Design curriculum challenges for today’s university

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Abstract

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Curriculum development is a large systemic enterprise. Curriculum involves course planning, course content, pedagogical delivery, and learning objectives for the individual teacher. For the student, it involves learning styles, personal development, mastery of content, and mastery of skills. At the program level, it requires coordination among teachers and across courses. At the school and university level, it involves other issues still.

In design, curriculum development involves eight kinds of education. In university, these include undergraduate education, professional education, and research training. Many schools also offer lifelong learning, continuing education, and executive education. Some schools offer vocational training and special courses.

Design is both a field of professional practice and a research discipline. The plural dimensions of research and practice both affect curriculum needs.
To discuss curriculum effectively requires a comprehensive view of all these issues in an integrated understanding.

The keynote presentation at the cltad international conference offered a systematic overview of the many issues involved in curriculum development for design, relating these issues to the changing needs of both the profession and the discipline.

This paper is the first third of a large, comprehensive examination of the issues considered in the keynote.

This paper places university-level design education in the context of university education for professional service. Professional education at university involves four great challenges: creating new knowledge, preserving existing knowledge, training specialists, and educating citizens.

To understand these challenges, it is helpful to understand the meaning and historical development of universities. This paper places professional design education in the context of these large historical issues.

**Introduction**

Life and work in the global knowledge economy demands more of education than has ever been required in human history.

At first, what would now be called design education took place in the apprentice tradition of the artisan guilds. When formal and informal schools for craft or art developed, they took a central role in design education. Some of these became schools of art and design. In those nations where design was taught outside the apprentice tradition, these were the primary centres of professional design and craft education until quite recently.

Over the past five decades, however, design education moved into the university. While European schools of art and design remained
independent, design education in North America was taught in university departments. These have generally been departments of art and design where design was seen as a form of applied art or craft skill, though some universities developed specialised design programmes in colleges of architecture, engineering, or – later – information science.

The transition of design education to university study was not merely a consequence of North American higher education, however. It was a consequence of the new needs and demands of the nascent knowledge economy. These needs and demands affect all forms of professional education. Design, as a cluster of professions, involves advice to clients. In some cases, these are internal clients within a large firm or business that employs a designer on salary. In many cases, these external clients turn to a design consultancy for help in planning, design policy decisions among alternatives, problem solving, or any other number of professional decisions. Forms, products, software, or images are often part of the solution to many design problems, but artefacts are the implementation of a design solution. Design itself is a planning process.

The increasingly clear focus on the role of knowledge in every field brings about a richer and deeper understanding of what it is that professionals do. In design, this has shaped a distinction between the planning and problem solving process common to all professional design, and the specific artistic and artisan craft skills used in any specific design solution.

So it is that the past quarter century saw many of the independent design schools of the United Kingdom first grow into polytechnics and later merge into universities. In other nations, independent design schools took on university status by government decision. In both cases, these university schools now face the challenges of all university-level professional schools.
Understanding the demands on design curricula requires us to recognise that all university-level professional schools face four great challenges: creating new knowledge, preserving existing knowledge, training specialists, and educating citizens.

The limits of this paper
As I began to write up my keynote presentation for these proceedings, I realised that I compressed many ideas into the hour we spent together. A keynote speech is often the outline of ideas that should properly be written up in a far longer paper or developed in a seminar. When I decided to write the complete paper that my keynote implied, I discovered that I had outlined a far larger inquiry than a short paper permitted. This inquiry had three parts.

The first sets all professional education in the context of the university. What universities are and what they should now be is a central policy choice for all advanced societies. These involve public policy choices by government and citizens, programmatic and development choices by university administrators, and content and pedagogical choices in the fields and disciplines.

Enhancing curricula lies in this last range of choices. For design, these choices depend on the context within which all professions now operate. To examine the challenge of university-level professional education, it is necessary to consider two large issues. The first is the past and present development of universities. The second is the knowledge economy within which universities take on new meaning.

This is the first part of the paper implicit in my cltad keynote.

The second part involves the changing nature of design education itself. The shift of design education from apprenticeship and artisan guild training to university education has many consequences. This, in turn, rests on the process and tasks of design, and the domains of design knowledge. I have addressed these issues in a series of
research projects, papers, and book chapters over the past decade. I will refer to these at the appropriate point in this paper.

It is my hope later to bring these papers and the issues in this keynote together in a longer and more comprehensive view of professional design education, linking them to the third part of the keynote on specific curriculum needs.

The third part of this paper builds on the foundations I establish in the first two parts. Thus, I began at the beginning. As it is, the proceedings’ deadline catches me still at work on the final third. It is there that I develop and articulate the consequences of university-level professional education in a knowledge society for the specific design school curriculum.

