially less favoured groups and communities
Institutional relationship: public interest campaign, municipality visual identity
Disciplinar guide, intervention methods, social connection, tradition rescue, association with other areas (medical)
New routes: Alternative Language, Blind sexual development, child psychological therapy, amusement for child hospitalisation, orientation and signs for blind people

**UdeG Degree programs**

If we compare tendencies is it possible to detect some areas to be strengthen and fortified to get deeper in the dominion of the areas and their processes, such as: DI UdeG with a strong participation on technology based projects to develop specialized equipment; DCG UdeG should try to diversified the project’s orientation to impulse the phenomenon of visual communication and integral programs to achieve results over the visual identity recurrent theme; but also try to extract the knowledge from the experience reached.

**Conclusions**

The actual paper includes the analysed performed to 3 degree program from 2 institutions, but by the time the paper is it presented at the “Joining Forces” Congress we may include another 2 programs which analysis face have been already concluded but the results have to be organized in the meantime.

Another face of the project in the future should include the analysis of the projects institutions, even national and international ones; and to interlink the results with the design interest of the City (and the country also), with the international design research projects, to explore new areas and to compare tendencies and possibilities.

---

21 Instituto Tecnológico y de Estudios Superiores de Occidente
The typology framework that has been built are still in construction and could be an interesting design research subject to be followed as an inter-institutional project.

Along the research was possible to detect important lines to be follow in the future as research projects considering its classification from design epistemology, phenomenology and praxiologia, such as:

- Boundaries and search zones
- Projects to be amplified their scope and reach
- Developments to be continued
- Influences to be followed
- Strategies, methods and models
- Criteria and alignments for product development

Many of the cases studied, after accomplishing its main goal of concluding the degree requirements and functions as a “final product”, could be considered as a starting point to generate research and development projects. Maybe some questions are still on the air and it is needed to build some bridges between degree studies and postgraduate studies to align efforts and consolidate a design research program to benefit the discipline transcendence.

Some questions around:

**How much the final work at degree studies could be considered as a design research project?**
Happens, quite common, that the information collected for the project development is assumed as a research matter…

**Could be final work a good base for a design research project?**
The methodology followed to develop the final project should have certain characteristics to prepare the continuation of the project as a design research one…

**Under what conditions the final work may be guided to reach further and deeper search and research?**
Tutor role represents the link with a research centre; a research team and a postgraduate studies program. The figure of research assistance may impulse the introduction of more design researchers.

Time to “Joining Forces” to go further and deeper…..
Abstract

How do you teach innovation? How do you teach creativity? How do you teach a student to design a product for the future when that future has not arrived yet? This is one of the challenges that faculty face when it comes to promoting design innovation in the classroom.

A truly innovative idea cannot be explained neither understood using current paradigms or concepts. Paradigms are temporary and circumstantial; on the other hand, the way people communicate and understand is temporary and circumstantial too. One way of teaching innovation in design schools is to focus student projects on people and not the paradigms. This focus on people allows students to create stories. Storytelling is a powerful design research tool that has been employed by top players in the industry for the past 15 years but very little in design schools.

This paper will discuss how Storytelling could become a powerful research tool that promotes innovation in the classroom. It helps students to organize their information in a manner that is easy to understand, not only for themselves, but for a variety of audience.

The First Project, The First Disappointment

The first project is to design the next “Big Idea” in wireless communication. Some students come with interesting ideas for a cell phone incorporating multiple functions. These small devices have everything: speakers, microphones, small color LCD screens, small flexible keyboards, tiny cameras. No one can deny the amount of creative work generated in the classroom and how excited the students are. But this is just the beginning of a much longer exercise of creativity, they don’t know but they are actually getting ready for their first “innovative project.”

After finishing the small design project the instructor praised them for the quality of their drawings, their work, their interesting ideas, and the aesthetics behind each design. But at the end he said that he couldn’t really find any idea that was truly outstanding or creative enough to call it: the next “Big Idea.” He explained that most of the ideas were no more than mere reinterpretation of current solutions. There was a lack of vision, no anticipation about how people might communicate electronically in the future.

The students were confused, disappointed: What went wrong? Aren’t we creative enough? Were the instructor’s expectations too high?

Looking for Creativity

Creative work is exactly what is expected from every design school in the country. When the creative work has a successful commercial application then we call it innovation. Innovation is precisely what design-driven companies are looking for.

The big question is how do you teach innovation? How do you teach creativity? How do you teach a student to design a product for the future, when that future has not arrived yet? What kind of technology do we need in the future?
Typically, design students have gone to their drawing tables and sketched their ideas on paper in a multiple-step process called “ideation”. The process is simple, the sketches or drawings are the pictorial representation of a basic idea that gets refined over the time allowing the designer to add more ideas until he eventually has enough clarity for himself and his audience.

The Future Computer: Pencil and Paper?

For years, designers, engineers and inventors in general have used the drawing table and pencils as their primary tools for their visualization of ideas. These traditional tools are increasingly being replaced because of rapid advances in technology. Computers, electronic tablets and rapid prototyping machines are slowly moving in, while drawing tables and pencils –the way we know them today- are moving out.

Are there no pencils in the future? Is the classroom of the future full of Tablet PCs? The answer is: Who knows.

Something we know is that human interfaces, the ability to draw, the ability to write, the ability to use our hands, our eyes, our voice, will never change. After all, our body is the medium we use to communicate with the outside world.

The computer of the future will probably come in the most unexpected package: that could be as a “smart” pencil or as a “smart” paper, but the future generations of designers may call them pencil and paper, just the same. This future pencil is not your typical wooden pencil that you use today; neither the more advanced plastic mechanical version designed 40 years ago. This “smart pencil” will incorporate all the power that personal computers have today and more. In the same sense, the “smart paper” will be the stage, the window, the canvas for our ideas. The difference is that this “smart paper” will be more powerful and lighter than today’s LCD screens. It will be less expensive and will electronically store all of our drawings, ideas and hand writing instantly.

Science fiction? Not really. 40 years ago nobody could have envisioned the creation of the Internet, personal computers and cell phones. There was apparently no need for such innovations even though the ability to communicate electronically was there; the technology was there –in an early stage of course-. But technology per se is not really what creates innovative ideas. What technology does is empower designers to create a vision of the future. An innovative idea pushes the creation of new technology. In that sense, innovation and technology are completely interdependent.

Classroom Challenge: Focus on People not Products

Going back to the initial student project: in order to spark creativity and innovation in the classroom, the professor offers students a new challenge. Curiously, the challenge will be the same one again: to design the next “Big Idea” in wireless communication. But this time there is a twist: the new designs cannot incorporate cameras, displays, speakers, earphones, microphones, not even keyboards!

After some initial awkwardness, the professor then explains that instead of focusing on the product this time they should focus on the situation, on the user experience only. This will force students to think out of the box.

The real challenge for students was not how to design a cell phone that doesn’t have speakers or microphones. After all, for this cell phone, talking was absolutely useless. What about video cameras? Or LCD displays and keyboards? Still, all of them are absolutely useless. So,
what kind of cell phone is this? The answer is nobody knows yet. For sure it can’t be called “cell phone”. And that is the way to start the new idea.

This is one of the challenges when it comes to design innovation. A truly innovative idea can’t be explained using the old paradigms. While concepts like TV, VCR, cell phone, laptop, PDA are today’s paradigms, in the future, these paradigms will seem quaint.

Paradigms are temporary and circumstantial; the way people communicate is temporary and circumstantial, too.

To understand the focus on people, the professor asks students to bring storyboards to the classroom instead of traditional idea-sketches. Storytelling is the basic tool to communicate ideas. Storytelling focuses on people not products.

It takes many hours of discussion with the professor and additional individual work before the students feel comfortable using the storyboard technique. Curiously they were still sketching, but they were no longer sketching products, they were actually sketching people.

Students focus their stories on simple situations. For example, communication between coworkers in different offices, or communication between members of a family in different cities, etc. They all use some sort of electronic communication device: cell phones, computers, video, etc. Still, the biggest challenge ahead: how would this people communicate without voice, text or images? What kind of wireless device would they use?

Exploring New Scenarios: “The Expectant Parents”

One student was exploring the following scenario: An expectant mother sharing her pregnancy experience with her husband who is temporarily out of town.

Because pregnancy is such a unique experience for the mother, communicating her thoughts and feelings to a husband out of town should be a no brainer: she could grab the phone and call him, or maybe, send a letter with pictures of the latest ultrasound, or much faster, an email with a picture attachment.

All of the above mentioned options are considered completely ordinary. There is nothing innovative about them. Here is when the professor’s challenge comes to play: How could the expectant mother communicate with her husband without voice, text or images? The answer is: touch.

After several discussions in class the student finally creates a story that is absolutely innovative: “Wireless devices specifically designed for expectant parents.”

These devices would be worn on the abdomen areas; the sensors embedded in the mother’s device would transmit some of the baby’s pulses wirelessly to the father. The father, in return, would rub his device to let her know he received the warm pulse. What a simple idea.

Of course, such a simple device could never transmit to the father all the complex sensations that the mother is experiencing inside her body. But the simple idea of communicating wirelessly and sharing without using voice, images or text is absolutely new and interesting. It could be priceless in some specific situations, for instance, being in bed and thinking silently about the loved one that is far away. Using such a device to touch each other in the distance, without saying a word, could be a powerful experience. This could be a new option, a new kind of intimacy for couples in the 21st century!
What should we call such an idea? We don’t know yet. We are not using voice so we can’t call it cell phone. We are not using text or images so we can’t call it computer, or e-mail, or webcam or anything like that. In this case a new paradigm has been created.

New technology has empowered designers to create new ideas that are not necessarily based on the old ones, that is why we can’t describe them using the old paradigms. In this case, there is nothing new about couples communicating through touch but doing so electronically could be a seed for a series of innovative products. Five years ago there was apparently no need for such innovation but now we have the technology that can make this innovation a reality. Once people adopt this new technology, the technology itself will be pushed again creating more innovative ideas. Innovation and technology will feed one another again.


**New Paradigms Inspire More Ideas**

Another similar student idea: A wireless device to share intimacy electronically for couples living in different cities who can only meet very few times a year. Again, a controversial but effective use of technology. Each lover would wear a specially designed garment. Each person would touch himself in order to touch the other one!

The student projects were finally reaching the stated goals. The focus on user experience and storytelling allowed students to think out of the box. New concepts were created.

Of course, some student projects are more of a creativity exercise rather than a product ready to hit the market. This is part of a more comprehensive design curriculum where the focus is on visionary thinking rather than styling.

The fast evolution of technology allows designers to design virtually any concept in any shape. Designers don’t work around the engineer’s box –also called styling- anymore. Now, engineers work inside the designer’s box.
Visionary Thinking

Innovation-oriented companies are always working on their visions of the future; they spend enormous budgets developing products and concepts ahead of time inside their laboratories. This is a difficult task since nobody can really predict the future.

The first company to hit the market with an innovative product or service will have an advantage over the competition - not to mention better profit margins and bigger market share - provided the company has the right business strategy.

Design-driven companies build their future in part by visionary thinking: so should Industrial Design schools. Creating innovative ideas through storytelling is one viable option for design schools to build their own visions emphasizing and understanding the user experience.

Acknowledgment

The author wishes to credit CSULB Industrial Design students E. Hill and J. Akiyama for images used in this paper.

References:

MANAGING DESIGN BY RESEARCH: DEVELOPING A
RESEARCH BASED DESIGN MANAGEMENT EDUCATION
FOR TURKEY AS A NEWLY INDUSTRIALISED COUNTRY
Özlem Er, Istanbul Technical University, Turkey

1. Introduction

“Design is one of the most influential competitive factors for all companies operating in a
global economy. This makes the management of design a vital factor for all these companies
regardless of whether they are based in the core, or the periphery of the global economy” (Er
and Er, 1999).

The recognition of the fact that design has a strategic role not only in the new product devel-
opment activities of the companies but also in the way they position themselves in the market
and undertake their activities led to the development of educational programs to enable that
design fulfils its potential as a competitive factor. Such a recognition also led to the develop-
ment of individual courses trying to link design with business context based on the body of
knowledge accumulated in the field of design management in countries such as Turkey which
is a Newly Industrialised Country (NIC). As Turkish companies try to lessen their dependence
on price competition, design is increasingly seen as a factor enabling differentiation and
added value creation. Would an educational program at graduate level in the field of design
management require a specific approach in a country like Turkey than a program to be estab-
lished in an advanced economy? What are the new concepts that such a program should take
into consideration and what its unique qualities should be? These are some of the questions
that this paper aims to deal with.

On the basis of the findings of a recent research study on international approaches to design
management education (Er, 2004), this paper will first review the prevailing factors
influencing the field of design management. It will then reveal the findings of a local survey
into the design management needs of manufacturing companies. Through these findings, the
paper will search for the foundations of an independent degree program in design
management. The paper will argue that research should be at the core of such a program in
order to create a local knowledge base and the students should be donated with research and
analysis skills to diagnose company and industry specific design management problems, and
to propose and implement informed and innovative solutions to these problems.

Through a literature survey on the evolution of design management and interviews with pro-
gram leaders and lecturers, certain developments were identified which have an impact in the
direction of design management education. We will review them in the following section.

2. Developments Having an Impact on the Direction of Design Management Education

The establishment of the thinking that design is a strategic asset for companies and
organizations alike to create value for all their stakeholders demands alternative concepts and
tools to unleash its potential. In this context, some authors (Cooper and Press, 1999; Press and
Cooper, 2003; Manzini, 1993) find that the term design management may not be sufficient for
such a role.

There has been an increasing emphasis on the contribution of design to company strategy in
the last decade (e.g. Mozota, 2003; Press and Cooper, 2003; Chung, 1998; Cooper ve Press,
1995; Manzini, 1993). To secure such a contribution, design needs to be managed
strategically at the top level and the design management process should start at the stage of
defining the corporate strategies before the identification of a new product and/or service idea,
going beyond being a function to be managed at organizational or project levels. A new thinking is also developed that design is not only concerned with products and that it is a strategic factor which can be used by organizations/companies to define themselves and shape their business processes (e.g. Buchanan, 2002; Rotman, 2004; Liedtka, 2004). The concept of design management which is traditionally considered as an organizational or project level task, is increasingly referred in areas such as organizational change management, the identification of customer requirements and brand identity development. Mozota (2003) makes a very general definition of design management: “Design management is the deployment of design within a company to help the company develop its strategy”. The evaluation of design as a factor which determines the company strategy and leads innovation and change brings alternative concepts such as strategic design or management led by design.

In the light of a paradigm change from product-oriented innovation to experience-oriented innovation (Pine and Gilmore, 1999; Prahalad and Ramaswamy, 2003), it is increasingly accepted that every aspect of the relationship between the products and the users concerns design. Brand identity, packaging, product and all other aspects influencing the user’s perception and usage processes should be in harmony to create a whole experience. More and more the planning of new products are considered together with brand and service strategies in the context of a specific marketing concept.

According to Buchanan (2002) design is now about "how people relate to other people and the products that mediate that relationship". Companies are more and more conscious of the need to understand how people use products, leading to a preference for field studies over focus groups in product development efforts. In order to differentiate themselves companies try to turn points of interaction between users and service providers or products into “delightful” experiences. In fact as they try to design all points of interaction, companies also realize that they can design their own organizations, how its parts relate to each other and their business processes. Designers with their special abilities such as to facilitate communication between different disciplines in an organization by visualizing issues and problems, are in best position to design the structure of the organizations and the ways they do their business (Buchanan quoted in Raz, 2002).

Buchanan (2002) also states that CEOs trained to think like designers can design all aspects of their businesses. Along this line, a new concept is developed as managing as designing in a workshop organized in the Weatherhead School of Management in 2002.

On the website of this workshop, it is stated that: “In the emerging digital economy, there is a need for new models of what organizations can be, new ideas of how value can be created in business and society, and new images for leadership. We believe that design thinking is central to providing these new models, ideas and images. Beginning with this workshop, the Weatherhead School of Management will lead a movement in education and research to make the act of designing and the critical evaluation of design recognized as two of the most important abilities a manager can develop”*

Similarly, Roger Martin, Dean of the University of Toronto’s Rotman School of Management writes that “business people don’t just need to understand designers better: they need to be designers. They need to think and work like designers, have attitudes like designers, and learn to evaluate each other as designers do” (Martin, 2004).

These ideas imply that there will changes in the nature of MBA programs to integrate design thinking and tools in the education of potential CEOs and managers. They also imply that instead of separate design management programs, design will be an integral part of management education.
Design education on the other hand will face the fact that their graduates are more and more likely to work with the MBA graduates, engineers, social scientists etc. who are familiar with the concepts and tools that they are equipped with.

Rachel Cooper and Mike Press who wrote several books on design management and undertook research in various aspects of it point out the danger in understanding design management as merely a control mechanism for achieving short-term aims of the companies (Press and Cooper, 2003). In their view, the perception of design management as process controlling would mean distancing from the original conception of design management to increase the impact of creative thinking and action in organizations. In the light of the challenges awaiting the future design professional such as the need for sustainable industry, new technologies and issues of usability and the paradigm change from product oriented innovation to experience oriented innovation, design management as a concept needs to be reconsidered. According to Press and Cooper (2003), “design management now not only means managing the people and the process, but deconstructing and analysing the total product experience to enable the designer to work with the organisation team to understand and contribute to that experience”.

Press and Cooper (2003) also point out the need to create new design professionals who will use their knowledge and skills to develop products and services which will add value to the lives of the people, who are also able to speak the languages of different disciplines in a business setting and to comprehend business processes structurally. They refer to the need that these new design professionals to be educated to pioneer change and innovation in the companies that they work for within or from outside, as consultants and also to evaluate design in the context of the whole product experience (Press and Cooper, 2003).

This approach implies that design professionals who can ensure the contribution of design in creating and adding value to the lives of the people can be cultivated through educational programs established within design schools/departments. Being independent from the factor of location, it is also emphasised that such programs should have an interdisciplinary character and strengthen the skills of teamwork.

Ezio Manzini offers alternative terms to describe the potential role of design for companies and the society in general. According to Manzini (1993), in the light of the paradigm change from a product-oriented economy to a service-oriented economy, companies are in need of a different and high design competence than managing design and the final aim is to become a company led by design. He offers terms like design direction and strategic design in the sense that design leads or shapes the company strategy (e.g. Manzini, 1993; 1999).

Some specific implications in terms of the content of design management programs are the results of various studies at firm-level. The research undertaken at firm-level show that the responsibilities of design managers change from one firm to another and that it is impossible to create a recipe which would suit the needs of each one of them (Thackara, 1997; Press and Cooper, 2003).

Two conclusions can be drawn from this finding. One is that the people who will be charged with the responsibilities of design management should be donated with a broad scope of knowledge and skills to comply with different circumstances. Therefore design management education should have a rich content to contain many responsibilities that a design manager undertakes in business context and also should enrich the abilities of research and evaluation, entrepreneurship and strategy development. The other is that design management courses should be confined to the specialist fields of design management such as creative team
management, design procurement management, etc. as suggested by Press and Cooper (2003). In either case, it is apparent that there is a need to develop educational programs understanding the potential of design in terms of value creation and organizational change. It is also apparent that design management as a concept needs to be reinterpreted.

