Uniped årgang 37, 2/2014, side 44–57

Artikkelen er vitenskapelig vurdert av forskere utenfor redaksjonen

Av André Liem og Johannes B. Sigurjonsson

Positioning Industrial Design Education within Higher Education: *How to face increasingly challenging market forces?*

André Liem
Associate Professor, Norwegian University of Science and Technology, Department of Product Design.
E-post: andre.liem@ntnu.no

Johannes B. Sigurjonsson
Associate Professor, Norwegian University of Science and Technology, Department of Product Design.
E-post: Johannes.sigurjonsson@ntnu.no

Abstract
This paper discusses how Industrial Design Education should be adapted to pressing future challenges of higher education with respect to promoting high quality mentorship and scholarship, as well as being more economically self-sufficient through stronger collaborative engagements with industry. The four (4) following trends will be presented on how prospective design programs are to be developed: (1) Mass-education and rationalisation, (2) Links between education and research, (3) Globalisation and internationalisation, and (4) Collaboration with industry and research commercialisation.

Given the challenges of market forces within academia, a consensus within the design education community should be established in order to expose students more to "active learning" and to vice-versa commute from generic to specialist and from abstract to concrete modes of working. Comprehensive and collaborative studio projects should be implemented as platforms, where social, interdisciplinary and inquiry-based learning can be developed in line with selected design themes, processes and methods.

1. Introduction

Market forces have challenged higher education to adapt to emerging trends such as the increasing mobility of students and scholars, the movement of academic programs and institutions across borders, the extraordinary impact of technology, and above all massification (Altbach et al. 2009). Massification, which is a trend towards broader post-secondary participation (Altbach et al. 2009), can be accredited to the following phenomena (Gibbons, 1998):

- Democratisation of politics and society
- Growth of the public sector and industrial economies requiring more highly skilled and educated workers

 Citation: *Uniped* 2014, **37**: 23519 - http://dx.doi.org/10.3402/uniped.v37.23519

- Widespread belief that economic development should thrive on a supply of educated manpower, especially scientists and engineers
- Education itself as an important asset to sustain and legitimise democracy in new welfare states.

Although ''massification'' is inevitable and may lead to greater social mobility for a growing segment of the population, new patterns of funding, increasingly diversified higher education systems and other positive tendencies (Altbach, 2007), it may also bring about an overall lowering of academic standards. Furthermore, this concern may widen the disconnect between policymakers and ''classroom teachers'' in higher education, as there was a common understanding that higher education was merely reserved for the elite sectors of a society (Coté and Allahar, 2011).

From a professional practice lens with roots in the visual and plastic arts, it has been debated whether or not Industrial Design should be part of this market-driven massification trend, because of the challenges it is currently facing in its one to one faculty-student relationship in ''Design Studio'' interactions (Scott, 1998). This debate also underlines that traditional design education, which assumed trust and was based upon the apprentice-master model, is changing and becoming more explicit and formal (Trathen and Varadarajan, 2009).

Given these global educational developments, design institutions are challenged to choose between the paths of University higher education or remain a traditional, practice-driven design school. Both directions carry consequences in terms of the type of student intake, students′ employment prospects, funding, academic activities of faculty, and so on.

Dependent upon the aims of respective design institutions, this article discusses how their design education should tailor its teaching and research strategies with respect to the ambitious and professionally conflicting requirements from higher education and research.

2. Literature Studies

Academic capitalism is a regime in which colleges and universities engage in market and market-like behaviours with the objective to generate revenue from their core educational, research and service functions, ranging from the production of knowledge (such as research leading to patents) created by the faculty to the faculty's curriculum and copyrighted teaching materials (Slaughter and Rhoades, 2004). As predicted by Kjeldstadli (2010), ''*Academic Capitalism in a New Economy*'' will have an implication on selected global trends in higher education, especially with respect to design education. The following selected global trends will be discussed in section 3:

- Provision of mass-education and rationalisation
- Increased links between education and research
- Globalisation of higher education
- Increased collaboration with Industry and research commercialisation

Section 4 presents more specific literature studies on design education with a focus on how educational, creative and explorative activities in design are to be adapted to the competitive and entrepreneurial requirements of University research and education.

In the discussion section (section 5), comparisons are made between the overall the University research and education arena on one hand and the design education arena on the other hand with respect to the four global trends. Besides this, recommendations are introduced on how to efficiently balance economic viability and quality in design research and education. Figure 1 illustrates the scope of research.