The challenges we face are deep enough and important enough that I wanted to develop this paper properly. For that reason, it is vital to start with the foundational issues that frame what must come next. In this way, curriculum challenges can be seen as a necessary outcome of the role that the design profession plays in a larger society. Without such a background, curriculum enhancements can always seem to be mere transitions in educational fashion as university administrators attempt to attract a proper number of students.

Nothing could be more dangerous to our conception of what university-level design education is or should be.

I apologise for delivering only the first part of my keynote in this paper, pointing to the second part elsewhere. At the same time, my apology is an apology for necessary constraints. To deliver a proper curriculum statement, we must establish a foundation that has not been clearly developed for university-level design education.

That foundation demonstrates the conditions within which we must consider the four great challenges of university education in general. To place these challenges in context, it is helpful to explore the evolution and changing role of the university over the past 5000 years.
The university today

Modern universities have many roles. They prepare citizens for life in industrial and post-industrial democracies. They train people to work in demanding jobs. They enable individuals to understand and interpret the world around them. They offer individuals the opportunity to think about fields of inquiry and study. They host research programmes that create new knowledge. They establish projects to apply the knowledge that each generates. Universities fulfil all these functions and more.

The curriculum is the mechanism through which the university meets its obligations to students. With the exception of individual faculty research – but not excepting research training and student research – delivering the curriculum is in some respects the core activity of a university.

The importance and scope of curriculum in a serious university requires curriculum development to be a large systemic enterprise. Curriculum involves course planning, course content, pedagogical delivery, and learning objectives for the individual teacher. For the student, it involves learning styles, personal development, mastery of content, and mastery of skills. At the programme level, it requires co-ordination among teachers and across courses. At the school and university level, it involves other issues still.

In design, curriculum development involves eight kinds of education. In university, these include undergraduate education, professional education, and research training. Many schools also offer life-long learning, continuing education, and executive education. Some schools offer vocational training and special courses.

Design is both a field of professional practice and a research discipline. The plural dimensions of research and practice both affect curriculum needs.
To discuss curriculum effectively requires a comprehensive view of all these issues in an integrated understanding.

This keynote presentation will offer a systematic overview of the many issues involved in curriculum development for design. It will relate these issues to the changing needs of both the profession and the discipline.

Design is changing as a professional field and as a discipline. To understand the curriculum needs of design schools today and tomorrow, the presentation will examine the larger knowledge economy within which designers are expected to work.

This analysis will lead to a model for effective curriculum development in different kinds of design programmes. Because most design is now taught in universities or university-level independent design schools, the issue of design curriculum in higher education essentially becomes a question of curriculum development in universities.

The early origins of the university

Frank Rhodes (2001) describes the university as 'the most significant creation of the second millennium'. Rhodes’s (2001) recent book points to many university functions: preparing citizens, training workers for demanding jobs, enabling individuals to understand and interpret the world, encouraging inquiry and study, supporting research, creating new knowledge, and finding ways to apply knowledge. A brief review of the university places the modern university in context, and helps us to place the role of curriculum in perspective.

The remote origins of the university are found in Plato’s Academy and Aristotle’s Lyceum. These early predecessors of the modern university were centres of philosophy where scholars studied mathematics, logic, and geometry, as well as social and natural science as they existed at the time. Plato’s Academy and Aristotle’s Lyceum essentially functioned both as colleges and graduate schools,
though they awarded no degrees. The great library at Alexandria was both a research centre and a graduate school.

Many scholars view Plato’s Academy as the first university (Roberts, 1988, p. 207) in the vital sense of a school with regular programmes of study and inquiry. According to Boorstin (1998, p. 38), ‘Some would call Plato’s Academy the ancestor of the modern university, and so have distinguished Plato as “the first president of a permanent institution for the prosecution of science by original research.”’ The seminar was the main form of teaching. Scholars recorded lectures, conversations, and seminars, as well as recording the research results of mathematical or philosophical inquiry. At the Lyceum, scholars also engaged in empirical observation in subjects such as biology and comparative social science (Boorstin 1998, p. 51).

