Report from the Recipient of the 2015–2016 Perry Chapman Prize

Aligning the Strategic Campus Plan With the Institutional Mission in 2030:

University Campuses as Complex Adaptive Assemblages

DR. KENN FISHER

Society for College and University Planning

HIDEO SASAKI FOUNDATION

THE PERRY CHAPMAN PRIZE

The term *En* goes back to ancient Buddhism. It is still used, however, in Japanese everyday life.

En corresponds to the belief that the world is filled with multitudinous unexpected meetings, or the feeling that we should appreciate those meetings and live together. It is the grace to accept the ongoing flood of encounters and events, no matter how unpredictable they would seem to be.

En also means the "edge" or "margin." It implies an ambiguous boundary that not only surrounds multiple kinds of living spaces but makes them interrelate and interpenetrate. The nature of those *En* boundaries and the resulting interpenetrative areas encourage humans to act and encounter each other.

We call the group of architectural works in this exhibition "*En* architecture." *En* architects try to produce spatial worlds in which human beings can live positively. Each of their practices fosters the momentum to originate architecture in tandem with the countless interconnections that are occurring among people, things, and locality. This momentum is fostered by *En* as an invisible force operating external to human beings.

Introduction to the Japanese Pavilion
Venice Biennale 2016
Social Architecture

Aligning the Strategic Campus Plan With the Institutional Mission in 2030: University Campuses as Complex Adaptive Assemblages

by Kenn Fisher

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ABOUT THE SOCIETY FOR COLLEGE AND UNIVERSITY PLANNING (SCUP)

The Society for College and University Planning is a community of higher education planning professionals that provides its members with the knowledge and resources to establish and achieve institutional planning goals within the context of best practices and emerging trends. For more information, visit **www.scup.org**.

WHAT IS INTEGRATED PLANNING?

Integrated planning is a sustainable approach to planning that builds relationships, aligns the organization, and emphasizes preparedness for change.

ABOUT THE PERRY CHAPMAN PRIZE

(Source: www.scup.org)

The Hideo Sasaki Foundation, under the auspices of the Society for College and University Planning (SCUP), seeks to honor the intellectual contributions of M. Perry Chapman.

As a recipient of SCUP's K. C. Parsons Founders' Award for Distinguished Achievement in Higher Education Planning, Perry Chapman was committed to developing and sharing knowledge to advance integrated planning and interdisciplinary collaboration in higher education.

Perry Chapman's influence on campus planning and design spanned more than four decades.

He affected colleagues, institutions, firms, and community organizations through his insight, mentoring, writing, and speaking.

He raised the standard of planning theory through research and analysis of the relationship between the campus as a place and its impact on learning and community.

SCUP is grateful to the Hideo Sasaki Foundation for its support of the Perry Chapman Prize. A prize of $10,000 will be awarded annually through 2016.

ABSTRACT

This study seeks to forecast possible future developments brought about by rapid online learning modalities (Shah 2015) and their impact on the campus-based face-to-face experience.

Using "experts" in the fields of learning sciences, teacher professional development, educational technologies, learning environment/campus design, and others, the study uses an evidence-based expert elicitation methodology in part based on the annual NMC Horizon Report model (Johnson, L. et al. 2015a, 2015b) to forecast how campuses might evolve over the next decade.

Several theoretical models are used to frame the research including the "flipped classroom/ campus" concept (Strayer 2007), the "sticky campus" (Lefebvre 2014), expert elicitation (Meyer and Booker 2001; Sullivan and Payne 2011), Delphi modelling (RAND 2015), and cognitive mapping (Jameson 2000). The three key sources of evidence—scholarly papers, expert elicitation, and surveys—are triangulated to determine the likely scenarios for aligning the 2030 campus to the university mission.

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The proposal included the following team:

Associate Professor Kenn Fisher, University of Melbourne and Woods Bagot

Professor Tom Kvan, Assistant Vice Chancellor, Campus Development and International, University of Melbourne

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PART 1 – Introduction

EXECUTIVE SUMMARY

M. Perry Chapman, in his 2006 book American Places: *In Search of the Twenty-First Century Campus*, foreshadowed significant tectonic shifts in the concept of the university campus as we have known it for centuries.

This SCUP-sponsored study reinforces his prescient arguments as it comes at a time when massive change drivers brought about by the rapid rise of broadband mobile technologies are impacting the physicality of the university campus concept.

Campus planners are required to design campuses to last for decades and even centuries, but the rapid fragmentation and availability of knowledge sources is necessitating a rethinking of what it means to plan strategically.

The Perry Chapman Prize aspires to seek ways of aligning the campus plan with the university mission, but what does this mean in an increasingly distributed creative/knowledge age with its associated entrepreneurial economy?

University vice chancellors and presidents the world over are now having to adopt an agile, adaptive, and flexible strategic planning framework to deliver the university's mission, so how should campus planners and designers respond?

The concept of learning environments—indeed also knowledge environments—now clearly involves integrating the virtual and the physical but we do not yet know what these new-generation learning and research environments will look like as they have begun to emerge only recently.

This study reviews the scholarly literature and the expert views of practitioners in campus planning (both virtual and physical) to take a position on what campus planners might need to look out for over the next 10 years as they strive to align the virtual and physical infrastructure with their respective university missions.

In this context it could be said that there are two extremes or bookends to the scope of higher education provision at present.

The first is a relatively new model that is exemplified by the Laureate International Universities network (founded in 2000), which has as its mission "expanding access to quality higher education to make the world a better place" (Laureate International Universities 2016, ¶ 1). With over a million students and some 80 institutions in 25 countries, achieving the Perry Chapman model of alignment offers many challenges. Conversely, at the other extreme, some of the oldest universities maintain a single institutional and campus model, such as the University of Cambridge (commemorating its 800th year). Its mission is to "contribute to society through the pursuit of education, learning, and research at the highest international levels of excellence" (University of Cambridge 2017, ¶ 1).

Clearly Laureate, as one of the largest universities on the planet, has a multi-campus blended learning model, whereas Cambridge favors a single campus face-to-face teaching model with global strategic partnerships.

And, of course, there are all sorts of possibilities in between.

So there is no one-size-fits-all solution to this emerging challenge of the future of the university campus. That said, the university concept has been challenged for decades, if not

centuries, by new technologies often cited as likely to make campus place-based learning obsolete (Ernst & Young 2012).

Some authors categorize university typologies and identify trends that are impacting those typologies.

The overall methodology used in this study is based on traditional doctoral research approaches using a number of mixed-method (qualitative and quantitative) research tools—namely systematic literature reviews, Delphi study online surveys, and selected interviews—to arrive at some conclusions as to what the university campus might look like in 2030.

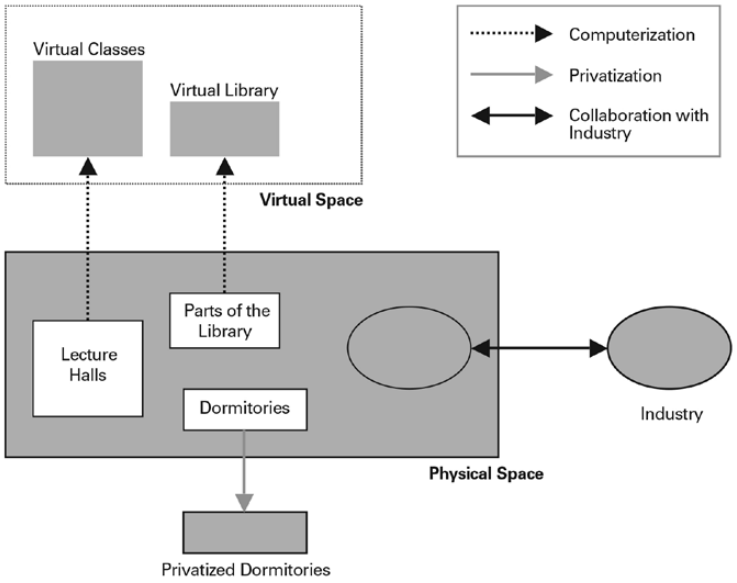
That said, there is an argument for the constant updating of these concepts in line with Dovey's (2016) idea of complex adaptive assemblages. Universities are complex. They need to adapt to constant change, especially in the digital age with its rapid rate of transformation. And they are assemblages in that they are a whole that itself consists of a wide range of elements.

A "complex adaptive assemblage" is a development of Deleuze and Guattari's (1988) notion of a "complex adaptive system." Dovey argues that the system itself is actually made up of many component parts, with many of these elements not working within a systematic framework but rather as separate assemblages that coexist on a campus and are impacted upon by uncontrollable outside forces.

Using city planning and urban design concepts to approach the notion of campus planning through this lens is a means of developing connected lines "from both sciences and humanities, not as a new ideology but as an integrated way of thinking about power, complexity, desire, place, adaptation, assemblage, emergence, resilience and territory. The movement from territorialization to deterritorialization and reterritorialization resonates with the adaptive cycle of resilience thinking with its foreloop of growth and conservation contrasted with the back loop of collapse and re-organization" (Dovey 2016, p. 268).

These separate assemblages and their interrelationships can be better understood in a campus context by using "experts" in the fields of learning sciences, teacher professional development, educational technologies, learning environment/campus design, and others to form a cohesive idea of how the separate parts might form a whole.

Figure 1: **The interaction of the virtual and the physical on campus**



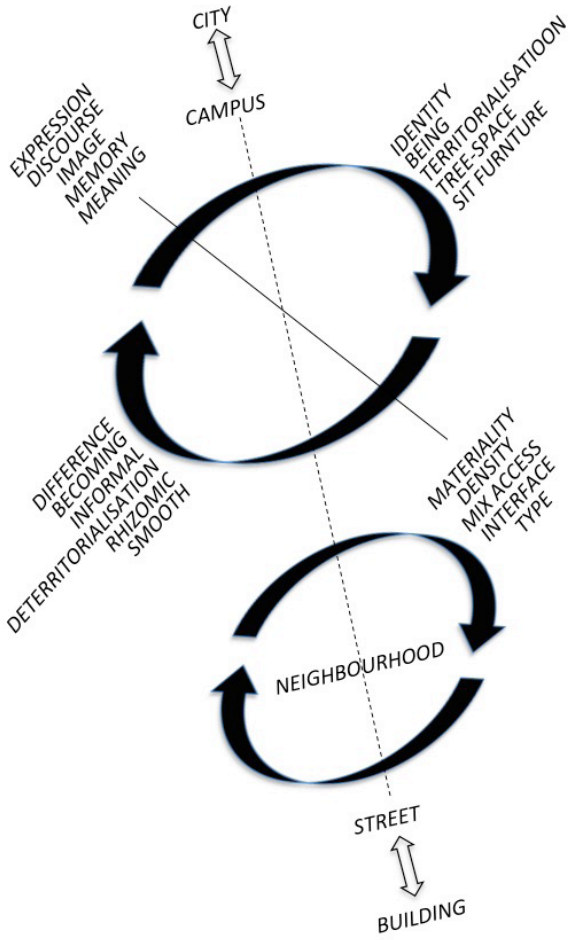
(Hashimshony and Haina 2006, p. 11)

Lohmann (2006) notes that the university is

> of human action, and not of human design. It is characterized by evolution, self-organization, and emergence (p. 2).... [It] has a unity, or "wholeness," to it. It cannot be split up or merged at will (p. 6).... A holistic analysis—as opposed to a reductionist analysis—is required to understand its design (p. 2).... Unbundle the research university, and it will die (p. 15).

External city urban planning and urban design drivers need to be complemented with internal drivers as neatly suggested by Hashimshony and Haina (2006) in their diagram that illustrates how the digital and spatial might interact on campus. This project will use both approaches to offer scenarios for campus typologies in 2030 in an evidence-based approach rather than simple statements of opinion.

Figure 2: **Complex adaptive assemblage drivers adapted from Delueze and Guattari (1988) in Dovey (2016, p.269)**



OVERVIEW

> Scenarios are not meant to predict the future. They can be defined as "consistent and coherent descriptions of alternative hypothetical futures that reflect different perspectives on past, present, and future developments, which can serve as a basis for action" (OECD 2016, p. 1). They are tools for thinking about the future, which will be shaped partly through deliberate strategies and actions and partly by factors beyond the control of decision makers.

With the OECD's note of caution in mind, this study seeks to forecast possible future developments brought about by rapid online learning modalities (Shah 2015) and their impact on the campus-based face-to-face experience.

Figure 3: **Rafael's School of Athens, depicting Plato's Academy founded 387 BC (Wikimedia Commons 2017)**

In the 21st century, the university campus has seen its presence evolve to become ever more multifaceted with a wide range of change drivers impacting its ability to support its mission.

Thus this study uses an evidence-based, Delphi-led, expert-elicitation methodology similar to the approach used in the annual *NMC Horizon Report* model (Johnson, L. et al. 2015a, 2015b) to forecast how campuses might evolve over the next decade.

Several theoretical models—with some now well tested in practice —have been used to frame the research including the "flipped classroom/campus" concept (Strayer 2007), the "sticky campus" (Lefebvre 2014), expert elicitation (Meyer and Booker 2001; Sullivan and Payne 2011), and cognitive mapping (Jameson 2000). This approach is also supported by Helmer-Hirschberg's (1967) "analysis of the future" modelling strategy encapsulated in the Delphi approach. Multiple issues are impacting the future of the campus both as a whole and also as a series of interconnected learning and research environments.

Figure 4: **Laureate International Universities (2017) global network**

These issues are being considered in professional and academic forums including recent conferences (Western Association of Schools and Colleges 2015). Indeed the whole concept of flipped learning is in the early stages of a rigorous scholarly evaluation (Freeman et al. 2014; Riddle 2015).

Some of these issues were also addressed in previous Chapman Prize winner reports. Boys, Melhuish, and Wilson (2014) focused on student perceptions of learning spaces, while Painter et al. (2013) focused on gaps in the research and the need for some form of agreed taxonomy regarding the range of issues being considered in this research domain. Further, Johnson, W.M. et al. (2015) examined peer engagement as a common resource on campus and explored the interaction patterns in institutions.

In continuing to build on that work, this study focuses on the views of eminent researchers in both industry and academe to forecast how university campuses may change in the near future using the well-tested practice of expert elicitation (Sullivan and Payne 2011).

BACKGROUND

An approach advocated by Norman (2010) calls for a "translational design" research model.

This model draws from translational clinical medicine wherein research and practice are intertwined. In leveraging this concept to campus planning and design, translational design seeks a stronger focus on research in the design of learning environments in an age of transformation and uncertainty. This approach also links academe to industry, with each discipline informing the other through empirical research studies.

Using this evidence-based planning and design approach first developed by health planners (Sage Journals 2017), the scholarly peer-reviewed published literature can be evaluated.

An alternative way of unpacking the complexity of university strategic campus planning in a systematic manner is to frame the analysis within a student-learning trajectory—as advocated by Boys, Melhuish, and Wilson (2014)—but filtered through Kolb and Kolb's (2005) four learning elements.

Kolb and Kolb suggest that four topologically nested subsystems—the *micro*, *meso*, *exo*, and *macro*—inscribe the principal domains in which students learn.

The *micro* is represented by the student's immediate classroom; the *meso* is mediated by student residences, family, and perhaps parallel online courses; the *exo* covers the policies and structures impacting the student via campus culture; and, finally, the *macro* is shaped by society's values and aspirations (such as valuing education over training, for example).

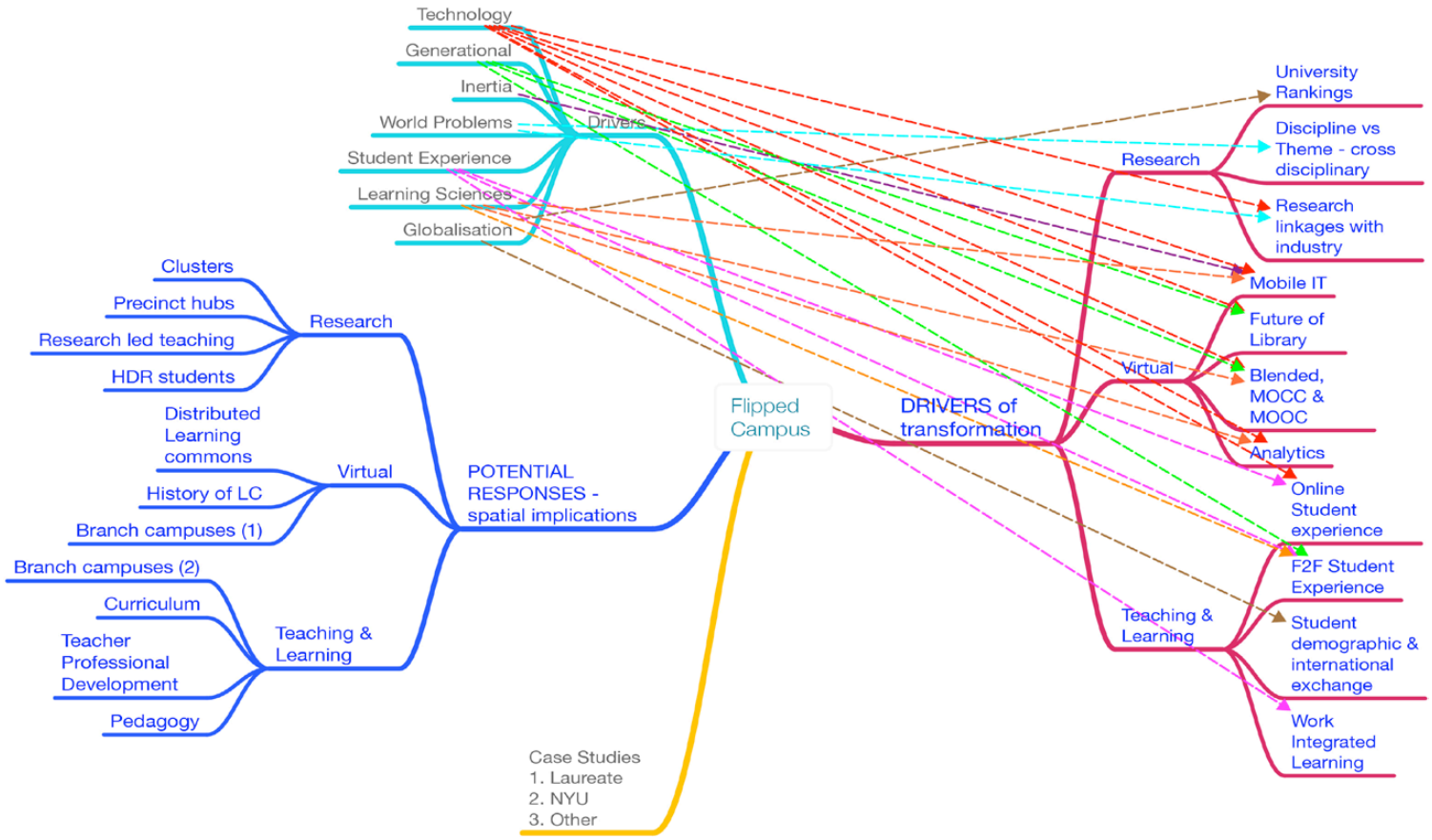
Kolb and Kolb (2005) also accesses research and knowledge transfer/community engagement in its analysis.

MACRO—SHAPED BY SOCIETY'S VALUES AND ASPIRATIONS

Several institutional studies that draw on expert elicitation methods are worthy of note. Norton (2014—see hereunder in the literature review) suggests that technology will have a significant impact on the campus experience. This campus-

based face-to-face disruption has been acknowledged by *The Economist* (2014) and Laureate (Zogby and Zogby 2014).