In the following section, we will reveal the findings of a survey into the design management needs of Turkish manufacturing companies.

3. The Design Management Needs of Turkish Manufacturing Companies

In the context of the research into the design management education, a survey was undertaken to understand the design management needs of domestic manufacturing companies. This survey was targeted to the companies with a design manager position. Out of 20 such companies 14 of them replied and the following results are based on their responses.

The companies which have identified a design management function in their organizational structure are mostly large scale companies in sectors where design is intensively used. A few medium-sized family companies can be added to these companies which have adapted a design-oriented competitive strategy. As such the findings of this survey represent the design management needs of large scale companies in design-intensive sectors. However, as 98% of Turkish manufacturing industry consist of SMEs, these findings will be interpreted in comparison with our experience with almost 80 SMEs through a project titled as “Industrial Design for SMEs” that we are involved in since 2002 in collaboration with Istanbul Chamber of Industry (Er and Er, 2003).

Contribution to the formulation of company design strategy and the definition of design process are the leading factors among other items listed as the fields of responsibility of corporate level design management. Contribution to the corporate strategy on the other hand appear as the least mentioned field of responsibility. Contribution to the formulation of product strategies and the identification of new product needs as fields of responsibilities also appear of less importance. Our experience with SMEs however show that their needs in the area of design management cover a large spectrum from the definition of company and product strategies to new product opportunities and needs. The transformation of market and user information into design criteria, the preparation of design briefs, the formation of design teams and the distribution of responsibilities, the planning and management of the prototyping process, undertaking of the necessary changes following the construction of the first prototype and the monitoring of this process, the coordination of the relations between different units during the project result are the prevailing responsibilities associated with design management.

The feasibility studies of design projects, project cost analysis and control also appear as less important factors. For SMEs however, these are all fields of responsibility of equal importance. For instance, considering that SMEs are short of financial means, the control of project costs is also among the responsibilities of a design manager.

The findings of this survey show that learning from successful national and international cases where design has played a role, to gain skills to identify and forecast market trends, future life styles and needs are positioned on the top of the list among the expectations from design management education. The other important knowledge and skill sets are in the area of creativity, teamwork, time and project management techniques, presentation and foreign languages.
The persons who are charged with design management responsibilities in the companies included in this survey prefer to receive design management education as “on the job training” or as a package integrated into the undergraduate industrial design programs.

4. Fundamentals of a Model for Turkey

The urgency of the needs of Turkey in terms of generating added value through design, their broad scope spanning to companies of all sizes from almost all sectors and the insufficiency of the human resources require that a new educational program in design management should have the flexibility to cater for this broad range of needs. Such a program should be able to offer educational choices to its potential audience. For example, it can offer short-term modules to donate designers with management knowledge and skills as well as managers with knowledge and skills in areas such as visual thinking, strategic design, etc.

A practical approach in the development of these different options is to design the program to consist of a number of main modules. These modules can then be used to create short-term educational offers. To have a program consisting of modules to which, students from other programs can also enroll is a way of increasing the potential student numbers and also the interest in the program. For example, part of a graduate degree program in industrial design can consist of a common module with the degree program in design management.

Despite involving different educational options, there should be a core module ending with a degree in design management to generate knowledge at local level through research in Turkey.

The body of knowledge in the field of design management is based on transferred concepts and methods from advanced countries like industrial design itself. An important responsibility of an educational program in design management is to follow the recent developments in advanced economies as they emerge. Considering the communication channels that are available today, it is rather easy for design academics in NICs to follow up such developments. However, the main responsibility of an educational program in design management should be to generate new methods and tools which are suitable to the local and specific conditions of Turkish companies and sectors. A point of consensus on the subject of design management is that design management consists of a body of knowledge and skills which should be adapted to specific situations rather than theoretical recipes relevant to all cases. This is also valid for Turkey. Thus, an effective educational program in the field of design management in Turkey should contain the knowledge base and the skills to undertake research to diagnose and analyse the specific conditions of the Turkish companies. Unless it has such a character, design management education can not go beyond superficial and most of the time outdated knowledge transfer. In other words, a research based graduate degree module should be at the heart of a design management education program. Depending on their specific needs, the students, can arrange the timing of their studies with short and long term options ending with various degrees such as diplome, certificate or MSc degrees.

In parallel with the approaches identified in the literature survey, a design management degree program to be developed for Turkey should cover the management of all the factors in the creation of product experience such as service, communication and packaging design in connection with the product itself in the context of “design management”. Another concept that such a program should consider is the management of the experience and therefore value creation process of a company/organization together with its stakeholders (Prahalad and Rawasmavy, 2003).
As well as the design management needs of the Turkish manufacturing industry, such a program should also consider the needs of the service sector. Under the general concept of design management, the program should look into communication, graphic and packaging design projects as well as product design ones within the perspective of experience and value creation.

In parallel with international approaches, the design management degree program at graduate level should have an interdisciplinary viewpoint. However, essentially such a program should depend on the body of knowledge created in the field of industrial design and be based in industrial design schools or departments.

In admitting students to such a program, balance should be maintained between the representation of disciplines such as design, engineering and management. Balance should also be considered in admitting students with and without business. Alternative time plans should be generated to cater for the needs of the working students. In sum, the program should have the flexibility to answer for differing needs.

Considering that design management roles and responsibilities change from company to company, the graduate program in design management should have a rich pool of courses to enable the students to make choices. Issues such as brand management, entrepreneurship, sustainability, social responsibility and intellectual property rights should be covered in the program.

5. Conclusions

In an earlier paper (Er and Er, 1999), we claimed that design management education should follow a two-track strategy in a country such as Turkey which is a Newly Industrialised Country. While the first track of this strategy is to follow and transfer the leading edge knowledge and tools developed in the context of advanced economies, the second one is to generate a local body of knowledge in design management. We argued that the specific conditions of Turkey such as the domination of SMEs in the economy, the urgency of their needs in terms of technology and product development in the face of increased competition coming from both the advanced and emerging economies require the development of a special program of education in the field of design management (Er and Er, 1999).

In the light of the results of the research study that this paper is based on, we can say that this argument is still valid, albeit in need of a review considering the new thinking developed by the fields of design and management. A new program of education is required which is based on the body of knowledge accumulated under the heading of “design management” while being aware of its limitations as a concept to unleash the potential of design for companies and for the society in general. The core of this program should be based on research to generate an original body of knowledge and set of tools to cope with the specific requirements of a Newly Industrialised Country such as Turkey.

As we mentioned in an earlier paper (Er and Er, 1999) although a research-based approach aiming both to solve defined problems in an organization as well as extending knowledge and learning of the processes is not new in the design management education (e.g. Svengren, 1993), its significance increases for design management education in a country like Turkey where the local body of knowledge is weak. From this particular perspective, equipping students who will take design management responsibilities in their companies with necessary research and analysis skills to diagnose company and industry specific design management problems, and to propose and implement solutions to these problems suitable to their own context seems to be one of the principal aims of a degree program in design management.
* The papers presented in this workshop can be accessed at the following internet address and the book:

http://design.case.edu/2002workshop/


References:


THE FACTORS SHAPING DESIGN RESEARCH AND ITS RELATIONSHIP WITH INDUSTRY
Fatina Saikaly, Politecnico di Milano, Italy

The Distinction Between External and Internal Factors

The interplay of several different factors has been shaping the nature and evolution of doctoral research in design and its relationship with industry. These factors were divided into external and internal factors. The distinction between external and internal factors was borrowed from a model of the history of sciences, concerned with the study of the evolution of scientific paradigms and theories (Findeli and De Coninck, 2002). According to this model, internal factors depend mainly on the internal logic of design. External factors depend on economic, social, cultural and political issues.

Following this model, the main external factors shaping the nature and evolution of doctoral research in design and its relationship with industry are the following: the higher education reforms, the decision makers stances, the programmes’ contexts and the new challenges and orientations of academic research. The followings are the main internal factors: design research as a young field of inquiry, the ‘nature’ of design in various contexts, the different areas of design research and finally the growing design complexity.

Strategy and Methods of Research

The identification of these factors resulted from the case studies of ten PhD programmes in design (Saikaly, 2004). The study covered seven countries where a considerable number of graduate programmes in design was found. The criterion for the selection of the programmes was the consideration of the best practices in doctoral education in design. Each case study was divided in three parts: the study of the PhD programme; the study of a selected PhD thesis and an interview with the coordinator or a supervisor of the programme (Saikaly, 2003; Saikaly 2005). Recently, a questionnaire was sent to a list of twenty-two experts in design research. Ten of these experts answered the questions. The questions are:

- What are the most significant (research and theoretical) trends within your PhD programme (or doctoral education in design in general)?
- Is there an increasing demand of this kind of design research?
- What about its relationship with industry?
- What do you think about the future of this kind of design education?

The study and analysis of the collected material are reported in the following sections.

External factors

Higher Education Reforms

Higher education reforms, such as changes in the structure of higher education, in the status of higher education institutions or in the nature of doctoral education, are among the several external factors shaping doctoral research in design. For example, in the Australian (Davis, 2003) and the British context (Archer 2000; Durling 2000) these changes due to higher education reforms were more evident than in other contexts studied.

In Britain for example, in 1965, local and regional colleges that taught art and design considered as ‘vocational’ subjects amalgamated to form polytechnics. As a consequence, a first degree in design was offered. In 1992, Polytechnics became self-governing universities. Doctoral degrees in practitioner disciplines such as design were introduced. Then, in 1997, the
UK Council for Graduate Education published its famous report “Practice-Based Doctorates in the Creative and Performing Arts and Design.”8 This event marked the launch of doctoral programmes in design in Britain. Several universities extended “[…] the requirements for the award of their Ph.D. degrees, allowing the submission of practical work as part of the candidate’s independent and original contribution to knowledge.”9 In particular, the latter reform shortened the distance between academic research from one side and practice from the other side.

Decision Makers Stances
Another factor that is contributing to the actual state of doctoral research in design is the knowledge stances of academic decision makers. In the studied Ph.D. cases, decisions concerning the Ph.D. programmes were mainly made by the heads/coordinators of Ph.D. programmes.10 In most of these cases the choices of the decision makers were significantly influenced by their educational background, professional background and personal vision concerning design and design research.

This was evident in many cases such as the PhD programme in Conception de Produits Nouveaux structured within the Laboratory Conception de Produits Nouveaux et Innovation, Ecole Nationale Supérieure des Arts et Métiers, ENSAM Paris. The coordinator of the PhD programme, Prof. Robert Duchamp, who is also the founder of the laboratory finds practice and the collaboration with industry fundamental aspects of their programme and he argues: “[…]. Our research candidates can’t make a PhD if there’s no a practical application to their research project. I think that, today, the characteristic of a research, once concluded, is to be able to introduce new courses for the development of new knowledge. […]”11

In another example, Prof. George Stiny, the coordinator of the Ph.D programme in Design Computation, Massachusetts Institute of Technology, argues: “There are people on the faculty, not in Design and Computation, but in Building Technology, who run big projects, and where Ph.D. students do one piece or part of that project as a Ph.D. I think it has much to do with the personality of the people who are running the programme. We could do it that way, but I don’t like this kind of organization. I don’t think it has much to do with design. I’m just not very keen on big projects, I’ve run several, but I’ve never really run one that I thought students learned any more or did any more than they would had if they just worked on their own. The most successful students are the one who worked on their own and did their own things and were motivated in terms of what they were interested in. That’s the way I did mine, but I didn’t do mine in design. I did my Ph.D. in mathematics and I don’t know, they just left me alone for three years. You know, I had to see my advisor occasionally, let him know what I was doing. But there was no classes to take or any pressure to do something that they wanted you to do. I thought that was successful.”12

Programmes’ Contexts
In some cases, doctoral programmes belonged to a kind of ‘scientific’ context. The surrounding environment, such as the different departments, conferences, initiatives and activities, etc., were mainly characterized by scientific ‘attitudes.’ In these cases, a scientific approach to doctoral programmes was adopted and basic research was dominant. This, for example, was noticed during the visits to the doctoral programmes Design and Computation at the Massachusetts Institute of Technology and Design and Innovation at the Open University.

In other cases, doctoral programmes belonged to an ‘art and design’ context. In these contexts design practice was a dominant activity. This was very evident in two cases, the doctoral programme in Art and Design from Sheffield Hallam University and the doctoral programme in Industrial Design and Multimedia Communication from the Politecnico di Milano. In both contexts, Sheffield and Milan, design is considered as a driving force for regional regenera-
tion and industrial competitiveness. In these doctoral programmes, applied research was often adopted.

**Challenges and Orientations of Academic Research**

The last external factor is the different challenges that face all the areas of academic research, with design research no exception. Among these challenges (*Centre National de la Recherche Scientifique*, 2002; Jonas, 2003) is the classical distinction between “fundamental research” and “finalized research.” The tendency is towards seeing research as an integrated space of different activities. Another challenge is the classical distinction between “theoretical priorities” of knowledge and “research tools.” The tendency is towards renewing methodologies and research problems by opening the way to new possibilities. The distinction between distinct disciplines, with each discipline assigned its specific camps and methods, is another challenge. The tendency is towards interdisciplinary research. Finally, “complexity” challenges and the need to face this challenge with new ‘thinking tools’ must be considered (ibid.).

All these challenges are orienting research within organisations towards multidisciplinary, interdisciplinary and transdisciplinary practices and thinking; towards the redefinition of the evaluation and consideration modes of the “social demand;” and towards reinforcing systematically, within each institution, a collective practice of scientific auto-reflectivity based on the existence of permanent places for exchanging ideas and debates (ibid.).

**Internal Factors**

**Young Field of Inquiry**

The fact that doctoral research in design is a relatively new field of inquiry can be considered the most significant factor shaping the nature and evolution of design research. In fact the study of the launch and evolution of doctoral programmes in already established disciplines, with a long research history and tradition, has shown that the existence of an initial phase of development is very common and is an important phase of evolution of all academic disciplines (Byrne, 2001; Friedman, 2003; Krippendorff, 1999).

Byrne (2001) makes a comparison with anthropology: “Anthropological inquiry has thrived on conflicts between different epistemological and theoretical traditions for over a century. The discipline grew because the conflicts offered tremendous opportunities to improve our knowledge about contested topics. The struggles spur anthropologists as a collective to discover more about our species, history, socio-cultural systems and options. […]”

**‘Nature’ of Design in Various Contexts**

The ‘nature’ of design varied from one doctoral programme to another, and as a consequence the nature of design research also varied. This change in the ‘nature’ of design depended mostly on the curriculum of the doctoral programmes and their relative intentions. The ‘nature’ of design and its dependence on the curriculum and the intentions of doctoral programmes can be better understood through the following example.

In describing the curriculum of design education within the Bauhaus tradition, Findeli (2001) developed the archetypical model represented in figure 1. A three-part structure, art / science / technology, was developed. The structure was enclosed in a general purpose for design.
In changing the articulation between the components of the curriculum, the relative weight of the three dimensions and the general intention, the nature of design and the general purpose of design varied as shown in figure 2. This was similar in the case of the doctoral programmes studied, where the ‘nature’ of design depended mostly on the curriculum and the intention of the doctoral programme. These curricula consisted of different embodiments. Embodiments were given different degrees of importance and were articulated in different ways, and had different overall purposes.

Areas of Research
The areas of research are among the internal factors that are contributing in shaping the nature and evolution of doctoral research in design and its relationship with industry. In each doctoral programme several areas of research were identified. In some areas of research, such as artificial intelligence in design, computer support for collaborative design, design cognition, shape representation and synthesis, digital modelling and rendering, etc., design research and design discourse are very similar to research and discourse in scientific disciplines.

In other areas of research, such as modelling product attributes, modelling the integration of professions within the conception process, creative practice, new product development, tangible computing, intelligent environments, etc., design research is practice-oriented and the resulting discourse is reflexive and interpretive.
Growing Design Complexity

Among the internal factors that have been contributing to the current state of design research, the notion of complexity can be considered as a fundamental issue. It is undeniable that the practice of design has been facing, during the last few years, a growing complexity (Duchamp, 1999; Findeli, 2001; Findeli and De Coninck, 2002; Jonas, 2003; Pizzocaro, 2000a; 2000b).


For a comprehension of such complex and evolutive design environments, it was found necessary to complement, but not replace, ‘traditional’ research training with a kind of “complex intelligence” (Findeli, 2001; Findeli and De Coninck, 2002; Le Moigne, 2003, 2004), i.e. the acquisition of methods that permit the perception, description and modelling of complex design situations in order to simulate them, make decisions, intervene, act and then evaluate results.

As a consequence, research should be carried out within, rather than applied to, these systems (Findeli, 2001; Findeli and De Coninck, 2002; Jonas, 2003; Le Moigne, 2003, 2004). The ‘project’ in these research settings gains a much stronger ‘theoretical’ status and becomes the terrain of design research, the design project as a support for the theoretical investigation. New research approaches has emerged, whose theoretical framework were inspired by systems science, complexity theory and practical philosophy (ibid.).

Conclusion

Doctoral research in design is in the phase of developing its own educational and methodological core. A progressive research programme, an agenda of core research topics and the quality of design research are among the main interests of the international community of design researchers. The studied cases of ten PhD programmes in design demonstrated a weak relationship between doctoral research in design and industry with only one exception, the PhD programme in Conception de Produits Nouveaux of the Ecole Nationale Supérieure des Arts et Métiers Paris. In the latter programme, most research projects are developed in partnership with industrial contexts.

The fact that a weak relationship exists between doctoral research in design and industry was also confirmed by the experts points of view. Many of them argue that there’s a need to inform and educate industry of why they should contribute to doctoral research in design through collaborations and funding. It is important to mention that this is not the situation in few countries where governmental efforts, through national policies were made. Countries such as Denmark, Finland, Norway, Sweden, Canada and Korea where design is seen as a major competitive asset in an era of saturated global markets (Korvenmaa, 2000).

In Finland, for example, the Finnish National Fund for Research and Development sponsored a project to investigate the condition and future challenge of Finnish design. As a consequence the ministries of education and of trade and commerce settled up a working group to produce a national policy programme. A mission declaration, released by the Finnish Government, considered design as a success factor for the future. Then a Round Table of Design was established in order to increase the exchange of design knowledge and expertise with
industry. And recently a national, multi-disciplinary research programme in design ranging from theory creation to r&d and covering social and cultural aspect was launched (ibid.).

Another positive example about the collaboration between design research and industry is from Korea where recently the Korean Government launched design policies to support Korean design. The result was the creation of a network of collaboration between universities, industry and government. Basic design research projects are financed each year by the government and done in collaboration between universities and industries (Lee, 2000).