In the political turbulence following the death of Alexander the Great, Ptolemy I Soter welcomed Demetrius of Phaleron to Alexandria to establish the library and museum. Demetrius, the exiled tyrant of Athens, had been a student of Aristotle at the Lyceum. The Lyceum became the model for a much larger institute for research and teaching at the Museum of Alexandria. The library of Alexandria was a repository of information with an immense collection of books estimated at over 700,000 volumes and a research centre with a large staff of scholars and researchers (Fraser, 1972, p. 320; Mason, 1985 p. 149; Oxford Encyclopedia, 1998, p. 18). The Museum at Alexandria ‘exercised the characteristically Greek functions of a university’ (Derry & Williams, 1961, p. 16) and comprised ‘a kind of institute for advanced study’ (Roberts, 1988, p. 220). It was a centre for research, for documenting and consolidating earlier science and philosophy, and for supporting the work of scholars and scientists, especially in mathematics, biology, and in philosophy (Innis, 1995a, pp. 10–11, 47, 69, 111–114; Roberts, 1988: 220–1; see also: Canfora, 1989; Johnson, 1970). At one point, the Museum was staffed with roughly one hundred professors. All were paid a public salary for their scholarly and scientific work (Mason, 1962, p. 49).
The Academy endured as a teaching institution for over 900 years. Founded circa 385 BC, it survived until 529 AD, when Emperor Justinian ordered it closed (Audi, 1995: 4–5; Machlup 1982b: 89; Mautner, 1996, p. 3). The Lyceum lasted for over five centuries (Audi, 1995, p. 453). The libraries and museum at Alexandria functioned for over eight centuries from Demetrius to the 6th century AD (Brundige, 2001).

Two specialised functions of the modern university had other predecessors.

The first specialised function of the university with an early predecessor is the professional school. The earliest professional schools date back nearly 5000 years. These were the priestly professional schools and scribal schools of Egypt and the great hydraulic empires of the Tigris and Euphrates.

The Academy and the Lyceum implied a concept of democracy, as it was known in Athens. The Athenian concept of democracy was restricted to voters of the specific citizen class, and the philosophical centres were dedicated to the life of the mind as a condition of effective and wise participation in the life of the city-state. In this sense, central purposes of Academy and the Lyceum involved educating young men to be wise, responsible, and virtuous. In effect, this was an education for citizenship. Other goals more closely resembled the function of the graduate school, including research and interpretation, creating, seeking, preserving, and codifying knowledge.

In contrast, the first professional schools had nothing to do with democracy. They were the arms of church and state that helped to manage the business of the first great empires.

Much of the business in these empires was assisted or supervised by the priestly class of scribes. They undertook their studies in the clerical schools of their temples that were comparable to the cathedral schools around which the medieval universities took shape.

It is impossible to date the earliest scribal schools with complete accuracy. It is reasonable to infer that they began at a relatively early stage in the process of forming organised societies. This is because of their role in preserving and transmitting the new and uncommon skill of writing in the slow, traditional societies of the Mesopotamian river plains.

Schools for scribes and imperial management specialists probably existed by 3000 BC, possibly earlier. This dates the first organised professional schools to a time 5000 years before our own.

We still use the curriculum of one such school today. Fragments of a training manual for Egyptian civil servants are still read as part of the Bible. Fragments of the 3000-year-old book known as The Instructions of Amenemopet appear in the Book of Proverbs. The book was written sometime between 1500 BC and 1000 BC as a guide to professional practice by aspiring civil servants (Proverbs, 22, 17–24, 34; Aitken, 1968, p. 3; Cambridge Annotated Study Bible, 1993, p. 557; Johnson, 1998, p. x; The New Jerusalem Bible, pp. 964–5, 997; NIV, 1995, xxiii, p. 935). It contains advice to young managers that would have been considered prudent at the palace schools and cathedral schools where medieval clerics trained for government service.

The second specialised function of the university with an early predecessor is the specialised institute or research centre. While some
of the other early schools of higher education partially resembled specialised institutes or research centres, one group of institutions came even closer to the modern model. These centres for science and scholarship grew during the first great flowering of Islam.

The expansion of Islam brought with it the birth of organised institutions for research and study. Many scholars trace the specific organisational innovations of the medieval university to what they see as Islamic universities (Rueegg, 1992, p. 8), others characterise the Islamic institutions of higher education as colleges and research centres, locating the first development of universities in medieval Europe (Makdisi, 1981, p. 287; see also, Makdisi 1990, 1991).

Islamic centres for scholarship, research and teaching included colleges of medicine, law, philosophy and theology; and centres for mathematics, chemistry, and astronomy. These centres made a profound contribution to Western learning. The political and religious divisions between Islam and the West often meant that Arabic philosophers and scientists were known by Latinised names for work that was detached from the centres where they worked.

We associate Peter Lombard, Robert Grosseteste, and Roger Bacon with specific universities. This knowledge captures both our respect for the individual scholarship of great thinkers, and our understanding that their knowledge developed in the context of an important institution. The institution of a university is anchored in its culture and society, as well as in the specific time and place of any one school.