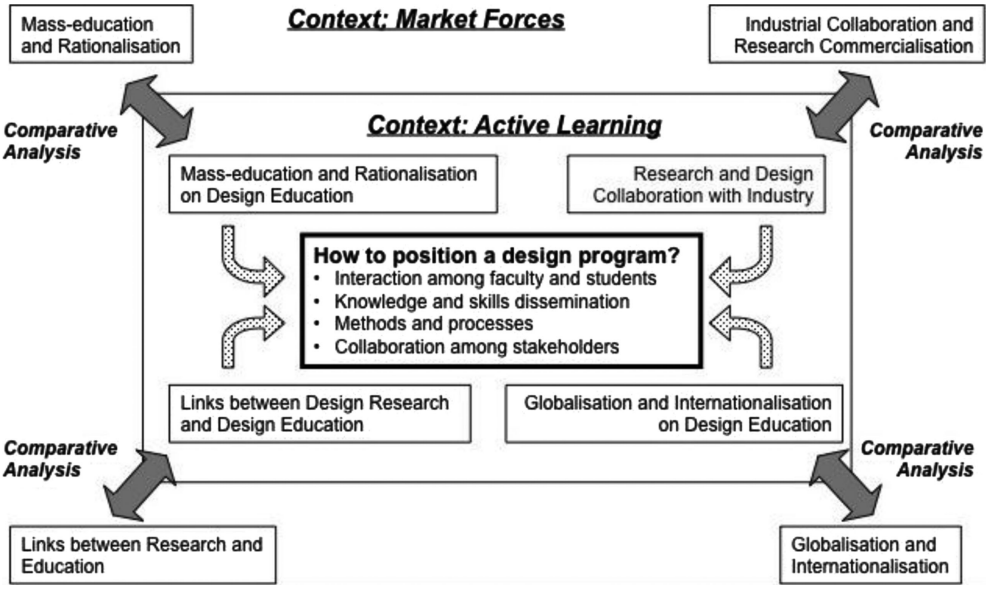

Figure 1. Research scope - A comparative analysis within the context of "market forces" and "active learning" with the objective of positioning a design program

3. Future trends in higher education and research

3.1. Mass-education and rationalisation

Diversification in the process of expansion in higher education has been a key policy issue since the 1950s when growth of enrolment rates challenged the dominance of teaching and research-oriented universities (Teichler, 2010). In the past few decades, it has fundamentally transformed the higher education system worldwide. Differentiated academic systems have emerged, with various institutions serving quite different purposes and roles within each country. Participation in post-compulsory education has expanded exponentially throughout the world during the last several decades from 19 percent in 2000 to 26 percent in 2007 (Altbach et al. 2009). Hereby, it was suggested that higher education was

likely to diversify in its expansion process in order to protect the traditional functions of ''elite higher education'' amidst ''mass and universal higher education'' (Trow, 2006). However, Trow (2006) argued that most nations will move toward mass or universal participation in post-secondary education. Entry rates in higher tertiary education in the OECD member countries have increased from around 10% in 1960 to 45% at the end of the 20th century, whereas graduation rates were on the level of 25% on average (OECD, 2007). For example, in Norway, Finland and the United States – preparation for all occupations ''above'' manual skilled labour is on the way to be provided by higher education, where an enrolment rate of about 70% is seen as appropriate (Teichler, 2003).

3.2. Links between research and education

According to the core values of classical European University education, which is embodied in the ''Humboldt'' model (Bloom, 2005), there is no border between teaching and research. They are complementary and overlapping activities in knowledge creation and interpretation (Williams, 1991) (Kjeldstadli, 2010). However, strong opinions have existed for many years denouncing the affinity between teaching and research (Feldman, 1987). For example, the Leverhulme Report claims that doing research does not improve someone's teaching (Williams and Blackstone, 1983). Furthermore, first-rate teaching also occurs in higher education institutions in which most of the staff pursues very little research; this is still the case in many polytechnics and colleges. Conversely, excellent research can exists in the absence of undergraduate teaching. As such, research and teaching need to be operationally redefined into scholarship and mentorship, perceived as a more global and long-term commitment, and determined by *discovery, integration, application,* and *knowledge transfer* (Boyer, 1990) (Liem 2008). Typically suitable for the education of professional design practices, a mentoring relationship comprises of more personal, closer relationships that demand time, commitment and a level of emotional engagement (Bhagia and Tinsley, 2000).

3.3. Globalisation of Higher Education

Universities are considered international institutions attracting students and faculty from many countries. However, limited by their capacity, these institutions of higher learning were not always able to compete in practical terms during the last half-century. (Dill and Sporn, 1995).

Recently, changing demands in the workplace, driven by European integration, global market forces and technological advancement, have triggered universities to compete again, but differently, by integrating the international dimension into their research and educational frameworks (Enders, 2004). Hereby, postgraduate education and continuing professional development became an increasingly important vehicle for attracting financial resources. For example, the numbers of students registering for part-time studies, opportunities for distance learning, and the establishment of branch campuses have increased considerably (Jeffries, 2007).