Notes

2. The study was developed in 2003/2004 and was one of the two strategies I adopted during my doctoral research where the main focus was on the methodologies of design research: Saikaly, F. 2004. Doctoral Research in Design: Towards the Designerly Way. Ph.D. thesis, Politecnico di Milano.
3. An unpublished research that I developed in 1999 at the Politecnico di Milano, focused on the mapping of undergraduate and postgraduate design programmes offered in different geographical-cultural contexts. One of the results of the study was that the majority of Ph.D. programmes in design were found in northern America, Australia, Europe and Japan, and that most of these programmes were launched during the 1990s. The selected countries for the study are: Canada and the USA from northern America; Australia; France, Germany, Great Britain and Italy from Europe and Japan.
4. The description of the best practice criterion, the list of selected PhD programmes in design; the methods used; the main findings and the discussion of the results of this empirical work can be found in the following publications:
5. The theoreticians that were considered experts in design research are: the ones who have several publications concerning the topics of design research and doctoral research in design; coordinators of PhD programmes in design and those involved in the structuring and orienting of doctoral research.
6. The experts who answered the questions are:
   - Dr Michael A R Biggs, Professor of Aesthetics and Associate Dean Research, Faculty for the Creative and Cultural Industries, University of Hertfordshire;
   - Dr. Lily Diaz-Kommonen, Coordinator PhD programme, Systems of Representation & Digital Cultural Heritage, Media Lab, University of Art and Design Helsinki / UAH;
   - Dr David Durling, Professor of Design, School of Arts, Middlesex University;
   - Dr. Giancarlo Ferrigno, Director of the Politecnico di Milano’s Doctoral School, Full Professor of Electronic Bioengineering, Bioengineering Department, Politecnico di Milano;
   - Dr Ken Friedman, Professor of Leadership and Strategic Design, Department of Communication, Culture, and Language, Norwegian School of Management, Design Research Centre, Denmark's Design School;
   - Dr. Terence Love, Department of Design, Curtin University, Western Australia;
   - Dr Darren Newbury, Birmingham Institute of Art and Design, University of Central England;

32
- Dr Charles L. Owen, Distinguished Professor Emeritus, Institute of Design, Illinois Institute of Technology;
- Dr. David Pijawka, Coordinator PhD programme, School of Design, College of Architecture and Environmental Design, Arizona State University;
- Dr. Silvia Pizzocaro, Associate Professor, INDACO Department, Faculty of Design, Politecnico di Milano
7. Before this date a vocational award was assigned. It was known as the National Diploma in Design (NDD). Then a more academically based award was established, the Diploma in Art and Design (DipAD). Then came the transition to undergraduate degree. For an in-depth study, refer to David Durling’s paper: “Design in the UK: Some Reflections on the Emerging Ph.D.” In: D. Durling and K. Friedman, eds. Doctoral Education in Design: Foundations for the Future, La Clusaz, France, 8-12 July 2000. Stoke-on-Trent: Staffordshire University Press, pp 317-327.
10. In six of the ten studied cases, the post of head / coordinator of the doctoral programme existed. During the interviews, they explicitly expressed their choices about the philosophies, intentions, contents and areas of research adopted within the programmes and their relative motivations.
14. Social demand is expressed by various actors such as local and public authorities, professional groups, enterprises, financial institutions, editors, media, justice, consumer associations, nongovernmental organisations, etc.
16. Comparisons were developed with disciplines such as physics (Friedman, 2003), anthropology (Byrne, 2001) and communication (Krippendorff, 1999).
17. According to Findeli in: Findeli, A., 2001. “Rethinking Design Education for the 21st Century: Theoretical, Methodological, and Ethical Discussion.” Design Issues, volume 17, number 1, p 12: “the French word ‘problématique’ is an important concept of Foucault’s archaeology. In design it is the result of the complexification of mere product-centred problems in terms of social, economic, symbolic, political, etc. issues.”

References


UNITED KINGDOM COUNCIL FOR GRADUATE EDUCATION. 1997. Practice-Based Doctorates in the Creative and Performing Arts and Design. United Kingdom: UK Council for Graduate Education.
**RESEARCH ON THE DIFFERENCE BETWEEN THE INNOVATION DESIGN IN FRANCE AND JAPAN BY E-SURVEY – NEW TRAINING EXPERIMENT FOR INTERNATIONAL STUDENTS**

*Masaru Uehara, Chiba Institute of Technology, Japan; Evelyne Laurent, UTC Compiègne, France; Tatsuo Oshima, Chiba Institute of Technology, Japan; Anne Guenand, UTC Compiègne, France*

**Abstract**

This paper comprises a report concerning the aforementioned title, from research by an international student studying abroad at the Chiba Institute of Technology. One purpose of this study was to research the possibility of the e-survey as a means of training international students. A simultaneous e-survey was also carried out with the same sample group (and taking time differences into consideration) in Japan and France using the internet.

This survey was carried out tentatively in 2004, and concerned testers from both countries Japan and France. The numbers of testers, however, were not enough to consider the results as meaningful for population representation. Anyway, from these high score evaluations, we can tell that French design particularly values style and technology, while Japanese design strives to excel in the areas of technology, style and the user relationship.

Furthermore, we will be able to found the characteristic and the grounds of design of the two countries if we push forward this study in detail. These results would be a suggestion for a new step of in global design.

**Key words:** innovation design, e-survey, training for international student, France and Japan

1. Introduction

Firstly, the present paper comprises a report concerning the aforementioned title, from research by an international student from the University of Technology of Compiègne and studying abroad at the Chiba Institute of Technology in Japan.

Within a 4 months internship, the student has been integrated as a laboratory student in the design department of the CIT. The project aimed to contribute better understanding of both culture similarities and differences, regarding the design innovation. It has been conducted through design study and e-survey focused on innovative products from both cultures.

Regarding the innovation definition, the study refers to the economist J.M. Martin Amouroux. He historically distinguished three kinds of innovation, according to their impact on people’s lives. The main discoveries are radical inventions, such as the steam engine and nuclear power, etc. These, however, are very few, strictly unforeseeable and often imply a radical change in technological trajectories. They also represent major scientific projections likely to upset economic, political and even geopolitical data. Major innovations apply to existing technology but imply a sudden and brutal increase in its performance. This can be implemented either by renewal interns or, in the words of economists, through “external fertilization”. These innovations may also be numerous during specific periods and in certain fields respectively. The "incremental" innovations or "evolutionists", meanwhile are innovations of detail and refer mainly to improvements in processes, products or equipment; falling under the category of prolongation of an existing technological trajectory. As such, they confirm no
more than tendencies which are already common knowledge. Nevertheless, such innovations may be plentiful and their accumulation can be very useful.

Our study takes into account recent innovations in product design, i.e. in the areas of technology, style, concept (functions & services), and relationship (with user).

2. Goals of this study

One purpose of this study was to seek the possibility of the e-survey as a mean of training for international students. This study was based on our previous research, image analysis for design using language, for example the image for “water” in Japanese, Canadian or Chinese. Finally, the purpose of this e-survey was to examine the potential of international surveys using the Internet. Survey samples were used with representative product designs in Japan and France and this survey were used to compare various objects from French and Japanese innovation respectively.

The goals of this survey are the following: (1) to know if products are perceived in the same way in France and Japan, (2) to know if there is a real difference between “innovation designs” in France and Japan, (3) to clarify the design impact as related to the perception of innovation.

3. Choice of sample products

The choice of the sample products was made arbitrarily, although the majority came from organisms specialized in innovation, namely APCI for France and JIDA for Japan respectively.

4. Criteria and inquiry valuation

Product samples placed in parallel, satisfying the same market needs and targeting the same user groups. These were considered the minimum criteria to ensure a common base and the ability to evaluate / compare these products according to other criteria. We wanted to determine the specific fields of design implied during the perception of innovation by different people. Criteria of this evaluation are also related to perception. The perception-related semantic concerning products has been developed using the ADEX method.

In the ADEX guidelines, four evaluation categories, i.e. technological innovation, style innovation, concept (functions & services) innovation and relationship (with user) innovation, are expressed in the form of 5 basic recognition factors i.e. in our case, differences between innovation designs in France and Japan were based on the following perceptions. 1. Perception of functions. 2. Perception of esthetic qualities. 3. Perception of products like symbols or metaphors. 4. Perception of relational dimension. 5. Perception of technology.

5. Method of e-survey

The survey samples are a representative 12 pairs of products available in Japan or France. Survey samples are showed in a color picture obtained from internet data. These pictures are showed in tables alongside results. (See table above)

The testers were students of a design department, with 20 students in Japan and 21 in France; from the Chiba Institute of Technology and the University of Technology of Compiègne respectively. This represented a total body of 41 student’s tester learning design in Japan or France.
A simultaneous e-survey was so carried out with the same sample group (and taking time differences into consideration) in Japan and France. When evaluating the French students, test pictures with questionnaire were sent to the University of Technology of Compiègne in France by e-mail, which was asked to transmit the responses from France. The language used for the evaluation in questionnaire was English for both tests in Japan and France, although the response languages of the questionnaire were respectively French and Japanese.

The evaluated factors included the following four items and “no innovation”: (1) Technological Innovation, (2) Style Innovation, (3) Concept (function & services) Innovation, (4) Relation (with user) Innovation, (5) No Innovation. Therefore, samples represented an image only without an accompanying explanation.

Testers evaluated / compared these products according to specific criteria. Evaluation of each sample involved 5 areas of evaluation and 5 specific items in total, i.e. technological innovation, style innovation, concept (functions & services) innovation, relationship (with user) innovation and no innovation.

6. Results and discussion

The results of the evaluation were shown in tabular form, while the points of the evaluations were shown by the numbers of mark (●). The mark (●) refers to the numbers of testers who selected the “highest” evaluation grade for each of the 4 items, except for the options of “No Innovation” and no answer. Meanwhile, individual explanations for the 12 pairs of products and results are clearly displayed in tables in the following pages.

We don't discuss the differences in evaluation dependent on the testers in Japan and France, given the small overall numbers of testers. In addition, it leads us to avoid discussion on the differences in the evaluation results for each sample, due to the lack of sufficient data. Nevertheless, the method has been tested as successful and will lead to expressive results in the next study, which should focus on the innovation perception similarities and differences between Japan and France regarding innovative products developed in both cultures.

The total score for each evaluation item provided by the samples in Japan and France are shown as follow. The total score of each evaluation item for the French Products samples are 34 for technology innovation, 35 for style innovation, 10 for concept (functions and services) innovation and 19 for relationship (with user) innovation. Whereas, the total score for the Japanese Products samples are 45 for technology innovation, 33 for style innovation, 17 for concept (functions and services) innovation and 33 for relationship (with user) innovation.

We limited our discussion to the interpretation of the high score evaluation as a result. From these high score evaluations, we can tell that French design particularly values style and technology, while Japanese design strives to excel in the areas of technology, style and the user relationship.

Furthermore, we hope to be able contributing to found the characteristic and the grounds of design of the two countries if we push forward this study in detail. These results would be a suggestion for a new step for global design. We confirmed that e-survey represents viable means of training for international students.

The sample pictures, explanation and table of results are shown on the next page.
<table>
<thead>
<tr>
<th>Country</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>A warm and fun personality. Engaging Comfort, space and light! Intelligent solutions! Latest technology. A car that combines elegance, versatility, and comfort that can be used every day. Reflecting our personality, it needs to offer us practical and enjoyable space. With these ideas in mind, Peugeot has created a new practical supermini.</td>
</tr>
<tr>
<td>Japan</td>
<td>Developed around the concept of “a compact three-door vehicle w/ high practicality,” the Cubi3 is uniquely distinguished by the following principal features: 1. Design 2. Packaging 3. Outstanding practicality 4. Mechanisms 5. Safety and Environmental Friendliness.</td>
</tr>
<tr>
<td>France</td>
<td>Technology Innovation 4.1  Style Innovation 4.1  Concept (Functions &amp; Service) Innovation 4.1  Relation (with User) Innovation 4.1  Related photo of a Peugeot car.</td>
</tr>
<tr>
<td>Japan</td>
<td>Technology Innovation 4.1  Style Innovation 4.1  Concept (Functions &amp; Service) Innovation 4.1  Relation (with User) Innovation 4.1  Related photo of a Cubi3 car.</td>
</tr>
<tr>
<td>France</td>
<td>Conceived in terms of individual space, the project produces a contemporary environment where architectural rigour combines elegance and vitality, where high tech is at the service of a new vision of comfort. The journey time offered by TGV trains is when time stands still. A time and space in which one can choose to work, rest, enjoy refreshments. The interior fittings were designed in terms of individual space, comfort and harmony in tune with contemporary aesthetics.</td>
</tr>
<tr>
<td>Japan</td>
<td>Superb comfort, excellent information accessibility, state-of-the-art technology. With the coming of the highly information centric society, the Sichuan is no longer able to meet the diverse needs of the age with just speed and comfort.</td>
</tr>
<tr>
<td>France</td>
<td>Technology Innovation 4.1  Style Innovation 4.1  Concept (Functions &amp; Service) Innovation 4.1  Relation (with User) Innovation 4.1  Related photo of the interior of a Peugeot car.</td>
</tr>
<tr>
<td>Japan</td>
<td>Technology Innovation 4.1  Style Innovation 4.1  Concept (Functions &amp; Service) Innovation 4.1  Relation (with User) Innovation 4.1  Related photo of the interior of a Cubi3 car.</td>
</tr>
<tr>
<td>France</td>
<td>This is an assistant bicycle that has already established a genre. Honda has enthusiastically developed folding bicycles. This new “Step Comp” adopts an aluminum die-cast frame. The driving unit and battery are put into the frame.</td>
</tr>
<tr>
<td>Japan</td>
<td>Comfortable and practical in its 2 versions (Racing and Shopping). It is equipped with a new electronic assistance with the pedal age (maximum speed: 25km/h) to pedal. Without effort (battery 24V, load converter).</td>
</tr>
<tr>
<td>France</td>
<td>Technology Innovation 4.1  Style Innovation 4.1  Concept (Functions &amp; Service) Innovation 4.1  Relation (with User) Innovation 4.1  Related photo of the Honda Step Comp folding bicycle.</td>
</tr>
<tr>
<td>Japan</td>
<td>Technology Innovation 4.1  Style Innovation 4.1  Concept (Functions &amp; Service) Innovation 4.1  Relation (with User) Innovation 4.1  Related photo of the Honda Step Comp folding bicycle.</td>
</tr>
<tr>
<td>France</td>
<td>The pleasure of dressing your wrist in a style and fashion that defines your every need becomes even more enjoyable. Make you wear your playground when you explore the exciting mix of fabrics, decorations, silver and metals textures, leather and color. And at 35mm it’s all stayed so comfortably thin.</td>
</tr>
<tr>
<td>Japan</td>
<td>The human body generates heat energy which if converted to electrical energy at 100% can be used to drive a 60 W light bulb. The voltage generated per degree of temperature difference between the body and the surroundings. Connecting 1000 cells serially therefore yields a voltage of 0.2 at a temperature difference of 1°C.</td>
</tr>
<tr>
<td>France</td>
<td>Technology Innovation 4.1  Style Innovation 4.1  Concept (Functions &amp; Service) Innovation 4.1  Relation (with User) Innovation 4.1  Related photo of a wrist accessory.</td>
</tr>
<tr>
<td>Japan</td>
<td>Technology Innovation 4.1  Style Innovation 4.1  Concept (Functions &amp; Service) Innovation 4.1  Relation (with User) Innovation 4.1  Related photo of a wrist accessory.</td>
</tr>
<tr>
<td>France</td>
<td>Designed for Life Easy. Messaging Colorful! Smart, inside and outside. Just what you would expect from Alcatel, the design of the One Touch 535 is attractive on this outside and intuitive on the inside. Thanks to the color display and enhanced interface, the advanced features are as easy to use as the basic ones. Intuitive Ergonomics.</td>
</tr>
<tr>
<td>Japan</td>
<td>NTT DoCoMo releases the Panasonic P255S Mobile Camera phone in 5 Colors. The small flip phone measures only 87mmx46mmx20mm and weighs 90g. It has a 2.0 inch color LCD to store photos and phonetable data. It also has some kind of emotion light that indicates incoming messages, Panasonic is mostly touting the fact that the P255S is available in five attractive colors.</td>
</tr>
</tbody>
</table>
7. Conclusion

We can confirm from the following survey results that e-survey represents a viable mean of training for international students.

(1) The evaluation categories based on ADEX has been relevant to express similarities and differences between innovation designs in France and Japan.
(2) We can propose Innovation Guidelines following the premise ideas that the latest products...
are used in our daily life. Innovative product can be understood as 1. Products that suggested a new life style to us. 2. Products which were not just fashionable but also founded on a steady concept. 3. Products that represented a new life style and applied innovative technology. 4. Products developed due to the social demand of specific users (handicap, age…). 5. Products with new styling.

(3) The specific features of the e-survey included the following advices. Generally, the same survey must be taken under the same basic conditions of receipt. At the time of the questionnaire investigation, the use of different language inevitably involves different forms of recognition and comprehension, due to subtle differences in meaning and interpretation between languages. As a method to ensure minimum recognition, the evaluation language has been unified in English. 1. Picture is an international language. 2. A different language should not apply to strictly international and mutual information. 3. E-Surveys should be implemented in the same language. 4. E-Survey seems to represent effective training for international students. 5. E-Survey is a useful, international and rapid form of research.

8. Footnote and References

1) CIT-UTC internal reports. The international student’s report is composed of 4 parts, namely: innovation design, communication, communicating products and designing. We compiled the innovation design section into this thesis in order to introduce the e-survey, international and speedy survey.

2) The international student, Evelyne Laurent, conducted research during the training period, 2004/4/2 – 2004/6/25, at the Chiba Institute of Technology.


4) CIT, internal report. The analysis of images on “water” was contained in individual research pieces in Japanese, Canadian or Chinese representing graduate study by 3 undergraduate students of the industrial design department over a period of 3 years.

5) APCI stands for the Agence pour la Promotion de la Creation Industrielle [Agency for the Promotion of the Industrial Design].

6) JIDA stands for the Japan Industrial Design Association.


8)
http://www.fing.org
http://www.inanov.fr/
http://www.studio-creatif.com/
http://tangible.media.mit.edu/
http://www.tii.se/studio_1221/
http://www.minatec.com/ideaslaboratory/
http://www.phonescoop.com/articles/moto_wearables/
http://perso.wanadoo.fr/bernard.gortais/
http://www.abacon.com/commstudies/interpersonal
http://members.aol.com/nonverbal2/nvcom.htm
http://www.designnumerique.net/
http://www.sony.net
http://www.nikkeibp.asiabiztech.com
http://www.icc-jp.com
http://www.nhk.or.jp


**PRACTICAL TRAINING AS PART OF INDUSTRIAL DESIGN EDUCATION – PRACTICES AND ATTITUDES IN FINLAND**

Miikka Vanhamaa, University of Art and Design Helsinki and Helsinki University of Technology; Laura Leinikka, Kalevi Ekman, Helsinki University of Technology, Finland

**Abstract**

This paper discusses the implementation of practical training among undergraduate students of industrial design. The number of in-house industrial designers in manufacturing companies is rather low in Finland, and many of the other product developers lack insight in working together with designers. Based on the authors’ experience, the practical summer training of industrial design students is not very systematic or organized, and many students face difficulties in finding places of work for practical training. There are some other disciplines, e.g. engineering, that have their representatives in almost every industrial organization, and also seem to have much more advanced training culture. The main research question is, how well the existing training culture supports the industrial design students’ growth from novice to expert, enabling interrelationships to their coming clients or employers in industry. The second question is what practical improvements, if any, could be suggested.