Many great Arabic scholars worked at specific institutions, and most of these institutions flourished at an earlier date than their Western counterparts, often conducting research far more advanced than anything done in the West. Al-Mamun worked at the House of Wisdom in Baghdad, for example, and Abulcasis was identified with the Cordova academy (Braudel, 1995, pp. 80–83; Mason, 1962, pp. 95–102; McLeish, 1992, pp. 137–156; Roberts, 1988, pp. 325–328, 500–501; see also, Leff, 1992; North, 1992; Siraisi, 1992). There is a
relationship between a conception of higher learning, the institutions
developed to promote it, and the societies within which it flourishes.

For complex reasons, the advanced research centres of the Islamic
world failed to develop into full-fledged universities. It is my
conjecture that the failure is anchored in the fact that Islamic
societies were often theocratic. In contrast, Western universities
grew and flourished precisely when Western societies accepted the
necessary tension between social cohesion and the free pursuit of
knowledge. Theocracy is a social and political structure that often
requires agreement on a specific set of principles. In theory, these
principles may also be established as a doctrine governing scientific
thinking. When scholarship and science are bound by a priori
dogmatic rules, free inquiry becomes difficult. Free inquiry requires
the ability to consider unacceptable premises as a form of heuristic
development. Free inquiry may also begin in dogmatically approved
research that leads to conclusions that official doctrine rejects. In all
these cases, scholarship and science slowly stop.

Western universities were engaged in this struggle since the earliest
conflicts between inquiry and governance. Until the Enlightenment,
church and state always won. It was only in 1798, when Emmanuel
Kant (1992 [1798]) published The Conflict of the Faculties, that
Western universities began to win the struggle for free inquiry.
While the search for unattainable universals shaped problems for
Enlightenment rationalism, the Enlightenment foundation of
reasoned inquiry and democratic government continue to serve us.
These goals remain foundations of the university enterprise.

If the struggle for free inquiry made the Western university what it
became, however, the process was to take much of the second
millennium. This growth built on earlier institutions, including
ancient professional schools and scribal schools, institutions of
research and study in the classical world, and the Islamic
universities and research centres.
The first modern universities

The first universities that still survive were born in the Middle Ages, along with the organisational structures that now characterise the university as we understand it today (Machlup, 1982b, pp. 121–122; Pace, 1912; Rueegg, 1992, pp. 4–8; Verger, 1992, p. 35). The first of these were the cathedral schools that trained the clerics for church service and clerks for public office. Medieval Europe also saw two other kinds of institutions around which the universities of the 13th century took shape: the law school and the medical school.

The cathedral schools were the earliest and most prominent of these institutions. The early form of cathedral schools began by the 2nd century AD as episcopal schools attached to the households of bishops for training clerics. By the 8th century, Europe saw the development of the first true cathedral schools attached to working cathedrals.

Each bishop was responsible for his cathedral school. Each school had a senior scholar and administrator known as the master of the school. The master held office under episcopal supervision.

Many cathedral schools had two branches. One was an elementary school that taught the basics of reading, writing and music. The other was a higher school that taught either the trivium or the full programme of trivium and quadrivium, along with scripture and theology.

The role of the cathedral school was central to the work of the church. It was established as canon law by the Third Lateran Council in 1179, ‘that every cathedral church have a teacher (magistrum) who is to teach poor scholars and others, and that no one receive a fee for permission to teach’ (Turner, 1908; LeClercq, 1910). The importance of these schools is still visible in the section of modern canon law governing education (Code of Canon Law, 1983, Book III, Title III, Chapters I–III). Many of the canon rules governing Catholic education descend in unbroken line from the
rules that governed the cathedral schools and the universities that grew out of them.

The universities of the Middle Ages grew in several ways. Many grew out of the cathedral schools. Others emerged from the communities of schools – including the cathedral school -- located around the great cathedrals. This was the case of the University of Paris, the greatest and most important of the early European universities.

Paris became the model that most great universities adopted. It was a university of masters and teachers organised in faculties. These were the ‘lower faculty’ of arts or philosophy, and the ‘higher faculties’ of professional study in theology, law, and medicine. Stimulated by a distinguished palace school established during the 8th-century reign of Charlemagne, the University of Paris later formed around three important schools of the 12th century: the cathedral school of Notre-Dame, the school of Sainte-Genevieve, and the abbey school of St-Victor. As was the case of most medieval universities, Paris seems to have been established and flowering well before its formal designation as a university in 1210 and 1215 (Boorstin, 1998, pp. 81–90; Feret, 1911; Hartvigsen, 1998, pp. 154–155; Oxford Encyclopedia, 1998, p. 695; Pace, 1912; Piltz, 1998, p. 107–115; Rueegg, 1992, pp. 6–7, 12, 30–34; Verger, 1992, 50–52, 60–61).