The challenges of internationalisation or globalisation in higher education are two-fold:

- To meet the demands of developing countries who are searching for means to support the further expansion and ''nationalisation'' of their higher education system (Moja and Cloete, 2001).
- To generate opportunities for higher education institutions in industrialised countries to be more market oriented in an integrated world economy, with respect to knowledge transfer and manpower development, IT, increased mobility for students, faculty, programs, and providers.

Operationally, commercial advantage within an international context can be achieved through several activities, including brand building, knowledge and language acquisition, and curriculum enhancement with international content. Specific initiatives such as the establishment of branch campuses, exchange agreements, programs for international students, English-medium programs and degrees have also been implemented as part of internationalisation measures (Altbach and Knight, 2007).

3.4. Increased collaboration with industry and commercialisation of research

On-going globalisation has made governments even more aware of their competitiveness, increasingly relying on universities to become an integral part of the national or regional innovation systems and a critical component of the evolving triple helix, where these universities, governments, and industries change their roles through interaction (Etzkowitz and Leytesdorff, 1997). This has resulted in University-Industry engagements, which extends beyond intellectual-property (IP) licensing or start-ups, facilitating improved collaborative performance in terms of innovation and economic development (OECD, 2007).

Within such a context, research-intensive universities are no longer expected to work in isolation; rather, they are perceived to be interactive players who work closely not only with industry but also with community and government.

4. How industrial design education should adapt to future trends in higher education

Since the introduction of a scientific approach in design at the Ulm School, the traditional view of the designer as a creative genius or stylist is changing. Based on acquired ''Active'' and ''Problem-Based Learning'' (PBL) skills and attitudes the designer is currently perceived as a team member, interpreter of complex systems, communicator and problem solver (Roth, 1999). This chapter discusses on how instructional methods can be introduced into the classroom that increase conceptual understanding among students (Prince, 2004), encourage independent thinking about ''real-world'' projects and complex problems within certain contexts, and motivate them to collaborate (Jorgensen et al. 2001).

4.1. General required competencies of industrial designers

According to Yang et al. (2005), a comprehensive Industrial Design education program should at least educate students in three categories of competency: 1) generic attributes, such as problem solving, communication skills, and adaptability to rapid changes; 2) specific

industrial design skills and knowledge, including design thinking and design process, design methodologies, graphical representation and communication skills, knowledge of product development processes, manufacturing, materials and processes, design management, environmental awareness, and model making; and 3) knowledge integration, for example strategies of system integration. In addition to the above-mentioned skills, other skills should also be emphasised, such as negotiation with clients (Lewis and Bonollo, 2003), project management, and communication (Sigurjonsson and Holgersen, 2010).

The expansion of required competencies have enabled designers to play a more critical, integrative, and active role in the product development process (Sethia, 2001). However, in high- tech industries, increasingly complex technologies coupled with more demanding consumers, require specialised designing and design research competencies in order to understand user needs and introduce more user-friendly products or systems. Additionally, a new designer in the 21st century will need to fulfil the roles of innovator, knowledge worker, sustainable entrepreneur, and active citizen concerned with issues of environment, society, commerce, network communication, and so on. (Press and Cooper, 2003).

Considering the demanding and sometimes contradictive competency requirements, it is a challenge not only to improve the faculty's classroom, but also to advance the practice beyond it. Industrial Design education is about educating and preparing graduates for understanding an ever-changing industrial and societal context (Trathen and Varadarajan, 2009).

4.2. Implications of mass-education and rationalisation on design education

Over recent years, higher education (HE) in the United Kingdom has developed towards a mass educational model of provision (Taylor, 2002). From 1995 to 2003, HE in the UK experienced a 39% growth in the number of students on full time and part time courses (UUK, 2004). In many subject areas, this has lead to changes in the Student Staff Ratio. Design and Creative Arts, for example, had a Student Staff Ratio of 1:14.7 in 1994/1995, which increased to 1:20.3 by 2003/2004 for programmes taught at an undergraduate level.

Although the context for HE has changed considerably in comparison to a decade ago, design education still aspires to distinct values and pedagogies that emphasise the need for low Student Staff Ratios, such as project-based enquiry, one-to-one tutorials, small group critiques, and significant quantities of individual formative feedback and guidance (Swann, 2002), (Design Council, 2006). However, to continue as an ''elitist'' type of study may not be economically sustainable. Only a privileged few will be able to survive as stand-alone educational entities, not affected by market forces and developments in HE.