Figure 5: **Mapping the "flipped" campus (author's "mind map")**



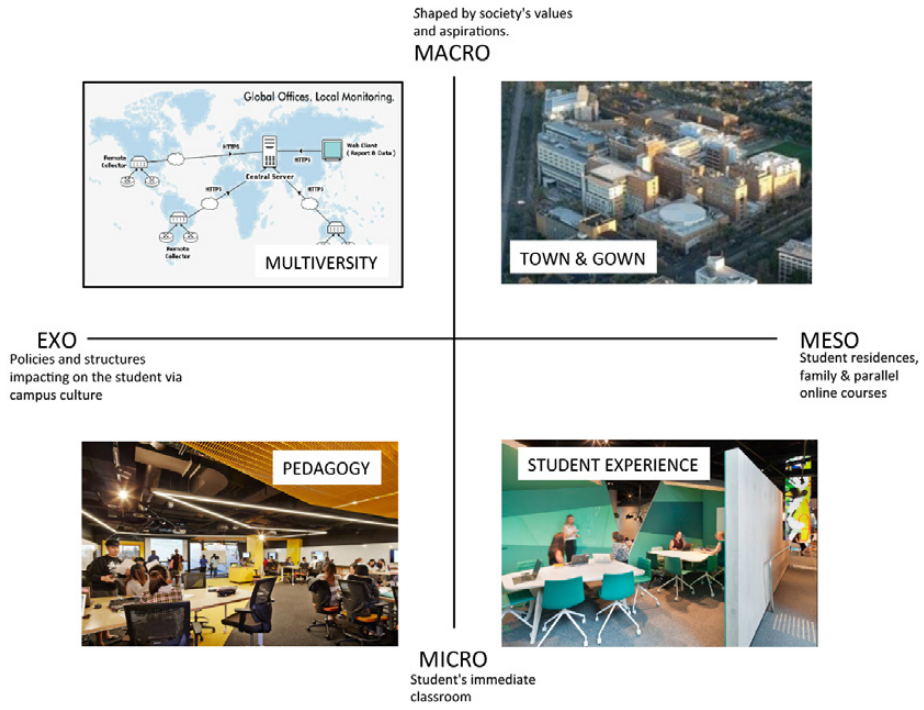
Massive open online courses (MOOCs) have evolved at a rapid rate, and now these courses recognize a need for an on-campus experience to support the online experience as completion rates for MOOCs are significantly low at only 10 percent (*The Economist* 2014).

There are clear implications here for campuses. For example, what support services should be provided on campus, where are they best located, and what would their built form look like? These needs are made explicit in the concept of affordances (Gibson 1977), which develops a framework for infrastructure in support of teaching and learning modalities.

Ensuring an effective on-campus experience for students is itself leading to innovation in course models, with both online and face-to-face elements. These are "branded" as blended learning models in which instructor time is reduced and replaced by an online component.

"Over half the 4,500 students at MIT take a MOOC as part of their course" (*The Economist* 2014 ¶ 22). Thus the concept of the "sticky campus" is a key factor. The university must provide a unique palette of knowledge sources and student experiences to ensure that students will want to come and stay on 21st-century campuses (Lefebvre 2014).

Figure 6: **Framing the research (adapted by the author from Kolb and Kolb [2005])**



Other equally—if not more—important issues are also in play, including government-framed research policy and funding, student fees and student debt, access and inclusion, overall funding from public vs. private sources, and the internationalization of both research and learning.

There is also a more recent questioning of how universities should be valued by the community; that is, just by financial performance and graduation numbers or by a more balanced approach that couples these metrics with a more qualitatively valued assessment of the relative importance of the concept of the university to the local community and the state as well as to the production of new knowledge, including its transfer.

EXO—POLICIES AND STRUCTURES IMPACTING THE STUDENT VIA CAMPUS CULTURE

Exo is related to policies and structures that impact the student via campus culture. These include internationalization, research, community engagement, student services, academic professional development, educational technologies, human capital, the student experience, and graduate attributes. In exploring how these themes impact students, the annual *NMC Horizon Report* (Johnson, L. et al. 2015a—see hereunder in the literature review) outlines educational technology trends (that is, the digital or the virtual) over short, medium, and long time frames.

One resulting physical impact is the "flipped" classroom (Strayer 2007). These environments require a remapping of the student experience (addressed in Part 3 of this report in more detail) in the context of graduate attributes. In terms of the built learning environment, graduate attributes can be used as a means of calibrating how learning environments are designed and how well they actually work. Indeed, these are now being connected to so-called "soft skills" such as entrepreneurship, start-up strategies, and cloud sourcing, all of which are not normally extant in a "traditional" curriculum.

The alignment with the institutional mission is through student graduate attributes at the institutional and the faculty/discipline level.

MESO—MEDIATED BY STUDENT RESIDENCES, FAMILY, AND PARALLEL ONLINE COURSES

Kolb and Kolb (2005) suggests that the meso is mediated by student residences, family, and parallel online courses. Linking this to the concept of the student experience may provide a fundamental way of understanding the influence of the meso. Suitably calibrated surveys and other qualitative research methodologies have been explored to provide evidence (Minsky 2016) that can be mapped onto a spatial campus framework.

This SCUP project argues for a stronger focus on the strategic imperative of universities through the cognitive mapping of educational drivers now impacting our teaching, learning, and research programs. For example, work by Laureate International Universities (Zogby and Zogby 2014) embraced the blended learning model to ensure that their 850,000 students are comfortable with a blended online and campus-based approach.

It should be noted that Laureate attracts students focused on education and training directed toward finding a job and that many of their institutions are vocationally oriented. At present, Laureate's predominant model is 40 percent on-campus face-to-face and 60 percent online but, tellingly, the university wishes to reverse that ratio through a blended study center model.

MICRO—REPRESENTED BY THE STUDENT'S IMMEDIATE CLASSROOM

There is a slow transformation from the predominating passive teacher-led model of didactic lecture halls toward a more active learner-centered environment (Fisher and Newton 2014). The arguments around funding ratios that have supported large lectures of 400–500 students in first-year courses are now being eroded. More online analytics are being used to determine student learning outcomes from all pedagogical models, and lectures have been found to be the least effective (Ellis and Fisher 2017). Blended learning spaces are emerging where larger groups can still be taught and where the evidence shows that there are improved learning outcomes.

Analytics enable a more personalized, constructivist approach to learning (JISC 2017). Students in the "flipped" mode can remotely view online lectures through iTunes or YouTube at their leisure and then have a more active and engaged event with an instructor and their peers on campus. Timetabling and space modelling have transformed the traditional one-hour lecture and two-hour tutorial into a one-hour online e-learning and two-hour blended tutorial model.

Lecture theaters are being replaced by spaces such as active learning classrooms (ALC), technology-enabled active learning (TEAL) spaces, immersive innovative learning environments (IILEs), and problem-based learning environments such as "conceive, design, implement, and operate" (www.cdio.org). This latter example is used largely in engineering and technology programs (Keppell, Souter, and Riddle 2011).

These developments are supported by evidence-based evaluations that argue for a significant change of pedagogical practice and, accordingly, for parallel changes in technology and the design of learning spaces to improve measured student learning outcomes. The design response can include, in addition to the innovative learning environments noted above, a campus-wide network of distributed learning hubs and increased informal and social student learning third spaces (Fisher 2007b). These can take the form of a distributed precinct, faculty, department, or school discipline-based learning commons designed to optimize the on-campus student experience.

Academic libraries are rapidly converting to centralized learning commons where books are making way for people, with some universities opting for automated book storage and retrieval to release book stack space for additional informal

and social space for students. Libraries are effectively being reengineered into cultural centers where campus social capital can expand (Johnson, L. et al. 2015b).

These issues are covered in part by a recently commenced research project called Modelling Complex Learning Spaces (Ellis et al. 2015). This study is synchronously mapping the digital/virtual behaviors of students over the physical to understand better how campus learning spaces provide improved student learning experiences and engagement. It is a study that evaluates the recent past to predict what might emerge in the future.

This study takes a very different approach in that it taps into expert opinion as to what works, how, and why, and which strategies are likely to dominate in the future to influence campus planning and design.

Both studies—this Chapman Report and the Modelling Complex Learning Spaces project—will complement each other, and both will serve to inform a much larger examination of the "wicked" problem: what will the campus of 2030 look like in aligning its affordances (Gibson 1977) with its institutional mission.

Hashimshony and Haina (2006, p. 5)

> identify transforming trends in society that are affecting the mission of universities, analyze the impact of those trends on the institutional and spatial structure of universities, and then summarize the factors that planners should be paying attention to in the future design of their institutions.

This statement—in a nutshell—suggests the use of cognitive mapping (Jameson 2000) as a means of understanding the impact of transformation and pedagogical change on the design of future campuses. Unless we critically analyze and understand the dynamic forces acting on universities in the 21st century, we can never expect to design built infrastructure to effectively support learner needs in our rapidly evolving digital world.

Cognitive mapping is a perfect framework to more deeply understand learner needs and map these over their potential impact on the physical learning environment. Jameson (2000) argues—in referencing Lynch's (1960) *The Image of the City*—that to understand the city, you must first understand society.

From this logic comes the socio-pedagogical-spatial notion of "flipping the campus," that is, where students can work and learn anywhere. Instead of coming to campus to sit passively in lecture theaters, students become active learners through collaborative workshops that are mediated and coached by academic "guides" with the material acquired through various online managed digital portals.

Thus the three prime campus spatial typologies—formal (teacher centered), informal (learner centered), and social (collaborative)—will change significantly in their mix, from the present 50:40:10 to perhaps 10:60:30.

This is a highly complex area, with the default position on many campuses being predominantly a process of incremental change. The industrial-age classroom model of didactic teaching is still prevalent despite the inroads being made by online learning modalities.

The evidence to date (Fisher and Newton 2014; Keppell, Souter, and Riddle 2011) points toward a more blended active learning, digitally supported model. This involves a mix of self-directed, collaborative, problem-based, immersive, active, and integrated workplaces and other forms of authentic learning in varying proportions, depending on the discipline, year level, and subject complexity.

I also think technology itself is a key trend, in that the advancement is creating rapid changes in how teaching and learning happens and where it happens (space design). Artificial Intelligence, for example, is progressing very quickly and will begin to impact on education more broadly in the near future. The multiversity is a terminology I have been thinking about for a while now that aims to capture what the campus of the future might be—truly student-centric—multi-locational, multi-optional, multiple choices for student learning. This concept could address the future of education beyond what we know is happening and beyond the trends of the now and toward a learning landscape where students can choose where to study, what to study, and how to study in a student-designed education model, facilitated by universities: the creation of the hyper entrepreneur.

Alan J. Duffy, Woods Bagot (pers. comm.)

PART 2 – Methodology

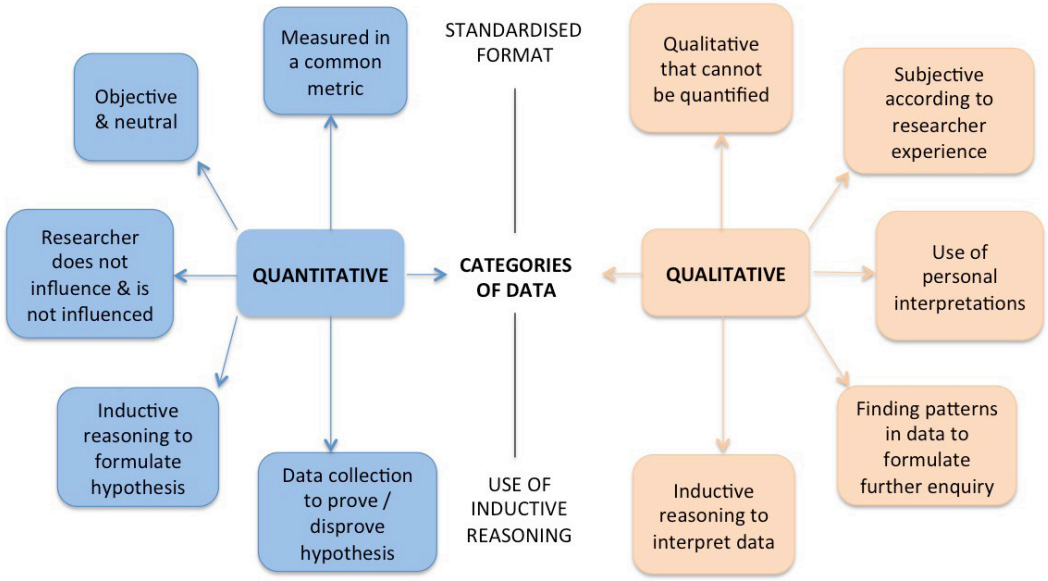
MIXED-METHODS RESEARCH—QUALITATIVE AND QUANTITATIVE

This study uses various tools to elicit views on the trends in campus planning over the next 10 years. The principal elements include:

- A scholarly systematic literature review of campus planning futures
- A review of a number of expert elicitation surveys undertaken by significant research bodies and institutes
- A Delphi study and proof of concept of a SCUP members' survey to elicit views of campus planners regarding campus futures
- A parallel study of Australian and U.K. university directors of estates and chief information officers on their views of campus planning, both virtual and physical

These sources are triangulated for validation and cross-referencing to determine the most probable campus futures in the opinion of these "experts."

Figure 7: **Mixed methods—qualitative and quantitative**



DELPHI ANALYSIS

In 1967, Olaf Helmer-Hirschberg (p. 3) noted

> In my opinion the so-called soft sciences are on the verge of a revolution. The traditional methods of the social sciences are proving inadequate to the task of dealing effectively with the ever-growing complexity of forecasting the consequences of alternative policies and thus furnishing useful planning aid to high-level decision-makers in the public and private sectors.

In so doing Helmer-Hirschberg pointed out that new methods include operations research, mathematical modelling,

simulation, and the notion of systematic utilization of expert opinions. He also noted that use could be made of informed intuitive judgment based on the notion that "projections into the future, on which public policy decisions must rely, are largely based on the personal expectations of individuals rather than on predictions derived from a well-established theory" (p. 4).

In this context he mentions the concept of expert opinion, which more recently has been framed as expert elicitation (Sullivan and Payne 2011). The Delphi method involves a series of repeated exchanges between the researcher and the selected experts, gradually narrowing down the key themes that form the questions, the answers to which are elicited from a wider group.

This approach was taken in this study, with approximately 40 "experts" responding to the iterations of the survey questions as they were continually refined.

QUALITATIVE

ABBREVIATED SYSTEMATIC LITERATURE REVIEW

The three stages of the literature review are

1. Conceptual

   The rapid structured literature review (RSLR) is used to formulate research aims, objectives, and questions. From these a conceptual map of topic areas is created. Seminal articles are sourced from such venues as peer-reviewed and professional journals, conference proceedings, market research, organizational literature, official statistics from government and company sources, and dissertations, theses, and unpublished papers.

2. Operational

   The research design and methodology uses data collection and quality assessment. Databases are searched using key words and strings. Tables are created of descriptive information, and these are then reviewed to create thematic relationships and connections. A literature map is then extracted and linked by theme, author, time series, or a combination of these.

3. Sense making

   Discussions and interpretations pick up differences between authors' views in the RSLR. Key outcomes are then determined. These may inform key insights for practice. The overall findings from the RSLR are compiled, and further work is identified for future study.

ARC DISCOVERY GRANT SURVEY (AUSTRALIA AND UNITED KINGDOM)

This project (led by Assoc. Prof. Rob Ellis with Assoc. Prof. Kenn Fisher and Profs. Marmot, University College, London, and Goodyear, University of Sydney) is continuing until 2019; thus there will be further data acquired through this source. The respondents in this study are directors and planners of estates and directors of IT and CIOs.

EXPERT ELICITATION

These expert opinions are sourced from various studies by scholarly institutes including the *NMC Horizon Report: 2015 Higher Education Edition; NMC Horizon Report: 2015 Library Edition*; Scottish Executive; Zogby Analytics; and various SCUP surveys such as SCUP Trends 2016 and the findings from the Delphi survey in this Perry Chapman Report.

QUANTITATIVE—QUESTIONNAIRE DESIGN

In framing the survey questions the Delphi phase of the project arrived at the following key themes:

- University strategy
- Student experience
- Informal and social learning
- Formal teaching and learning
- Impact of technology
- Staff experience
- Research spaces
- Industry engagement

The following categories of SCUP members were selected as respondents:

- Directors and planners of estates
- Directors of IT and CIOs
- Deputy vice chancellors/deputy presidents

Approximately 100 responses were received, which indicated that these respondents had an interest in the topic and thus the data gained will be valid and reliable. One possible drawback of the questionnaire—the design of which highlights the extraordinary complexity of campus ecosystems—is that it would have been difficult for one person to complete it. Indeed, four or five departments in a university might need to be consulted to complete the data required.

SURVEY IMPLEMENTATION

The survey was managed through SurveyMonkey and the data analyzed using the tools available in that system.

PART 3 – Literature Review of Research into Higher Education Campus Futures

A range of key drivers and issues are impacting the future of the campus both as a whole and as a series of interconnected learning and research environments. These are discussed under Kolb and Kolb's (2005) four categories: macro, exo, endo, and micro. The following literature review is organized around these four themes. Furthermore, the source documents are referred to directly so that these eminent studies reveal the voice of the authors, rather than simply being referenced or cited within this report's narrative.

MACRO—SHAPED BY SOCIETY'S VALUES AND ASPIRATIONS

This category includes references that have used an expert elicitation process to determine their findings.

1. MOOCS MASSIVE OPEN ONLINE COURSES (ALLEN ET AL. 2016)

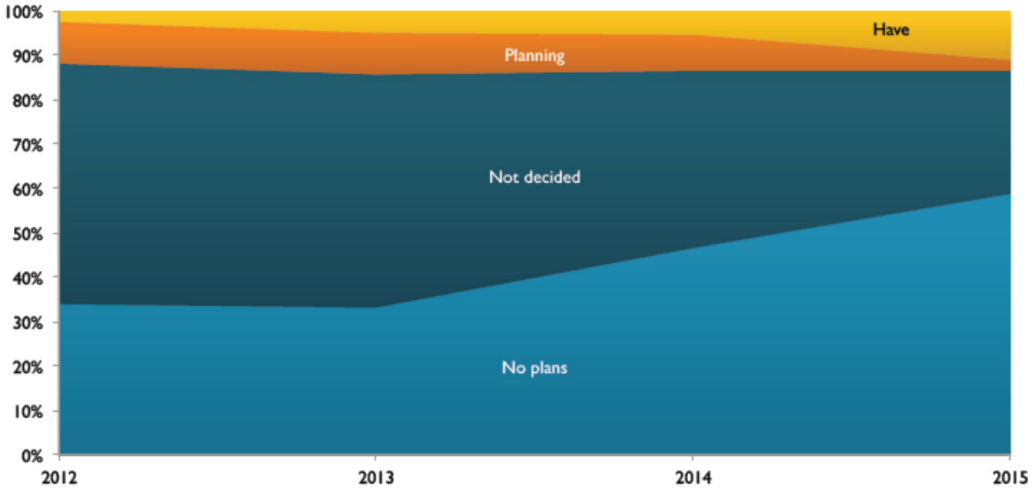
The use of online learning is tracked annually by this organization. It seems that there is still significant resistance to this form of learning—compared with face to face—by academics/faculty in the United States. This is evidenced by the lack of growth in the number of MOOCs, which has remained relatively flat from 2012–2015 (see figure).

If this remains the case in the near future, it is likely that place-based learning will still be the most favored, and thus the physical campus will continue to be highly relevant. This finding is in contrast to the statement earlier that MIT has some 50 percent of its students taking a parallel MOOC.

While students may well take parallel courses, at this stage there is little evidence that these will be accredited at the degree level, although they may be included as a partial assessment by some lecturers.

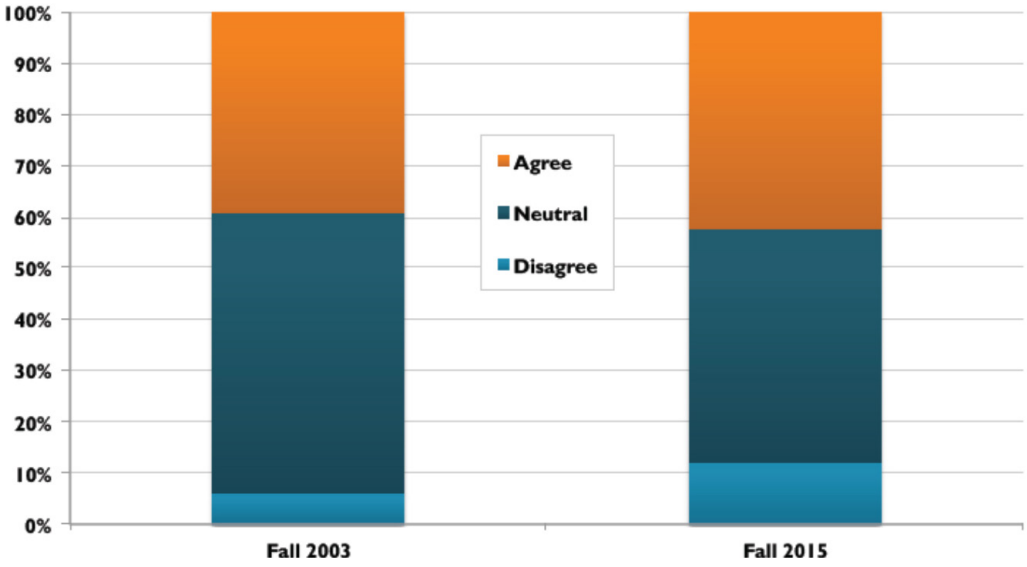
The report does go on to say that blended learning is gaining some traction (see figure). This further supports the notion that the place-based campus will remain a significantly effective learning environment into the future.