Some universities grew around the body of an earlier institution of higher learning. This took place at Salerno and at Bologna. Salerno was the site of a medical school as early as the 9th century, while Bologna was home to a school of law and several schools of the liberal arts by the 11th century. Bologna was the model of a second form of university governance, the student university. In contrast to Paris, the university was established and controlled in many important respects by students rather than by the masters. This form of university governance is now defunct, but it established many important precedents that survive in the modern university (Boorstin, 1998, pp. 81–82; García y García, 1992; Gunnes, 1991, pp.
There were two other common forms of university growth. One was by migration. Migration took place when a group of masters and students departed one university to establish another elsewhere. In early academic slang, this was known as ‘the swarm’, comparing the birth of universities to the birth of a new hive that took place when a swarm of bees left one hive to establish another. Cambridge University was established this way. It grew between 1209 and 1214 when a swarm of masters and students left Oxford (Verger, 1992, p. 53).

The other way that universities were established was the decision of civil or church authorities to establish a university. After the Middle Ages, this was the most common way that universities were founded. While the nearly biological and often ambiguous processes of organic growth or the swarm built the first universities, conscious foundation has been the central pattern since. Emperors founded universities at Naples and Prague, for example, and enterprising city leaders established universities at Treviso, Pisa, Florence and Siena. Still others were established under the authority or the church, and many earlier universities were solidified when a pope confirmed their privileges (Machlup, 1982, pp. 121–144; Verger, 1992, pp. 53–62).

The shift to research universities

The shift from medieval universities to modern research universities was a long, slow process that involved many strains and difficulties. One typical example of conflict gave rise to Kant’s (1992 [1798]) famous essays titled The Conflict of the Faculties.

The core of the dispute was a conflict between the so-called lower faculty of philosophy and the so-called higher professional faculties. The conflict raised an important question in university life: how is knowledge to be established, and which faculty shall govern? This
was a conflict between the free search for knowledge and the bounded search for knowledge. The free search for knowledge was a search for pure truth that goes back to the Platonic Academy. The bounded search for knowledge involves the applied knowledge of the professions, a form of knowledge that is constrained by the obligations of service to church or state, and governed by the needs of ecclesiastical and public policy.

On the one hand, the claim of professional education is a claim of service to society. It is bounded by the oath of service that each physician, lawyer, or priest takes on entering office, and it stands for the highest professional ideals of humanity. On the other, it is subject to constraints that generally restrict the concept of knowledge to what is accepted today – or to what has been acceptable in the recent past. This is a contrast with the free search for knowledge on which new knowledge depends. Both principles represent an important social value. The challenge to universities is that each principle has at different times had superior claim. Most often, the claim of service has prevailed, linked, as it is, to the funds that establish and support the university.

Kant’s discourse was occasioned by the edict of censorship imposed on German scholars when the tediously religious Frederick William II appointed a dull and bureaucratic minister of justice. King and minister joined in an attempt to shift Germany from the Enlightenment to a doctrinaire and orthodox polity. One step in this was to reduce the freedom of inquiry that scholars had enjoyed under the far more liberal Frederick the Great (Gregor, 1992, pp. ix-xi).

One of the key issues in this great debate is the understanding of the lower faculty. The idea of a lower faculty is not an idea of reduced status, but a concept of fundamental standing, for it is the lower faculty on which the university rests. The lower faculty is the first faculty, and philosophical knowledge is the foundation on which the university depends. While the higher faculties generally represent
worldly power and higher social standing – not to mention better salaries – the higher faculties cannot exist without the lower.

The conflict of the faculties survives in several active debates. One is the debate between the university as a centre of free inquiry and the university as a centre of applied knowledge and social service. Another is the debate on how the university shall be controlled and governed – whether by the professorate on behalf of science, or by the founders and governors, state, church, or even private. These debates echo in important current books, such as an updated discourse on the conflict of the faculties (Rand, 1992) or Bill Readings’s (1996) highly regarded critique of the university in the post-industrial nation-state.

These debates are relevant to design curriculum in several ways that I will consider later. These include the frequently conflicted relations between theory and practice and the difficulty of linking the design curriculum to the larger university curriculum. The debate over the conflict of the faculties also occurs in the insistence of many design teachers that design schools teach a special professional knowledge that must be linked to the practising profession, which they claim to represent, as contrasted to the larger body of knowledge represented by the university professorate.