This means that the majority of design programs may need to seek refuge under the umbrella of University higher education, being steered to revise their values and pedagogies in order to cater to the needs of mass- and universal education.

4.3. The Link between design education and design research

Since there is no consensus in the literature on the definition and scope of design research, it is unclear whether design research should follow the model of traditional academic disciplines or seek a new model, based on the intimate connection among theory, practice,

and production (Buchanan, 1996). This dilemma is further complicated due to rapid technology developments, whereby 50% of the skills students learn in schools today will be out of date by the time they are employed, and approximately 70% of the competencies of industrial designers are acquired through on-the-job experience (Schön, 1988), (Lin, 1995). Therefore, design educators tend to place more emphasis on the design process to facilitate continuous learning of new skills and knowledge. These developments have changed and refocused the role of industrial design and industrial design education in the product development process.

Given these circumstances, the goal of educating design students in universities is then to cultivate their abilities in design management, problem solving, lifelong learning and reflective thinking so that they will be better able to adapt to future changes and challenges (Schön, 1988), (Friedman, 2001). This not only implies that scholarly research leads to new knowledge, but also that products and artefacts themselves should be considered a form of knowledge (Frayling, 1993).

Operationally, research-based learning should be advocated through models of scholarship and mentorship (Liem, 2008), emphasising the study of design processes, methods, and behaviours referenced to social, economic and cultural contexts. These studies should then expand the scope of ''designing'' from artefacts to systems and services.

4.4. Implications of globalisation on design education

Globalisation of higher education has led to the exploitation of web-based delivery of post-graduate courses. As exemplified by experiences from The Open University, the use of Information and Communication Technology (ICT) in teaching improved the satisfaction and motivation rate among students by assisting them with their learning and design processes (Tjørve et al., 2010). ICT delivery tools and mechanisms, such as Lynda (2013) and MOOCS (Waldrop, 2013) may relieve the increasing pressure on resources and physical studio space in face-to-face settings, enabling flexible peer support and providing more possibilities for different stakeholders to be physically as well as virtually engaged. Based upon franchising constellations, proper implementation of these ICT delivery tools and mechanisms can positively shape future design education in developing countries, if supported by an experienced design education community (Holden, 2009).

4.5. Collaboration with industry within the context of designing and design research

As the world becomes more interdisciplinary and our students more diverse, design education will need to adequately prepare students by imparting valuable skills on how to collaborate, negotiate, and compromise (Niederhelman, 2001). Connecting subjects, people and disciplines is not only timely in relation to professional trends, but also necessary if design hopes to find itself closer to the centre of the university education model. These challenges require collaboration across various competences, clarity concerning interests and responsibilities, as well as communication within a single organisation, within an organisational ecosystem, and between organisations and a group of (potential) users (Brandt and Messeter, 2004). In addition, a service design orientation has shifted knowledge production to cross-disciplinary,

application driven, non-linear and transient collaboration, expanding the number of research or knowledge actors (Laurillard, 2000).

From a science-based design education perspective, the challenge is to sustain and extend an inquiry-based problem solving attitude linked to effective methods for design development (Friedman, 2001), while at the same time yielding effective outcomes and meeting the economical interests of industrial collaborators. Therefore, an understanding among different social groups and stakeholders should be established about the concept of ''Social Learning'' and Legitimate Peripheral Participation (LPP) (Brown et al., 1989), which is complementary to interdisciplinary teamwork in design projects and research (Rittel and Weber, 1973). Both concepts focus on a dynamic, two-way relationship between people and the social learning systems in which they participate (Wenger 2000). Contextualised around project-based learning, observational learning, imitation, and modelling (Omrod, 1999), novice designers and other stakeholders who are new to the community of design, first become acquainted with the tasks, vocabulary, and organising principles through peripheral activities, before moving on to more complex senior level tasks and responsibilities (Lave and Wenger, 1991), (Brown et al., 1989).

Reciprocally and concurrently, Universities and design schools should implement more flexible and inclusive policies for the ''Social Learning'' environment and for encouraging various forms of industry collaboration and a stronger engagement with the design profession.

5. Discussion

To facilitate a more seamless transfer of knowledge and skills, design departments and University management should be more receptive to social learning principles within communities of practice. The following perspectives have been identified as crucial for strategizing and developing design programs:

- Conscious positioning of the design program by higher management
- Interaction between students and faculty within the context of knowledge acquisition and dissemination
- Influence of models, processes and methods on design programs
- Collaboration within a network of stakeholders

5.1. Positioning of design programs

The commitment to a fixed-term first degree, the transferability of credits, and common criteria for access are only the most visible of the tendencies towards convergence on American models. European systems move in that direction not because the United States is a wealthy superpower or the strong influence of American popular culture, but rather for the following two reasons:

1. American higher education system is simply better adapted, normatively and structurally, to the requirements of a ''post-industrial'' age, which is marked by rapid social and technological change that decision makers in all countries saw the necessity for a wider

distribution of knowledge and skills and therefore a broader access to post-secondary education (Trow, 2006).