Figure 8: **Growth of MOOCs 2012–2015**(



(Allen et al. 2016, p. 38)

Figure 9: **Blended learning courses hold more promise than online courses**



(Allen et al. 2016, p. 31)

2. SCUP—SUCCEEDING AT PLANNING: RESULTS FROM THE 2015 SURVEY OF HIGHER ED LEADERS (SOCIETY FOR COLLEGE AND UNIVERSITY PLANNING 2015A)

There were key findings in two prime areas:

- Long-term vision and planning: there is a lack of a clear vision for the future
- Uncertainty and change: plans are easily disrupted when new circumstances arise

There were a number of themes that are relevant to this study, and these are picked up in some of the comments by the respondents in the SCUP study.

INTEGRATING PLANS

Much of the extant planning is carried out by individuals who are not using an integrated campus-wide implications approach. An example given was academic planning disconnected from budget or facilities planning.

The findings suggest that planning should be integrated across departments with stakeholders linked together so that a shared understanding of integrated planning and the resources required is achieved. This should be codified into an integrated process or planning model. The process should also connect planning committees with individual planners across academic, strategic, campus, and facilities planning.

There is also a need to integrate academic planning with campus planning and foundation (financial) planning.

BEING NIMBLE

Higher education leaders noted that it is important to invest in what "we must do to remain viable and vibrant," but in a nimble way. A drawback is that the complexity of campus stakeholders makes planning slow and so deters nimbleness.

Colleges and faculties appear to be better at planning than the university as a whole. This is largely because of the inability of the university to make decisions based on strategic planning. [Author's note: This is in contrast to the Australian situation where in the author's experience faculties can often lack coherence and congruence unless this is directed from "the top" in the strategic planning process.]

However, planners do need to be flexible in responding to future changes in student demographics and technological innovations.

MANAGING CHANGE

Senior administration needs to understand the critical urgency for change. Further, universities must be willing and able to see the changes in learning and student demographics that are already occurring.

Change management and capacity building need to be implemented to build a culture of continual acceptance of change. Uncertainty of funding levels can also impact the ability to change for an unknown future.

Faculty need to understand university-wide imperatives as well as their own focus.

3. SCUP—TRENDS FOR HIGHER EDUCATION FALL 2015 (SOCIETY FOR COLLEGE AND UNIVERSITY PLANNING 2015B)

This survey uses a STEEP taxonomy: social, technological, economic, environmental, and political. This review selects those trends that are likely to have a significant spatial implication both now and in the future.

Figure 10: **SCUP Trends for Higher Education Fall 2015**

Trends	Spatial Implication
Social	
T-shaped professionals—students need soft and hard skills that can be developed through work-integrated learning (internships and placements), research-integrated learning, and entrepreneurship training.	Blended learning, incubators, and makerspaces for students to practice a variety of skills.
Boot camps are becoming popular where industry enterprises are taking employees into training blocks.	Increase in use of executive training programs such as in Schools of Business—these may need expanding across other faculties.
Increased innovation.	Growth in makerspaces, incubators, and industry linkages, e.g., research parks.
Technological	
Gartner's trends—"device mesh," which integrates a seamless connection of mobile devices, wearables, and smart home electronics with a focus on "continuous and ambient user experiences" including 3-D printing and machine learning (artificial intelligence).	More adaptive spaces, incubators, makerspaces, and immersive experiences.
MOOC growth meaning less need for campuses.	Possible development of learning commons for students to co-learn via MOOCs.
Trachtenberg predicts that "devices will replace faculty by 2030." Students will use online tools that best suit their needs. University will be year-round. Research may move more off campus.	Universities will need to be agile and adaptive for uncertain and unknown futures. Infrastructure may need to focus on the student co-learning construction of the knowledge experience.
Economics	
Projected reduction in middle income families and demographics meaning possibly more students of lower socioeconomic demographics requiring more developmental education.	Possibility for more on-campus senior secondary schools.
Projected sector growth in health care, computing, construction, and social services.	Adaptive infrastructure to cope with future changes.
Increased demand for "soft skills" such as writing, critical thinking, and problem solving.	Growth in STEM, STEAM, and STEMM programs and resulting facilities support.
The emergence of the collaborative economy. Greater asset sharing, increased inter-business partnerships, and ongoing training and development.	Greater connections to industry with possible growth in technology parks.
Synthetic mergers between institutions—central management with separate branded campuses.	A prime example is Laureate International Universities in 25 countries with 80 institutions blending campus face-to-face and online student experiences.

Trends	Spatial Implication
International student growth—10 percent in 2015.	Increased international student hubs in Asian and other countries competing with traditional destinations.
Disengaged graduates. Millennials especially looking for a more experiential and active learning model.	Increased use of blended active learning spaces, makerspaces, incubators, and entrepreneurial facilities.
Environmental	
Schawbel predicts a move away from open offices toward designs that offer different styles of office spaces to accommodate a range of employee preferences.	Re-engineering the changing academic workplace to a 21st-century model.
Makerspaces for maker fluency with 21st-century skills. A creative environment across technology, engineering, arts, and sciences.	Repurposing of existing spaces.
Active learning spaces.	Reengineering all traditional learning spaces.
Sustainability	Platinum building ratings.
Deferred maintenance and accruing liability.	Regeneration of building stock.
Climate change.	Possible recalibration of HVAC.
Polital	
Americans with Disabilities Act (ADA)—still very low graduation rate of this demographic 25 years on.	Reengineering accessibility for ADA.
Retention rates still very low.	Increased focus needed on the student experience.
Higher Education Act likely to refocus on accreditation.	Possible impact on facilities and infrastructure resources to maintain accreditation (already exists in business, medical, and engineering degrees).
Private vs. public higher education and the relentless push for public institutions to seek alternative funding.	Possible need for joint ventures, partnerships, technology/ research and science parks, biohubs, and the like.

4. 2016 NMC TECHNOLOGY OUTLOOK FOR AUSTRALIAN TERTIARY EDUCATION (ADAMS BECKER ET AL. 2016)

This annual survey of some 400 leaders in technology in higher education focuses mainly on the impact of technology trends. However, these technological advances can have an impact on the use of the campus physical infrastructure.

The 2016 survey of 400 technology leaders in higher ed continues the relentless march of the impact of emerging adaptive and agile technology. In the next 1–2 years they point to the redesigning of learning spaces to support blended learning and how advancing cultures are seeking change and innovation. Most importantly they also see a rethinking in how institutions work, most likely reflecting the impact of the MOOC developments. As the Internet has brought the ability to learn something about almost anything to the palm of one's hand, there is an increasing interest in the kinds of self-directed, curiosity-based learning that has long been common in museums and science centers. These and other more serendipitous forms of learning fall under the banner of informal learning and serve to enhance students' engagement by encouraging them to follow their own learning pathways and interests. Many experts believe that a blending of formal and informal methods of teaching and learning can create an environment that fosters experimentation, curiosity, and above all, creativity.

Three themes are explored, namely: (1) key trends accelerating educational technology adoption in higher education, (2) significant challenges impeding educational technology adoption in higher education, and (3) important developments in educational technology for higher education. In 2016 the trends included:

1–2 Years	3–5 Years	5+ Years
Growing focus on measuring learning (analytics)	Redesigning learning spaces	Advancing cultures of change and innovation
Increased use of blended learning	Shift to deeper learning approaches	Rethink how institutions work

Emerging technologies included:

<1 Year	2–3 Years	4–5 Years
Bring your own device (BYOD)	Makerspaces	Affective computing
Learning analytics and adaptive learning	Augmented and virtual reality	Robotics

Key challenges included:

Solvable	Difficult	Wicked
Blending formal and informal learning	Personalized learning	Balancing our connected and unconnected lives
Improving digital literacy	Competing models of education	Keeping education relevant

The trends in the *Horizon Report* are determined through the expert elicitation process. The 400-plus academics' opinions are then triangulated to determine the listed outcomes. Perhaps the most profound outcome in the 2016 report is the trend away from teacher-centered lectures toward a more student-centered blended and flipped learning model as illustrated.

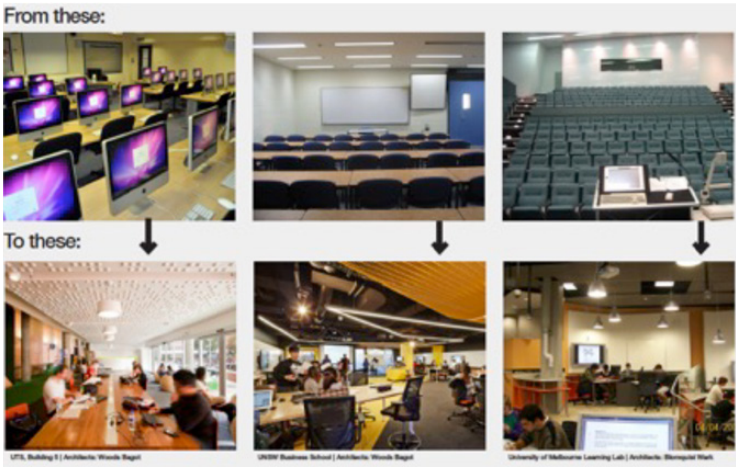
5. FOUR FUTURE SCENARIOS FOR HIGHER EDUCATION (OECD 2016)

The OECD Centre for Educational Research and Innovation has a program that examines the future of higher education (www.oecd.org/edu/ceri/centreforeducationalresearchandinnovationceri-universityfutures.htm). At a conference in Athens four future scenarios were envisaged.

Scenario 1 explored *Open Networking*.

It foresaw a highly internationalized network where institutions collaborated in research, with industry, and in student mobility.

Figure 11: **From teacher centered to learner centered**



(Image: Woods Bagot)

The increased use of technology is likely to offer a greater range of options to students and researchers alike. While the premier institutions are likely to still continue to network with each other, the collaborative knowledge generated will become available to all. Key drivers are open knowledge, efficiencies through technological advances, and exchanges. Student exchanges and study abroad programs are also likely to proliferate in parallel with research consortia and the emerging MOOC platforms.

Scenario 2 focused more on *Serving Local Communities*.

While research can be internationally collaborative, in many universities teaching and research will be more focused on the local communities from which their funding is largely derived. This envisages a more teaching-focused environment, with research largely left to governments and the more prestigious universities. To a degree the drivers can be seen as a backlash against globalization. Government research is likely to be more focused on strategic security, i.e., in the natural sciences, life sciences, and engineering, with the arts and humanities remaining a prime role for universities.

Scenario 3 responds to the *New Public Responsibility*.

While some universities remain essentially publicly funded, there is an increasing focus on the use of management tools such as market forces and financial incentives. The boundaries between public and private institutions blur as postgraduate fees become increasingly fully paid by the student and not the government. While research remains important so, too, does the quality of teaching and the employability of graduates. There is increased differentiation between institutions so that they can focus on their strengths and the local community's needs. Research is less cross-border except for the EU where the newly established European Research Council funds an increasing share of European academic research.

Accountability, transparency, efficiency and effectiveness, responsiveness, and forward vision are the golden standards of good public governance. "Rising public debt has shifted a significant part of the cost of higher education from government to other education stakeholders, especially students and their families. In ageing societies, the costs of health and pensions are now the primary government spending priorities" (OECD 2016, p. 7). Other factors include more distance from government, more autonomy, and a resulting need for greater entrepreneurship. Research funding becomes more competitive and project-based.

Scenario 4 envisages *"Higher Education, Inc."*

In this scenario higher education institutions compete globally for education and research services. Research and teaching become disconnected, becoming separate "core businesses." Vocational education increases its market share, and there is stronger competition for students. Many universities open branch campuses abroad and franchise educational programs. Emerging economies begin to specialize in their competitive advantages such as technology in India and agronomics in China. Some of these rapidly emerging economies also offer educational services to the developing world. Some drivers include trade liberalization in education.

6. SCUP PLANNING FOR HIGHER EDUCATION "CAMPUS MATTERS" ISSUE, APRIL–JUNE 2016

This issue of SCUP's *Planning for Higher Education* journal covers a range of campus planning matters, all of which relate to this project. All of the authors could be considered "experts" in their field, and their findings contribute to the evidence-based research in this study. Here the focus is on the first article.

THE 21ST-CENTURY CAMPUS—IT MUST ADD EDUCATIONAL VALUE (HAGGANS 2016)

> Those places that do not add educational value, even though beautiful, will become the American equivalent of the grand country estates of England, museums of a faded golden age. (Haggans 2016, p. 1)

So notes Haggans in his opening remarks. He argues that the original assumptions underlying higher education are now being seriously challenged. The digitization and transformation of higher education is resulting in a multiplicity of competitors to the traditional campus-based

model. This model, rooted in the chapel origins of the 12th century, is now faced with hybridization in the delivery of programs, which will see learning spaces that will be "bigger, flatter, and faster" (p. 3). That is, bigger in area per student, flatter to accommodate group work, and faster in bandwidth to accommodate such mediums as virtual reality.

Thus the concept of campus is now in question as these transformations "are about adjusting the performance of the whole campus to support a digitally transformed pedagogy and academic community" (p. 4). Furthermore, "campuses that begin to move quickly on their libraries and learning spaces will be better able to provide the expected capabilities. Those that can't move quickly enough will be left to offer less in an increasingly transparent higher education marketplace" (p. 4).

In terms of responding to this digital transformation, Haggans suggests there are six themes to consider: (1) build no net additional square feet, (2) upgrade the best; get rid of the rest, (3) manage space and time; rethink capacity, (4) right-size the whole, (5) take sustainable action, and (6) make campus matter.

In taking a hybridized approach to 21st-century campus-based learning, Haggans notes that "Harvard, Yale, Princeton, and Stanford are examples of elite institutions for which technological transformations and rising financial demands are manageable. Add to this A-list others with strong financial stability and a well-established marketing brand, and you have a group of institutions that are not at risk" (p. 7). Others with unique missions or those "too big to fail" will also survive. But it is suggested that this leaves a vast swathe of universities that could be at risk, and these will need to transform by balancing the duality of "respecting legacy and starting fresh" (p. 7).

Haggans concludes that "as the need for synchronous place and time evaporates, investments in the physical campus will be questioned as never before. For campuses to be justified, they must provide value that is not available by other means. To become such places, they will need to adapt and transform as if their survival were at stake" (p. 8).

7. FUTURE PERFECT: WHAT WILL UNIVERSITIES LOOK LIKE IN 2030? (TIMES HIGHER EDUCATION 2015)

This collection of academic opinions resonates with the underlying methodological premise of this study—the elicitation of expert views on what the concept of the university might look like in 2030 and what this might mean for campus planning.

Open-ended questions elicited some contrasting results, with one respondent suggesting that all learning will be delivered through artificial intelligence (AI) in 2030. Another respondent predicted that by 2030 we are likely to see the return of the lecture, where students will re-learn how to focus on a question for a lengthy period of time and hone graduate attributes in critical thinking, collaborating in debate about concepts, re-reframing knowledge, and indeed acquiring a form of wisdom.

[Author's note: A recent study (Dodd 2016) used artificial intelligence "nano tutor" robots at Georgia Tech in a course called "Knowledge-based Artificial Intelligence." The teachers did not tell the students that the online tutor—the nano robot they called Jill Watson—was not human. The students did not pick up that their tutor was a robot. But when told, the students were "amazed and receptive."]

The notions of learning, lifelong learning, and continuous learning came up a number of times, including the idea of work-integrated learning and the need to re-learn new concepts for new skills as existing ones become redundant through the takeover of robots in the workplace. The oft-cited future that sees robots and AI taking over 50 percent of jobs in the next 15 to 20 years will mean that universities will have to teach students for jobs that we do not yet know will exist. The rate of change of digital technology—with capability

doubling every 18 months—means that it is likely to have a significant impact as evident in, for example, the proliferation of MOOCs.

Concurrently, though, others noted that technology has been cited for the past 30 years as having a major impact on teaching and learning, yet lecture, tutorial, and laboratory pedagogical practices are still strong today.

Others noted that the need for the social construction of knowledge and for the human race to socialize will make the university even more central to higher education and that participation rates will continue to increase. The origin of the word "university"—from the Latin *universitas magistrorum et scholarium* (a community of teachers and scholars)—will continue to be valid as these institutions will still emphasize place-based social interactions (see also Johnson, W. M. et al. 2015).

The following category of references includes the opinions of individual "experts" in scholarly peer-reviewed journals and/or books.

8. AN AVALANCHE IS COMING: HIGHER EDUCATION AND THE REVOLUTION AHEAD (BARBER, DONNELLY, AND RIZVI 2013)

> It's tragic because, by my reading, should we fail to radically change our approach to education, the same cohort we're attempting to "protect" could find that their entire future is scuttled by our timidity.
>
> David Puttnam, speech at Massachusetts Institute of Technology, June 2012, cited in Barber, Donnelly, and Rizvi (2013, title page)

SUMMARY OF SPATIAL IMPLICATIONS IN AN AVALANCHE

Challenges include how to educate for employability, achieve quality without high costs, and learn from the emerging idea of learning by practice and mentorship.

Students of the future will be consumer "kings" (and "queens"?), taking up options of studying and gaining qualifications from providers outside the university. Massive globally available open online courses can employ the best instructors across continents and will test the cost, quality, effectiveness, and efficiency of funding traditional models of curriculum, teaching and learning, and the targeting of students. Students and citizens need to take more responsibility. [Author's note: This might lead toward a "heutagogical" approach to learning.]

Five possible new models may emerge: *elite*, *mass*, *niche*, *local*, and *lifelong learning*.

- *The elite university*, where technology becomes a greater part of the learning process, benchmarking is against global peers, and partnerships with other universities, institutions, and businesses are important (e.g., Yale's expansion into Singapore in association with the National University of Singapore).
- *The mass university* that will mostly use online or blended approaches, perhaps partnering with other respected institutions and practitioners from business and other fields. Some will shut "their physical doors" (p. 57) to be entirely online (similar to what is happening to many newspapers).
- *The niche university*, each different from the rest, may comprise a beautiful campus in a small town, "a handful of global stars" on staff, very high fees, and/or students drawn from the top echelon (examples include Oberlin and Williams in the United States and The New College of Humanities in the United Kingdom). As non-elite universities compete for students they will require offerings that are "sharper and clearer about what they offer and to whom" (p. 51).
- *The local university* may deliver and organize local student experiences with much of the content coming from large, elite universities (e.g., the local function

of Indian Institutes of Technology in supporting their local economy). As well, universities that teach subjects requiring face-to-face content and training (like medicine) will remain important.

» *The lifelong learning* mechanism could lead to people who have developed expertise without ever attending a university by drawing on a range of services and acquiring relevant knowledge being awarded bachelor's and master's degrees similar to honorary doctorates for exceptional performance (e.g., Steve Jobs and Richard Branson).

As patterns of innovation in the global economy broaden, education systems and governments will need to be innovative and rethink their business models to cater to the changing nature and pattern of skills and knowledge in which students shop globally for the best offerings. As learning and work become inseparable, businesses will be interested in collaborating with universities that offer "external perspective, academic analysis, [and] critique" (p. 52). Innovative models include year-round operations, students taking more responsibility and learning in groups, faculty teaching in groups, cross-curricular courses, and courses that are almost totally online.

In Australia, the government is using research funding to encourage collaboration between business and universities. The Browne (2010) Review recommended a direct funding relationship between the student and the university. Barber, Donnelly, and Rizvi (2013) suggest some alternatives to the four-year model, one being work recognized as part of learning and accreditation and another being the seamless movement between work and university, perhaps a semester at a time. The government would like to see innovators in industry focus on what their skills, products, and knowledge could do for higher education and institutions to "embrace this new world" (p. 67).

This publication is a provocation. It does not pretend to have the answers.

9. FUTURE CAMPUS: DESIGN QUALITY IN UNIVERSITY BUILDINGS (TAYLOR 2016)

Professor Tom Kvan has previously spoken in the context of "from campus to classroom." In his introduction to this book, he notes that in looking outward to society and community there are two key typologies of campus planning: (a) "there are those large bounded campus territories that can be regulated by the university," and (b) "there are campuses composed of discrete buildings located in an urban fabric controlled by other agencies" (Taylor 2016, p. 3).