When this debate touches on design schools, the claim of professional knowledge by design teachers is conditioned by three paradoxical aspects. First, it is linked to the crafts guilds that were never connected to universities. Second, none of the learned professions considers design as a profession, and most professionals regard design as a vocation connected not to the lower or philosophical faculty, but to the tradition of vocational education outside the university entirely. Third, few design teachers genuinely represent the profession of design. Few leading designers teach, and relatively few design teachers have had active careers in business or industry. Those few, interestingly, tend to have entered the university because
they love research. It is a double paradox that the more successful designers to become academics are those who argue most effectively for the new curriculum. In contrast, those who argue for guild knowledge and craft traditions tend to represent the art and craft approach, and – for the most part – these art and craft designers have had no major work outside design schools.

Kant’s debate set the stage for the birth of the first modern research university, the University of Berlin.

The next great advance in university development came with the establishment of the Humboldt university reform that created the University of Berlin in 1809 (Gellert, 1993, pp. 5–11). Research became a central feature of the university. In the medieval university, students once attended university to pursue a career in church or state service. Training for the professions also gave way to a vague post-medieval education in which the sons of gentry and nobility were expected to spend time engaged in a transition from childhood to manhood. While these universities followed the noble goal of training for citizenship expressed by Newman (1927) and others, universities were also places where students drank away the lazy days, learned to duel, or attempted to study with professors who rarely (if ever) taught. This was the basis of Adam Smith’s famously savage critique of education at Oxford in The Wealth of Nations (Smith, 1976 [1776], v. II, pp. 283–296, 334–335).

The two final shifts in universities that must be considered came in the 1800s and the 1900s.

In the 1800s, a new kind of university emerged. In Britain, this was the new university, where such institutions as Manchester, London, or Leeds broke the earlier monopoly held by Oxford and Cambridge.

The major change, however, came in the United States, when a century-long move developed that created the great land grant universities, the major general universities, and the full-fledged
research universities that have become the model for universities around the world today. This story is so long and detailed that it would require an article in its own right. The important result is that the general research university is open to all citizens based on talent. Most universities today aspire to the status of the research university and many authors tell parts of the tale (Clark, 1993; Damrosch, 1995; Readings, 1996; Rhodes, 2001; Veysey, 1965).

In the United States, the political struggles of the 19th and 20th centuries that led to the birth of the great land grant universities culminated in universal access to higher education by the late 1900s.

At the end of the Second World War, the United States made a far-reaching and influential decision. This was the Veteran’s Readjustment Act of 1944, commonly called the GI Bill. The bill effectively made it possible for all returning service members to attend university. (Fenske, Besnette & Jordan, 2000, pp. 114–105). No longer was higher education a privilege of the fortunate few. While the promise of universal higher education was born in the great land grant universities, the fact that universities existed did not solve the challenge of enabling all individuals to attend them. The GI Bill and a host of successive measures made it possible for nearly any student to attend the universities built and developed with public funds. This, in turn, created rising expectations of access and knowledge, and it became a cornerstone of the coming knowledge economy. The relation between broad student participation in university life and the impact of higher education on the greater society is a central fact of academic life today (Ottinger, 2000). The result is visible in the shifting role of knowledge in modern industrial life. This, in turn, has brought about a powerful transition in every industrial democracy that strives to maintain its position relative to the other developed nations.

The creation of universities is a general democratic decision of the electorate in many places, and a strategic initiative of government in
others. The result has been the same. Universities have been established more widely and in greater numbers than ever before. Some have grown out of other institutions. Some have come about by merger. Altogether, there are some tens of thousands of universities around the world. Only a small number of the universities we find today existed a century ago, and many are only a few decades old.

From the oldest to the youngest, all universities face four challenges that have been at the core of higher education for the past 5000 years.

**The four great challenges of higher learning**

Universities today face four great challenges. Institutions of higher learning have addressed these challenges in different forms over the past 5000 years, and they have met them in different kinds of programmes and institutional arrangement.

The four great challenges are:

1. creating new knowledge,
2. preserving existing knowledge,
3. training specialists, and
4. educating citizens.

It is immediately clear that these challenges create an inherent tension.

The requirements of new knowledge both demand a foundation in earlier knowledge and push the boundaries of what is known. This always means negotiating a delicate series of forces that draw the past into the future. At some moments, the need for preservation emphasises the past, and the love of the past often involves a tendency to preserve the past intact. At other times, the need for new knowledge can apparently overwhelm the past, and those who move forward sometimes care little for what we have known as societies and as individuals.
The first institutions of higher learning were imperial and religious centres of specialised education. These were created in vastly hierarchical societies where a few knowledge specialists served even fewer great lords and potentates, and all of them ruled a vast and oppressed majority with little thought for service to the whole.