The authors analyzed the current situation by interviewing students, university authorities, and industrial employers. We used semi-structured interviews and analysis of transcribed interviews and discussions. In addition, two electronic questionnaires (one for students and one for industry) were developed for collecting quantitative data and written comments.

This study covers industrial design study program only on university level. The research includes both quantitative and qualitative aspects, considering the summer 2004 and the ongoing academic year. Employers were asked about, e.g., how many trainees they have hired, why to hire or why not, what kind of expectations they have, what are typical tasks for trainees, and how they see the future. From students we asked, if they have managed to get a traineeship, how easy or how difficult that was, and how they actually search for employment. From university authorities we asked about training guidelines and instructions given in study manuals or by personal tutoring, and about the underlying philosophy behind it.

Based on the interviews and analyses we have concluded that there are interesting possibilities to increase productivity in product development in manufacturing industry by introducing a better organized training program for industrial design students. The existing training practices do not encourage the students to search actively for training employment. The companies don’t fully understand the capabilities of industrial design students, or are unnecessarily afraid of not finding proper tasks for them. By starting an advanced training program, we could generate a positive spin: first some pioneer companies join the program – then the first summer trainees join as well - students learn from other students’ experiences – both sides become more aware of the needs and offerings – more companies join the program – etc. We also suggest a new ‘integrated design’ model for practical training, in which the training period is carried out in a two-person team, consisting of both technology and industrial design students. These pioneering ‘guerilla duos’ were introduced to the Finnish industry during the winter 2005.

**1. Introduction**

The number of in-house industrial designers in manufacturing companies is rather low in Finland, and many of the other product developers lack insight in working together with designers. Based on the authors’ experience, the practical summer training of industrial design (ID) students is not very systematic or organized, and many students face difficulties in find-
ing places of employment for practical training. There are some other disciplines, e.g. engineering, that have their representatives in almost every industrial organization, and also seem to have much more advanced training culture.

No specific studies have been conducted in this field of research. In 1994 Sari Karttunen published a survey on the students of the University of Art and Design Helsinki with the topic “Art and Design Training and the Labour Market”. The goal of this study was to survey student’s conceptions of the content of candidate degree and working life opportunities as well as to survey graduates adapting in working life [6]. Based on the survey concerning the employment situation of industrial designers in Finland, 37.8% of them were labour, 20.7% entrepreneurs, 0% freelancers, 28% had several work places and for 13.4% the situation was different [10]. Based on the survey made in 2003, the biggest need of industrial designers for Finnish industry will focus on university level students between years 2005-2010 [5]. For this progression the research tries to find out reasons and factors for change.

The authors of this article believe that by connecting firmly the practical training and its practices to industrial life, a directive effect for transmitting industrial design students to working life can be created. According to the research made by The Finnish Association of Graduate Engineers (TEK) 2003, 25.7% of Master of Science students in technology considered the earlier employment in the company as one of three most significant factors of getting summer job [8]. In the study made during year 2002 the comparable value was 26.9% [7].

This paper discusses the implementation of practical training among undergraduate students of ID. The main research question is how well the existing training culture supports the ID students’ growth from novice to expert, enabling interrelationships to their future clients or employers in industry. The second question is what practical improvements, if any, could be suggested.

The authors of this article derive practical training to working environment- or occupation training. Working environment training means training work done as ‘factory floor’. Occupation training includes training covered as the ‘office’ work.

The study covers ID study program only on university level. The study compares practical training practices of ID and machine design in:

- University of Arts and Design Helsinki (UIAH), The School of Design, Product and Strategic Design,
- University of Lapland (UL), Faculty of Art and Design, Department of Industrial Design and
- Helsinki University of Technology (TKK), Machine Design.

The authors compare training practices between ID and engineering to find if some practices could be equalized. The research includes both quantitative and qualitative aspects, considering the summer 2004 and the ongoing study year.

2. Methods

The authors analyzed the current situation by interviewing university authorities, and industrial employers. We used semi-structured interviews and analysis of transcribed interviews and discussions. Total number of 10 interviews were done for this study. In addition, two electronic questionnaires (one for students and one for the industry) were developed for collecting quantitative data and written comments. Similar questions with TEK query [7, 8] were used to get comparable results. The response rate of electronic queries was remarkably low.
Therefore, students were also personally asked to fill the questionnaire at the university facilities.

We asked employers, e.g., how many trainees they have hired, why to hire or why not, what kind of expectations they have, what are typical tasks for trainees, and how they see the future. From students we asked, if they have managed to get a place for training, how easy or how difficult that was, and how they actually search for employment. From university authorities we asked about training guidelines and instructions given in study manuals or by personal tutoring, and what is the underlying philosophy.

3. Practical training in the finnish universities act and in its regulations

The government of universities is set by the Finnish Universities Act (645/1997) and its regulations. According to Section 2 of the Finnish Universities Act the universities shall have autonomy. The Universities Act does not include comments of practical training relating to the education of ID or engineering.

The University of Arts and Design Helsinki and University of Lapland – Faculty of Art and Design comes with the territory of decree (440/1994) on the universities teaching the industrial arts. According to Chapter 1 Section 3 of the decree a studies leading to a degree may include practical training.

Helsinki University of Technology is affected by the Finnish decree of scientific degree (215/1995). According to Chapter 2, Section 6 of the decree:

6 §
The composition of training program
The composition of training program consist of basic studies, which includes also language and communication studies, basic studies, intermediate studies and practical training, which will be scheduled in the way that they will be in useful interaction with between.

In addition, Chapter 2, Section 8 defines: To complete the degree student have to proceed education and practical training comes with the territory of the study program. In TKK there are detailed instructions for practical training on department level and training is compulsory.

3.2 Bologna Process

The new decree will cause some changes to the practical training practices. In Chapter 2 Section 9 of the Finnish Government Decree on University Degrees (794/2004) defines Lower university degree as follows: A studies leading to a lower university degree may include work practice for professional development. In the Chapter 2 Section 15 the higher university degree is defined as follows: studies leading to a higher university degree may include internship to improve expertise.

3.3 Practical Training as Part of Current Industrial Design Education at UIAH

The studies in UIAH in current system are divided into two detached degrees; triennial bachelor’s degree of arts and Master’s of Arts degree for which the turnaround time is five years. In addition is possible perform doctoral degree in arts.

The existing training culture at UIAH does not strongly encourage students to choose training as an option for their personal curriculum. This in part reflects the fact that there are no men-
tions of practical training in the standing orders of University of UIAH. There are only random comments of practical training in the study guide. The instructions for practical training are also limited. So far there is a possibility to perform practical training during the candidate period. In some specific cases like in the Destraetus-program, students can perform training in a Master’s program. This convention is so far exceptional. Student could achieve at most 4 credits from practical training. Recommended time to perform practical training is during summer between 2\textsuperscript{nd} and 3\textsuperscript{rd} years of bachelor’s degree. There is no factory floor training culture in the ID education at UIAH.

The goal and content of practical training is not defined in public guidebooks. Students can discuss about their practical training with the Head of Program. To get credits from practical training students need to create one A4 page training report, testimonial and show references about the works done during training (portfolio) to the Head of Program.

3.4 Practical Training as Part of Current Industrial Design Education at University of Lapland

The current system at UL is structured similarly as at UIAH. In the ID study program is not included practical training in the bachelor’s degree. ID students in the master’s degree can carry out practical training as elective subject of 2 to 6 credit units. One month of practical training with training report together will authorize for 2 credits.

Practical training at UL is normally situated in the study guide of educational structure at 4\textsuperscript{th} year. It is often done during the summer between 4\textsuperscript{th} and 5\textsuperscript{th} year (Lipiäinen, L. personal notification 24.5.2005). For practical training in the study guide are produced for instructions only ¼ page of compact text. The additional information on web pages helps students quite well in the process of finding training place and funding it.

The goal of training is to familiarize students with job description of vocational area and field as well as professional operations model of the one in question. The student will get subjective experience from the realistic tasks on the professional field and will operate interact professionals of field and customers alike [9]. At the Faculty of Art and Design practical training is not divided into working environment or occupation training. The idea of practical training is determined broadly: The education and working model is that the students will work on the area relating to the professional field [9]. In the figure one can be seen the credits achieved by training.

1 month practical training + report of practical training (3-5 pages) = 2 credits  
2 months practical training + report of practical training (5-10 pages) = 4 credits  
3 months practical training + report of practical training (10-15 pages) = 6 credits [9].

FIGURE 1: The Required Completions for Practical Training.

Following rules are for students at UL to get the study attainment from practical training. Students have to deal approval for the practical training before starting the practical training [9]. Students have to create the report of practical training with the following contents:

- description of the workplace and personal tasks,
- the use of knowledge learned from university during the work tasks,
- description of exercises or design assignments (with pictures or sketches during the different phases of ideation of the task) or analysis of specific problem or function,
examination possibly do relate with the theory of major subject,
what new viewpoints or things do relate with major subject were during the practical job offered,
description of organization and operational environment of training job,
possible assignment in suchlike working environment after graduation [9].

Between the years 2002-2005 only one MA-student has carried out international practical training period (Lipiäinen, L. personal notification 24.5.2005). The number of the students carrying out practical training varies between the years; 2002–2003 there were 5 students, 2003–2004 13 students and 2004–2005 4 students (Heikkilä, R. personal notification 26.5.2005).

3.5 Practical Training as Part of Education at Helsinki University of Technology – Machine Design

Based on decree 215/1995 Chapter 1, Section 2 in science and technology the higher degree is Master of Science in Technology and post-graduate degrees are Licentiate in Technology and Doctor of Technology.

In the Degree Regulation of TKK (Teknillisen korkeakoulun tutkintosääntö) there are several clear definitions for practical training as a part of education of Master of Science in Technology. The Degree program is two-tier and depending on the curriculum of training program it may contain from 2 to 10 credits of practical training [3].

In the Machine Designs’ study guide there is circa 16 pages appendix with clear guidelines for practical training. At department of Machine Design the experiences of practical training along with other studies have traditionally felt to be important and it raises the level of profession, maturity and understanding of business life [4]. Because of the versatility on education at Machine Design the goal and requirements for practical training vary greatly between special fields [4]. Clear goals and orders have been set for the specific education direction. Practical training can be working environment- or occupation practical training. If the training period is at least 2 months long the trainee can make a report of practical training in order to earn an extra credit (6+1=7 credits or 8+1=9 credits).

Practical training Guidelines at Machine Design are based on the Degree Regulation of HUT and decisions made inside training schedule. The minimum requirement for practical training is 6 credits, which can be accomplished by 18 weeks of full time work [4]. In this system 3 weeks all-day practical training corresponds to one credit which is the minimum length for practical training period [4].

The international training is highly recommended. The Students can attain full 8 credits if at least 6 weeks of the training has been international [4].

3.6 Summary for Legislations and Practices of Universities on Practical Training

As a conclusion, acts and decrees do not define practical training as a part of education. However in degree regulations it can be done. On the department level instructions are very detailed in TKK and on the other hand very common and short in ID. The training guidelines at TKK include both ‘factory floor’ and ‘office’ training both of them are considered as equally important. All universities considered in this study have career services. The Bologna Process will not force art and design universities to make change in their current systems on training.
4. Findings

4.1 Student Inquiry Findings

A survey questionnaire was set up for ID students, in order to learn about their activities during spring term and summer 2004. A total of 26 respondents took part in the inquiry. From the respondents 57.7% were male and 42.3% female. 61.5% of the respondents were studying at UIAH and 38.5% at UL. 38.5% of respondents were studying in bachelor’s degree and 61.5% in Master’s of Arts degree.

Most of the ID students had been working while studying. 38.5% of students said that they had worked for less than one week, 38.5% had worked for 40–400 h, 19.2% had worked for more than 400 h, and 3.8% had worked continuously during spring term 2004. Even though students worked in addition to the studies, on the average they carried out 16 credit units during spring term 2004.

According to our study, majority of ID students wanted to work in the fields of design and product development, planning, and research. In the reality, students worked mostly in design and product development, planning work, or in other undefined field. The biggest difference occurred in the field of research, where none of the students had worked even though more than half of them would have been willing to.

![Figure 2: What kind of work industrial design students would like to do and what task they mainly did during summer 2004.](image-url)

Based on the inquiry, most of the ID students sent less than five job applications and none more than 30. Most of the students worked in a field related to the studies, almost as many in a field not related to the studies, and some in a field slightly related to the studies. None of
them had a diploma work placement or were in the army, on maternity leave, or on nursing leave.

Have instructions concerning practical training been produced for students at ID degree programs? Most of the students of UIAH felt that they are not informed of, nor supported or encouraged to participate in practical training. At UL most of the students felt that they are not well informed of the practices of practical training, but they are still able to get more information if they ask for it. Overall 80.8% of students did know that training is not compulsory part of their studies. 57.7% of students were still satisfied with the current training instructions. Altogether 52.2% of students knew that their universities offer recruiting services and 50% knew how many credit points at most they could achieve by practical training.

According to our study, the students who did not get a job during summer 2004 used mostly the following methods for job-hunting: by answering internet job advertisement, by contacting the employer, and by using recruiting services. Unused ways to get work were: by answering advertisement (newspaper), the employer offered work, work in own company, and other undefined reasons.

Based on our study, the students who had a job were mainly employed by a design or consulting company, industrial enterprise, or other undefined employer. Students did not work for nation or state owned companies, municipalities, federations of municipalities, or municipality-owned companies, or organizations and foundations.

As in figure three can be seen, students worked mostly in design or consulting companies (40%). 20% worked in industrial enterprises, and 13.3% in commercial or service sector.

According to the students’ estimation, the main reasons why they got their job are the following: by contacting the employer 46.7%, the employer offered work 33.3%, and other undefined reason. The students did not find the following job-hunting methods significant: by answering advertisement, by using recruiting services, and working own company.

Comments on how the work was managed and instructed varied a lot. The fellow workers acted for the most part positively towards the trainees. The median working time for domestic training was 12 weeks and for international training 0.
FIGURE 3: Results from ID student questionnaire.

4.2 What Student Felt About Training?

The students’ feelings on getting a job or a training job for summer 2004 compared to the previous year varied as follows: easier 26.9%, harder 11.5%, no change 38.5%, and don’t know 19.2%. Students felt it would be very helpful if there could be a better structure or forum for finding open job opportunities. They also wanted some ideas on what kind of work positions could be available for industrial designers, and perhaps a training guidebook including salary recommendations as well.

Students felt that practical training gives them hands-on experience, it helps build their own occupational image and contacts, and they are paid. In the question of what kind of skills the ID training should educate they answered: design process in reality, hands-on experience, manufacturing methods, co-operational and communicational skills, understanding real working pace, scheduling, and skills for working with customers. Except for two students, all felt that the importance of practical training is not enough emphasized in their studies.

4.3 Interviews of Industrialists and University Administrators

The interviewees agreed that there is a need for practical training for students of ID. The representatives of companies emphasized the fact that students learn customer driven working style. The goal for practical training on the industry side is to show students the realism and practices of working life. Through practical training students will learn and understand processes of the companies, manufacturing methods and other limitations. The representatives of administration said that it is good for students to see what the actual work is in practice. It was mentioned that trough training students learn how multifunctional teams work.

When asked about the suitable role and task for an ID student in practical training, there were different opinions. Some of the company representatives said that the role should be to produce new ideas and views, like in planning and product design tasks. Another said that he would give trainee tasks, that take a long time or “tasks that a project manager wants to get rid of”. The representatives of administration emphasized that the task must be ‘professional’ that
students can train their abilities. However the roles of trainees are very case-specific. The working areas may include tasks on usability, designing appearance of products and producing marketing material. The main idea is that all activity should happen under direction of an experienced worker.

The benefits that students bring to companies where considered to be mainly new ideas, fresh insights and also a possibility to check out possible recruits. Administration representatives emphasized more the possibility to get to know the design industry and profession in whole.

Reasons to the fact that companies don’t take so much industrial design trainees, company representatives answered that the possibilities to take any trainees have been weak, because of financial situation. Also concerns existed related to question how to find a good trainee, they answered that there isn’t good practices and structures available to be able to easily recruit industrial design trainees. All the representatives of administration said that the reasons lie in the regulations. Training isn’t obligatory and that drives to the fact that students aren’t enough motivated to find training places and schools can’t support them enough.

So how to improve the situation? Companies say that there should be more ways and structures to help recruit students. The representatives of administration rely on the force of communication. They say that there should be more communication towards companies to tell about the benefits of design and design students.

What should the training teach to trainees? Companies say that the most critical is the ability to work in multifunctional teams and also see how the real world works. Also administrative people emphasize the ability to work with different people and learn communication skills. Also learning how the actual design process proceeds cost efficiently. These factors help students to find their role and occupational profile in working life.

In whole both company and school administration representatives saw the training full of good possibilities. Companies saw the biggest threats related to how to find good trainees. Administrative people saw challenges in finding good training places for all students.

How to prepare students to the training? This question aroused a lot of ideas. Company representatives talked a lot that students should prepare themselves by gathering information about the firm they are going to go for training. Administrative staff emphasized the fact that students must be able to present their works and what they can to their possible employees in form of for example portfolios.

Companies said that students should self be active in finding training places but there would be need to open a forum for recruiting trainees. Schools’ administrative faculty admit that they should be more active but say still that student should be active.

4.4 Summary

There are still many difficulties in the current training culture to support students’ in occupational growth from novice to expert. To summarize, students must be more encouraged (to apply, to make many applications, to contact manufacturing companies). Students’ motivation for training is low, because it is not demanded. For companies the recruiting process is difficult (companies don’t master, how to hire a trainee of ID). It is unusual for ID students to perform their practical training as “factory floor” (share of casual work or manufacturing is close to zero). Communication will need improvements or new channels between universities and companies.
5. Discussion

The question of the role of practical training proved to be difficult. Universities in their current education system don’t appreciate the significance and potential of the work practice for professional development in the process growing from the amateur to the professional industrial designer. Problems are the high competition of training jobs, lack of resources and industry currently don’t use the full potential of industrial design students. The consequence of these problems industrial design students do not currently put enough effort in finding work places, because universities don’t encourage them enough. The timing of practical training in educational structure during the bachelor degree in current model is not facing up fully the industry and R&D companies needs for trainees. Based on comments of industry training periods could be more easily organized if running these around the year.

One suggestion for getting training places for the students is use of government funded vouchers. However, this kind of system will not be equal and practical in the competitive society. Problems mentioned before can be partly fixed by concentrating to the development and adding resources for the career services. Building the competitive and around year continuous recruiting forum which take care the student’s personal development goals will be useful for all parties.

The current study do not include question do student feel difference as learning experience between study projects and practical training. The art and design universities have project courses where they can perform the specific tasks set by the industry. Though, our assumption is that in such kind of projects students do not experience fully the real working environment, working pace and processes of industry.

5.1 Ideas for Future

By starting an advanced training program, we could generate a positive spin: first some forefront companies join the program – then the first summer trainees join as well - students learn from other students’ experiences – both sides become more aware of the needs and offerings – more companies join the program – etc.