He addresses eight points in the introduction: (1) campus planning, a historical perspective, (2) the academic mission today, (3) the learning experience, (4) a place for work, (5) the virtual and the physical, (6) the role of a campus today, (7) the campus development framework, and (8) the academic mission guiding particular projects.

These points all serve to address the ideals of the Chapman project. In the context of the future of campus and strategic planning, a campus development framework is outlined hereunder in the section on the meso.

10. THE SHAPE OF THINGS TO COME: THE EVOLUTION OF TRANSNATIONAL EDUCATION (BRITISH COUNCIL 2013)

The Shape of Things to Come is a report on the evolution of transnational education (TNE) and its global impact. It examines the flow of students to and from all countries and the implications for host countries. It also develops a matrix of opportunities for the forthcoming period of time in the international education marketplace. Some key findings include:

Policy environment—while much of this is directed toward policies and regulations, the report notes that

the "development of education cities and economic free zones dedicated to education and training are indicators that host countries are serious about TNE. Incentives to attract foreign universities play an important role in driving TNE activity, but do raise questions as to its sustainability in their absence" (p. 54). At the same time the differences in qualifications recognition and quality assurance frameworks can be a deterrent to those wanting to establish a branch campus offshore.

Market environment—the authors note that there "appears to be a positive relationship between economic development and TNE activity. Economic growth will remain supportive of demand for TNE in most host counties over the forecast period 2012–2014" (p. 54).

Mobility environment—further, "the mature TNE hosts are perceived as having relatively high quality domestic higher education systems" (p. 58) with China and Malaysia cited as being quite advanced.

Impact of transnational education on host countries—some countries are using TNE for academic staff capacity building. The three study countries—China, Malaysia, and the UAE—are all exploring TNE for knowledge transfer in addition to the emergence of professional development programs. The UAE is using TNE to develop and retain a skilled workforce. The report also notes that international branch campuses are not attracting foreign direct investment in terms of physical or equipment infrastructure. This is somewhat at odds with Jones Lang LaSalle's views regarding the establishment of branch campuses in China (see hereunder).

11. INTERNATIONAL BRANCH CAMPUSES (GALLAGHER AND GARRETT 2012)

There are external threats taking market share from Australia in a new "post-export" phase through various drivers:

- *Lateral*—led by cash-strapped institutions such as Berkeley, UCLA, and Washington capitalizing on the impact of the global financial crisis and bad publicity regarding the treatment of foreign students (new export competition)
- *Above*—ambitious private universities such as Duke and NYU wanting to leapfrog the export phase using multi-lateral global supply and distribution chains to become multinational universities
- *Below*—high-quality, low-cost online courses by Coursera, Udemy, and Udacity but also Harvard and MIT; the first wave "crashed" in 2001 with the dot.com bubble but this second wave is likely to be more robust (MOOCs)

"These challenges—new entrants into existing markets, multinational firms slicing up the global value chain, and online cost cutters at massive scale—are common to most industries in today's truly global, technology turbocharged, and ultra competitive world economy" (Gallagher and Garrett 2012, p. 4).

The report covers four parts: (1) a conceptual model of the internationalization of higher education from traditional nationally focused universities through the export model of the past 20 years; (2) the impact of high-quality American universities; (3) the idea of the multinational university and examples given in four prototypes from Duke, MIT, NYU, and Yale; and (4) how Australia might respond through policy and university strategy.

English instruction is in demand. At the time of reviewing this publication, there were 200 degree-awarding inter-branch campuses worldwide. Singapore had several, and Monash was the most aggressive Australian overseas brand. There is now some thought of turning these into multinational universities, e.g., Monash is now in Suzhou, China, building research capacity. This could foreshadow a higher education revolution in multinational universities.

It is possible to then have a "back of house" in headquarters and outsource in a value-added chain. Singapore and China are the most popular as they are the most ready. Australia educates more students on branch campuses than any other country—27,545 in 2011. Curtin has seven campuses across the Asia-Pacific region.

The newly emergent multinational universities tend to follow the Apple model as the "icon of contemporary globalization as well as the technology revolution" (Gallagher and Garrett 2012, p. 22)—a distributed supply chain with global sales. This is very different from the Ricardian 19th-century model of international economics—products made in one country and then exported, which is the current university model. But this is changing, e.g., Duke in Singapore. Liverpool and Nottingham appear to be the first multinational universities. Detailed discussions are given on a range of examples including

- NYU Shanghai—the next phase of NYU's global network university
- DKU (Duke-Kunshan University)—business focus plus focus on China's new 12th five-year plan regarding health, including incubator centers
- Yale-NUS— business focus on 21st-century issues; West and East liberal arts curriculum; based in a university town with 40 founding business partners, e.g., AMEX, Microsoft

12. ANNUAL HIGHER EDUCATION SECTOR PROJECTIONS (NORTON 2014)

The Grattan Institute in Australia has commenced an annual review entitled *Mapping Australian Higher Education* (Norton 2014). This 104-page report collates data from various sources and notes that it is rare to find these sorts of data in one place. The report considers higher education providers and students, the workforce, research, finance (macro and micro), and policy making. It considers the benefits to employers, the public, and students. Data are used to populate 40 figures and 12 tables.

A key point is that the inevitable embracing of private funding in Australian universities, following the American model, will impact the built campus through more engagement and partnerships with industry and commerce, leading to work-integrated learning.

Norton (2014, p. 3) notes that "online enrolments have grown rapidly in recent years, but the distinctions between online and on-campus are blurring. Almost all students use online technologies, while some universities have established study centres for their off-campus students."

There are other equally groundbreaking shifts in international student market sources (China predominating) and in research funding (private twice the public). Clearly campus planners and designers now need to consider the impact of town and gown much more than ever before.

These trends are supported by Gallagher and Garrett (2012) above. The 19th-century national model of university is largely funded by the state. In the United States today this model makes up only 10 percent of universities. Study abroad models emerged after WWII in the 1950s and '60s, beginning a form of internationalization. Now we see this expanding into the concept of branch campuses with satellites that provide, firstly, a face-to-face campus experience in those countries where students study abroad and, more recently, a similar experience to local in-country students. If students in those countries can acquire a Western English-speaking education without leaving—in many cases with academic staff ensuring quality is maintained—it will be much cheaper than sending them overseas.

13. RESEARCH CLUSTERS (SÖLVELL, LINDQVIST, AND KETELS 2003)

Sölvell, Lindqvist, and Ketels's (2003) work examines clustering as a way to enhance social capital, cross-disciplinarity, and knowledge transfer. Social network analysis can be used to examine where collocating departments or entities might gain synergies and efficiencies. Examining strategic research directions together with teaching and learning niche/specialities might offer a coherent approach to developing such clusters.

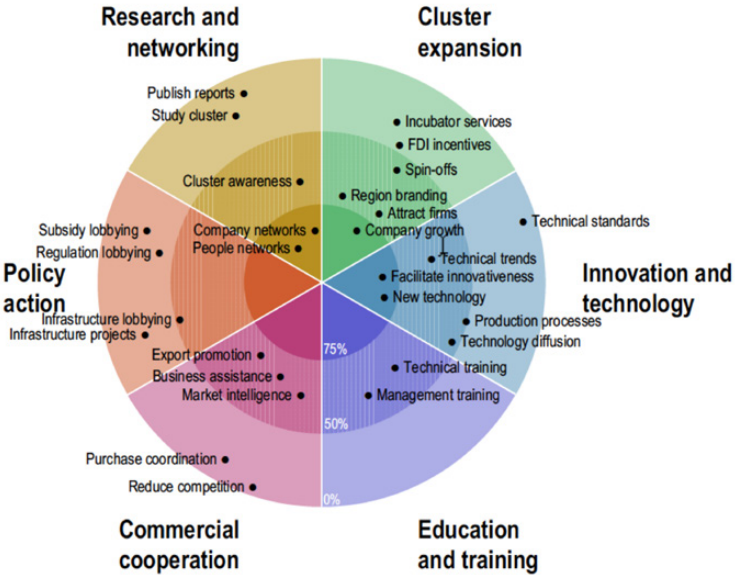
These clusters need to be planned within a physical framework that integrates the campus into a coherent whole. They could accommodate research and networking, innovation and technology, the commercialization of intellectual property, and education and training (Sölvell, Lindqvist, and Ketels 2003). A strategy of "hubs and spokes" across campus will contribute to a form of social "glue" if they are strategically placed and designed to contain many of the social elements outlined above. The University of Melbourne's rapidly emerging biomedical sciences Parkville Campus is an excellent example of this evolution of critical mass.

Such interactions are also being emphasized by funding authorities in their performance criteria as noted hereunder.

Cities evolved over time to support transactional exchanges. While these originally included skills and goods, they also enhanced the development of friendships and ideas. Their effectiveness is measured in many ways, and these may include economic, social, and environmental (the so-called "triple bottom line") to which cultural could be added. Castells (2009) calls this exchange the "space of flows" that occurs in both the public life of cities and also on university campuses.

> At their best, public spaces act like a self-organising public service; just as hospitals and schools provide a shared resource to improve people's quality of life, public spaces form a shared spatial resource from which experiences and value are created in ways that are not possible in our private lives alone. (Worpole and Knox 2007, p.7).

Figure 12: T**he Cluster Initiative Target Board**



(Sölvell, Lindqvist, and Ketels 2003, p. 36)

Of course these concepts are also embedded in the proliferation of research parks, technology parks, biohubs, and the like. Examples appear globally including Melbourne University's Parkville Precinct (www.rch.org.au/uploadedFiles/Main/Content/rch/Melbourne-Biomedical-Precinct.pdf).

Further, the international Association of University Research Parks (http://international.aurp.net) and the International Association of Science Parks (http://www.iasp.ws) support these strategies.

The experience in Australia is that these clusters seem to be growing at a rapid rate, achieving the requirement for greater community engagement and knowledge transfer of most, if not all, universities.

14. BRAND IDENTITY (DRORI, DELMESTRI, AND OBERG 2013)

A Google Scholar search of "university brand identity" results in 1.5 million hits, many outlining policies, procedures, and strategies for university branding. Increasingly the built fabric is becoming critical to image building, as noted by Robert A. M. Stern:

> Delivering his speech to celebrate the inauguration of Spangler Hall, Harvard Business School's newest building, on January 22, 2001 … Stern was most contemplative about the place of architecture in conveying and constructing the brand of the university. "Can a building promote a brand, and should it? After all, a lot of building is about functional accommodation," Stern muses and then continues, "[A building] can take a symbolic role, it can become an emblem, it can become a part of a brand and even be a brand in itself. A building can express the identity of an institution through a stylistic language; it can express both an institution's inspirations and its aspirations; it can reflect a system of values and place those values in a continuum." Although Stern's speech focuses on architectural expressions of the brand of the university, his thoughtful commentary reveals much about the current institutional conditions. (Drori, Delmestri, and Oberg 2013, p.137)

Figure 13: **The Cambridge Backs on the River Cam**

University buildings are featured most often on university brochures, charters, strategic plans, and prospectus documents. The campus, likewise, can present a strong image about a university's culture and ambience, for example, the Cambridge Backs.

Branding and identity can be for raising internal staff attachment and sense of belonging, but it is also related to marketing and differentiating a particular university's mission from its competitors. Indeed, if the Chapman ethos is to be fully supported, then the campus plan must "ooze"—and the buildings and grounds reflect—the university's values.

> The content of the artefacts of universities—university buildings and seals—visually captures the identity of the institution. The construction of such visual artefacts—architecture for buildings and branding for seals—is a social process that articulates the vision or values of the related organization and of the institution. Here, the seals of universities and the process of branding universities tell the story of the globalization-induced changes that confront this organization and the institution of higher education. (Drori, Delmestri, and Oberg 2013, pp. 146–47)

Drori, Delmestri, and Oberg (2013) suggest a shift away from the marketized constraints on university promotion to a greater response to the emerging global sociocultural forces that drive branding. This shifts the focus from strategic impetus/outcomes shaped by resources and competition to one embedded in identity and the meaning of a university in the 21st century. This would seek to engage trust in society through semiotic codes and meaning.

Trust has traditionally been inward looking in terms of "binding" a community of scholars through cultural academic artefacts as symbolized in the coat of arms and seals. This is now shifting to a more outward focus through the idea of a logo, which, although it has some notions of corporatization, at least attempts to engage the community.

Thus, university seals are morphing into a more branded style that attempts to address both internal scholars and how they might be relevant to the external community. Yet there is an inherent risk here of confusing scholarly independence with corporate bias:

> Literally nothing, not even undeniable utilitarian achievements, can justify the slightest compromise with honest truth-seeking in research and education. Whatever your theory of truth happens to be – one of correspondence or coherence, or whatever – truth is an indispensable regulatory idea, a *sine qua non* for universities. Mendacious or slanted research is simply not research at all. In this respect, the rationale of universities must always differ from that of virtually all other organizations, perhaps other kinds of schools excepted. (Drori, Delmestri, and Oberg 2013, p. 149)

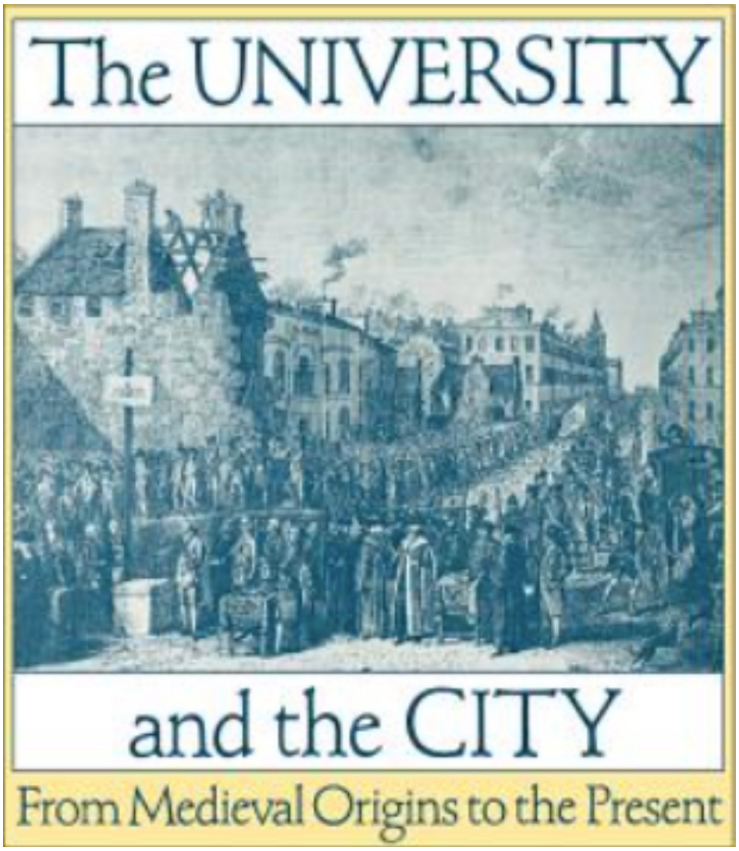
15. A HISTORY OF THE UNIVERSITY IN EUROPE SERIES (DE RIDDER-SYMOENS AND RÜEGG 1992–2011)

In this branding context, it is worth noting that this series on the history of the university covers similar issues—without the technology bent—for universities in Europe since the 12th century. Not surprisingly, the series is a result of a conference convened to commemorate the centenary of the Faculty of Arts of New York University, a campus embedded in the city's very DNA.

Much can be learned from these studies in the sense that many of the issues encountered centuries ago are still relevant today.

For example, Volume 3 of the series reviews the book *The University and the City: From Medieval Origins to the Present* (Bender 1988), which includes a chapter on Chicago and the University of Chicago by Edward Shils.

Figure 14: **Town and gown from medieval to today**



(Bender 1988)

Figure 15: **Social inclusion of the digital citizen**

(Source: www.digitaltrends.com/mobile/belgian-city-launches-text-walking-lanes-for-smartphone-addicts/)

Another chapter entitled "Parisius-Paradisus: The City, Its Schools, and the Origins of the University of Paris" by Stephen C. Ferruolo (Bender 1988) clearly seeks to establish what community-service oriented universities are struggling with today: the tension between an inward-looking scholarly academy versus an outward-looking mission that supports communities and their needs. The contrast with the collegiality of the book cover illustration in the medieval city with the text walking lane in Antwerp, Belgium, is stark. Increasingly, new university buildings seek to identify the university in its context, such as gateway buildings.

16. UNIVERSITY RANKINGS

These have become a significant driver of student choice. Trends in international student mobility related to the emerging middle class in rapidly developing economies such as China and India indicate that these students, funded by their increasingly well-off parents, choose higher-ranking universities. Further, research output is a key driver of university rankings, and universities are restructuring their faculty organizational arrangements to differentiate between teaching and research faculty in order to increase their output per research staff member.

Figure 16: **New university campus secondary gateway in tight urban context**

(Source: Woods Bagot)

Rankings agencies are now looking at rating faculty types and differentiating between Western, Middle Eastern, Asian, and African universities. Interestingly, despite the prestige of the built fabric of Ivy League universities such as Yale, Harvard, and the like, the rankings do not score the physical environment. Anecdotally, though, there may be a link between the prestigious notion of "special places" and rankings if we consider the top 10 universities for 2016 (Shanghai Ranking Consultancy 2016).

1. Harvard
2. Stanford
3. University of California, Berkeley
4. Cambridge
5. MIT
6. Princeton
7. Oxford
8. California Institute of Technology
9. Columbia
10. Chicago

17. DESIGNING THE NEW AMERICAN UNIVERSITY (CROW AND DABARS 2015)

The large contrast between university typologies in the United States is epitomized by Columbia University and Arizona State University (ASU).

There are 200 research universities in the United States, many considered Ivy League or its equivalent. For example, Columbia was King's College prior to the American Revolution. In contrast ASU is a largely "undifferentiated" regional public metropolitan university. Columbia has evolved over centuries to its current form, whereas ASU has "deliberately undertaken an exhaustive reconceptualization to emerge as one of the nation's leading public metropolitan

research universities, an institution that combines accessibility to an academic platform underpinned by discovery and knowledge production, inclusiveness to a broad demographic representative of the socioeconomic diversity of the region and nation, and maximum societal impact" (Crow and Dabars 2015, p. vii).

The authors designate this the "New American University," arguing that it is a complex adaptive system or knowledge enterprise combining discovery, creativity, and innovation accessible to a broad socioeconomic and intellectual demographic that is also highly scalable.

But they also note that the design of the New American University is encumbered by an academic cultural practice that has a disciplinary history, is increasingly specialized, and is accompanied by outdated organizational practices.

> We face social and environment challenges of unimaginable complexity, but rather than restructuring institutional operations to embrace and manage complexity, academic culture perpetuates existing organizational structures and practices and restricts its focus with disciplinary entrenchment and increasing specialization. Our universities sometimes appear hesitant to mount operations to address these challenges in real time and retreat instead to the comfort zone of abstract knowledge. The organizational frameworks we call universities—this thousand-year-old institutional form—have not evolved significantly beyond the configurations assumed in the late nineteenth century, nor have differentiated new designs come to the fore. (Crow and Dabars 2015 pp. vii–ix)

Major research universities "trade" in knowledge production as it becomes of greater value in the form of intellectual property. The proposed ASU model of the New American University is a "recasting of the American research university as a complex and adaptive comprehensive knowledge enterprise committed to discovery, creativity, and innovation, accessible to the broadest possible demographic, both socioeconomically and intellectually. These commitments together imply scalability at a level previously considered improbable if not undesirable" (p. viii).

Crow and Dabars find that universities generally do not evolve and adapt in real time as in the "moonshot model" espoused by Google X and others that follows three stages: (1) the establishment of a change target on a global scale (2) followed by shaping a realistic solution (3) that is supported by a reality check in the form of some sort of evidence that may ensure a level of confidence that the moonshot target could actually work.

This SCUP study is akin to a moonshot project.

As a form of evidence, the New American University project sought concepts and ideas from various sources that are not expanded here—they can be found in the book itself. Suffice it to say that many of the concerns addressed in this SCUP project are covered in Crow and Dabars' book, including the key issues of cross-disciplinary design, innovation in the research university, and the future of the public university in the United States.

They also question the form of teaching and learning as currently practiced and the vastly higher costs of a four-year degree at the top-ranking universities, estimated at U.S. $250,000. They question whether this elite form of learning is actually worth it. They also suggest that there is a symbiotic "disengagement pact" between research academics and students that revolves around the idea that, if students "leave academics alone" to pursue research, then the academics will not work the students too hard.

They also proclaim that teaching is less valued than research, while research is out of touch with the real needs of society. Further, they predict that the "learning industry" is likely to face the mergers and acquisitions that have already been

faced in health, manufacturing, welfare, and other public institutions.