2. ''Spiralling Costs'', global economic forces and the increasing burden welfare systems makes it more and more difficult for social-democratic European nations to administrate a sustainable higher education funding system for all. Recent examples showed that Sweden has implemented tuition fees and offers scholarships for students from outside EU/EEA from academic year 2010/2011 onwards (Swedish Institute, 2010), whereas tuition fees to study at English Universities are obligatory for British, EU and Non-EU citizens (The Guardian, 2011).

The rising relevance of research in professional graduate education and interdisciplinary fields is serving as a catalyst for enhanced engagement between research and teaching. However, the search for a higher status by branding themselves as scientific has resulted in a quasi-scientific treatment of theory, when modelled on a positivist conception of natural science. This phenomenon, termed ''academic drift'' by Slagstad (2007), has also intruded into the field of Industrial Design, causing detrimental effects to the identity of its profession.

As it now stands, it is very unlikely that the different views of how Industrial Design should be positioned within the arena of higher learning will lead to a consensus. Presently three types of design schools can be broadly identified. Type 1 includes the art and design schools or 'Kunsthochschule' in German. These schools are not affiliated to any University, usually offering a wide variety of Art and Design Courses. Type 2 design schools are partly independent. They are affiliated to a University, but are administrated and assessed according to different criteria. Examples of such design schools are: Umeå Institute of Design (Sweden), Academy of Arts & Design, Tsinghua University (China), Nanyang Technological University, School of Art Design and Media (Singapore). Type 3 design schools are fully immersed in a University system. They follow the University's rules and regulations concerning teaching and research, whereas the education supporting this research is science or engineering oriented.

In reference to this third type of design schools, there is an on-going debate as to whether designers should be educated as generalists or specialists. The School of Design at Carnegie Mellon University in the U.S. is one example of the generalist-oriented programs, whereas the Industrial Design department at the Technical University Eindhoven (TU/e) in the Netherlands is a prototype for the specialist-oriented model. By multiple broad curricula and the interdisciplinary collaboration with the departments of engineering, management, and social science on campus, the former may educate design students to have a higher level of generative design expertise (Buchanan, 2000). The latter is based on the educational goals of 'competency-based learning' and where the student executes specific design projects and upholds intensive contacts with industry within a simulated professional environment (Vinke, 2002).

Depending on the type of design education strategy preferred, faculty and students should decide whether to adopt a scholarly or practical approach for life-long learning and designing

in Universities. This means that design programs should choose between a specialist or universal orientation in how they educate undergraduate and post graduate students with respect to massification trends in higher education.

5.2. Knowledge dissemination and acquisition among students and faculty

Discussions on how to position design programs inevitably challenges higher design education institutions to rethink how they allocate and balance faculty resources in terms of scholarly activities and the dissemination of knowledge. In support of a University-type of design education, Sigurjonsson and Holgersen (2010) argued for a more active engagement of practicing designers in tutoring activities if ''designing'' should remain the core subject of the educational curriculum. This move would then create more time and opportunities for tenure-track and tenured faculty to conduct research. Another suggestion is to have faculty and practicing designers collaborate in the course management, teaching and tutoring. Project management, processes and methods are to be inculcated by faculty, whereas skills, philosophies and experiences from practice are to be communicated by the practicing design tutor.

5.3. The influence of models, processes and methods on design programs

Presently, most design schools advocate a certain worldview, supported by specific reasoning models to support their designing activities. However, as social sustainability and service-oriented design thinking are becoming more important for developing innovative products and experiences, students should be exposed to a broader range of design models, processes and methods. The spectrum for design reasoning embraces both structured processes, such as ''Problem Solving'', ''Normative'' and ''Social'', as well as emergent practices, such as ''Hermeneutics'', ''Reflective Practice'' and ''Participatory''. Being equipped with this basic knowledge about design thinking models (Lie, 2012), the student should be able to select the most appropriate processes and methods for their projects. These processes and methods can either be explicitly structured or remain unstructured.

Furthermore, the understanding of these models, processes and methods will also better contextualise a broad range strategic design and innovation approaches, such as *User-Centred, Design Driven, Technology Driven* and *Market Driven*.