We suggest also a new ‘integrated design’ model for practical training, where the training period is carried out in a two-person team, consisting of both technology and industrial design students. These pioneering ‘guerilla duos’ were introduced to the Finnish industry during winter 2005.

The idea of ‘working pairs’ was considered good from the side of companies and administrative staff. Some said that the idea is already ‘old’, but necessary. Questions arose around how to guide the pairs and whether it would be double time compared to one trainee. Industrial design students felt the idea of ‘working pairs’ model is good and opportunity to narrow the gap between industrial design and technology students.

6. Acknowledgements

The research is financially supported by National Technology Agency Finland - Tekes, which is gratefully acknowledged. Authors are also grateful for support of faculty in Machine Design at HUT, The Finnish Association of Industrial Designers TKO and The Finnish Association of Graduate Engineers TEK to their permission to use their platform for student questionnaire.
7. List of references

BEYOND PHD., EXPECTATION FROM AMERICAN INDUSTRIAL DESIGN INDUSTRY
Tsai Lu Liu, Auburn University, USA

Background of Study

American industry designers are facing unprecedented domestic and international competition. There are more than a thousand industrial design firms in the U.S. listed in http://www.coroflot.com, a major American designer portal website. After investigating 286 of these firms, we found 20% of them were established in the last five years and 50% in the last ten years. In spite of the rapidly growing number of design firms, many US manufacturers are outsourcing their product design to foreign countries (Engardio & Einhorn, 2005) to lower their R&D cost and to be closer to their production sites which have already moved overseas. In the meantime, more American design schools are sending more graduates to the industry every year, further escalating the competition. In addition, the design schools in many other countries, especially in Asia, are generating great numbers of designers who are potential competitors to their American counterparts as a result of the outsourcing trend of R&D. Korea and Taiwan have each doubled their industrial design programs in the last decade to almost equal that of the U.S. There are more than 11,000 industrial design students graduating each year from 230 schools in China, 68 of them founded after 2001 (National Instructive Committee of Industrial Design Education China, 2005). The National Development and Reform Commission of China is planning to build Chinese industrial design into a major international competitor by 2020 and a new global design power house by 2030.

The intensifying competition is challenging American design industry to perform more effectively and efficiently at shorter lead time with less cost. These challenges are also requiring industrial design education in the US to prepare students with better competitiveness in the market place. To improve the quality of design education, many US educators are exploring various avenues of design schools. Doctoral study in design is one of the directions that many educators are working on in order to enhance American design education. This paper aims to provide a perspective according to the industry, and raise questions as to how they perceive the priorities of design education and how they response to the transition to making PhD as the terminal degree for industrial design. This paper, however, does not attempt to judge the merits of one viewpoint over another; nor does it attempt to state that the goals of industry in terms of education are more important than students’ goals, or research/universities’ goals. Rather, it is intended to provide a comprehensive analysis of how many design firms and companies respond to the idea of the transition, and to help create a more balanced perspective of how the changeover will affect an important beneficiary of design education: the industry that employs design graduates when they complete their studies.

Method of Study

Survey Questions
The survey was distributed through one-on-one e-mail to respondents. A variety of question formats including matching, ranking, and choice were used to gain a more complete perspective. This 18-question survey appealed to a varied population of design professionals on several issues pertaining to design education including the priority of various design skills, areas needing improvement in design education, company hiring practices, and the transition of the terminal degree for industrial design educators from Master’s to PhD. Significant data about each respondent’s organization’s size, revenue growth rate, outsourcing policy, organization, and hierarchy was also collected. A range of organizations was polled, from small design consulting firms to large-scale manufacturing corporations.
Participant Selection
An in-depth survey was distributed to a broad spectrum of 1,343 designers, managers, and executives working for both design consulting firms and manufacturers. Individuals selected to receive the survey were listed in the membership directory of the Industrial Designers Society of America (IDSA). IDSA is the major organization of industrial designers in the United States with more than 3,000 members. The first round of surveys was sent to all design consulting firm department heads listed in the IDSA directory. The second round of recipients consisted of all listed designers and managers working for manufacturers. This selection of recipients was intended to promote a diverse and well-balanced response with views represented from designers to managers to executives.

Limits of Study
After receiving survey results, there were factors of concern. The first factor was the 9.3% rate of return, which may indicate that only those who felt strongly about the issue completed the survey. If this is the case, the results may demonstrate a more polarized/specific response of those who are most affected rather than the broad-based sentiment of the entire group. However, the overall results of this study were very consistent despite the concern of a lower response rate than expected. The second concern is inherent in polling surveys; respondents are limited to the answers provided by the survey author. This problem was addressed in part by the addition of an “other” option in many cases, in which a field was provided for a respondent to add his or her own response. Another limitation of this type of research is that some respondents felt the questions were too vague or too general. Further, it was difficult to rank the value of certain skills, which all seemed important. These concerns are all recognized limitations of opinion polling. Despite this, the survey method provides the most correct first hand information in accordance with an accepted standard, as well as, providing quick and easy-to-analyze data.

Results of Survey
Most of the respondents work for manufacturing corporations (59%) or for consulting firms (26%). The sizes of the organizations surveyed include a wide range; some 21% have between one and ten employees and 56% employ more than 200 people. Seventy-three percent of the manufacturers that were surveyed have more than 200 employees and 44% of the design firms employ less than 10 people.

Eighty-two percent of the respondents hold bachelor’s degrees and 17% have master’s degrees. Ninety-two percent hold degrees specifically in the field of design. Respondents come from a variety of industry backgrounds and environments, as well. Both large and small companies are represented; from design firms and manufacturing factories, from consumer products to industrial equipment, from well established organizations to start-up firms. Most companies do, however, have a strong emphasis on and respect for industrial design.

The survey results indicate that industrial design has, on the whole, plays a more (41%) or much more (29%) important role for manufacturers than it did five years ago. No more than 26% think the importance has remained the same and only 4% answered that industrial design is becoming less important in their organizations. This increasing significance indicates that corporate America is focusing on industrial design as a strategy to help answer escalating international competition and satisfy more demanding consumers. In a similar study conducted by British Design Council (2005), 50% of the manufacturers in the UK think design is increasingly important to their competitive edge.

Over the past five years, the revenue of 80% of the organizations has increased, with 43% growing more than ten percent. It is relevant to note that of the manufacturers whose indus-
trial design function has become much more important in the past five years, 63% of them reported a more than 10% average annual growth in their sales revenue. More than 10% of average growth is a very significant increase for manufacturers as total sales of US manufacturers grew only 2% in average for the last five years, according to US Census Bureau. This reinforces the findings of Hertenstein, Platt, and Veryzer (2005) that industrial design is able to enhance a company’s financial performance. With such high rates of growth for companies placing a great value on industrial design, the quality of design graduates is becoming increasingly important to corporate America.

**What Does Industry Most Want From Design Graduates?**

One of the first questions in the survey solicits respondents to rank the most important criteria for hiring new designers. The design industry expects graduates to have certain skills upon degree conferral, and it is important that educators understand the industry’s needs so that students can be duly prepared. According to the responses of this survey, a design graduate’s portfolio is the most important factor in the hiring process. A nearly equal amount of emphasis was placed upon creativity. The third most important factor was a graduate’s experience. Resumes, GPAs (grade point averages), and the use of entrance tests were rated with less magnitude.

Portfolio, the most important factor according to this survey, presents a potential job candidate’s design skills integrated with creative ability and problem solving capability. This finding resonates with the results of another question, which asked respondents to rank a list of skills deemed to be most important for design graduates to possess (Figure 1). Results from this question show that problem solving and innovation, closely followed by sketching are the top three sought-after skills, echoing the most important criteria for hiring designers—portfolio and creativity—as outlined previously. Each skill has a score nearly equal to that of the other. Of secondary importance were teamwork, verbal, and materials skills, followed by computer-aided drafting (CAD), styling, production, anthropometry, marketing, human factors, and technical engineering skills. The category model making was ranked least important. However, the difference between the least important and most important categories is only a few points, indicating that after problem solving, innovation, and sketching, all other skills are similarly important, with the exception of model making. A balanced design education centered on these three major skills seems to be the expectation from the industry.

The other interesting perspective is the importance of “Team Work” which is the most needed skill immediately behind problem solving, innovation, and sketch. Industrial designers are more likely to be working within a team these days rather than as independent individuals like in the past because of the complexity of requirements and the need for efficiency. Designers are expected to work not only with other designers but also with engineers, marketing, and production counterparts in the same firm, in different companies, or even in different countries through the Internet. Thus a designer’s ability to work within an interdisciplinary team is becoming more and more critical to the industry and it should be a new focus that design education ought to pay more attention to.
What Areas Need Improvement?
Following the question of most important skills for design graduates, it is relevant to explore the areas in which design graduates need the most improvement. According to this survey, practicing design professionals see innovation, problem solving, and sketching (three of the most important skills for graduates to possess) as needing improvement. Respondents were moderately satisfied with students’ sketch abilities. Another interesting note—model-making was given the highest level of satisfaction when professionals were asked to rank the abilities of recent graduates, yet it is the least important category when professionals were asked to rank the most important skills for an industrial designer. This is likely due to the decreasing need of model making skills for industrial designers in this era of rapid prototyping and the increasing value of time (Reeder, 2004).

In the ranking of skills which need improvement, sketching skills were rated fifth, innovation was seventh, and problem solving was ninth, out of 14 different abilities taught in industrial design programs. It should be noted that these three skills need improvement because they are the most important skills an industrial designer can possess. Other areas of improvement, such as verbal skills, teamwork, technical engineering, marketing and knowledge of materials need to be addressed because they were rated substandard for graduates.

Areas of materials knowledge, technical engineering, and marketing are shown as needing more improvement. The field of marketing is abundant with research opportunities and students will only benefit from learning basic marketing concepts and understanding how products should be designed to compete in the marketplace. Fundamental marketing research strategies are necessary for designers to understand their target market and by placing industrial design students in a more business-like context, such as industry collaboration projects where they must practice real-world design requirements, they will have a better idea of what to expect and what is expected of them as they move into the work environment.
Focus of Faculty
The survey also addresses the industry’s preferred focus of industrial design university faculty. This survey shows that research directed toward publication and design competitions were the lowest-ranking categories, indicating that the design industry does not see them as being readily applicable to the teaching of problem solving, innovation, and design skills, which make up the primary need from the point of view of industry. Though it is important to recognize, understand, and advocate the need for pure research, it should not suffocate the longstanding practical tradition of teaching industrial design skills.

How Does Industry View the Transition toward PhD Design Faculty?
There is an on-going trend in the US toward making a PhD a required degree for design faculty. A majority (71%) of survey respondents disagreed (34%) or strongly disagreed (37%) with the statement “PhD will improve design education” (Figure 2). Only four percent agreed with the statement, while three percent of respondents strongly agreed. Twenty two percent marked, “neither agreed nor disagreed”. When separated by industry, 74% of consulting firms disagree or strongly disagree and 70% of the manufacturers disagree or strongly disagree with the statement. This response sends a strong signal to educational institutions; most designers and design managers do not see the benefits of incorporating a PhD as the terminal degree for design educators. This finding is also consistent with a previous part of the survey in which respondents rank areas they consider most important for design students to be trained. While professors with master’s degrees teach design skills, problem solving and innovation, the necessity of a doctoral degree, which is usually centered on research and publication, ranked least important. Overall, the message from the industry is that industrial design education should be focused on teaching design skills along with creativity and problem-solving methods rather than research and publication.

Figure 2

This data was further analyzed to explore the range of responses of those with advanced degrees. An interesting correlation was discovered—respondents holding advanced degrees were more likely to disagree with the statement. Of those surveyed who have graduate degrees (18%), forty percent strongly disagreed with the statement that transitioning to a PhD as a terminal degree will improve the quality of design education. Another 36% of those with
advanced degrees disagreed with the statement. The percentage of those holding masters or doctoral degrees that disagree or strongly disagree is 76% compared to the 71% that either strongly disagreed or disagreed from all those who replied. Perhaps because these respondents are more familiar with the process of procuring an advanced degree, they were more likely to have a strong opinion. Having firsthand experiences with graduate school may have convinced the respondents who disagreed with the above statement that students would not benefit a great deal from faculty members having more advanced degrees. Fewer respondents (14%) selected “neither agree nor disagree.”

Conclusions of Study

Though the sample size is limited by the number of practicing industrial designers listed in the IDSA directory, results are consistent throughout the survey. The message from the US industry clearly indicates that design professionals prefer students to focus on their design skills and sharpen their creative/innovative abilities as they attend school, and that they do not agree that greater requirements for the education of design faculty will enable those faculties to meet industry needs more efficiently than the present requirements. Moreover, results indicate that the American industry may view doctoral design work as being overly focused on research and not focused enough on experience, and therefore may interfere with industry goals of graduates with improved skills and increased readiness to work. If the path to PhD is to be continued, academia must show the industry that students will leave school better prepared to be designers.

This paper does not intend to advocate for or against the transition from Master’s to PhD, but to bring to light an underrepresented point of view—that of the American industry. No matter what qualifications, diplomas, or degrees are required in members of an industrial design faculty, the real needs from the perspective of the US industry remains the ability to teach design skills, to inspire creativity, and to educate students to intelligently solve the problems that they will face everyday in their designer career and when they face the competition challenges from designers around the world.

References:

TOWARDS A STRATEGIC ROLE FOR DOCTORAL RESEARCH IN DESIGN
Silvia Pizzocaro, Politecnico di Milano, Italy

Abstract

Design has a long history in Italy. Milano, in particular, has a long tradition in the practice of design, a profession dating back of the early years of the century, well based on local crafts and industries.

Conversely, national accreditation of the Ph.D. research programmes in design dates back only fifteen years, followed by the awards of degrees (Laurea) in industrial design. It was Milano itself, with the Politecnico, that fostered the creation of Italy’s first Ph.D. programme in industrial design (1990) and the Degree course in industrial Design (1993), exploiting the fruitful dialogue with the long lasting entrepreneurial and management tradition of the small and medium size companies and manufacturers of the local and national industrial system.

Therefore, although consolidated in its vocational character, industrial design is just in its infancy as an academic discipline. Further, it is a rather young field of advanced academic enquiry: design curricula are still in progress, as well as perspectives on the form and nature of academic design research.

Nevertheless, education in design - since its beginnings - has been facing the requirements of the demand of design, at both local and enlarged scales.

This contribution proposes a reflection on some critical issues deriving from the “search vs. research” transition in design. Assuming that the shift to a disciplined learning on “how to make research in design” has started to produce strategical visions for pitfalls on applied research. To guide and develop this vision some elements are discussed, stemming from the design research experiences developed within the Ph.D. programme in industrial design at Politecnico di Milano.

At present this Ph.D. programme partly performs an incubator function, in terms of potential skills to capture key aspects of design research development and to try to manage the complexity of design issues deriving from the technology-society interaction.

An emphasis will be proposed on the idea of the Ph.D. programmes as hubs, whose relevance is not (only) linked on a particular area of study, but on the skills to foster research “strategies”, coherent (but not necessarily dependent) with the tacit or explicit factors expressed by some design demand and societal needs.

A premise

Italy has a long tradition in the practice of design, a profession dating back of the early years of the century, well based on local crafts and industries.

Milano, with its Politecnico, fostered the creation of Italy’s first Degree course in industrial Design in 1993, exploiting the fruitful dialogue with the long lasting entrepreneurial and management tradition of the small and medium size companies and manufacturers of the local and national industrial system.

Since the beginnings the faculty engaged by this degree course has represented a variety of cultures, merging the scientific and academic subjects stemming from design studies either in
architecture and engineering. A relevant number of entrepreneurs, experts, designers, practitioners in the areas of management, services and culture, as well as professional associations, often join the local academics.

Academic curricula in industrial design (first and higher level) are expected to provide the theoretical, scientific and professional knowledge required by a designer. An enlarged area of learning is articulated by the curricula so to meet as extensively as possible the educational requirements expressed by goods industry, public administrations, companies specialised in the design of communication, interiors, exhibitions and fashion, as well as sectors covering marketing and distribution.

The Ph.D. programme in design

The Politecnico di Milano was also among the first design schools to start a Ph.D. degree programme in industrial design (1990).

Since its origins it is intended as a highly focused and intensive programme for reaching advanced knowledge in design theory, methods, processes and practice. The Ph.D. is expected to culminate with a dissertation extending the corpus of knowledge inherent to theoretical design issues or design practice and process.

The introduction of a research Ph.D. programme in design answered the explicit demand for high profile design researchers, while recognising a tacit demand for professional education at the most advanced academic level. The aim of the doctoral programme has been expressed as the education of senior researchers in design expected to operate either in the academic or in the industrial contexts. The Ph.D. degree in design is for those who wish to teach, conduct or apply fundamental research in design. Since 1990 the domains of research investigated by the doctoral activity in industrial design were mainly centred on innovation-related phenomena and theory. Such attention was due to various factors, partly internal to the dynamics of the discipline of industrial design, partly related to the perception of the growing complexity of the innovative process, thus motivating in-depth analysis and new approaches to emerging domains. A relevant number of local doctoral investigations has emphasised the importance of technological change, orienting the direction of conceptual analysis towards systemic, evolutionary, complex approaches. Whatever the motivations for the analysis of technological change and innovation, this field of enquiry has highlighted the factors and fundamental ingredients of the process of development and transformation of industrial products, services and systems. Moreover, as a starting point a broad view of innovation has been assumed, i.e. a dynamic process related to achieving competitive advantages involving the development or improving of new products, services, technology, processes, institutions, systems, solutions. This view of innovation encompasses not only science and technology, but also the range of

---

1 The three-year Degree course (Laurea) is expected to train graduates who are design technicians, practitioners in all the technical duties and design activities of the design process (from product conception to production and distribution). The further Higher degree (which is a Laurea Magistrale) is awarded after two more years of study and it offers rigorous, advanced design training in highly specialised areas. The Higher Degree graduates are expected to supervise and define the strategic aims of design activities. These graduates are expected to be able to co-ordinate complex design activities, oriented towards the creation of extensive and multifaceted product systems. Finally, those who have completed the Higher Course may attend the Ph.D. programme, an academic curriculum for training in scholarly design research. At Politecnico di Milano the design area features Ph.D. programmes in industrial design and multimedia communication, interior architecture, design and methods of product development.
economic and social activities competing in the marketplace and relevant to design in areas such as communications, corporate organisations, education, and institutions.

**Addressing the nature of scholarly design research**

Within the outlined context, the Ph.D. programme curricula have been addressing a number of core questions: what is the purpose of doctoral design research? What is it useful for? Who is going to make use of it? What is its explicit or tacit or potential target? What was the nature of the marketplace it is directed to (considering the market in its broad acceptation of society as a whole)?