The Greek ideal of democracy brought about a new kind of higher learning: education for the wise exercise of civic responsibility. However, this was not democracy, at least not as we know it. A few, wealthy citizens could afford this education, and only a few more were entitled to vote in societies that depended in great part on slave labour and on the subjugation of smaller and lesser cities to the great powers of the era.

The tension between education for the few and education for an increasingly large many has been a pendulum driving the growth and spread of education from the first days to our own time.

The two polarities of knowledge and citizenship also establish a subtle dimension of opposing and co-operating tendencies.

Professions require specialisation and the preservation of a coherent body of knowledge. This cements professional engagement and permits the development of practical affairs. At the same time, all professions require new knowledge to improve and grow. This demands research and a challenge to what is known. This challenge in itself can weaken the professional sodality while strengthening the profession in the long term.

Professions are by nature inclined in two directions. In one direction, they serve the larger polity. Most professions are granted specific ranges of control and social status precisely because they serve the larger polity. All professionals are in one sense citizens who act on behalf of the larger society. At the same time, the privileges and opportunities that drive professional development set professionals at odds with fellow citizens outside a specific professional group.
Any diagram of the relationships among these four challenges will reveal a series of conflicting and communicating forces that operate in an energising dialectic. At each step, we see tensions between specialisation and generalisation, between theory and practice, between research and repetition, between hierarchy and democracy, between the pull of the past and the press of the future.

These meet today in a new knowledge economy. The central virtues and challenges of the knowledge economy are simple. Societies need to know more and do more to thrive. Knowledge is an inherent property of individuals. To thrive, therefore, any society rooted in a knowledge economy must achieve two goals. The first is to grow its corps of professional specialists. The second is to widen democratic participation.

The rich web of social interactions implicit in this simply stated challenge is not at all simple, and I will not address it here. I brought this long story forward over the past 5000 years to set the stage for a few basic thoughts on the design curricula for the knowledge economy that we have see around us.

If design could still be taught or learned in artisan guilds or independent design schools, this conceptual background would not be as important as it is. The fact is that nearly every form of design that has a purpose in today’s world is far too complex for the older forms of education that were considered suitable even as recently as 1975. Designers are now professionals and they must become even more professional to perform the professional services that they are now called on to perform.

Meeting this challenge requires university education and a research culture, the culture of the universities and research centres around which universities grew.

When we met in London at the citad conference, I outlined some of these issues in a short presentation. Here, I wanted to develop a
thorough background to set the stage for a few conclusions. Before moving to those conclusions, I will point to a few useful sources for detail.

Rather than draw out all the implications of the university enterprise, I will recommend Frank Rhodes’s (2001) elegant book, *The Creation of the Future: The Role of the American University*.

Rhodes makes a good case for the importance of the research university in world affairs over the past 900 years, and he addresses issues that face us all, in Europe, Africa, and the Asia-pacific region, as well as in the Americas.

The core issues in the book are the challenges that great research universities face today. Rhodes begins by defining the nature and task of the research university. He examines the issue of professionalism in a knowledge economy, the nature of community in modern societies, and the theme of teaching as a moral vocation. He then explores undergraduate education, professional education, and research training. Finally, he examines the large social issues facing universities today. These include costs and financing, research as a public trust, social service and information technology.

Designers and design educators will find the concluding chapter particularly important. Today, we find ourselves debating the nature of research in a formerly vocational field. While most of us teach in universities, our departments and schools are relatively recent. In some places, design schools have only entered the university or attained university status quite recently. Doctoral education and research training are a central concern for the field, but some of us seek new forms of doctorate while others are not quite sure what the doctorate is. This debate can be framed in the question of the new university. This book offers a good foundation for conversation on the role of design and design research in the university.
During my talk, I presented some models and a taxonomy of issues for design education. I describe these more completely in a keynote presentation I gave at IDATER (Friedman, 2000, 2001). These follow an earlier article in which I discussed the implications of the shift from artisan training to university education (Friedman, 1997).

Before turning to the challenge of design curricula for today’s universities, I want to set a background in several issues that face all forms of professional education in a knowledge economy.

The industrial revolution of the 18th century brought enormous change to the world economy. In the 19th century, the electrical telegraph ushered in the first telecommunication era while the American Civil War gave rise to the first industrialised war in a comprehensively industrial society. By the end of the century, the telephone and the railroads had reshaped societies around new communication and transport media. Soon after, Henry Ford’s mass production methods and the automobiles they made possible would reshape much of the world.

Over this same period, physical science advanced from Newton’s mechanics to Maxwell’s equations, and then it leaped forward as Einstein developed the theory of relativity and paved the way for quantum physics.

By incremental steps and quantum leaps, these changes shifted the world from agriculture to mechanics to electrics and finally toward electronics.