This restructuring could take two forms. One would involve adjusting essentially sound existing universities to current economic circumstances. The other would be to consider all universities "beyond repair" or "in serious crisis" (p. 7), requiring the development of completely new frameworks, models, and standards to achieve desired outcomes. Crow and Dabars suggest that both approaches are relevant and both should be used in appropriate contexts.

In passing over the 375-year-old Harvard Ivy League model (which originally adopted the Oxbridge live-in college tutor teaching model), Crow and Dabars note that the German Humboldtian model represented by the University of Berlin in 1809 was the framework adopted by Johns Hopkins University in 1873 that established the basis of the latterly formed American research university when combined with the Oxbridge tutor model. This they call the "gold standard." It is interesting that the University of Adelaide is using this as its motif in seeking ways to inform deeper research-informed learning practices in its students.

The authors cite one scholar as stating that this development was possibly the single most decisive event in the history of learning in the Western hemisphere.[1] The authors' redesign seeks to emulate and leverage this German/English hybrid of Johns Hopkins "to produce not only knowledge and innovation but also students who are adaptive master-learners empowered to integrate a broad array of interrelated disciplines and adapt over their lifetimes to changing workforce demands and shifts in the global knowledge economy" (p. 80).

They also cite MIT—established in 1865—as one of the first "economic development enterprises" that conjoined universities with industry. The authors observe an "institutional revolution" accompanied by accessibility and accountability in part due to the science and engineering requirements of standardization emanating from the Industrial Revolution.

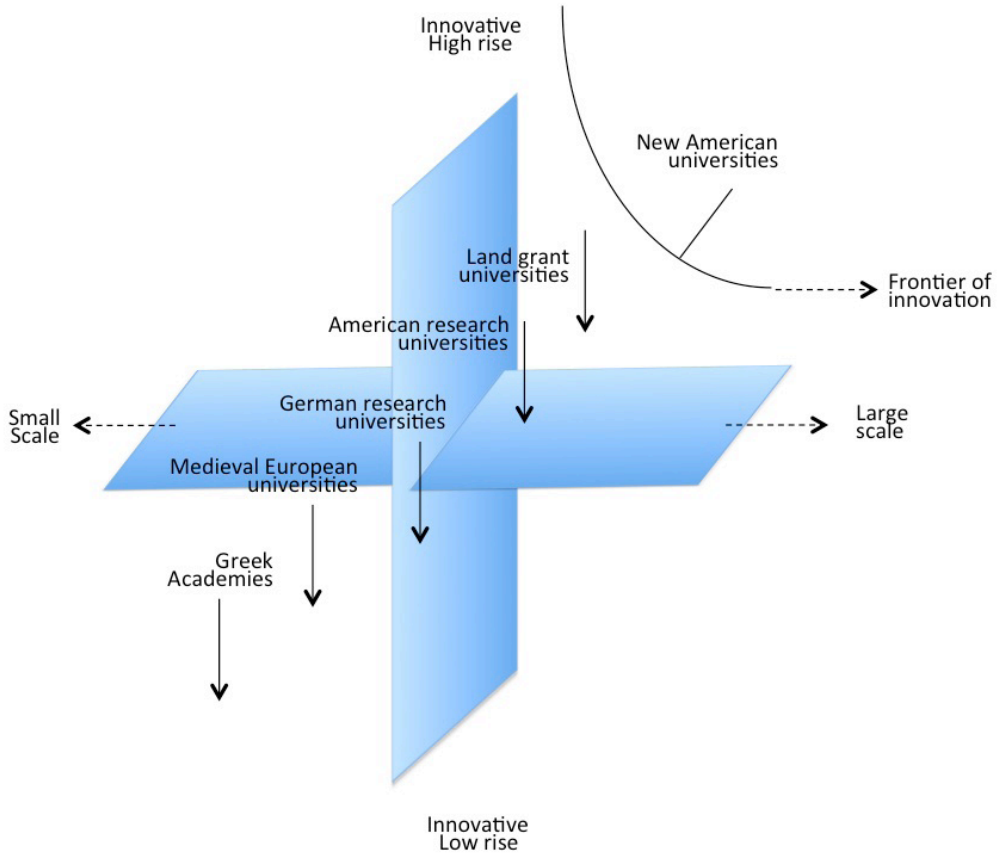
Thus the rather more "abstract" format of the Oxbridge model became more subject to community requirements and also less elitist.

The formation of the "gold standard" between 1865 and 1915 then evolved into a more market-oriented, decentralized, and competitive form. While there are state-funded universities and missions, U.S. federal funds are competitively targeted by all universities. This is in contrast to the European, Canadian, United Kingdom, New Zealand, and Australian centrally controlled model.

Another factor in American university evolution was the Morrill Act of 1862, which led to the land-grant universities that were developed by states from federal funds recouped from the sale of federal estates. Thus within a decade some 36 new research and teaching universities were established. Cornell is cited as one exemplar of this type of university, which, while it had a more "practical" or utilitarian slant in programs, also offered the humanities along with engineering, agriculture, and sciences.

1 Author's note: I would have thought the establishment of the University of Bologna in 1050 might have held that distinction, where traveling monk tutors were attracted to a center where they could engage as a critical mass of knowledge and learning that could be built upon directly.

Figure 17: **The trajectory toward a New American University**



(Crow and Dabars 2015, p. 104)

18: CAMPUS OF THE FUTURE (ARUP 2012)

SPATIAL IMPLICATIONS OF THE PAPER

These include:

- Students can study anywhere and anytime—they thus need "sticky" spaces that entice them to come to campus.
- Students need collaborative spaces to learn from peers plus spaces for intercultural events, festivals, and markets.
- There is greater choice in learning environments, with work-integrated experiences and spaces essential. There will be a need for more informal learning spaces as students increase their online learning experience, but they will want to do this in collaboration with others.
- There is an emergence of "pop-up" laboratories, makerspaces, and augmented reality centers all enhanced by ambient intelligence and robotic features.
- Second Life may enhance how campuses can integrate the virtual and the physical. Global tele-teaching and tele-presence will assist in co-relating the physical and virtual space and place.
- The transformation of the library is an indication of how the university campus is likely to evolve. [Author's note: This speaks to the campus as a learning commons and the need to enhance collaboration, encounters, and serendipitous moments through distributed learning hubs across campus—a hierarchy at precinct, faculty, and school/departmental levels.]
- Smarter, intelligent, and biophilic buildings will create a more bespoke experience for campus users.

In the context of social media, online learning, the globalization of education, and tight higher education budgets, ARUP has proposed four key themes that shape the drivers of change for the future campus:

- Students of the future
- Changing the delivery of higher education
- Physical facilities and learning environments
- Skills needed by future employers

The experiential component of learning will be enhanced through pop-up labs, makerspaces, and augmented reality along with ambient intelligence-enhanced physical spaces. Other forms of learning support are likely to include immersive experiences, the use of robots for some learning experiences, and the abovementioned augmented reality advances. Other innovations such as Hamburg's University of Neighbourhoods will provide an on-site live-in urban collaborative experience that could revive the charrette form of learning.

Virtual gaming is expanding as a form of online learning (Juniper Research 2017) in the form of massive multiplayer online games (MMOG), which fall into four categories: fantasy, sci-fi and superhero, combat simulation and first-person shooter, and social and other situation-based games. Increasingly these types of activities are being explored in learning environments such as Second Life (Irving 2016). Incoming undergraduate students are likely to have significant experience in this, and the idea of campaigns and challenges begins to introduce the concept of competency levels. When coupled with analytics and the ability to practice skills and tasks, this form of learning is likely to be very powerful.

Another form of global collaboration is the Shanghai lectures model, where the University of Zurich, the University of Salford/MediaCity, U.K., and the Shanghai Jiao Tong University collaborated with 12 other universities around the globe using online collaborative, 3-D, simulation, and other tools to share ideas and promote a community of practitioners.

An example of the transformation of the campus is how the library has moved from housing books (predominantly) to accommodating student study spaces. Examples exist at the University of Technology Sydney and Macquarie University in Sydney where books have been housed in compact, robotically accessed stacks and the released floor spaces have been turned over to student learning commons with a significant variety of choice and experience. The Joe and Rika Mansueto Library at the University of Chicago has housed its 3.5 million volume collection underground with robotic access and created a vibrant learning hub in the former book stack spaces.

ARUP (2012) notes that

> One cannot disregard the advantages that a physical campus can bring in terms of access to facilities, research equipment and other resources. Nor should one overlook the basic human need for physical social interaction. Chance encounters, serendipitous conversation and recreational activity all play a fundamental role in any one person's education and life journey. These encounters provide a deep level of sensory engagement and lead to the development of important social bonds and friendships, interpersonal skills and memory creation. In short, the physical interface cannot be replaced entirely by technology. (p. 20)

[Author's note: As noted elsewhere, the University of Melbourne has created distributed satellite learning hubs with a precinct, faculty, and school/departmental focus depending on the campus context. These hubs are supported by help desks, departmental offices with a student services focus, learning support centers, food and beverage, meeting rooms, and event spaces.]

Across the campus there will be a mix of virtual and physical affordances that will also include "smart" classrooms and the aforementioned makerspaces, pop-up labs, events, markets, festivals, fairs, and more.

There will also be an increase in the design and construction of "intelligent buildings" that will have smart building services control systems based on the "Internet of things" to enhance sustainability and offer human comfort options to a greater personal level than at present.

User control of the learning environment will be a feature as will the idea of biophilia to enhance the well-being and therefore performance characteristics of building inhabitants and the campus as a whole.

Transportation options to and from campuses are likely to change through the use of e-bikes, shared rides in electric cars, and other options as they emerge.

19. FUTURE OF HIGHER EDUCATION: BEYOND THE CAMPUS (CAUDIT ET AL. 2010)

This publication analyzes the future of higher education beyond the campus. While it of course has a strong information and communication technology focus, significant conclusions are drawn regarding the impact of this on the physical campus.

For example, it is noted that "formal, traditional boundaries are becoming more permeable and porous. There has been a rise in interdisciplinary fields (e.g., nanotechnology, bioethics). Leading faculty are recruited worldwide. The physical constraints on when and where students participate in education are being removed through open and online education, as well as competency- or experience-based credentialing" (p.2).

Thus the higher education sector is more of a complex adaptive organization (Dovey 2016) that will increasingly have to respond to external forces. To that extent the fixed campus model where a student comes to a fixed point may be under pressure to evolve. But the authors wonder what options it will evolve toward.

It is thought that the future will revolve around access "now that virtually everything and everyone are connected, the 'network' underlies emerging models rather than place, whether a classroom, a building, or a campus. The network provides an architecture for participation and collaboration—irrespective of time, place, age or position" (CAUDIT et al. 2010, p. 6).

Diverse student socioeconomic demographics including age, culture, working life, family and home life, commuting, and the need for lifelong learning for reaccreditation or upgraded/new skills development mean that more flexible models are in demand. Online learning and accelerated trimester programs offer more flexibility than the traditional campus.

There is a much greater "town and gown" connection with universities linking to industry through a translational research model coupled with innovation, leading to an increase in the entrepreneurial development of products, services, and intellectual property.

> Higher education has a history of collaborating with government, business, industry, and nongovernmental organizations in problem definition, technology transfer, process improvement, and entrepreneurship. These cooperative endeavours ensure local, national, and international communities benefit from innovation. College and university innovations are diffused through patents, start-up companies, and consulting. (CAUDIT et al. 2010, p. 10)

Emerging themes include

- Cloud computing ("above the campus")
- Focus on access, not ownership

- Trend toward collaboration vs. the individual
- Analytics
- Identity and mobile devices
- Collaboration tools

20. UNIVERSITY OF THE FUTURE (ERNST & YOUNG 2012)

Ernst & Young has a worldwide operational footprint and works with universities across the globe. As such it is in a relatively unique position to comment on the trends that are impacting the university and what this might mean for the future.

This paper was received with some skepticism in the higher education sector in Australia in 2012, but re-reading it now suggests that some of its forecasts are already gaining traction only four years on. The drivers of change suggested include global mobility, integration with industry, contestability of markets and funding, democratization of knowledge and access, and digital technologies.

Ernst & Young has suggested that there are a number of scenarios that might emerge over time as illustrated hereunder. In surveying/interviewing some 16 vice chancellors a number of the propositions in the diagram were contested. But Ernst & Young has stood by its provocation and already there are some signs of its forecasts coming to fruition.

One contested area in which Ernst & Young has taken a strong position—that related to teaching-only institutions in Australia—is the one that has received most comment from the sector.

Figure 18 **Four possible evolutionary scenarios for universities**

INCREMENTAL CHANGE	**Type 1 – Current State** » Dominant model as broad-based teaching and research » Supported by large asset base » Large, predominantly in-house back office *Examples* » Expected slow pace of policy change » Some focus on quality of teaching	**Type 2 – 'Streamlined Status Quo'** » Continue as broad-based teaching and research » Transform delivery of services » Transform organisations *Examples* » Change in ratio or support staff to front line staff, i.e., much lower support staff numbers
STEP CHANGE	**Type 3 – 'Niche Dominators'** » Fundamentally reshape & refine services & operating 'markets' » Comcurrent shift in business model, organisation and operations *Examples* » Aalto University (focused disciplines) » BPP University, UK (professional accredited quals with industry)	**Type 4 – 'Transformers'** » Private providers & new entrants » Carve out new positions in the traditional sector » Create new markets which merge parts of higher education sector with other sectors *Examples* » Venture Garage, Aalto University » Coursera

(Adapted by the author from Ernst & Young 2012, pp. 14–21)

Since a major reformation in Australia in 1987 in which "teaching-only" colleges of advanced education were granted the status and title of university, there has been an unwillingness to go back to that supposed "lesser" status. Thus, universities in the "incremental change" bracket will continue to struggle to develop their research profiles unless they can improve their grant success rate and demonstrate a high impact for their research.

Of course for perhaps the last three decades there has been a focus on inbound international students in host nations. While postgraduate program recruiting is still rising, there is increasing evidence of a plateauing and maturing of the international student market in host countries. Ernst & Young cites five primary drivers of change:

- Contestability of markets and funding
- Democratization of knowledge and access
- Integration with industry
- Global mobility
- Digital technologies

EXO—POLICIES AND STRUCTURES IMPACTING THE STUDENT VIA CAMPUS CULTURE

21. RECALIBRATING ONLINE (OFF-CAMPUS) AND FACE-TO-FACE RATIOS (ZOGBY AND ZOGBY 2014)

Additional, more recent findings are emerging out of work by Laureate International Universities (Zogby and Zogby 2014). Laureate embraces blended learning and wants to ensure that its 850,000 student base is comfortable with a blended online and campus-based model. It should be noted that Laureate attracts students looking for education and training toward finding a job and that many of its 79 institutes in 29 countries are vocationally oriented.

At present the balance is 40 percent campus and 60 percent online, but the university wishes to reverse that ratio through a blended study center model (see image of permeable, transparent, adaptive learning space at Billie Blue School of Design, Sydney). To that end Laureate commissioned a survey of all its students with the following key findings:

- *Accessible*: 43 percent expect that content will be free for most courses—half believe that social media platforms will enhance a peer-to-peer model, and 70 percent believe the future will see universities with free online libraries.
- *Flexible*: 53 percent believe in the truly flexible delivery model—any time of day, any time of year, any time for enrollment; 44 percent agree there will be no fixed schedules; 41 percent believe just-in-time certificates will emerge that can be accumulated over time toward a degree.
- *Innovative*: 52 percent expect courses will be more group oriented and collaborative; 43 percent believe they will be able to access personalized instruction and support online.
- *Job focused*: there will be a much greater focus on job-ready courses; 61 percent believe these courses will be designed by industry experts; 64 percent expect them to be multilingual; 70 percent believe that career-oriented skills will be taught in addition to subject matter.

Figure 19: **Laureate Billy Blue School of Design**

(Source: www.think.edu.au/colleges/ultimo)

22. STEM

Science, technology, engineering, and mathematics are all very much in serious discussion at present, as students are tending to shy away from these subjects. Successive Australian Government chief scientists over two decades have lamented the diminishing student uptake of science and mathematics as a subject choice (Batterham 2000; Office of the Chief Scientist 2014).

This problem still exists as evident in national STEM survey reports in both the United States and Australia (Australian Industry Group 2015; Marginson et al. 2013; President's Council of Advisors on Science and Technology 2010). "Only 16 percent of American high school seniors are proficient in math and interested in a STEM career" (U.S. Department of Education, n.d., ¶ 5). Significant effort is being made in the Australian vocational training sector to address the issue of declining STEM skills by strengthening school-industry STEM skills partnerships (Australian Industry Group 2015).

What is somewhat alarming in these documents is the lack of reference to the spatial and virtual aspects of STEM education and how these interact with STEM pedagogy. Yet there is evidence to illustrate that these aspects are a critical part of the instructional framework for STEM teachers and students alike. Furthermore virtual and spatial interactions with users in art galleries, museums, interactive science centers, aquariums, and zoos are outstripping cognate interactions in the teaching and learning of STEM in schools, vocational educational colleges, and universities (Hall, Wieckert, and Wright 2010).

There are related strategic documents in the United States, notably the 5-Year Strategic STEM Report to the President by the Committee on STEM Education of the National Science and Technology Council (Holdren 2013), among numerous others.

A search of scholarly journal and book articles on the spatial design of STEM learning programs results in a massive focus on the virtual in preference to the physical. But where do students engage with the virtual? What spaces do they occupy? How do these spaces assist in their learning? What spaces do teachers occupy, and so on?

A small number of organizations do consider space in a limited way, such as schools in the Teaching Institute for Essential Science (Morrison 2006) and design and technology programs in secondary schools in the "maker education movement" (Thomas 2012). At the university level the preeminent organization is CDIO, which has 150 members across five continents. At the vocational level there are exemplars of this practice, but there are few statewide global organizational efforts that focus on the issue of space in STEM (Fisher 2010). Thus the bibliography on STEM with a spatial focus is minimal.

While there may not be a focus in the literature on STEM spaces, there is much happening on the ground in terms of developing STEM precincts. These are also beginning to include medicine (STEMM) and arts (STEAM).

The University of Sydney is looking at developing a Health and Medical Precinct to combine public health and medical acute care, both of which have often operated separately. The University of Melbourne is also developing an Engineering and Technology Precinct adjacent to its Science Precinct as a means of developing further the STEM concept.

In research, too, there is recognition that new knowledge around some of the world's greatest problems is transdisciplinary, leading to the thematic study of issues such as water and food security, energy security, nanotechnology, and biomedical engineering to name a few, which points to cross-disciplinary developments on university campuses.

MESO—STUDENT RESIDENCES, FAMILY, AND PARALLEL ONLINE COURSES

23. MILLENNIAL STUDENTS (NORTHERN ILLINOIS UNIVERSITY, N.D.)

Millennials prefer active learning and an environment with fast digital capability. They will move to these environments if not provided with them.

Born 1982 to 2000, Millennials are arguably the most diverse student demographic. These students prefer to be engaged with their learning and want to interact with technology as they learn. They are active, not passive, learners, and they value being able to voice their views digitally rather than face-to-face. "Students can be more engaged and motivated to learn by providing authentic learning experiences instead of "lecturing" the facts. We should consider creating learner-centered classroom environments to engage Millennials" (Northern Illinois University, n.d., p. 1). Games and simulations assist them in visualizing complex systems, and they are more interested in authentic problems and case studies.

They have very different behaviors and understandings of contemporary issues, including:

- Computers are not technology—the digital world is ubiquitous to them
- Reality is no longer real—images come from many sources and can be altered easily
- Doing is more important than knowing—results and actions are more important than knowledge, given its half-life
- Learning more closely resembles Nintendo than logic—it symbolizes trial-and-error approaches to problem solving; "losing is the fastest way to mastering a game because losing represents learning" (p. 2)
- Multitasking is a way of life—music, talking, or texting and working on homework simultaneously
- Zero tolerance for delays—just-in-time service-oriented culture; 24x7 instant turnaround
- Consumer and creator are blurring—with file sharing and cut and paste, digital production becomes everyone's property

We may need to move from the traditional forms of teaching to a more immediate, interactive, and group-oriented model. Lectures, if still used, need to be directed to the digital student.

In the case of Generation Z students (Seemiller and Grace 2016), differences from Millennials include:

- Loyal, responsible, not wanting to let others down
- Compassionate; wanting to make a difference for someone else
- Thoughtful, open minded, accepting of others
- Craving predictability and order
- Determined, innovative, entrepreneurial
- Concerned about education, employment, and racial equality
- Skeptical about the cost and value of higher education
- In contrast to Millennials, not as motivated by money on the job
- Just 55 percent Caucasian—may be the last majority-White generation

Spatial implications include designing for innovation, adaptivity, and entrepreneurship as discussed elsewhere in this report.