Approaching design research raised (and still keeps on raising) an extraordinary challenge. This challenge comes about due to the unusual nature of design research as a field of inquiry. As Friedman (1999) observes: “Design research is unusual for several reasons. First among them is that design is both an intellectual discipline and an applied discipline. Design research operates on several levels, both theoretical and applied. The questions of design research methods therefore span a number of issues. The second important aspect of design is that it is an integrative discipline, frequently required to operate across disciplines and engage multiple research methods. Finally, the variety of fields involved in design is far larger than we find in most disciplines”. The theoretical foundations of design can be located in the natural sciences, the humanities, and the social sciences. The practical applications of design engage technology and engineering, the arts, and the human professions. Each of these also has dimensions of theory in addition to dimensions of application and practice. As in Margolin (2000): “Design, as various scholars have suggested, is a contingent practice whose techniques, goals, and objectives are continually changing. What is fixed about design is that it is an art of conception and planning whose end result is a product, whether that product is a material object or an immaterial service or system. Design is also an integrative activity that, in its broadest sense, draws together knowledge from multiple fields and disciplines to achieve particular results. It has both a semantic dimension and a technical or operative one”.

The starting of the Ph.D. programme was a step in the recognition that basic design research might be fruitfully carried on within some emergent sites - doctoral curricula - where research-oriented activities may converge and cluster independently from the applied research carried on within companies or professional laboratories. In this sense, Ph.D. programmes could be addressed as strategic sites where research “takes its time” and where design research may generate deeper qualities. Consequently, times required by doctoral research in design may coherently neglect rhythms imposed by the day-by-day redefinition of the product-system (i.e. the integrated whole of products, services and communication imposed by the marketplace).

A preliminary meaning of design research outcomes was starting to take shape as something similar to shelf innovation, as formulated within the dynamics and approaches of concurrent engineering. Shelf innovation consists of the anticipated development of technological solutions and components so that a heritage of innovation can be created, available at any time for possible use in new products, being the shelf concept that of storing solutions ready for future applications (Wheelwright and Clark 1992 and 1993). According to this model, the

---

2 As in Friedman (2002, 931): “The profession of design involves the professional practice of design. The discipline of design involves inquiry into the several domains of design. The field of design embraces the profession, the discipline, and a shifting and often ambiguous range of related cognate fields and areas of inquiry. (...) The foundation of design theory rests on the fact that design is by nature an interdisciplinary, integrative discipline. The nature of design as an integrative discipline places it at the intersection of several large fields. In one dimension, design is a field of thinking and pure research. In another, it is a field of practice and applied research. When applications are used to solve specific problems in a specific setting, it is a field of clinical research”.

61
activities of component invention and testing are separated from product development: in this way advanced technologies can be incorporated in new products avoiding the risks associated with innovation. As a first claim Ph.D. design research was conceived as similar to shelf innovation, accepting that it can generate "research semi-finished components" that can be shelved for future utilisation. Either in the form of design practice components or portions of theory, research results could thus accumulate while being available for use.

From reflection to research

If we assume with Friedman (2000, 19) that research is distinguished from reflection, the approach to design research first taken by this Ph.D. programme seldom exceeded the borders of reflection – the awareness that research borders had to be set being part of the tacit knowledge the programme was fostering. Initially, the preliminary unifying factors for the doctoral research activity were research themes of a varied nature, not a methodological one. The approach to innovation-related issues proved to be the effective common background of this doctoral programme. The theoretical framework underpinning a relevant number of doctoral dissertations reflected this unity of approach. An outline of some titles of dissertations developed along the first decade of the Ph.D. programme offers a view of such an approach: Evolutionary Approaches to the Analysis of Products and Technical Systems (by the author, 1994), The Household Appliances in The History of Artefacts (Riccini 1994), Design and New Models of Perception in The Mass Media Society (Ceppi 1995), Innovation and Environment (Morelli 1995), Strategic Management of The Environmental Quality of Products: Theory and Praxis (Mangiarotti 1996), Environment, Products and Standardisation (Pratesi 1996).

In 2000, the board of the Ph.D. programme faced the issue of partially maintaining the former curricula or radically changing the programme. Anticipating the institutional changes expected from the major revision of the national university system, now oriented towards a 3+2+3 system, and stimulated by the critical and theoretical developments taking place in the international arena about the form and nature of the Ph.D. programmes in design, the Faculty chose to encourage a radical reorientation in the intention and structure of the programme.

The revised Ph.D. programme started to perform an incubator function, in terms of potential skills to capture key aspects of design research development and to manage the complexity of design issues deriving from the technology-society interaction. As a consequence curricula were re-designed, advocating a progressive shift from searching in design to learning how to make research in design.

The new framework for the programme now expressed a conceptual transition:

(i) from subjective reflection to the objective activity of research;
(ii) from informal training (focusing on the supervisor support) to a formally taught component;
(iii) from identifying areas of research interest to building questions of research interest.

Three major influences prompted the review:
(i) infrastructure changes to the Italian national education system at university level, as mentioned above;
(ii) the inadequacy of the former programme to cope with the requirements of the emergent demands of design research;

---

3 Friedman (2000, 19) argues: “What distinguishes research from reflection? Both involve thinking. Both seek to render the unknown explicit. Reflection, however, develops engaged knowledge from individual and group experience. It is a personal act or a community act, and it is an existential act. Research, in contrast, addresses the question itself, as distinct from the personal or communal”.

62
(iii) the critical and theoretical developments emerging from the international debate around the form and nature of Ph.D. programmes in design.

The whole doctoral programme was then redesigned into two main areas: industrial design and multimedia communication, without any prerequisite for eligible areas of research. At the same time it was structured into a curriculum framework of basic, main and elective courses, to be selected by students, along with a doctoral dissertation component. Students would also be expected to actively participate in institutional research activity.

Industrial design, in the context of this revised doctoral programme, is intended to be a discipline acting within the industrial culture. Among its main tasks is to deal with the configuration of industrial products as well as with general factors involved in the process of product design in general. In this sense, this school’s specific research interests refer to use, function, social and individual consumption of the products (the functional, symbolical and cultural factors) and to manufacturing (techno-economical, techno-productive and techno-distributive factors). Communication design, on its side, is meant to provide an appropriate learning environment for the resolution of complex problems in the field of multimedia communication.

**Light on the nature of design practice and design research**

A substantial change has occurred: approaching design research has shed light on the nature of design practice and its relationship to design research itself. Different frameworks have started to be proposed, justified and supported in expected “designerly” ways. The approach to design research through the design project has become the emerging context of reference, thus joining the international debate where different terms - project grounded research, project-driven research, research through design, Ph.D. by project, ricerca progettuale, recherche-projet - tend to ground design research in practice, where practice is considered as a terrain and medium of study. The need for further understanding of the underpinning principles of this approach to design research may be considered the renewed expected conceptual trajectory of the Ph.D. programme itself, assuming that research through the design project is progressively leading towards improved definitions of designerly ways of researching. Further, while still building the appropriate paradigm for design research, a distinction started to be debated between works of practice and works of research.

As a simple note we also remind that Christopher Frayling’s category of “research through design”, although somewhat crystallised, contributed to gain recognition for ongoing and future design research. Among many interpretation of Frayling’s categories we mainly refer to Alain Findeli (2000) when observing that "Research for design" describes what is known as "R&D"; it has no scientific recognition (...), since there is usually no discourse attached to it, no intention of generalisability except technological, and no "accumulative" effect in the theoretical realm (...). "Research about or in design" covers academically recognised, published, and even funded research in the field of design (its objects, products, processes, values, theoretical and historiographical models, etc.), carried out by academics of the design or other disciplines, with the epistemological and methodological tools of the already established and respected academic disciplines, and as such foreign to design (...). "Research by or through design" is research in the field of design carried out with the tools of design, i.e. mainly with its more original and specific feature: the project”.

---

4 As in Cross (2000): “The whole point of doing research is to extract reliable knowledge from either the natural or artificial world, and to make that knowledge available to others in re-usable form. This does not mean that works of design practice must be wholly excluded from design research, but it does mean that, to qualify as research, there must be reflection by the practitioner on the work, and the communication of some re-usable results from that reflection”.

63
At the same time, the growing awareness of the intrinsic strength of design thinking within its own context and a growing acceptance of design on its own terms helped to recognise that design has its own distinct intellectual culture.

The scholar-researcher

This doctoral programme task is now represented as the induction of an advanced researcher, whose aim is to develop design research either in academic or industrial contexts: a scholar-researcher devoted to planning research, building a research culture and disseminating research, whose main task is to sustain the operability of research in industrial design, fostering their cultural foundations (inter-and extra-disciplinary). But also, or in alternative, a high-profile researcher capable of identifying problems, selecting objectives and detecting problem-solving strategies within the industrial context: an analyst for tacit or implicit problems, a strategist for desirable interactions in design solutions, a designer in a wider sense, with specific skills in positioning a design problem in the correct dimension and perspective. This researcher’s task is to lead the transition from design hypothesis to design solution in industrial contexts, exploiting limits, constraints and opportunities.

Complexity thinking is now considered a ground for design research.

Faced with new, uncertain, unexpected, dynamic events of society, the relevance of flexible approaches and creative thinking becomes strategical for design (Boutin and Davis 1997, 117), meaning the opportunity to re-define and re-invent according to the specific evolution of each situation. By both accepting and clarifying some elements of complexity theory and its role in revolutionising thinking in scientific and management milieu, the notion of complexity can open promising horizons for designers and educators in design. As a recurrent starting, it has been recognised (Boutin and Davis 1997, 115) that the problem is not that of understanding complexity, but to define and create flexible methodologies allowing practical application for design of new emerging theories, to transform the discovery of complexity into a method to handle complexity. Further, keys concepts central to handling complexity may gain clarity when going with a cultural maturity that entails the designer responsibility (1997, 116) and are revealed as familiar to designers: the complex thought integrating uncertainty while planning organisation, linking, contextualising, globalising, recognising both singular and general dimension. Using holistic visions then turns into a broader (entwined) sense of reality, meaning rapid ability to adapt to changes, to be part of change itself, to take uncertainty as a chance (not only a risk or a limit), to rely on processes (rather than structures), to develop skills of organisation, disorganisation and re-organisation, inventing dynamic concepts (as well as their links).

It has been argued (Friedman 1999) that acting within complexity involve either substantive challenges to design (increasingly ambiguous boundaries between artefact, structure, and process; increasingly large-scale social, economic, and industrial frames; an increasingly complex environment of needs, requirements, and constraints; information content that often exceeds the value of physical substance) and contextual challenges (a complex environment in which many projects or products cross the boundaries of several organisations, stakeholder, producer, and user groups; projects or products that must meet the expectations of many organisations, stakeholders, producers, and users; demands at every level of production, distribution, reception, and control). These challenges require a qualitatively different approach to the practice of design research: analytic and synthetic planning skills that can’t be

---

5 In this sense, according to Cross (2000), “a taxonomy of the field of design research would therefore fall into three main categories, based on people, process and products: design epistemology - study of designerly ways of knowing, design praxiology - study of the practices and processes of design, design phenomenology - study of the form and configuration of artefacts”.

64
attained through practice alone, advanced knowledge that is not a higher level of professional practice but a qualitatively different form of professional research practice.

**Conclusion**

Continuing the activities of the original programme, we could say that, as before, an extensive approach still allows this Ph.D. programme to be open to that range of activities and entities (communication, organisational strategies, dynamics of the market, education and public institutions) that are part of the activities connected to industrial design as physical or immaterial artefacts themselves. If a change has occurred, this comes from an improved understanding of the intended learning outcomes and results expected from doctoral study. As previously stated, the programme has moved from the overall intention of researching in design to that of learning how to make research in design.

Sato has observed (2000, 137) that the basic questions raised as guiding forces of design research are directed to two areas of research interest: scientific engagement of understanding the acts of design, and understanding the subjects of design. The first leads to the general theories and methodologies of design that intend to offer models of the general nature of design. The second leads to the development of knowledge about subjects in the domains of design concern.

The curriculum I have been describing for the Ph.D. programme in industrial design is somehow in the middle:

(i) it’s addressing the ‘matter of research’ but it is a matter of research itself, addressing the core questions of the nature of design research,
(ii) it’s producing research results as well as research reflection,
(iii) it’s producing research objects as well as research strategies,
(iv) it’s articulating research outcomes as well as research cultures.

These are provisional claims so I will not emphasise this point. Further, being the Ph.D. continuously revised, results of the curriculum change can not be evaluated with rigour. Rather, I am simply proposing that as expression of potential skills to manage the complexity of design issues, Ph.D. programmes in design might advocate the functions of research sites where the complexity of research actions is made explicit; research poles serving to capture key aspects of basic research development; research centres where identifiable communities produce and ratify forms of design knowledge; as well as research sites whose relevance does not depend on the particular areas of study, but on the development of research strategies, coherent (but not necessarily dependent) with the tacit or explicit factors expressed by the design demand and societal needs.

**References:**


Bio

Silvia Pizzocaro is Associate professor of industrial design at Facoltà di Design, Politecnico di Milano.

She holds a Ph.D. in Industrial design (Politecnico di Milano, 1994) and a Degree cum laude in Architecture (Politecnico di Milano, 1985).

Academic experience includes appointments as researcher and professor at Politecnico since 1996 for the Degree course in Industrial design and the PhD programme in industrial design; research supervisor within the Department of Industrial Design of Politecnico; post-doctoral research fellow; co-ordinator for research projects funded by the European Commission; scientific co-ordinator and chair of the organising committee for the "Design plus Research" conference held in 2000 at Politecnico di Milano.

Principal areas of research interest are: theory of design, design research methodologies, the design of research into design, doctoral education in design.
THE BUSINESS OF THE DESIGN DOCTORATE – A CRITICAL ANALYSIS OF AIMS, INTERACTIONS AND IMPACTS

Martin Woolley, University of the Arts, London

This paper examines the aspirations of research students, whether they are aimed at the creation of new knowledge within the design discipline and profession, or whether they relate more directly to new knowledge within a company, sector, industry or commerce in general. To this end, a distinction has been drawn between students who arrived at the research degree stage through a conventional path, via first degree, masters degree, without time spent beyond education, defined for the purposes of this paper as the continuing group (CG). And those students, often mature, who have spent significant time in industry or are still employed within it pursuing their degree part-time – defined as the professional group (PG).

There is a longstanding debate about how far academic freedoms might be curtailed by commercial constraints with regard to research. However there is little doubt that involvement with non-academic institutions means different rules of engagement, which may, or may not, favour the academic researcher; and some have argued the case for distinctive differences for retaining separateness:

“….innovative features suggest that design research might be fruitfully carried out within emergent structures like doctoral programmes, where research-orientated activities may converge and cluster independently from the kind of research carried out within companies or professional laboratories.”

(Manzini 1998)[ref.1]

However, in my experience the research student is more likely to be held back by the lack of response from potential collaborators, than by reluctance on the part of the commercial partner to divulge material or agree to its publication, once relationships have been established. In the case of continuing students, obtaining collaborative agreements can be more difficult than it is for professional students, for obvious reasons.

Relevance of student background and previous experience

Generally, design research degree students in the UK are drawn from a wide range of backgrounds and study within a variety of contexts: part- or full-time; overseas, European or UK status; self-, government- and occasionally commercially-funded; from academic and/or commercial backgrounds; and are positioned within assorted academic departments, research centres and occasionally within the workplace. Although firmly rooted within an academic context, the work undertaken varies from the practical to the theoretical, mirroring the breadth of the discipline of Design Research.

‘Design research undertaken by academics can be ‘blue-sky’ (open-ended activities) but it can also be practical applied research. Academic design research should challenge current assumptions, and provide a sound overview of work to date on the topic.’ (Cooper, Press, 2005)[ref.2]

The variety of contexts has meant that students have not always followed the predictable path of: degree, postgraduate degree and research degree; instead they have entered study at differing points in their careers. Although there are signs that as the design research culture matures and becomes managed and funded more professionally, this diversity tends to narrow in favour of the norm of continuous graduate and postgraduate study. Nevertheless, this ‘maturing’ design research culture has enabled students with diverse experience and professional backgrounds to study. Such a varied cohort might be considered particularly appropriate to con-
tribute to the growing knowledge base of the field of design research, as it provides professional skills which can contribute significantly to interdisciplinary research. Students with such varied professional backgrounds also have the potential to make unique contributions to the practical, and often, commercially focused field of design research for several reasons, including: unique access to data, resources, case study material and organizations; the ability to identify realistic and grounded research questions, often with relevance to design practice and industries; and broad experience of the global contexts and positioning of design and research – economic, technological, societal and organizational.

In terms of the motives of the professional group, beyond the obvious reasons for pursuing a research degree, such as acquiring research training, professional development and status, are the equally strong objectives related to the research field itself, which I have identified as research which takes four different forms.

There is research into:
- a professional practice or profession-related problem, context or opportunity
- a wider industrial/commercial problem, context or opportunity

or research which:
- extends or complements professional activity
- establishes a model which parallels a significant aspect of professional activity

In each case and to fulfill the criteria for a research degree, the scope of the field of study is required to be significant, substantial achievable and cannot be exclusively concerned with short term, purely commercial objectives and values. However attempts continue to be made to identify how the rigour, transparency and substance of the research degree, can be positioned within or alongside the professional world. Russell identifies three purposes that might induce a design practitioner to undertake postgraduate study: Firstly, the initiation of new design works (a creative & speculative approach). Secondly, the advancement of existing design work (a critical & speculative approach). Thirdly, the culmination of longstanding design work (historical and critical approach). (Russell, 1998) [ref.3]

Significantly, examples of all three purposes were found in both the continuing and professional groups response to the questionnaire, suggesting that there is little variation in the type of research carried out, but more likely in its context.

The different ways in which doctoral design investigation can draw upon industry

The range of research methods that can be applied within a collaborative relationship between academia and industry are limitless. The most significant issues do not therefore arise in terms of their choice, but through the wider context of their application. There are three basic forms in the way a researcher interacts with an industrial partner:

- **one-way data capture**
- data capture is an interactive process
- final results of the study are fed back directly into the company or industry to effect change

Firstly and most straightforward is one-way data capture which may involve interviews, primary source analysis and case studies; where the results are simply transferred out of the company. Both professional and continuing groups can employ this research approach. Secondly, a more complex situation, in which data capture is an interactive process, in which the researcher and/or data contributes to the process being observed or recorded, as in the use of participant observation techniques methods. (Dane, 1990) [ref.4] The researchers may adopt some form of interactive practice as part of the recording phase, but the final outcomes and the conclusions of the research investigation are essentially not part of this process and lie outside the company or industry. Both professional and continuing group members employ
this approach, but there is a tendency for the professional group to deploy such methods more frequently. Thirdly, data capture may, or may not, be interactive, but the final results of the study are fed back directly into the company or industry to effect change or substantiate the status quo. Here there is a significant tendency for the professional group to adopt this approach in comparison with the continuing group.

The general pattern of involvement between the CG’s and the PG’s with industry is clear: with the continuing group extracting data by the most direct means (such as by a telephone, emailed or face-to-face questionnaire to company employees). In contrast, the professional group tend to be more strategic in their approach, taking a responsive position with respect to data analysis and a more proactive position with regard to their findings, research outcomes and conclusions.