5.4. Collaboration within a network of stakeholders

In collaborative design and research projects, a good understanding of network dynamics is needed to discern prevailing interests and objectives among participating stakeholders. This understanding will enhance the value and outcome of the design project, but also retrospectively contribute to certain self-awareness among students. Design educators should create a social learning and research environment that positively encourages mentorship and scholarship, leads to engaged learning, nurtures a shared commitment and motivation for the ethic of inquiry and intellectual rigour, to the excitement of speculation, creativity and discovery.

At an operational level, the implementation of ''Vertical Studio Teaching'' at various levels of the study program and in collaboration with companies can be seen as a first initiative towards project-based learning within a master/apprentice context (Liem, 2010).

6. Conclusion

Economic imperatives and pressure from University management and external stakeholders are resulting in more selective and restricted funding, with the intention of increasing the rate of return on investments in higher education (Ramsden and Moses, 1992). Somehow, this may endanger an integrated approach towards research and education. Even in Norway, where institutions of higher education are very well state supported, research and teaching have become more separate. Market forces determine that Universities are allocated state funding based on numbers of students passing exams, whereas research funding is to be applied for at research councils on increasing competitive terms (Kjeldstadli, 2010).

The distinction between research and teaching challenges the positioning of Industrial Design education in the ''Corporate World'' of higher learning and research. This challenge should be addressed by how models, processes and methods are to be taught in relation to knowledge dissemination, acquisition, design practice, and collaboration. Based on a network of pre-selected stakeholders, and their level of involvement and intensity, design students need to be trained to commute from generic to specialist, as well as from abstract to concrete modes of working, and vice versa. In such contexts, comprehensive and complex studio projects should be implemented as platforms, where social and interdisciplinary learning practices can develop in line with selected design, themes, processes and methods.

Re-emphasising design educational roles and resources, it is recommended to establish a team with the following roles and qualities:

- Faculty practicing mentorship and scholarship with the interest of promoting learning and inquiry from a theoretical, collaborative and process perspective (Liem 2008).
- Faculty engaged in management, dissemination and promotion of their design programs beyond the ''Physical home-based studio environment'', by capitalising on media technologies for distance education.
- Professional designers, who can contribute in skills development and share design experiences from practice, using a ''design thinking'' lens.

On a final note and within the context of Systems Thinking, Social Learning and Legitimate Peripheral Participation (LPP), students, educators and companies operating within the field of Industrial Design should be jointly engaged in a collaborative network of mentorship and scholarship to face the challenging market forces in higher education.

References

Altbach P. G. (2007). ''The logic of mass higher education''. P. G. Altbach (Ed.), *Tradition and Transition: The International Imperative in Higher Education*, Netherlands, Sense Publishers. 3–22.

Altbach, P. G. & Knight, J. (2007). ''The Internationalization of Higher Education: Motivations and Realities''. *Journal of Studies in International Education*, *11*(3–4), 290–305.

Altbach, P. G., Reisberg, L. & Rumbley, L. E. (2009). ''*Trends in Global Higher Education: Tracking an Academic Revolution*''. A Report Prepared for the UNESCOWorld Conference on Higher Education Published with support from SIDA/SAREC.

Bhagia, J. & Tinsley, J. A. (2000). ''The mentoring partnership''. *Mayo Clinic Proceedings*, *75*, 535–537.

Bloom, D. (2005). Raising the pressure: Globalisation and the need for higher education reform. In G. Jones, P. McCarney & M. Skolnik (Eds.), Creating knowledge: Strengthening nations: The Changing role of higher education (pp. 21–41). Toronto: University of Toronto Press.

Boyer, E. (1990). ''*Scholarship Reconsidered: Priorities of the Professorate*''. Princeton, New Jersey. The Carnegie Foundation for the Advancement of Teaching.

Brandt, E. & Messeter, J. (2004). ''Facilitating collaboration through design games''. *Proceedings of the eighth conference on Participatory design: Artful integration: interweaving media materials and practices*, *1*, 121–131.

Brown, J. S., Collins, A. & Duguid, P (1989). ''Situated Cognition and the Culture of Learning''. *Education Researcher*, *18*(1), 32–42.

Buchanan, R. (1996). Book review: ''Elements of Design''. Design Issues, *12*(1), 74–75.

Buchanan, R. (2000) ''The problem of character in design education: liberal education and professional specialization'' *In International Design Education Conference Reinventing design education in the university*.

Coté, J. E. & Allahar, A. (2011). *Lowering higher education: The rise of corporate universities and the fall of liberal education*. Toronto: University of Toronto Press.

Design Council, Creative & Cultural Skills, (2006). ''*Creative & Cultural Skills, Design a new design industry: design skills consultation*''.