24. THE STUDENT EXPERIENCE

The Australian Government's Office of Learning and Teaching has a significant portfolio of commissioned research on this topic. A recent study by the University of Melbourne (Baik, Naylor, and Arkoudis 2015) that reviewed the research in this field over the past 20 years notes that "online technologies are ubiquitous but their effects on student engagement remain unclear" (p. 3).

The use of online technologies is ubiquitous with nearly all students in the cited study having used an online management system (99 percent), Internet-based resources designed for their course (96 percent), and lecture recordings (91 percent). The majority of students (63 percent) thought that online resources and educational technologies allowed them to spend less time on campus.

Figure 20: **Flipped classroom concept**

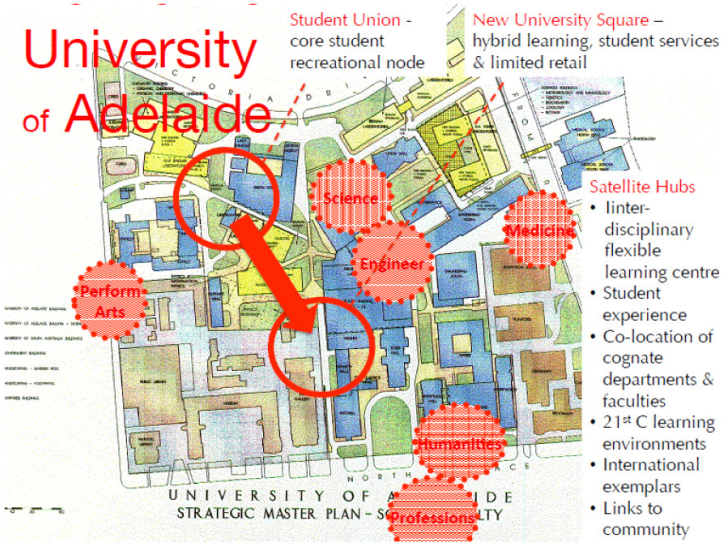
(Source: Woods Bagot)

This is a clear sign that the campus experience could be, for whatever reason, not resonating with students.

However, despite the fact that there "has been a growth in the proportion of students undertaking subjects/units wholly online, from 8 per cent in 2009 to 11 per cent in 2014, … students' appreciation of the campus-based experience has increased, with two thirds of students reporting that they really like being on campus, a significant rise in the past ten years" (Baik, Naylor, and Arkoudis 2015, pp. 3–4).

Students who indicated that they did not "enjoy" the campus experience included those planning to defer, low achievers, part-time students, mature students over 25 years of age, and full-time students in paid work 16 or more hours a week.

Figure 21: **A network of learning hubs**



(Source: Fisher 2007a)

An evaluation method that might seek to elicit student views of the campus physical experience is lacking. A close examination of the University of Melbourne study and a review of the Office of Learning and Teaching website shows little evidence in this regard.

25. MAKERSPACES (WITH HUSHAN CHIANG)

How can institutions leverage makerspaces, open-source cooperative platforms, and the so-called 6th space? The maker movement has its roots in the digital revolution, firstly through the Internet's avid experimenters: programmers.

These coders are keen DIYers in the digital domain, leading the way in the creation of software, digital devices, and robots. When the coding community met with the

engineering and traditional arts disciplines—supported by access to digital fabrication equipment and pushed along by other keen tinkerers, DIYers, and inventors—the maker movement was born. This movement is made possible not only by interdisciplinary collusions but also by the ability to easily disseminate and access knowledge.

The movement began in 2005 in San Francisco through the creation of the physical print magazine *Make*, which was quickly followed by the online magazine *Instructables* with the motto "Share what you make" (Stone 2015). There is a strong narrative that weaves through all makerspaces; that is, "A makerspace is an area that appeals to the spirit of invention by providing tools and resources for people to discover, create, design, model, engineer and learn" (COnway 2014, ¶ 1). This is important because the community's embodiment of the open-source mind-set is the solid foundation that its loose cooperative structures are built on.

Essentially, a makerspace is a form of co-working with a "making" theme. The co-working infrastructure is well established in most cities with themes such as coding, social entrepreneurship, digital and artist workshops, makerspaces, etc.

Ananse Group (2015) defines these spaces as innovation spaces; spaces that bring multidisciplinary practices together to create and share. Ananse Group's mapping exercise has found more than 6,000 innovation spaces established around the world. In other words, by accident a global network of innovation spaces is now operating and transforming our social and economic landscape (Virgin, n.d.).

Makerspaces can also be a single point of contact for interdisciplinary pollination within educational institutions. Typically, existing makerspaces are siloed in separate campus locations used only for teaching and research. A front-of-house makerspace would be a beneficial interface for both interdisciplinary activities and access to specialist makerspaces elsewhere on campus. [Author's note: This approach was recently confirmed in a study at the Queensland University of Technology.] It could also be a vehicle to strengthen connections between the engineering discipline, with which makerspaces are typically associated, and the arts, medicine, and entrepreneurship disciplines.

Institutions are already formalizing digital fabrication as an educational vocation. SENAI, an industry training institution in Brazil, has built a FabLab within the SENAI Technology Centre for Automation and Simulation in Rio de Janeiro. The institution believes that providing digital fabrication skills will equip the workforce to deal with new challenges in manufacturing and develop an innovative culture for its students (SENAI, n.d.). The full program plans to scale up its operations by installing FabLabs in 40 schools around the city.

In terms of linking an institution to its civic context, the provision of makerspaces on an urban scale is something all types of educational institutions can be part of. For example, Barcelona has committed to being a "Fab City" by 2024 (Green 2015), meaning it has committed to pioneering distributed manufacturing at a city level with the intention to ultimately reduce the movement of materials and energy consumption and, at the same time, provide locally produced consumables (Fab City Global Initiative 2016).

As part of this commitment, Barcelona has equipped FabLabs in every district so its citizens can cooperate with organizations, educational institutions, start-ups, and industries to find solutions to the high 45 percent youth unemployment rate (Trading Economics 2016). This new urban model for a self-sufficient city has only been made possible through the bottom-up creation of makerspaces as agents for change in an otherwise top-down economic stalemate. It is in this context that educational institutions can participate in and contribute to the future by investing in open-source cooperative infrastructure.

Neil Gershenfeld describes the digitization of manufacturing as the third digital revolution (What's the Big Data 2014). He argues that this brave new world is already here, the programming of the physical environment is already possible (O'Reilly 2014), and its progress is accelerated by the makerspace platform. This platform then allows the dissemination of knowledge needed for individuals to invent and produce consumables locally. In fact, the entire ecosystem of the global co-working infrastructure (having been at the vanguard of developing open-source cooperative know-how since the inception of the Internet) should be considered as the interface for the third digital revolution. It is in these co-working spaces that educational institutions can leverage the value of individual contributions not found through traditional means. It is in the "6th space" where formal and informal learning entwine with entrepreneurship.

This approach is already emerging in some universities with the advent of postgraduate courses in entrepreneurship and, in some cases, linking them with start-ups and incubators through makerspace concepts.

26. STUDENT HOUSING

Jones Lang LaSalle (JLL) reported in 2012 a growth in student tertiary enrollments in the 2000–2011 period from 98 million to 165 million, expected to grow to 263 million by 2025 (Hillman 2012).

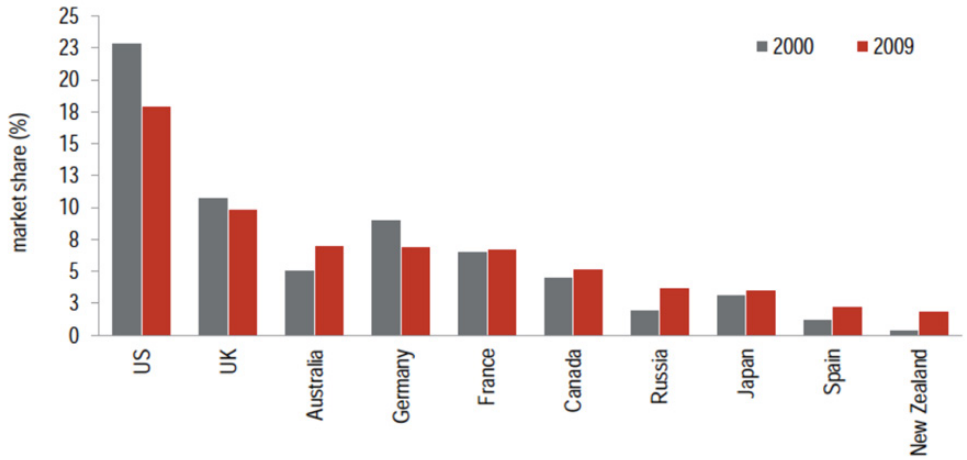
The report cites Asia as the key source of international student demand for half of OECD-based universities, with Europe and North America capturing 75 percent of students. The United States, United Kingdom, and Australia are the most popular destinations. It also cites a structural undersupply and chronic shortfall of modern-amenity student housing across the globe.

As an investment sector JLL notes that student housing has relatively stable income and rental growth above inflation, resilient performance in downturns as higher education is less cyclical, and high occupancy rates. Other issues include a shortage of high-quality accommodation in Australia, expansion opportunities in continental Europe, consolidation opportunities in the United States and United Kingdom, and the interest of developers in the growth opportunities of higher education and its associated housing requirements.

The market share differentials for overseas students can be seen in the figure, with Australia's share growing significantly. This is validated by the amount of student housing under construction at the time of writing.

Further, QS Top Universities (2017) cites London, Montreal, and Melbourne as among the top five student-oriented cities in the world.

Figure 22: **Market share of student housing, top 10 countries**



(Hillman 2012, p. 7)

JLL notes that students make their choice of university based on several factors including language, quality, accommodation, worldwide qualification recognition, visa access, distance from home country, graduate employment, and fees.

English is the preferred language, and quality of instruction and student housing are rated highly. This has led to the emergence of the student-housing sector as a significant investment asset class.

Interestingly, JLL notes that when unemployment rises due to economic difficulties, there can be a significant rise in students attending higher education. Further, "the provision of student housing in the US comprises university affiliated residence halls and apartments located on-campus, off-campus private purpose-built housing, and private rental assets" (Hillman 2012, p. 12). Aged university residence halls in the United States comprise 29 percent of the student market.

In the United Kingdom, however, the private residential sector provides some 78 percent of housing, with university purpose-built accommodation around 15 percent. In Australia there is a significant boost in privately funded student accommodation, but with strong associations with specific universities.

The United States is seeing an increase in public-private partnership housing with very strong links to specific universities, which in many cases has an impact on campus-based student housing requirements. The successful "ingredients" for a student housing development are cited as understanding consumers, microeconomics (of the specific city), location and design, and the operating platform, i.e., the relationship to the university.

Future student housing themes include consolidation, leveraging relationships, and maintaining a strong balance sheet to capitalize on development and acquisition opportunities.

JLL focuses on the Australian market, citing its proximity to Asia and the historical economic links to that region. The report notes a doubling of students in the 10 years up to 2012, with a concomitant increase in student accommodations being constructed. This was because private housing rentals were difficult to procure by students, often not of sufficient quality, and not supported by universities at all.

Initially, private developers built accommodations on a private rental model without considering student needs, and these accommodations were less attractive to students. Of late, more focused developers have improved their product, and some developers now have a student accommodation focus across Australia. Where possible some of these developments are on campus in partnership with universities.

There is also emerging evidence of the design of a Jeffersonian model of student accommodation mixed with academic facilities within the heart of campus, a model (in the post-monastic tradition) first developed at the University of Virginia. A small number of universities have now recognized that this is a way of enlivening the campus 24-7-365, with the whole campus activated by these campus-based residential students.

27. THE LIBRARY—BACK TO THE FUTURE? (FISHER, HOLMES, AND MAGRE 2013)

GENEALOGY OF THE LIBRARY

Webster says the word "library" was first used in 1400, which is around the time of the Bodleian Library in the United Kingdom and when books were first bound, more or less. The word "liber" comes from the Latin term for inner bark, rind, or book (see www.etymonline.com/index.php?term=library).

- a place in which literary, musical, artistic, or reference materials (such as books, manuscripts, recordings, or films) are kept for use but not for sale
- a collection resembling or suggesting a library

» a series of related books issued by a publisher

» a collection of publications on the same subject

» a collection of cloned DNA fragments that are maintained in a suitable cellular environment and that usually represent the genetic material of a particular organism or tissue

As the material content has changed over time, so has the shape and purpose of the library, as can be seen in the figure.

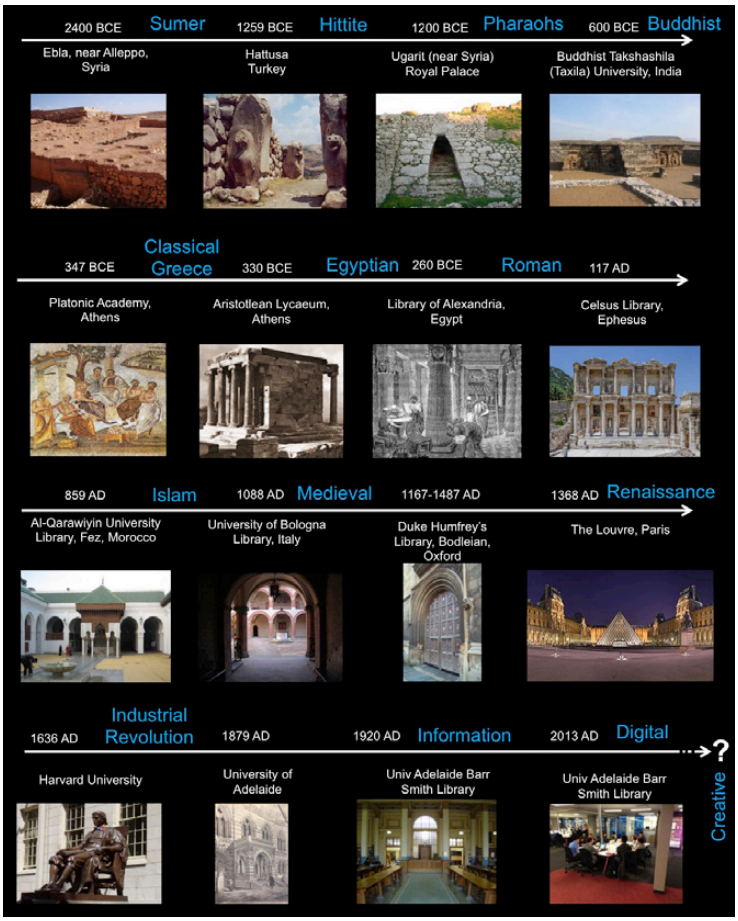
A common theme over the millennia—given the genealogy of the library—is accessing data and information to help shape knowledge. Data and information have been held in collections in various forms since 2400 BC.

These forms have varied over time, with books being supported—in modern times—by microfiche and now to a large degree being superseded by the Internet and digitized collections.

But libraries are about more than just storage; they are also about accessing and navigating data and information, and they still have that role today in a digital world. Just "surfing the web" is no longer sufficient as millions of "hits" can be found on various subjects. The key is deciding which of these sources are valid and reliable, and librarians still have a role in assisting in this process by way of supporting "digital literacy." Librarians and libraries are becoming more of a portal, where readers and researchers might cluster to access these curated resources.

The hybrid nature of learning can be understood and illustrated in a variety of models, but perhaps the best approach is that in which synchronous, asynchronous, local, and remote learning forms are linked in both time and space (Mitchell 1995). Virtual communities are forming (and dissolving almost as) rapidly, and this raises the issue—are these virtual communities emerging at the expense of campus-based communities? And are they as sustainable?

Figure 23: **Genealogy of the library**



(Source: Constructed by the author from various sources)

Figure 24: **Informal learning space**

(Source: Woods Bagot)

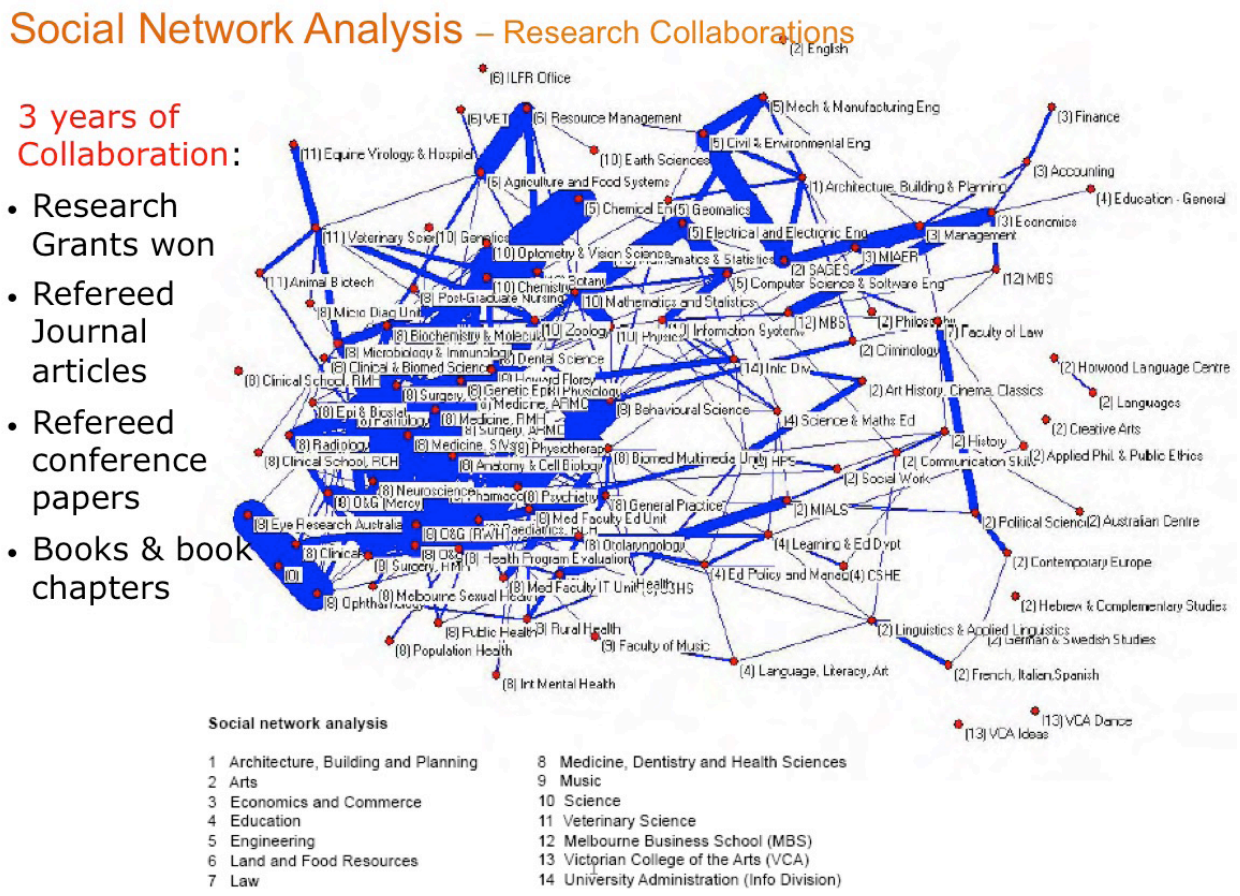
CASE STUDY—STRATEGIC LIBRARY STUDY AND THE MELBOURNE MODEL

Social network analysis can be applied within faculties and schools or across the complete campus in the context of cross-disciplinary research and, to an increasing extent, undergraduate teaching and learning as cross-disciplinary studies emerge. Measuring research output performance results over three years for research grants won, refereed journal articles, refereed conference papers, books, and book chapters generated insight into the clusters of collaboration efforts in both virtual and physical terms.

In approximately 2012 the University of Melbourne initiated a new academic model called Growing Esteem. This emulated the European model of a three-year more general undergraduate degree with embedded breadth and depth electives and core units followed by a two-year master's degree. The master's programs are more specialized and discipline based and are accredited with various professions such as law, engineering, business, education, and so on. Students have the first three years to decide which "specialism" they want to take at the master's level by taking various electives in the undergraduate program.