There is also a contrasting concern regarding the level at which researchers collaborate with non-academic institutions. The CG approaches the worker, whilst the PG tends to communicate with senior management; this varies from individual employee, department manager, company (executive), industry or industry body representative. In a global economy there is the added dimension of international collaboration i.e. sufficient seniority to include international links. There is a notable difference in the ability to develop viable investigative relationships between the PG and CG research student groups, with the former more able to successfully penetrate the hierarchy at a more senior level. This one element can have a profound impact on the effectiveness of the research collaboration/investigation outcomes and can be a significant pressure on the inexperienced student. Too often relatively inexperienced CG students spend considerable time and effort establishing relationships which do not have sufficient senior approval within a company to ensure that they are viable and sustainable. In contrast, professional group students are generally able to develop good working relationships within a relatively short time-frame (or are equipped with these at the outset) and at sufficiently senior level to ensure they are productive.

The impact of the research degree on the non-academic community

It is often suggested that in the design field, academic research has little to offer commerce and industry. The research degree in particular, can be viewed as a diversion, unconnected with the ‘real world’ of business and commerce and isolated within a particularly inaccessible ‘ivory tower’. Such criticisms are often made on the assumption that the research student is often disengaged with commercial realities (not an issue for either of the groups studied, since engagement with practice or profession is a fundamental research aspiration of all members of both). The prejudice is further deepened, perhaps because it is based on the misunderstanding that continuing students are by far the most common; the suspicion being that rather unworldly students, with little experience of industry and an exclusive commitment to academic values and research interests, predominate. Yet this ignores the complementary nature of much academic research with respect to industry, in particular the ways in which an academic approach can be useful in its own right.

‘Academic design research frequently follows rigorous methodological conventions which ensure that the findings are objective and contribute to new knowledge, thus providing the business with important, but often new, insights and directions which may not be identified when research is undertaken in more subjective environments.’ (Cooper, Press, 2005)[ref.5]

In practical terms the research degree can make two general contributions:
Firstly, that it can improve the professional effectiveness of the researcher or the organization – through ‘new, insights and directions’. Secondly, that it can improve the knowledge base of the wider professional context within which the researcher operates. Although as professional
group respondent suggests: ‘Influence on policy and conventional practice is harder to achieve via research that is focused on short/medium term business ends.’

Whilst it is quite common for a CG student to produce worthy results, it is equally possible that they remain relatively unexploited externally, simply because their personal connection with the wider world is, by definition, restricted. Conversely, the PG student is more likely, not only to produce realistic, insightful, usable results for the non-academic community, but is also often in a better position to disseminate them directly to that community.

**Research into doctoral programmes**

The paper draws directly on evidence from a pilot study questionnaire of twenty doctoral programmes, some currently in progress and others completed, carried out within the past ten years; to identify and compare their relationships within the three primary contexts. The study is part of a continuing investigation into the impact of doctoral studies in Design Research and intended to improve analysis and understanding of the student profile.

The pilot study consisted of analysis of the original student applications to pursue a research degree, which provided information on background, experience, qualifications, age. Alongside this information, a questionnaire has been circulated to the same students which addressed their attitudes and ambitions concerning industry and the design discipline. Comparison of the results in terms of the small sample group size at this stage, yielded indicative information only, but suggested that there were common concerns and differences in research focus, aims and context. Both continuing CG and professional PG groups tend to carry out research founded on a basic design-related critique of some aspect of current practices, methods, models, or design outcomes. To a degree one of the primary research questions related to the viability, or otherwise, of this critique for both groups; who also tended to view the research outcome as effecting real-world change within the non-academic field and/or organisation. Both groups also tended to provide a broad context for their research, beyond the immediate concerns they had with commerce and industry.

The questionnaire comprised seven sections –

A. Personal details.  B. Research Degree Information.  C. Relevant personal background D. Contribution to and/or from industry to the study. E. Impact of the completed study on the non-academic world. F. Attitudes and experiences in relation to academic values and commercial interests. G. Additional comment. Group designation was determined on the basis of C. and information contained in the original research proposal. These initial results from the pilot study were collated and analysed using a single spreadsheet.

**Research findings – The CG’s and The PG’s**

**The previous professional experience of the research student**

The significance or otherwise of non-academic experience can be explored by making direct comparisons between those students who have had significant and relevant non-academic experience (*the professional group*) and those who have not (*the continuing group*). Table 1 sets out the general characteristics of both groups in terms of personal and research backgrounds.
### Table 1. Comparison of the two research student groups

<table>
<thead>
<tr>
<th></th>
<th>Continuing Group</th>
<th>Professional Group</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>mode</strong></td>
<td>full-time</td>
<td>part-time</td>
</tr>
<tr>
<td><strong>country of origin</strong></td>
<td>Mainly overseas</td>
<td>UK</td>
</tr>
<tr>
<td><strong>industrial experience</strong></td>
<td>little or none</td>
<td>Significant previous and/or current</td>
</tr>
<tr>
<td><strong>age</strong></td>
<td>under thirty</td>
<td>Mature – over thirty</td>
</tr>
<tr>
<td><strong>general research context</strong></td>
<td>design discipline-related</td>
<td>corporate- or industry-related</td>
</tr>
<tr>
<td><strong>research focus</strong></td>
<td>design contexts, processes, practices and outcomes</td>
<td>corporate or industrial contexts, functions, models and outcomes</td>
</tr>
<tr>
<td><strong>research origin</strong></td>
<td>theoretical critique</td>
<td>practical critique</td>
</tr>
<tr>
<td><strong>research outcomes</strong></td>
<td>tools, guidelines, recommendations, methods, models, practice examples.</td>
<td>tools, guidelines, recommendations, methods, models, practice examples.</td>
</tr>
<tr>
<td><strong>Research dissemination</strong></td>
<td>Within an academic or design practice field</td>
<td>Within an academic, design practice, corporate or industry field.</td>
</tr>
</tbody>
</table>

There were generally three areas of significant difference between the two groups.

Firstly the continuing group CG tended to be more ‘idealistic’ and had a wider engagement with ethics, environment, politics, culture and improving the social contribution of design, with or without a commercial or industrial focus. In contrast, the professional group PG tended to be more pragmatic, often aiming at making industrial practices more competitive, effective, efficient, or safer.

Secondly, the continuing group CG tended to locate their research within a practice discipline (industrial or graphic design), whilst the professional group PG tended to locate their research within the context of a particular commercial sector or company type. This could be related to the fact that most of the professional group had successful careers and were consequently working in an executive rather than design practice capacity.

Thirdly, the continuing group CG tended not to have an initial direct role within, or immediate access to, industry and often had to work hard to achieve basic contact. In contrast, the professional group tended to have effective initial access.

**The benefits and problems associated with collaborations**

The following represent a small but significant sample of student responses under questionnaire headings C. to G.

**Relevant personal background**

This group of questions acted as a primary method of differentiating between PG and CG students and provided detailed information beyond higher education for the PG only.

One PG researcher clearly linked his previous experience to theory/practice issues: ‘The experience worked as a reference and indicator for me to know how relevant of the research was to practice.’ PGCC. Whilst another PG researcher was able to view her own professional focus in a wider ethical context: ‘My experience of the above roles informed my belief that trend forecasting should and could be used in a more responsible way.’ PGMT
**Contribution to and/or from industry to the study**

During the course of their research, or after, more PG than CG students made significant contributions to commerce and/or industry: making available their own ideas, concepts, data, research outcomes, papers and designs. CG students were significantly less able to introduce their eventual findings back to industry, although many did this indirectly by employing their material within a higher education context.

**Impact of the completed study on the non-academic world**

At least one student (PG) noted a mismatch between academic and commercial interests which reduced the impact of the research findings and final evaluation and outcomes on the company: ‘Unfortunately one of the side effects of my particular research direction was the fact that the critical approach to the women’s publishing industry was not seen in a positive light on the part of the company, which was part of my case study. Hence, it would have proved very difficult for me to contribute to their commercial development.’ PGNS

**Attitudes and experiences in relation to academic values and commercial interests**

In general terms both groups found their contact with industry or commerce to be productive. Although a significantly higher proportion of CG than PG students were of the opinion that linking research directly to industrial/commercial needs reduces research impartiality or freedoms.

Responses to both PG and CG students were similar when it came to identifying the primary barriers to their research in relation to industry. Typically these were seen as:

- a lack of willingness to collaborate with academia
- intellectual property, non-disclosure agreements and commercial sensitivities
- restrictions caused by a lack of interest in a wider (academic) exploration of the research
- lack of interest in research collaboration which was not seen to directly benefit the company or industry.

**Additional comment**

A third of the students made use of this questionnaire section. One PG student made the point that experience in one industrial company or sector does not automatically provide relevant skills to work within another, although in the end this was a positive experience: ‘Generally I have found talking to industry easier than I anticipated. However, it is very important to feed back research findings in a format that industry can access and find helpful.’ PGMT

The same student comments on the wider cultural gap: ‘I have been made very aware of the gaps between academia and the commercial world in terms of language, organizational cultures, and pace of work and of course priorities in financial terms.’ PGMT

Another student comments on the need for industry involvement at the early stages of the collaboration: ‘In terms of confidence and trust in researchers’ outcomes, industry people seem to me to prefer things that they have fostered or they were involved in…..’ CGSR

Students from both groups share similar views on the possible barriers to industrial collaboration, although predictably the CG students see a lack of continuity of the industrial collaboration and the lack of industry-friendly outcomes from the PhD as being paramount. PG students speak of a general lack of will to collaborate and the narrow focus interests on both sides which are not compatible.
Conclusions

The investigation is an initial pilot study and will be continuing with increased numbers of interviewees in both groups planned for the future. At this stage results are indicative rather than conclusive. They include the suggestion that both CG and PG students generally share a critique as the starting point of their research. In the case of CG students, this is likely to be design discipline-related, whilst for PG students there is a predisposition for the doctoral investigation to be company or industry-related. Both groups also share an interest in optimising the impact of their research on a wider community. In the case of PG students, this tends to be almost exclusively within in the research period. In the case of CG students, this occurs both during and after the completion of the research degree. Finally, as many of the CG students move on to or return to an academic career on completing their research degree, one of main impacts of their work is within learning and teaching. This factor may well condition the positioning of their work relative to industry and commerce from the outset, with less of a priority given to industrial collaboration in most cases.

As stated at the outset, the pilot questionnaire has produced only indicative results at this stage. Nevertheless, it points towards significant differences in the ways that CG and PG students view non-academic collaboration. As the UK higher education sector is increasingly involved in commerce and is in many cases bringing research and enterprise closer together, it is perhaps timely to examine the positioning of the research degree relative to this shift. CG and PG students offer different approaches and could be aligned more effectively with enterprise or research, if they are better understood.

It is crucial to address the relative strengths and weaknesses between the CG’s and the PG’s and more specifically, to consider decreasing the gap between their abilities to access non-academic collaboration by developing supplementary research training models for each group in order to reinforce their contrasting strengths and anticipate their weaknesses; such as: offering training in industry-related methods for CG students and ‘broadening the academic context’ for PG students.

On a cultural level, and given that part-time and full-time students have few opportunities to mix, it may be helpful to decrease the divide between the two groups so that one group can inform the other. Perhaps this strengthened and diverse research group culture might ultimately make a contribution to the new kind of university proposed by Buchanan:

‘This new kind of university - and there may be only a few of them in the future - will discover a dynamic balance among theory, practice and production, a balance that we do not now find in the vision of most universities today.’
(Buchanan, 2001) [ref.6]

References:


Finding Design Direction on the Journey From Mode A to B

Derek McGarry, National College of Art and Design, Ireland

The purpose of my research was to evaluate the taught Masters (mode B) approach in design education by reviewing a number of multidisciplinary programmes. My survey illuminates a variety of contemporary design directions that heavily influence the manner in which students are taught. One overriding criteria which connects each programme is that they all attempt to function in the ‘real world’ making significant links to the design industry. Therefore, my work highlights contemporary design issues within this context and discusses their impact on the postgraduate curriculum.

Design Interaction at the Royal College of Art (RCA), FunLab, IM (industrial, interior and identity design), and Man and Humanities Masters at the Design Academy in the Netherlands provided four individual, but philosophically linked, two year Masters courses for my research. The Product Design and the Design Management Masters at the University of Central England form another connected strand to my investigation. Through visits to each institution, I was able to meet with staff and students to discuss and review the various multidisciplinary taught Masters models.

Part One:

What is Design Interaction?

Design Interaction investigates issues such as design experience, design sustainability, and new technology. It is a programme that evolved from computer related studies in 1990 to one that now researches design in context. Current research themes include scenario creation, lifestyle design, as well as social inclusion/exclusion. The objective of the course is to engage with conceptual and contextual inquiry in order to build the design skills necessary for the future designer. Much of the created work is presented in the form of two dimensional concept illustrations. The course attracts multidisciplinary, multicultural students with an international profile.

What is FunLab?

Funlab was established in 2002 and teaches design scenario and ritual creation at the expense of product. Funlab reflects an increasing self-conscious and socially aware design world. Funlab is also about design in context where the future of design will focus on human interaction with design. Now the emotional needs of the user will take precedent over the traditional value of aesthetics and function. Funlab sets out to establish a new design skills base that centres on sociological and psychological requirements where designers become choreographers and storytellers. The work created is conceptual design in both two and three-dimensional form. This course also attracts international multidisciplinary, multicultural students.

What is IM Masters (industrial, interior and identity design)?

The IM masters established in 2002 enables the future designer not only to design the product but also the context in which it is exists. The course is lead by Gijs Bakker and Renny Ramakers of Droog Design. The course ethos defines design as something beyond the insatiable development of new product. Today, social and philosophical change in the world offers new opportunities for design. The course aims to research, develop, and establish a new role for the designer in the 21st century. Design sustainability, in addition to recycled design
and materials, features heavily in the work that is created by the multidisciplinary, multicultural international students.

*What is Man and Humanities Masters?*

The Man and Humanities programme was established in 2002 addresses changes in lifestyle and legislation in society. Students are asked to explore social and ethical issues through reflective practice to generate new design consideration. Humanitarianism, ethics and design sustainability are central to this investigation. Contextual inquiry introduces a raft of ideologies and directions beyond the recognised geography of design. This emphasis departs from the traditional understanding of product and aesthetics attempting to arrive at more philosophical design. Design as social commentary, or social conscience, is key to this multidisciplinary, multicultural line of inquiry.

*Curriculum Infrastructure*

The framework supporting the curriculum clearly prioritises research methods and technical development. Rapid skill acquisition in the areas of contextual and conceptual inquiry is paramount. The academic staff are high profile practitioners with a ‘real world’ attitude to design.

Each of these courses attracts diverse multidisciplinary art and design students with an international background. With this cultural diversity, a variety of systems of support are necessary to assist and encourage learning. All classes are conducted in English. A well-structured lecture series introduces significant and relevant material, which is supplemented by additional individual and team assignments. The move towards de-individualism is deliberate to mirror the professional world beyond the institution. Through collaboration with industry and social partners, several team based ‘live’ projects further enhance the learning experience.

Design methods classes are a prerequisite on all postgraduate courses in the United Kingdom. However, all of these programmes expose the student to a variety of research techniques that enable more rigorous investigation of core issues. This exercise is vital in developing the necessary research ability to fully question the exploration of design work.

Computer aided design and presentation skills are now a design industry requirement and are reflected in the curriculum and facilities. Well equipped studios enable computer literacy in a number of interesting software programmes. Electronics and software development play a more significant role on the Design Interaction curriculum at the RCA. However, it is almost impossible to provide fully equipped workshop facilities for individual specialist disciplines within each multidisciplinary student group. This factor considerably impacts object making and the type of finished design work produced by the programmes I investigated. Just how to address this issue is a complex problem for multidisciplinary course development.

*Learning Outcomes*

The diverse issues that effect the direction of contemporary design create a complex position for research active academics. When you focus on design experience, design sustainability, as well as humanitarianism, the traditional value of form, function, and craftsmanship can somehow become less relevant. This observation was most evident in the graduate exhibition at the RCA where design illustration in the form of rendering was predominantly used at the expense of three-dimensional work.
Today, design seems more interested in exploring new terrain. Social science, behavioural studies, human geography, as well as anthropology and ethnography enlighten and influence design and consequently the structure of the design curriculum. Institutions like the Design Academy and the RCA place a very high value in using specialist academics and professional practitioners from outside of the design disciplines to help expand the traditional design boundaries. However, much of this research is apparently divorced from the required commercial reality faced by many in design manufacturing.

Ostensibly, academics are now investigating design that moves away from product to something that offers more meaning, connection, and longevity. Much of this work is presented as concept illustration that often requires breakthroughs in future technology to achieve reality. However, the skill base acquired through such experimentation and exploration is highly regarded by the design industry. Graduating students presented their work with remarkable conceptual fluency and professionalism. Many of the designers I interviewed now have full-time employment in industry. Therefore, it appears conceptual design is a productive research skill base essential to tomorrow’s commercial application. This situation is not only highly significant to curriculum development but also encouraging as we strive for design innovation.

Simultaneously, the role of socially conscious design activation is being explored through collaborative projects with aid agencies. Design Academy work for UNICEF is a good example of how design can highlight difficult human conflict and issues such as child abuse and social exclusion.

The ability of the designer to activate or engage the viewer/user is the ultimate measure of success or failure in the arena of design scenario creation. By the time the student has completed their postgraduate studies, they should have a comprehensive contemporary design awareness. They will have the ability to work individually or as part of a multidisciplinary team. Their design vocabulary will include an arsenal of skills acquired by researching subject matter, methods and techniques beyond the scope of traditional design.

The danger for the multidisciplinary conceptual/contextual designer is that they may have achieved a general education at the expense of specialist single discipline training. By this I mean that the degree work presented may often lack the craftsmanship and material consideration that would be associated with and expected of single discipline (mode A) scholars. Given the core value system employed by these programmes this situation is not surprising or perhaps even relevant. Self-directed masters courses can often not achieve the same standard of rigorous research as taught programmes. Mode-A courses can often provide not much more than a valuable studio space for continuing work in splendid isolation. However, I would suggest a better balance between cultural awareness, conceptual development, and object making ability would be more beneficial for taught multidisciplinary design courses.

**Part Two:**

The Product Design and Design Management Masters are twelve-month programmes at the University of Central England (UCE) are perhaps less concerned with social and ethical design considerations and more interested in the commercial design world.

**What is the Product Design Masters?**

The Product Design Masters course is constructed for students interested in product and want to achieve a better understanding of design methodology. Product evolution and teamwork are a priority at the expense of individualism. The programme is multidisciplinary attracting
international students from diverse backgrounds like industrial design, ceramics, glass, and furniture design. Despite the multidisciplinary student cohort, UCE see the course as specifically single discipline. Students are taught the prerequisite design language and skills to explore and experiment using their specialist background to meet the course requirements. A cultural and commercial design context exists for all design inquiry, which in turn influences the traditional design values of form and function.

What is the Design Management Masters?

The Design Management Masters caters to students interested in the specific nature of the design industry who want to acquire key skills to gain employment. Attracting an international multidisciplinary cross section of students, the course work is explored in both team and individually based assignments specifically geared towards personal specialisation. Design research is in the context of integration with market policy, technology, and organisational development. UCE believe that design management is the ability to link a range of design organisational activities through strategic planning. Students develop a skill base and knowledge appropriate to a variety of industries and art organisations that use or contribute to art and design.