Dill, D. D. & Sporn, B. (1995). 'The Implications of a Post-industrial Environment'. In D.D. Dill & B. Sporn (Eds.), *Emerging Patterns of Social Demand and University Reform: Through a Glass Darkly*. Oxford: Pergamon Press.

Enders, J. (2004). ''Higher education, internationalisation, and the nation-state: Recent developments and challenges to governance theory''. *Higher Education*. Vol. 47. pp. 361–382. Kluwer Academic Publishers. The Netherlands.

Etzkowitz, H. & Leytesdorff, L. (1997). *''Universities in the Global Economy: A Triple Helix of academic-industry-government relation''*. London: Croom Helm.

Feldman, K. A. (1987). ''Research productivity and scholarly accomplishment of college teachers as related to their instructional effectiveness: a review and exploration''. *Research in Higher Education*, *26*, 227–297.

Frayling, C. (1993). ''Research in Art and Design''. *Research Papers*: Vol 2. London, UK: Royal College of Art.

Friedman, K. (2001). ''Design education in the university: Professional studies for the knowledge economy. Re-inventing design education in the university''. *Proceedings of the Perth Conference*. School of Design, Curtin University of Technology: Western Australia. pp. 14–28.

Gibbons, M. (1998). ''Higher Education Relevance in the 21st Century''. UNESCO World Conference on Higher Education, Paris, France. Association of Commonwealth Universities.

Holden, G. (2009). ''Design at a Distance''. *In: Creating a Better World. Proceedings for the 11th Engineering and Product Design International Conference*: Brighton, 2009. (The Design Society and Institution of Engineering and Designers).

Jeffries, K. K. (2007). ''Diagnosing the creativity of designers: Individual feedback within mass higher education''. *Design Studies*, *10*(5), pp. 485–497.

Jorgensen, J. E., Mescher, A. M. & Fridley, J. L. (2001). ''Industry collaborative capstone design projects,'' *International Conference on Engineering Education*, August 6–10, Section 7B6-12 – 7B6-17, Oslo.

Kjeldstadli, K. (2010). *Akademisk kapitalisme*. Forlaget Res Publica. 1. utgave, 2. oppslag.

Laurillard, D. (2000). ''Students and the curriculum''. In P. Scott (Ed.), *Higher Education Re-formed*, s. (133–153). London: Falmer Press.

Lave, J. & Wenger, E. (1991). ''*Situated Learning: Legitimate Peripheral Participation*'', Cambridge University Press.

Lewis, W. P. & Bonollo, E. (2002). ''An analysis of professional skills in design: implications for education and research''. *Design Studies*, *23*, 385–406.

Lie, U. (2012). ''*Framing an Eclectic Practice; Historical Models and Narratives of Product Design as Professional Work*'' (Ph.D. dissertation). Department of Product Design, Faculty of Engineering Sciences, Norwegian University of Science and Technology, Trondheim.

Liem, A. (2008). ''Developing a win-win mentorship-scholarship, higher education model for design through collaborative learning''. *UNIPED (Tromsø)*, *31*(3), s. 32–45.

Liem, A. (2010). ''Planning and early implementation of vertical studio teaching based on a systems design approach''. *Proceedings of the 12th International Conference on Engineering and Product Design Education ''New Paradigms and Approaches''*, pp. 143–149. *(The Design Society and Institution of Engineering and Designers)*.

Lin, H. L. (1995). ''An identification and validation of competencies for industrial designers in Taiwan'' *Proceeding of 10th National Technological and Vocational Education Conference*. Category of industry VI, pp. 259–270.

Lynda (2013). ''Start Learning Today''. Retrieved from http://www.lynda.com/18B

Moja, T. & Cloete, N. (2001). ''Vanishing borders and new boundaries''. In J. Muller, N. Cloete, & S. Badat (Eds.), *Challenges of Globalisation. South African Debates with Manuel Castells*, s. 244–270. Cape Town: Maskew Miller Longman.

Niederhelman, M. (2001). ''Education through Design''. *Design Issues. Vol. 17*, No. 3. pp. 83–87. The MIT Press.

Ormrod, J. E. (1999). ''*Human Learning*'' (3rd ed.). Upper Saddle River, NJ: Prentice-Hall.

Organisation for Economic Co-operation and Development OECD, (2007). The Assessment of Higher Education Learning Outcomes. *Higher Education and Regions: Globally Competitive, Locally Engaged*. Paris.

Press, M. & Cooper, R. (2003). *''The design experience: the role of design and designers in the twenty-first century''*. UK: Ashgate Publishing.

Prince, M. (2004). ''Does active learning work? A Review of the research''. *Journal of Engineering Education*, *93*(3), 223–231.