Concurrently, a strategic analysis was undertaken of the 14 libraries on campus, resulting in the development of six precinct hubs in which libraries were clustered in disciplines that had affinities with those precincts. The satellite libraries provided a distributed learning commons, and seven years on these have become almost mandatory as informal spaces where students study online between classes. The precinct foci were based on the evidence resulting from the aforementioned social network analysis of research outputs over three years. The precincts were then shaped around the faculty locations on the campus.

Figure 25: **Social network analysis of research clusters on a university campus**

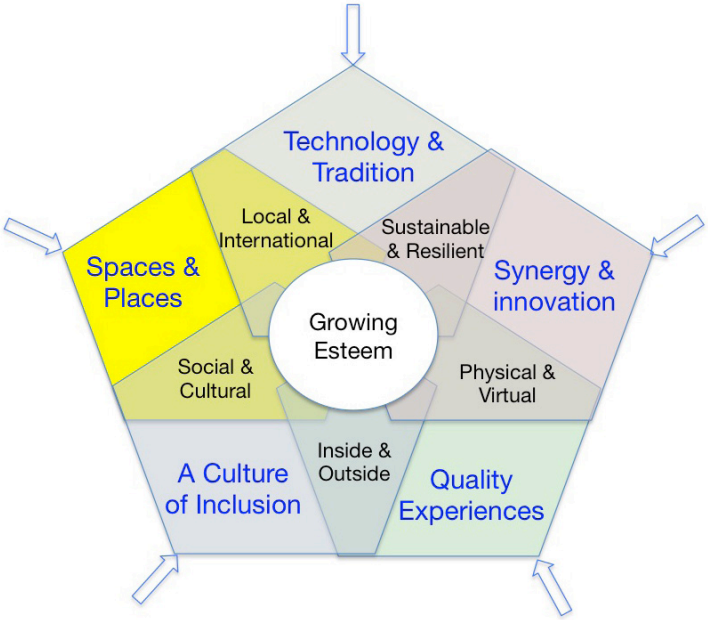


(Fisher 2007a, p. 29)

A strategic master plan was undertaken to parallel the new curriculum and course program model. The consultative process over two years resulted in five themes supported by five subthemes as illustrated in the figure. New capital works projects comply with these themes to ensure a spatial linkage between the curriculum and cross-disciplinary program. The five themes—technology & tradition, spaces & places, a culture of inclusion, quality experiences, and synergy & innovation—also map across the virtual information developments that are occurring in parallel.

There is a "need to improve the ability to communicate what is happening." This includes shared contexts and conversations that clarify. There is also the need for a better shared language as we "will never be able to calm things down" (pers. comm.). There should be an alignment between the university mission and the need for new-generation learning environments: "We want a different future; therefore we need to engage younger colleagues in committee structures. Bring in the innovators to build a future physically but also culturally" (pers. comm.). This resulted in the recommendation that the 14 libraries be amalgamated into six precinct library hubs.

Figure 26: **A strategic masterplan model**

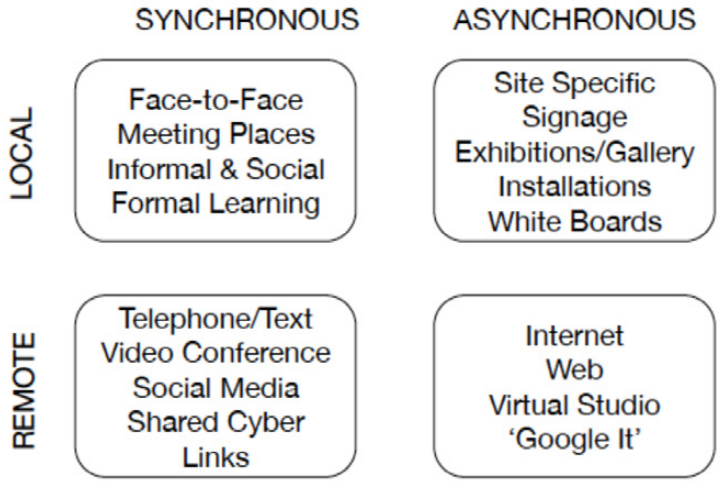


(Tracey 2014)

Thus the libraries were able to link with multiple faculties rather than be devoted to just one of the 120 or so schools across the campus. These links between departments and faculties showcased "social construction of knowledge" and "communities of practice" based around asynchronous and synchronous modalities in time and space (Fisher 2007a).

The "new production of knowledge" (Gibbons et al. 1994) draws on social capital—networks of researchers—that in turn is linked to government research priorities. It also argues for another examination of the idea of cluster theory, but on campus rather than in an independent research or technology park (Batelle Technology Partnership Practice 2013).

Figure 27: **Virtual and physical, time dependent and independent**



(Mitchell 2005)

What might such a clustering of activities look like? Instead of dispersing activities in a random fashion across campus we could look at a number of factors that might suggest improved key performance indicators such as an improvement in serendipitous interaction, critical mass, cross-disciplinary interaction, clustered (one-stop) storefronts for student services, multimedia development, retail, professional development, flexible/collaborative learning centers, postgraduate study space (coursework), casual surveillance 24/7, events and industry, and alumni resources and facilities.

One model that works well—although in a significantly different context—is the airport club lounge. These facilities have a wide range of settings and resources tuned to the needs of the business traveller. Why not replicate such a facility but tune it to the needs of the student and researcher? For example, one "corporate" university project in Malaysia—the Sasana Kijang of the Bank Negara Malaysia—is based on the airport club lounge model together with the problem-based years 10/11/12 Australian Science and Mathematics School model in which three modalities of learning and research are clearly articulated and interacting. These include Mode 1, teacher-centered/siloed research; Mode 2, learner-centered and collaborative cross-disciplinary research; and Mode 3, "third-space" learning and research.

Collocation is critical to having the full range of pedagogies and research methods readily available. Another example is the University of Pennsylvania (n.d.), which has organized itself virtually around campus hubs and communities and physically around a number of centers including a technology hub and a university square.

This approach has created a hierarchy of learning hubs as illustrated.

In part this was modelled on the University of Pennsylvania's concept of hubs, in which the Weiss Tech House has among its key goals the intent to infect undergraduates with excitement of technological innovation; provide an action-oriented context to motivate learning; foster development of problem solving skills critical for innovation; nurture an innovation community at Penn; and provide knowledge and infrastructure resources that enable innovation. Such a network of hubs is now being organized over the University of Melbourne's vast campus.

Instead of 14 or so branch libraries hidden away in schools offering reduced hours of service because of a lack of critical mass and excessive staffing costs, there is now a network of vibrant, collaborative, cross-disciplinary hubs that revitalize the campus.

The university is now engaged in rolling out this strategy as part of its new graduate degree in the Melbourne Model. Such a strategy has been recommended for the University of New South Wales, yet another large campus, and the University of Adelaide's City campus. Similarly, a more transparent and integrated central library/campus hub model has been designed for Victoria University of Wellington.

These models are really a 21st-century evolution of the learning commons that proliferated in the 1990s throughout the world's universities. Wireless networks and communications mobility have reduced the need for hundreds of desktop computers clustered in "barns," as the University of South Australia calls them. Yet we still need to provide critical mass and social interaction along with resources for students. Examples of such emerging models can be seen at the University of Otago Information Commons and the University of Auckland Information Commons/Student Commons, among others.

At the heart of this discussion is the idea of transforming pedagogical practice to match changing student learning modalities brought about by a number of factors including wireless, broadband, and mobile communications. We need to transform our campus environment to resonate with and complement these virtual changes.

No longer will the 80 percent mode 1 (lecture), 15 percent mode 2 (tutorial), and 5 percent mode 3 (3rd space informal/social) mix suffice. We must look to alternative spatial models as a matter of urgency as the lead time for spatial reorganization is much greater than that for information/communications technology (ICT). We need to expand our concept of learning technologies to embrace not only ICT but also spaces and places that are in alignment with new and emerging pedagogies.

Figure 28: **A learning commons hierarchy across campus**

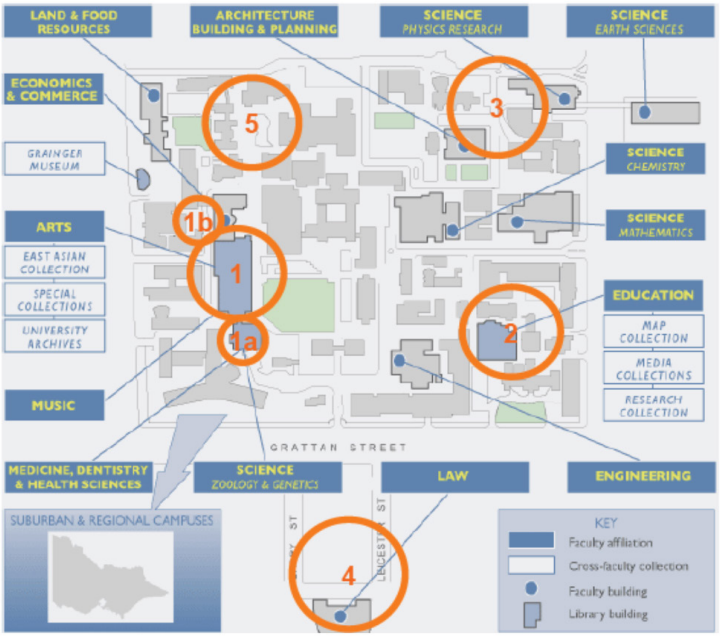
Central Library	• *Undergraduate* • Information & digital literacy 'training' • *Student services* • Social informal learning hub
Precinct	• *Cross disciplinary interaction* • Events/conferences • Coursework post graduates • Food & beverage
Faculty	• *Larger Professions eg Engineering, Medicine, Commerce* • Problem-based learning & CDIO • Symposia
Departmental	• *Specialisms eg bioscience doctoral research* • Specialist facilities • Display of research • Seminars

(Source: Author)

Figure 29: **Creation of precinct learning hubs from 14 libraries**

14 Libraries Rationalised to 6 Hubs

1. Arts
1a BioMedical
1b Music
2. ERC, Eng, E Asian, GS
3. Architecture, Physical Sciences
4. Economics/ Commerce, Law, MBS
5. LFR, Life Sciences
6. Bio21



(Source: Author)

MICRO—STUDENTS' IMMEDIATE CLASSROOM

Micro is represented by the student's immediate classroom. The slow transformation from the predominating passive student, teacher-led model of didactic and directive lectures to a more active learner-centered learning environment is occurring in fragmented fashion in some university campuses in the United States and Australia. The arguments around funding ratios—meaning we need large lectures in first-year university—are being eroded as more online analytics are being used to determine student learning outcomes.

Analytics[2] enable a more personalized constructivist approach to learning where, as noted earlier, students view online lectures and other course content through say iTunes or YouTube at their leisure and then participate in a more active and engaged event with an instructor and their peers.

These can be distributed in precinct, faculty, department, or school-based discipline-specific learning commons and are all designed to optimize the on-campus student experience. Academic libraries are rapidly converting to centralized learning commons in this hierarchy (as noted in an earlier section), where books are making way for people with some opting for automated book storage and retrieval to create additional spaces for students. Libraries are effectively being reengineered into cultural centers where campus social capital can expand (Johnson, L. et al. 2015a).

These designs need to support the significant use of interactive and video technologies and provide a range of spaces from individual quiet workspaces through small collaborative discussion suites up to larger learning commons. The student experience and graduate attributes are also very much in focus. Greater use of natural light and access to the outdoors are also essential. These spaces are akin to the co-working spaces emerging in cities worldwide, such as Impact Hub with 86 centers now operating (http://www.impacthub.net).

These place-based experiences can also support MOOCs (massive open online courses). Coursera (2017) is experimenting with distributed learning hubs, and "lobby learning" is emerging as yet another distributed learning hub in hotel lobby lounges. Indeed other incubator spaces are also on the increase (Freeman et al. 2014).

Rather than illustrate this concept in this micro section with a built example we have opted to tackle the vexed question of academic professional development. Such a task is inevitably fraught as academe—as we commonly know—is based on academic freedom where quality assurance occurs through peer-reviewed scholarly works and conferences.

What is lacking however is any formal executive professional development training—the word "training" being one "large elephant in the room" on university campuses. Thus the uptake of these new innovative learning environments (ILEs) is very slow, as academics cling to their more didactic lecture-based pedagogical modalities as noted in the Crow and Dabars (2015) review earlier. For example, the ILE learning commons at Glasgow University is to be accompanied by no less than an 800-seat lecture theater. How does this work? It works because academics are not yet—broadly speaking—ready to embrace the concept of blended learning.

With this in mind a bid was made for funds from the Office of Learning and Teaching, and the $220,000 study *Not a Waste of Space: The Professional Development of Academics in the Use of Innovative Learning Environments* was funded (de la Harpe and Mason 2014). The underlying premise of that project—a collaboration between the University of Melbourne and RMIT University—was that a range of face-to-face and virtual pedagogical methods was used to connect academics, linking the virtual and the physical.

These pedagogies are what we expect instructors to use in ILEs—we used them to complete the project, and they are used as demonstration case studies. The outcome is an online professional development program available to any academic who is aware of the Office of Learning and Teaching study and website (www.olt.gov.au).

28. ADDITIONAL SOURCES

Temple (2014). This edited book has a range of excellent chapters on campus planning although there is no forward look.

2 Author's note: For additional information on the subject of analytics, see EDUCAUSE Library's Learning Analytics page: https://library.educause.edu/topics/teaching-and-learning/learning-analytics.

Chapman (2006). The author after whom this prize is named covers a range of issues in seeking to ascertain what factors will influence the 21st-century campus. His wide scope concludes with a forecast of the future, suggesting three typologies: (1) clicks and mortar: virtual hinterlands, vital centers; (2) the intellectual agora: transformation of the civic metaphor; and (3) the legacy reaffirmed: back to the future. I suspect he will largely be right.

Dober (2010) has published several books on campus planning over some decades and much of this work is combined in three publications for SCUP. This book mainly focuses on the process of master planning rather than strategic futures.

French and Kennedy (2015) have explored a number of strategic documents on the future of campus in a 15-page article.

den Heijer's (2011) dissertation examines the management of the university campus. It has a chapter on the future of the university estate.

There are other resources that were examined, but it was decided that the evidence base included in this report thus far was sufficient to put forward a case as to what the campus might look like in 2030.

PART 4 — Expert Elicitation Surveys

EXPERT ELICITATION SURVEY FINDINGS (FROM LITERATURE REVIEW)—THE NEXT 10 YEARS

This section summarizes the combined findings from the following surveys: *2016 NMC Technology Outlook for Australian Tertiary Education: A Horizon Project Regional Report* (Adams Becker et al. 2016); *Trends for Higher Education: Looking at the External Environment* (Society for College and University Planning 2015b); *2014 Global Survey of Students* (Zogby and Zogby 2014); *NMC Horizon Report: 2015 Higher Education Edition* (Johnson, L. et al. 2015a); and the *NMC Horizon Report: 2015 Library Edition* (Johnson, L. et al. 2015b).

These are summarized under the eight categories identified in the development of the questionnaire: university strategy; student experience; informal and social learning; formal teaching and learning; impact of technology; staff experience; research spaces; industry engagement.

A source audit trail in a matrix is available for the following statements.

UNIVERSITY STRATEGY

There is an ongoing debate as to whether the university as a public good (Lambert 2014) should focus on its local community or the global community. Funding often comes from local sources—government, industry, and student fees. But revenue can also come from international sources. Note that the Brexit is likely to see some U.K. universities establish offshore campuses in Europe to continue to secure research funding (Oates 2016).

Some of the higher-order changes that the campus master plan will have to adapt to are advancing cultures of innovation, a rethinking of how institutions work, competing models of education, keeping education relevant, embracing the need for radical change, rethinking the roles of educators, and defining and transitioning to new business models.

These drivers of change will also be affected by a proliferation of open educational resources, the need for greater innovation to stay competitive, and distributed learning options. So, while 74 percent of universities have campus master plans connected to strategic plans (see survey hereunder), the latter are likely to be subject to some significant sources of disruption largely driven by technological developments and a related globalization of education.

There is a growth in synthetic mergers of academic institutions—e.g., Laureate, with a shared back of house but many brands. So while Laureate has 80 brands and is focused on work-related courses, other universities focus on their local community. In developing countries there can be more conservative responses than in the Western world. There is rapid growth in China, Russia, and Malaysia that will challenge the United States and England.

In the Western world there is a growing demographic change due to the reducing middle socioeconomic class. As a result, there will be a larger lower class, which could mean greater development required.

Some other issues include greater integration of planning at the executive level, an entrenched infrastructure deficit in information and communication technology, and the potential for the open licensing of course material and online delivery models. There is an under-resourcing of campus infrastructure that could have an impact on the scaling of teaching innovations.

Small numbers of universities are running summer semesters/trimesters (37 percent), and there is an expected growth (10 percent) in postgraduate programs, both nationally and internationally. It is predicted that there will be only 10 percent growth in undergrads and little or no growth in international undergrads. Between 2010 and 2021 (Hussar and Bailey 2013) student enrollments ages 18 to 24 are projected to increase 10 percent; ages 25 to 34, 20 percent; and over age 35, 32 percent, which may indicate changing student needs on campus and online as these demographics develop over time.

STUDENT EXPERIENCE

Key issues in this category begin with Millennials having different learning styles and expectations, as will Generation Z. There will be a demand for year-round learning, as 52 percent of students expect classes to be delivered 24/7. There will be increasing value placed on the user experience and this will have a high priority. Students will expect their learning to be transient with a constant upgrading of credentials.

There will be a rise in more authentic assessment and a shift to deeper learning approaches accompanied by a focus on learning measurement, learning analytics, and adaptive learning all supported by disability services.

The integration of international students will be paramount, and student accommodation quality will need to be improved. There has been significant interest in student accommodation for local and international students by universities.

There is a greater need for library study space accompanied by a need for improved "bring your own device" (BYOD) access and equity.

INFORMAL AND SOCIAL LEARNING

There has been shown to be a significant interest in the growth of informal learning spaces and also in the conversion of libraries to informal learning. Creating more authentic learning opportunities and increased incidental learning is also cited.

Some of the technology implications of informal learning include location intelligence, networked objects, BYOD, cloud computing, the increased issuance of badges and microcredit for MOOCs, the notion of the "quantified self," and the emergence of telepresence.

There will also be learning through augmented and virtual realities, and the use of ePortfolios may mean more informal learning spaces for students to prepare these. Artificial intelligence is also likely to play a significant role.

There will be increased use of blended learning designs, more blending of formal and informal learning modalities, and an increase in personalized learning. More individual and group study spaces are needed.

FORMAL TEACHING AND LEARNING

There is considerable interest in blended learning developments as well as lab-based faculties in active learning spaces. MOOCs are only being adopted at a slow rate, while BYOD is growing.

There is a strong interest in professional development in blended learning in part due to a search for the relevance of formal teaching, learning, and creative inquiry. This has led to the increased development of the flipped classroom.

There will be more crossover learning, and so-called "soft skills" are becoming more critical—communication skills, entrepreneurial concepts, start-up concepts, self-directed learning, writing, critical thinking, and problem solving.

Student disengagement (Millennials and society) requires more experiential and active learning space.

There is increasing need to accredit professional programs and focus on quality and rating tools. Half of students now expect learning and assessment to be collaborative. This is all leading to a redesign of learning spaces to accommodate the aforementioned issues, but also to be sufficiently adaptive to support augmented and virtual reality learning, makerspaces, and the increased use of robotics in the workplace, which pushes back into academe as a need to train students in these models.

There is a move toward embedding libraries in the curriculum—with improved digital literacy—and offering alternative avenues of discovery leading to libraries possibly becoming closer to faculties.

IMPACT OF TECHNOLOGY

There is likely to be an increase in MOOCs offered to partner institutions, e.g., through the Coursera network, and by 2020 MOOCs will have increased by 500 percent. It is expected that MOOCs will manage growth in student numbers without the need for more physical facilities although there is emerging evidence of the need for a face-to-face component in courses to ensure positive learning outcomes and reduce attrition rates.

Kurzweil (2016) predicts that there will be a significant growth in AI by 2030, 3-D printing will expand, wearables and VR will impact learning, and the Internet of Things will impact teaching. Makerspaces will evolve for 21st-century skills of making, doing, entrepreneurship, co-working, and start-ups. There will be increased online learning coupled with the emergence of machine learning.

There will be a need to support lower socioeconomic cohorts in more flexible ways—more nontraditional students in nontraditional institutions and in nontraditional educational models, e.g., competency-based education. Half of students expect course material and technology/MOOCs to be ubiquitous, and a third expect most tuition to be online.

There will be a need to manage radical change.