Curriculum Infrastructure

Both the Product Design and Design Management Masters courses are closely linked. A common series of prerequisite lectures are introduced during the first semester. Sequential lectures and related research assignments introduce the essential components and skills of each discipline. Leading academics and design professionals work with the students providing a ‘real world’ research application. Students work individually and in teams as part of this industrial organisation and design policy research and development structure. Ultimately, students achieve a greater level of understanding of the professional world, as well as a comprehensive awareness of academic research. According to the course directors, students learn to become design specialist generalists able to more easily adapt and integrate within a rapidly changing industry than their single discipline peers.

UCE believe written research is an essential exercise in developing deeper knowledge. The dissertation component of the Design Management course is regarded as a significant asset in this mode B approach.

However, it is in industry where practice takes precedent over theory. Well-established research models are used as practical methodologies in knowledge acquisition. Knowledge transfer partnerships (KTP’s) are an instrumental mechanism through which specific research information is achieved that not only benefits the student but also the industry investigated. Thoroughly examining the design manufacturing industry from every angle is the function of this mandatory policy audit module for both courses. The KTP reflective learning experience allows the student to extensively investigate and understand the design learning history, as well as design organisation and company policy. This process makes the implicit explicit. The fact that many of the Design Management students study part-time while working in specific design industries, over eighteen months through an innovative learning contract, underlines the practical value of this taught module. UCE also employ a staff member specifically to help develop KTP opportunities for their students.

Learning Outcomes

Both courses at UCE focus on developing comprehensive design understanding in a commercial and industrial context. This approach is holistic moving away from individualism to-
Research education

Towards multidisciplinary knowledge and skill acquisition. Reflective practice provides deeper knowledge through applied research. UCE foster analytical thinking by taking a non-linear approach. They achieve a balance between innovation and manufacturing viability. The students learn why and how things are made, as well as what factors influence design production. Therefore, a complete understanding of the design process is achieved through this mode B approach.

While the use of 3D Studio Max and Power Point helped to generate tremendous design options in virtual reality, one apparent weakness in the product design course is the lack of three dimensional design objects. The exciting post-optimal product computer illustrations did dramatically push design boundaries. The fluency, immediacy and idea expansion achieved in design development with the computer tool is extremely appealing. However, like the first four multidisciplinary programmes researched, a better balance between the real and the implied needs to be struck to satisfy my traditionalist values. Perhaps, this situation is partly the result of the intensive nature of the twelve-month course and the need to rapidly move ideas. What would happen if the Product Design Masters were twenty-four months instead of just twelve?

Conclusion

A complete understanding of the design process, which enables the student to make a meaningful contribution to art and design, must be the true measure of all the taught mode-B multidisciplinary programmes. Academics must also be extremely aware that they are teaching students who seek employment in the design industry. Ultimately, this should also be the goal of self-directed mode-A programmes.

My research highlights two distinct approaches to design education. One direction explores social and ethical design interaction. The other path investigates design development, but also industrial manufacturing, organisation, and policy. Although there are times when ideology converges, a sliding scale of importance with regard to educational relevance and prerequisite subject matter exists in each of the programmes researched. At one end of the spectrum students experiment with design in the context of scenario creation, experience and humanitarianism. At the other end of the scale there is design in the context of commercial realism, research and development in manufacturing, and design industry survival. Both philosophies are valid, illustrating the complexity of design and design education where finding the appropriate direction to follow is not straightforward.

However, I would signpost a number of locations that must be explored to achieve considerable design awareness and understanding. Contextual design studies are an essential component in any postgraduate research. Future designers will work in environments far beyond the familiar single discipline, individualistic, terrain they navigate today. Clearly, designers are now required to help interpret multiculturalism in an increasingly technological era. To be fully equipped for this responsibility, it is incumbent on educators, students, and the design industry to search for deeper knowledge and understanding through curriculum development and collaborative initiatives. From my reconnaissance, it is evident that multidisciplinary contextual examination and team design research assignments better prepare designers for an industry that requires multi-tasking abilities in a rapidly changing world. Therefore, contextual inquiry must be included on the design curriculum. In addition, modules in design research methods, conceptualism, and professional practice, including creative writing, should be provided to sustain the necessary holistic vision.

Knowledge transfer partnerships are an essential element in the professional training of students. It is imperative that our students directly gain design industry work experience. KTP’s
ensure that academia develop a curriculum that has relevance and futurity. Sustaining design innovation and knowledge acquisition through academic and industrial collaboration is mutually beneficial. Industry benefits in numerous ways through academic experimentation, technical development, and access to non-commercial lateral thinking. Universities can benefit by availing of industrial manufacturing technology that is often beyond the constraints of most academic facilities and budgets. Computer aided design and computer aided manufacturing are two good examples of highly expensive but crucial technical skill bases required by many design industries. Therefore, through design research and development programmes, well-structured KTP’s can address deficiencies identified in both academic and industrial company profiles. They can also better position the academic institution for essential seed funding and investment.

My recommendations address research areas that circumnavigate both the academic and industrial design world creating deeper design knowledge. Postgraduate design education now requires a more encompassing but relevant approach that provides required design literacy. Contemporary designers must decipher, discern, and form opinion on issues that question their role and that of design in the twenty first century. Accordingly, design colleges must now look to disciplines beyond design. Anthropology, ethnography, and the social sciences offer new insight for reflective design practice. In addition, the strident progression of new technology and new materials significantly influences future design education. Mechanisms to embrace and pioneer change must be found.

Design education has always been about context but today this agenda identifies one that is increasingly more orientated towards people. Therefore, our design education itinerary should include both social and ethical provision and reflect on the wider implications for industry. Design Experience should be investigated by exploring design interaction and how design can be used to provide more meaning. Taught programmes, including multidisciplinary courses, are enormously influential because they create the required topography to foster ideological perspective. Developing a reflective cross discipline research culture and learning organisation within the design faculty, that can interface with the design industry, should be seen as academically essential. However, you do not need to establish a multidisciplinary masters programme to achieve this dynamic, it should already exist.

As we search to find design direction on the journey from mode A to B, establishing a creative educational compass must now be seen as a priority for both design education and industry.
GROUP PROJECT WORK: PROFESSIONAL PRACTICE OF FORMAL AND INFORMAL KNOWLEDGE CREATION AND EXCHANGE

Aukje Thomassen, Utrecht School of the Arts, The Netherlands

Introduction

This paper elaborates on how to sustain and exchange knowledge creation through design research practices within design education. The didactic model of group project work provides a conceptual framework which unravels the knowledge creation processes in terms of design learning in a formal and informal way through each participative level.

The Learning Process

Institutions in higher art & design education are by nature organizations which value learning and creativity. Education and knowledge creation is the core business of these organizations. As such, it is quite remarkable how poorly developed the notion of knowledge creation through research is at an institutional level. Although educational facilitators put lots of energy at enabling knowledge creation and facilitating learning at a student level; few organizations have developed a knowledge vision on how they can enable knowledge creation within research processes at an institutional level.

The challenge of any evolving field is to bring tacit knowledge into articulate focus. This creates the ground of shared understanding that builds the field. [Friedman 2000]

The new approach; the exegesis approach, gave the institution the wanted insights of research which addresses this stated issue on both a theoretical and practical level within the EMMA [European Media of Arts] and the PhD in Design program.

In art education, learning is considered from a constructivist point of view: “Learning is a process of creating knowledge” [Weick, 1991]. This definition of learning implies that knowledge is both the input of a learning process as well as the output of a learning process. Learning, perceived as a cyclic process, involves three types of learning activities: following a concrete problem or task students are triggered [A] to collect relevant information, [B] to process & synthesise this information and to [C] create and evaluate solutions for the initial problem or task [Renger, 2000].

When the learning process is observed from this angle, and it is part of the culture of the institution to value the learning process of the student as an important aspect to monitor [instead of focussing on output alone], this poses new challenges. One of these challenges, in the light of supporting the process, is keeping track of that process, and maintaining a fair and rigorous assessment process based on evidence delivered by the students.

To be effective, designers can no longer focus simply on the narrow domains of specific applications. They must increasingly reach deeper and more broadly into the foundations of design, and they must understand more about the cultural contexts in which their designs are created and used. They are now called upon not only to produce new products but also to manage the processes by which the products are produced. They must also understand more about the ways products are used and the people who use them, about how to involve users in a design process, and about how to evaluate designs based upon usage. In addition, more than ever before, designers are required to investigate and articulate the principles and methodology behind the designs through systematic research, experimentation, intellectual inquiry, and theoretical speculation. They are also expected to communicate their findings
and contribute to a body of knowledge that constitutes the basis for an emerging academic discipline and a true science of design. [Design Vision; Proposal for a School of Design at the University of California, Irvine November 2002]

Utrecht School of the Arts: Setting the Scene

Utrecht School of the Arts [HKU] is one of the largest institutes of higher education for art and culture in the Netherlands. The school consists of five faculties, which together offer around 100 courses. The Utrecht School of the Arts offers courses within the area of Visual Arts and Design; Music; Theatre; Art, Media & Technology; Art & Economy.

The Utrecht School of the Arts aims to provide an exceptionally high level of the education; each educational facilitator [teacher, supervisor, tutor] - in whatever faculty - is a highly driven expert in his or her specialist area. It is within this context, the Utrecht School of the Arts is focussed at imparting sufficient knowledge and experience to students to enable them to flourish in the world of art and design.

The approach as discussed in this paper is being applied and educated within the European Media Masters of Arts. The MA in European Media [EMMA] is a master program for young professionals with a multimedia background who want to extend their technical and theoretical scope towards a master degree. The programme has been validated by the Open University, London.

Group Project Work

In this module of the EMMA the development of (multi)media- & music-productions is the key strategy for acquiring professional skills and attitudes. The end-product of the module should be a client approved, state-of-the-art application or creative artefact or project portfolio. These end-products have to be made either as a team effort, with different members of the group taking different roles and responsibilities, in a manner which reflects current industrial practice. The goal of the project is for students to enrich their professional practice with formal and informal knowledge as in being part of a multidisciplinary team and as in applying project management skills, design skills and theoretical knowledge into a coherent state of the art design meeting the client requirements.

role of knowledge in design: formal and informal knowledge

The group project’s main focus is on enabling knowledge creation processes by the creation of an artefact within a professional setting. It is this central position of the artefact which evokes processes that enable learning and as such knowledge creation.

Practice tends to embody knowledge. Research tends to articulate knowledge. The knowledge creation cycle generates new knowledge through theorizing and reflection both. [Friedman, 2000]

Within the setting of group project work formal and informal knowledge is being created and shared. First of all more specification is required in order to identify the meaning and effect of formal and informal knowledge. On the pedagogical level the group project can be classified as experiential learning in which problem solving plays a central role. The knowledge created occurs outside the traditional setting of classroom-based education. Students practice their profession within a real context such as experiencing professional practice, building up an understanding and reflection of social practices and group dynamics and finally develop their
design skills. Explicating the group project we see that it enables students to experience skills and attitudes both formal and informal:

Formally students learn:
- to be prepared for the complexities of multidisciplinary projects and the necessary management skills to successfully complete a project of that kind
- design and development skills such as usage of software
- to develop an understanding of management procedures to complete all phases of project management form original concept development through to delivery and debriefing.
- to conduct self directed research, both applied and theoretical, at M-level
- to explore a full range of research methods and technological applications with relevant case studies comparing and evaluating their application in the field of Multi-media.
- To reflect on the relevance and applicability of theoretical and models and insights in their creative practise, and to bring theory and practise into meaningful resolution.
- to structure and sustain a coherent self-directed contribution to complex externally assigned project(s) over an extended period of time
- to manage and co-ordinate their own skills and those of others in a manner which delivers results which are both innovative and practical.

Informally they learn:
- to work in multidisciplinary teams and deal with their group dynamics
- to balance their personal desires in their designs vs. the wishes and requirements set by the client and the context
- to develop the critical self-reflection needed to continuously question underlying assumptions of any proposition or assignment set by the context or the client.
- to take an informed position on the meaning and status of research in the context of multi-media
- to be able to discuss and present research concerns and interests employing an appropriate level of knowledge and references
- to develop the skills of sharing critical dialogues and conducting debate around a variety of specialisms
- to develop and reflect upon their personal professional practice by their dialogue with the industry

And as an institute we strive for:
- providing the students with the skills and resources needed to successfully resolve a complex externally sourced assignment(s) which closely mimics future complex work situations in a safe but rigorous learning environment.
- developing the skills needed interrogate assumptions underlying a given assignment with an intensity sufficient to lead to innovative outcomes and a more developed subject area discourse.
- understanding a variety of the project models and methodologies including tasks, roles and responsibilities required to successfully resolve projects of this complexity.
- providing for a multidisciplinary environment in which successful cooperation with people from other disciplines and backgrounds is vital for successful completion of the projects.

In the end the required learning outcomes for the students are both from a formal and informal order: They will be competent to professionally deliver a client approved and state-of-the-art end-product. This end-product is the result of multidisciplinary team effort and responsibilities which reflects current industrial practice.
Requirements for the Group Project Work

The problem-solving oriented didactic approach Group Project Work can only be operated under certain constraints and requirements. The following diagram illustrates the requirements necessary for the above articulated objectives:

```
+------------------+
|                  |
|                  |
|  context         |
|                  |
| researc          |
|                  |
| design & development |
```

Each group project work has the same point of departure: the end-product of the module should be a client approved, state-of-the-art application or creative artefact or project portfolio. It enhances the creative practise through informed dialogue with theory and its implications for design, production processes and making. This requirement demarcates the context in which the artefact is created. The client will brief the students what is required:
- Which techniques and/or platform is required, eg. games, film, web application
- Which target group audience, eg. the users
- Which aims and objectives, eg. for which purpose

From hereon the students will start their research [Frayling, 1993]:
- research into the design of the artefact, its technical objectives, its targetgroup audience, its aims and objectives
- research for the design of the artefact, user design related issues such cultural diversity
- research through design of the artefact, iterative prototyping (learning by doing)

This strand is especially designed to support the student in conducting supportive research underpinning the practical projects, as well as providing the student with the necessary tools and insights to undertake the research required in their project.

This closely relates to the core of the education, Design and Development. All the projects are characterized by a research and context driven design approach. This model incorporates formal and informal knowledge.

knowledge transfer: enabling knowledge creation

In parallel to the group project work the institute also focusses on what enables these processes and how we as an institute can foster these new creations in order to support the exchange of these. It can be said that the enabling learning processes is the core business of institutions of higher education [Thomassen, 2001]. As such universities have developed a range of services [libraries, campuses, ICT-systems] and hired competent staff to enable and stimulate learning and knowledge creation. Krogh, Ichijo and Nonaka [2000] have defined key enablers, which promote learning:
- Creating the Right Context
- Managing Conversations
- Globalising Local Knowledge

These concepts, although from the knowledge management discourse, are highly applicable in the above articulated model of the group project work approach towards learning and the role of the artefact.
Creating the Right Context
Effective learning depends on an enabling context, which can foster ideas and facilitate the articulation, creation and evaluation of learning experiences. As such the “whole process of knowledge creation requires the necessary context or “knowledge space”. Creating a ‘right context’ is crucial to student-centred learning and typically requires the institute to initiate a learning process by stating a problem or assignment. By offering the students a formal assignment from the industry a context is created and the student will be enabled in its knowledge creation. Furthermore the associated workflow of the group project work approach [from concept to end-product] is supported by contextual supportive studies such as the Methods of Research and Project Management.

Managing Conversations
Educational facilitators in student centred education often apply the beneficial effects of conversation on individual learning processes. In coaching student groups educational facilitators often rely on conversations for the purpose of stimulating intellectual effort, promoting the articulating of progress and structuring the workflow. These Socratic dialogues stimulate students to articulate the knowledge and learning experiences acquired and promote critical reflection. [Thomassen et al, 2001] The students are supported by their domain related supervision involving both a project supervisor and process supervisor. It is within this manner the group project work can fully flourish as both supervisors keep a close watch on relevance and connection to the assignment, the quality and creative innovation of the end-product.

Globalising Local Knowledge
Critical to the quality of learning processes is the flow of information between students, educators and the institute. Supervisors require access to articulated learning experiences to enable coaching or evaluation of student-users. Peer learning can be promoted by enabling the exchange of learning experiences within and between student groups. Furthermore, the institute may require the collection of research papers, concepts, project plans and the final end-product. As a consequence the institute requires the students to upload and share the articulated experiences formal and informal: as in uploading formal deliverables but also informal logs elaborating on their (personal) experiences. So both articulation and reflection on local knowledge will be globalised with the usage of an E-learning environment. And can therefore be shared, created and exchanged.

Case study: DEMOR joins the forces

Demor is a location based 3D audio shooter. This highly innovative game was developed by a multi-disciplinary team of seven EMMA-students for the Bartimeus Institute for the visually imparted. Demor does not only focus on the entertainment aspect of computer gaming, but also attempts to contribute to the emancipation of the blind and visually impaired people in order to enhance their integration with the ‘sighted’ world. It is a proof of concept developed on the basis of theoretical and practical research. (DEMOR, 2004)

If apply the design triangle on the DEMOR case we see that:
- **Context**: the Bartimeus Institute for the visually imparted demarcated the assignment given to the students. Therefore the students could develop and create a concept within the constraints of the institute and which type of users it represents. In other words clarification was given on the technology to use, the targetgroup audience, the purpose of the game.
- **Research**: the outcomes of the research can be characterised within three interlocking areas and accordingly gave both the students and the institutes highly desired insights into the targetgroup (visually imparted kids), the technique (audiogame), the purpose of the artefact (entertaining game), the design and development (audio game develop-
Research education

...ing, location based techniques). research for the design of the artefact, user design related issues such cultural diversity
- Design and Development: the core of the project triggered the students to broaden and deepen their skills as designers, developers and project management. The project enabled them to upgrade their portfolio and their professional skills and attitudes. It also provided them a position as a designer/developer/manager in the highly competitive field of professional practice.

The institute gained insights into their target group audience, into techniques to use for this particular group, essence of the game and extra attention and awareness for this matter.

Conclusion/Openings

The group project work approach originated as a response to traditional approaches for design learning. An important focus of the approach is the ability to enable knowledge creation and exchange. This is where concepts and ideas from the field of knowledge management appear to be highly applicable to an educational setting. We believe as an institute that the active actors in the process of design created knowledge so highly necessary and required for this innovative field of design. Working in close contact with the professional practice we can offer students and the industry a platform on which innovation, creation and experience are priority.

The requirement model for a fruitful practice of the group project work demarcates the design and research area into three interlocking areas, research, context and design. And accordingly help students and educational facilitators to create and articulate their retrieved knowledge through all the ranges of this full design cycle: education and industry.

References:

Frayling, C., Research in Art and Design, Royal College of Art Research Papers, Vol.1 No.1, London: Royal College of Art, 1993
Friedman, K., Creating design knowledge: form research into practice, In: IDATER 2000, Loughborough University, United Kingdom
University of California, Design Vision; Proposal for a School of Design at the University of California, Irvine November 2002