Ramsden, P. & Moses, I. (1992). ''Associations between research and teaching in Australian higher Education''. *Higher Education*. Vol. 23: 273–295. Kluwer Academic Publishers. Netherlands.

Rittel, H. W. J. & Webber, M. M. (1973). ''Dilemmas in a General Theory of Planning''. *Policy Sciences*, *4*, 155–169.

Roth, S. (1999). ''The State of Design Research''. *Design Issues*, *15*(2), 18–26.

Schön, D. A. (1988). ''*Educating the reflective practitioner''*, Jossey-Bass Publishers, London, UK.

Scott, P. (1998). Massification, Internationalisation and Globalisation. In P. Scott (Ed.), *The Globalization of Higher Education*. Buckingham: SRHE & Open University Press.

Sethia, N. K. (2001). ''Generating and exploiting interdisciplinary knowledge in design product development and innovation in the new economy''. *The 2001 IDSA National Education Conference* (CD ROM).

Sigurjonsson, J. B. & Holgersen, T. D. (2010). ''What do they do? A survey of employment and work situation for ''IDE'' candidates''. *Proceedings of the 12th International Conference on Engineering and Product*

Design Education ''NEW PARADIGMS AND APPROACHES''(The Design Society and Institution of Engineering and Designers).

Slagstad, R. (2007) ''*Høyskolen som kunnskapens hus*'', SPS arbeidsnotat nr. 1.

Slaughter, S. & Rhoades, G. (2004). *''Academic Capitalism in the New Economy''*. Baltimore, Md.: The Johns Hopkins University Press.

Swann, C. Nellie is dead Art (2002). Design & Communication in Higher Ed. Vol. 1, pp. 50–53.

Swedish Institute (2010). Sweden introduces tuition fees and offers scholarships for students from outside EU/EEA. Retrieved from http://www.studyinsweden.se/Home/News-archive/2010/Tuition-fees-from-2011/

Taylor, J. (2002). ''Changes in teaching and learning in the period to 2005: the case of postgraduate higher education in the UK''. *J. of Higher Education Policy and Management*, *24*, 53–73.

Teichler, U. (2003). The Future of Higher Education and the Future of Higher Education Research, *Tertiary Education and Management Vol. 9*, No 3, pp. 171–185, Kluwer Acad. Publishers.

Teichler, U. (2010). *Diversity of Higher Education. ''International Encyclopedia of Education''*. (3rd ed, pp. 347–353).

The Guardian (2011). Tuition Fees 2012: What are the Universities charging? Retrieved from: http://www.guardian.co.uk/news/datablog/2011/mar/25/higher-education-universityfunding#data

Tjørve, K. M. C., Sutterud, E., Midtskogen, B., Krüger, Å. F., Fulton, N. & Ellefsen, S. (2010). ''The use of technology in teaching: student satisfaction and perceived learning''. *Uniped*, *33*(3), 56–64.

Trathen, S. & Varadarajan, S. (2009). Taking on Australian Industrial Design Education: Current Practice and Future. *In*: *Creating a Better World. Proceedings for the 11th Engineering and Product Design International Conference*. Brighton, 2009. (The Design Society and Institution of Engineering and Designers).

Trow, M. (2006). Reflections on the transition from elite to mass to universal access: *Forms and phases of higher education in modern societies since WWII*. In J. J. F. Forest & P. G. Altbach (Eds.), *International Handbook of Higher Education* pp. (243–280). The Netherlands, Springer.

UUK. (2004) ''*UUK, Higher education in facts and figures*'', Universities UK, London.

Vinke, D. (2002) ''*Industrial design at TU/e: the student as a junior employee''*, Interim report. retrieved September 15, 2003: www.industrialdesign.tue.nl/education/downloadableFiles/theStudentAsAJuniorEmployee.doc

Waldrop, M. (2013) ''Massive Open Online Courses, aka MOOCs, Transform Higher Education and Science''. *Scientific American*. Retrieved from: http://www.scientificamerican.com/article.cfm?id=massive-open-online-courses-transform-higher-education-and-science

Wenger, E. (2000). ''Communities of Practice and Social Learning Systems''. *Organisation Articles. Vol. 7*(2): pp. 225–246, SAGE, London.

Williams, R. J. P. (1991). 'Science in universities: teaching, research and autonomy'. *Studies in Higher Education*, *16*, 15–22.

Williams, G. & Blackstone, T. (1983). Response to Adversity. *Guildford: SRHE (Leverhulme Report Vol. 10)*.

Yang, M-Y., You, M. & Chen, F-C. (2005). ''Competencies and qualifications for industrial design jobs: implications for design practice, education and student career guidance''. *Design Studies*, *26*(2), 155–189.