Just before the Second World War, the Australian economist Colin Clark (1940) created an important classification scheme for different kinds of economies. He identified three classes: primary, secondary and tertiary. Primary economies extract wealth from nature, secondary economies transform extracted material through manufacturing, and tertiary economies engage in service. At the same time, the Canadian economist Harold Innis (1950, 1951, 1980,
1995a, 1995b; see also Acland & Buxton, 1999) was laying the foundation of a social theory based on information, while American economist Fritz Machlup (1962, 1970, 1978, 1979, 1980, 1982, 1984; see also Machlup & Mansfield, 1983) developed the first theories of information economics.

During these same years, Peter Drucker (1973, 1990, 1993, 1996 [1959], 1999) studied the managerial society. By 1959, he concluded that we were about to enter the post-modern world, a world defined by well-known social forces meeting in radical new configurations.

By the 1960s, Daniel Bell (1976, 1999) announced the coming of post-industrial society. Bell argued that a significant change in the character of knowledge was taking place, with professional knowledge elite developing to manage it.

Knowledge has always been a key factor in productivity. The earliest design and the start of manufacturing began over two and a half million years ago when homo habilis made the first weapons and tools (Friedman, 1997, p. 54; Ochoa & Corey, 1995, p. 1). The search for productivity focused on scarce material resources and the challenges of understanding the physical world. All manufacturing was handicraft until the industrial revolution gave rise to mass manufacturing in the 19th century. The wealth created in the industrialised economies of the 20th century changed this.

By the time of Colin Clark’s model of societies, a focus on knowledge became inevitable. While the vocabulary of the knowledge economy is relatively new, the idea of a knowledge economy has been emerging for the past half century. For example, W. Edwards Deming’s (1986, 1993; see also Aguayo 1990; Halberstam, 1987; Scherkenbach, 1991; Walton, 1989) work in post-war Japan reflects the principles of knowledge management and organisational learning. Economists such as Harold Innis and Fritz Machlup have gained increasing importance, along with sociologists such as Daniel Bell, Manuel
This influences the work of all professionals in significant ways because effective knowledge work demands creating, sharing and distributing information as the raw material that individuals and organisations process into knowledge. The administrative principles of Henri Fayol (1987 [1916]), Henry Ford (1922, 1991) or Frederick W. Taylor (1911) restricted the flow of information and power in vertically stratified organisations. The management principles of a knowledge economy encourage the flow of information and knowledge within dynamic networks.

Since then, many thinkers have attempted to analyse and describe the forces at play and the consequences of their interaction.

Today, these forces affect university education at a time of crisis. National economies suffer under many forms of turbulence. Ageing populations and a shrinking base of workers who must pay for increasingly costly social services and pension requirements exacerbate these strains. As societies attempt to meet a greater range of demands across and increasing range of social services, the demands on higher education increase even as resources are increasingly constrained.

Good universities balance the tension between these forces by developing better and more effective curricula. This is true of education for professions, liberal arts, humanities and technology. It is even truer for fields such as art and communication with a weak link to career outcomes – and it is true of many design fields. Effective curricula are more important in these fields than elsewhere.

Curriculum development is a large systemic enterprise. Curriculum involves course planning, course content, pedagogical delivery, and learning objectives for the individual teacher. For the student, it
involves learning styles, personal development, mastery of content, and mastery of skills. At the programme level, it requires co-ordination among teachers and across courses. At the school and university level, it involves other issues still.

In design, curriculum development involves eight kinds of education. In university, these include undergraduate education, professional education, and research training. Many schools also offer lifelong learning, continuing education, and executive education. Some schools offer vocational training and special courses.

Design is both a field of professional practice and a research discipline. The plural dimensions of research and practice both affect curriculum needs.

To discuss curriculum effectively requires a comprehensive view of all these issues in an integrated understanding.

Any serious inquiry into enhancing design curricula must offer a systematic overview of the many issues involved in curriculum development for design. It must relate these issues to the changing needs of both the profession and the discipline.

Design is changing as a professional field and a discipline. To understand the curriculum needs of university-level design education today and tomorrow, requires placing design in the context of the larger knowledge economy within which designers now work.

This analysis is the basis of a model for effective curriculum development in different kinds of design programmes.

The taxonomy of domains of design knowledge (Friedman, 2000, 2001) offers a basis for approaching the field. While the taxonomy is not complete or perfect, I propose it as a heuristic model describing the field of design. The taxonomy began as an approach to meeting
the needs of planning a university-level design programme. As we learn more, the taxonomy will change.

At this point, I will close the background discussion. I will return to these issues again in the next part of this paper.

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