STAFF EXPERIENCE

There is continuing resistance to MOOCs, while 100 percent of students prefer blended learning. With the advent of machine learning it is possible that devices could replace faculty by 2030.

Teknion (n.d.) predicts a move away from open spaces to offices that nurture staff, suggesting a rethinking of workplace design and staff well-being. The increased integration of the library with academic programs may imply more distributed librarians/library space.

RESEARCH SPACES

There is likely to be an increase in the separation of teaching and research as forecast by some. The gross floor area of research buildings is likely to grow by up to 10 percent. Research partnerships will include business and industry. Much research may move off campus to be closer to industry (*Times Higher Education* 2015).

This study has not had the time or scope to delve deeply into research space futures. We began to look at discipline-specific spatial implications but it quickly became clear that this is really another project—or projects—for a later day.

INDUSTRY ENGAGEMENT

There is likely to be much greater industry engagement with associated work-integrated learning. The development of research hubs, technology parks, and bio hubs is likely to increase. Research partnerships will include business and

industry, and there will be more context-based learning. Some research will move off campus in this context.

There will be a greater drive for public universities to seek further funding from these linkages. Also there will be greater work-integrated learning so that graduates of those institutions that are more focused on professional training are more "job ready."

Due to a shift to seeking job opportunities, students will study closer to home for qualifications there and/or in their region. Teaching students for a robotic future will rapidly become the norm (30 percent of jobs will be automated in 65 percent of occupations). There will be a trend toward selecting courses in health care, computing, construction, and social services.

Student disengagement (Millennials and society) requires more experiential and active learning modalities. Between 50 and 70 percent of students expect there to be greater work-integrated learning.

SCUP DELPHI SURVEY RESULTS

EXPERT ELICITATION: SCUP MEMBER SURVEY—PROOF OF CONCEPT

As noted elsewhere, the Delphi Approach requires the elicitation of some 30 respondents to test and further develop a survey.

Most SCUP respondents were from the organizational and administrative departments of the university (68 percent). Teaching and research universities dominated (63 percent) followed by primarily teaching (21 percent). Ninety percent of respondents were from the United States; 10 percent were in the central business district (CBD), 47 percent outside the CBD, and 26 percent were regional/rural.

Further, 47 percent enrolled <10,000 students while 21 percent enrolled 50–75,000 students. Top-ranking themes were—in priority order—teaching, student experience, research, and community engagement. In addition, 74 percent advised they connected their campus master plan with their university mission. Of those who didn't, 20 percent thought it was not relevant, 20 percent were on the way, and 60 percent were "other."

Regarding cross disciplinarity, learning space strategy development, and managing a digital learning environment, the survey indicates that approximately 30 percent of respondents are working on all three. Another 25 percent have developed a digital strategy already but it is not yet university policy. A quarter have cross disciplinarity as a policy whereas only 15 percent have a learning space strategy and digital learning environment strategy in place.

Cross disciplinarity is encouraged, according to the results, in four primary ways, each of which scored 4 to 5 on a Likert Scale of 0–5. These included interdisciplinary undergraduate courses (5), academic leadership, administrative and executive leadership, and developing grant programs (all 4).

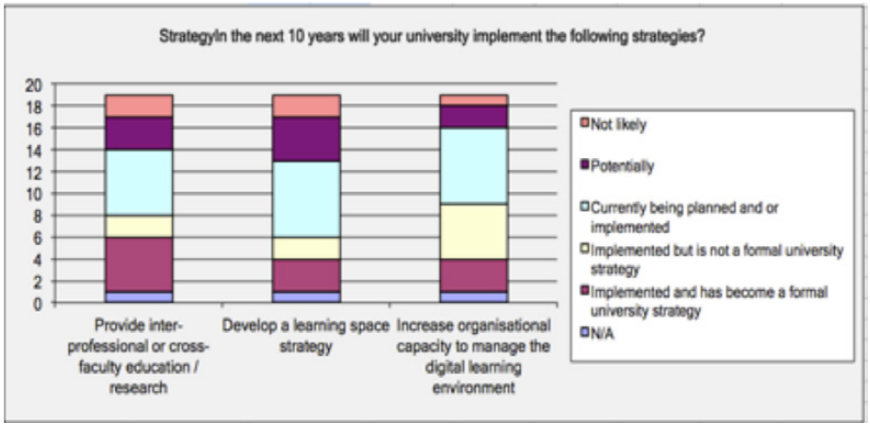
Interestingly 38 percent of respondents said such concepts were not stated in their strategic documents (strategic plan, mission, values).

Thirty percent of respondents advised they would be developing new curriculum policies for the delivery of programs, and 50 percent said that potentially they would do so for the use of an online learning platform.

It was noted that 79 percent run a semester system, 5 percent a trimester system, and 10 percent a quarter or term model. Thirty-seven percent already have a summer extended timetable, with 21 percent "experimenting" and 26 percent "exploring" the option. Ten percent will not use it at all. Likert preferences for blended learning were 4.3; for online programs 4.5; for after-hours programs 4.7; and for alternative languages 2.5.

A question was asked regarding growth in recruiting in the following categories: local postgraduate research, local postgraduate coursework, local undergraduate, international postgraduate research, international postgraduate coursework, and international undergraduate. Between 30 and 50 percent of respondents expected up to a 10 percent growth in general student numbers over 10 years. International postgraduate research was expected to rise by 30 percent, with respondents saying they would not be recruiting extra domestic postgraduate research or coursework, while another 25 percent replied saying they would not recruit extra local undergraduates or postgraduates.

Figure 30: **Cross-faculty, learning space, and digital strategy**

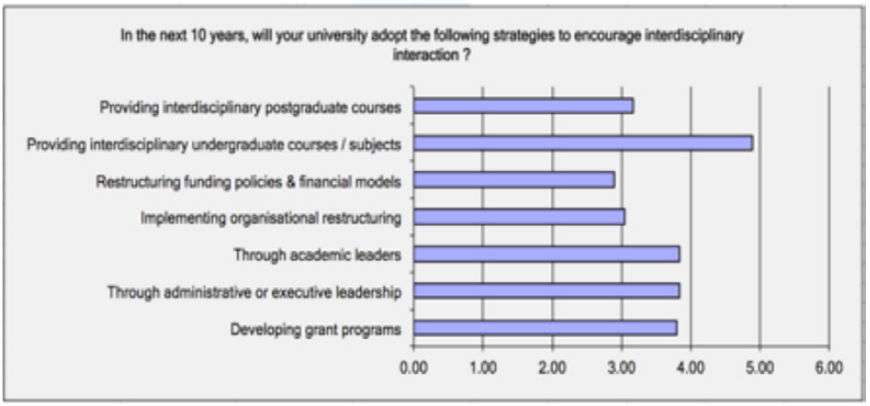


In terms of students taking offshore programs for a semester or two, 50 percent of respondents said that no postgraduate students took these programs, while 30 percent said they did. At the undergraduate level 30 percent said that up to 10 percent of students took offshore programs, and another 20 percent said that 76–100 percent of students did.

The issues impacting offshore uptake seemed to be evenly agreed to, with exchange rates and cultural, security, and political issues uppermost.

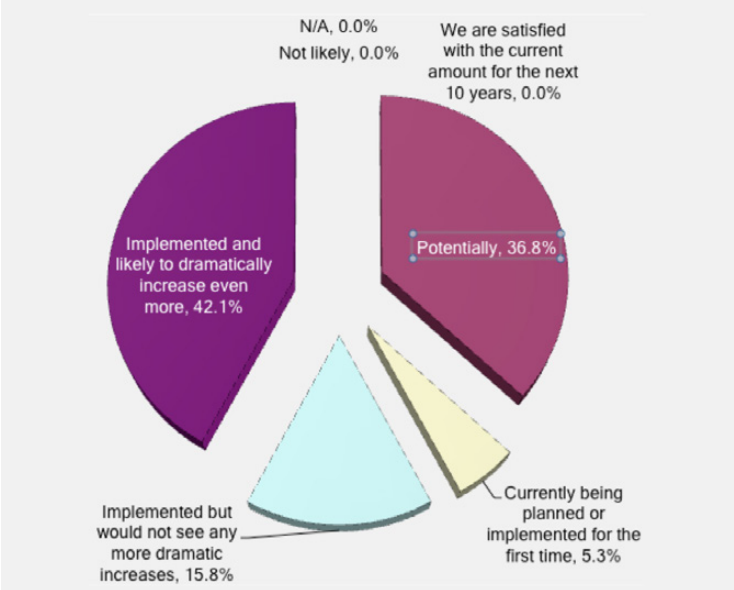
In relation to student accommodation, there was a consistent interest (30–40 percent) in the additional provision of accommodation for all student categories—on-campus international, national/interstate, and local in-state students. This was repeated for supported off-campus categories as well. There was interest at a lower level (around 20 percent) for both categories. Another 10 percent of respondents were very interested in all categories except the off-campus local/state students.

Figure 31: **Cross-disciplinary strategies**



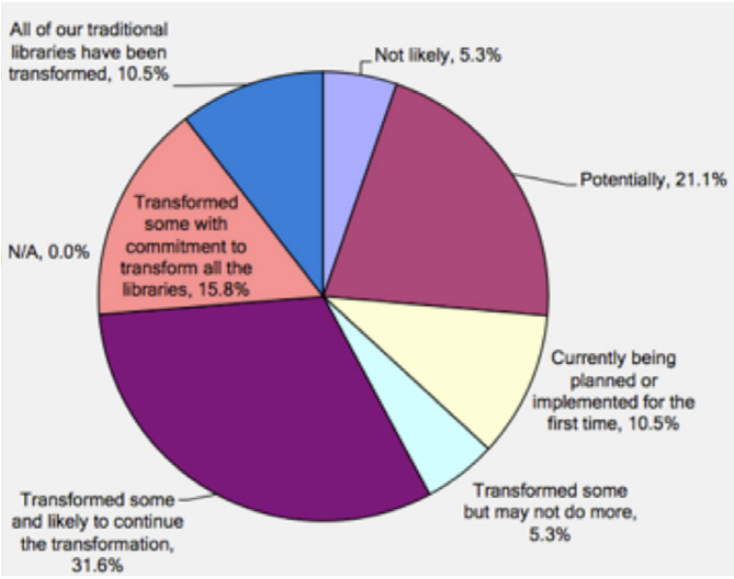
A further question sought to elicit interest in the development of informal/social learning spaces including distributed learning commons, and 42 percent saw a dramatic increase in their provision.

Figure 32: **Provision of informal/social learning spaces**



Conversion of library spaces to informal and social learning commons was seen as very important and highly likely at 32 percent. Another 10.5 percent said it was being planned, and a further 21 percent thought it was potentially needed.

Figure 33: **Transformation of library to learning commons**



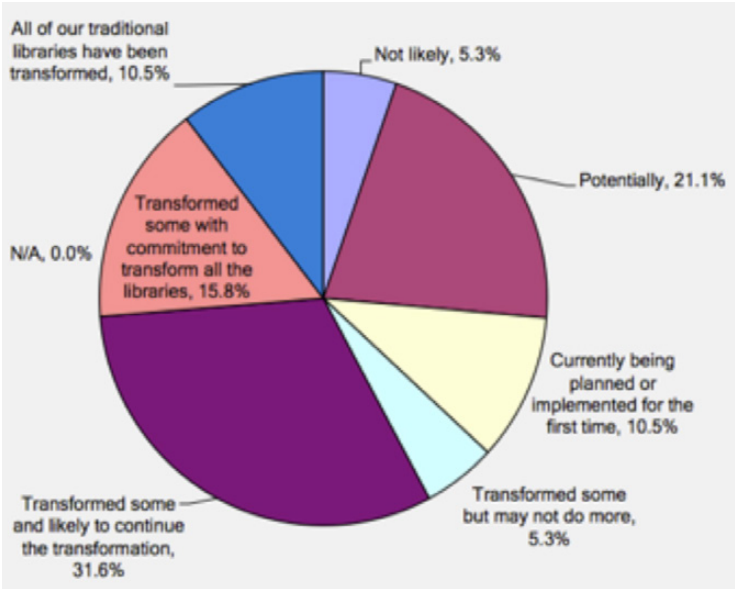
Interest in co-locating other services with the library, such as student services, retail, and IT, was varied. Twenty percent said they had already done so and will continue with this trend, 30 percent said potentially, and, interestingly, 25 percent said they would not.

With regard to a centralized or distributed model of library, there were contrasting positions. About 70 percent had a strong focus on the central library but also 80 percent had a combination of central and distributed library services.

There was an all-around strong interest in developing blended learning pedagogies, spaces, and programs on their campuses.

When respondents were asked if they planned to evaluate new-generation learning spaces, 10 percent said “not likely” and the remainder split evenly between “already doing this” and “potentially looking at it.”

Figure 34: **Blended learning space implementation**



A somewhat complicated question to present answers to related to work-integrated learning (WIL), problem- and project-based learning (PPBL), makerspaces (MS), clinical teaching models (CTM), and teleteaching (TT) across faculty groupings. Broadly, the "highly likely" results were

Figure 35: **Faculty interest in active learning models**

	Biotech	Engineer	Human	STEM	Soc Sci	Medical
WIL	20%	50%	15%	25%	15%	50%
PPBL	50%	45%	20%	50%	20%	50%
MS	20%	25%	15%	20%	10%	25%
CTM	10%	5%	5%	55	5%	50%
TT	10%	10%	5%	5%	5%	40%

The standout result of course is the interactive nature of teaching and learning in medicine and health sciences, followed a fair way back by STEM, engineering, and science. This is perhaps not surprising due to the laboratory nature of learning in these disciplines. But the standout once again is the medical and health interest in teleteaching, due in part to telemedicine and the increase in robotic and micro surgery.

One wonders why the other disciplines do not follow this lead, although it may be due to the lower costs and different funding models for non-medical programs.

Another question elicited a trend toward an increase in blended learning but with supporting lecture-based programs, both rated at 3–4 out of the 6 Likert scale points.

"Bring your own devices" has increased significantly, although the rate of reduction in university-supplied desktop computers was very slow.

The growth of online presence, delivering online courses, and measuring the use of the online environment was essentially split evenly between a "slow rate" and a "steady rate."

However, this did not translate to the adoption of MOOCs (despite MIT's uptake of 50 percent stated early in this report), with the majority of answers around parallel online courses through MOOCs and MOCCs (Massive Online Campus Courseware) rating 0–2 on the Likert scale. When asked if there were funding issues prohibiting the uptake of these courses, 45 percent said no and 25 percent said yes, with the remainder not applicable. One peer reviewer in the Delphi study noted that in the United States there is some difficulty in funding students for online courses delivered out of the state in which they are undertaking their tuition.

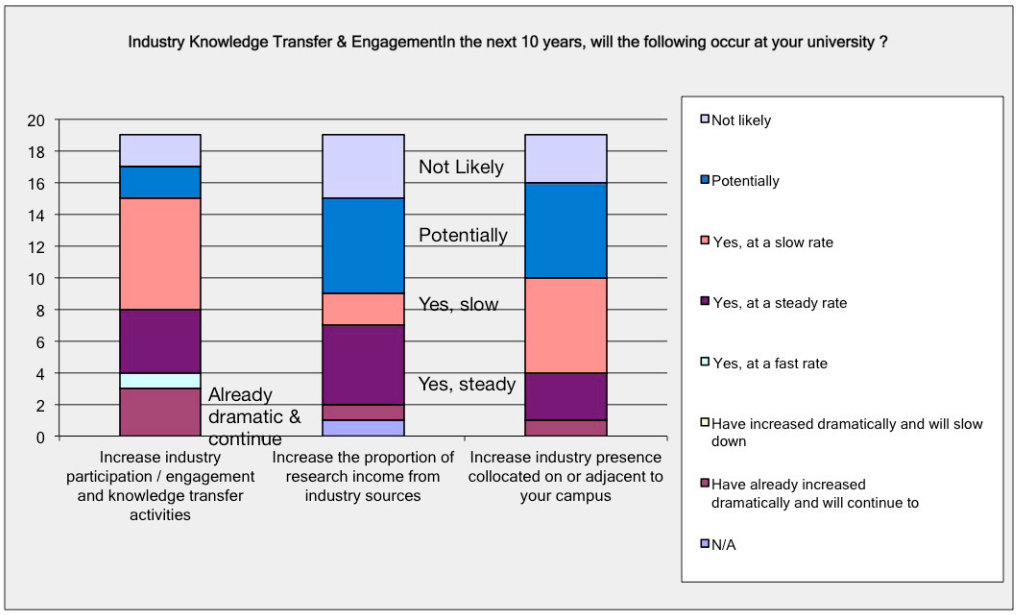
There was a strong "yes" to an increase in professional development for blended learning delivery, noting that many were already doing this and would expand these efforts at a faster rate.

Staff remuneration was likely to remain linked to both research and teaching. A second validating question noted the greater balance of current teaching and research positions vs. both teaching only and research only.

More than half of the respondents thought there would be a continuance of combined teaching and research staff positions, and the rest of the respondents were split between a bias toward teaching or research positions.

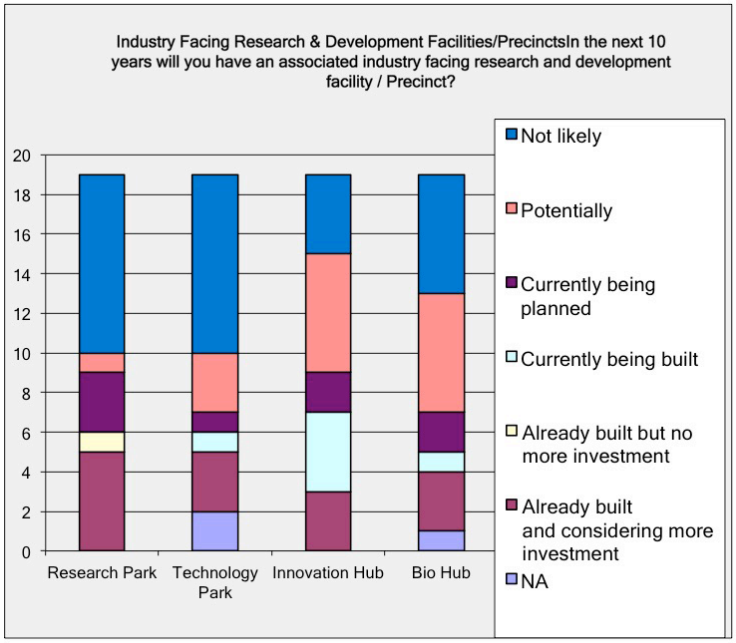
Regarding the gross floor area of research buildings on campus, responses were evenly spread between a research allocation as a percentage of total floor area of 1–10 percent, 11–25 percent, and 26–50 percent. Growth was estimated by 50 percent of respondents to be 1–10 percent in 10 years.

Figure 36: **Industry presence growth**



There appears to be a strong appetite for industry engagement as illustrated. However, in terms of development of research and tech parks, there seems to be little appetite at some universities that may well be teaching focused. There is certainly potential interest, with some currently being planned or already built or being built.

Figure 37: **Research and technology parks and innovation/bio hubs**



ARC DISCOVERY INTERVIEW RESULTS (THIS PROJECT CONTINUES TO 2019)

ARC DISCOVERY GRANT: INTEGRATED PLANNING—THE RELATIONSHIP OF MODELS OF COMPLEX LEARNING SPACE TO CAMPUS PLANNING AND UNIVERSITY MISSION STATEMENTS

The growing use of digital tools and resources means that students' learning activities are no longer tied to unique physical places. Their work is distributed across increasingly complex mixtures of physical and digital spaces that both shape, and are shaped by, students' activity.

Evidence and models generated by the project aim to strengthen the logic connecting the use, management, and design of learning spaces. A better understanding of the relationships between pedagogy, activity, and space will improve the work of architects and other designers, campus managers, university teachers, and students themselves.

Campus planning is no longer just the physical; it is also the virtual. The intersection of these areas occurs in many ways. One way is in time spent learning by students. In universities,

blended course provision (students learning both in class and online) is shaping space requirements and campus planning. If universities understand and measure the formal time (time counted for course credit) students spend studying online, time that otherwise would have been spent studying in classrooms on campus, then a better balance between physical and virtual space provision will be achieved.

An assessment of the formal time spent online in courses will also reveal the scale, scope, and trend of online environment provision in campus planning, something that is likely to continue to significantly affect the size and shape of physical space provision for key university processes. These basic relationships between courses and physical and virtual spaces have important implications for campus planning and university missions.

The project has a series of parallel studies, some in the United Kingdom at London University College, some at the University of Melbourne, and others at the University of Sydney.

The project includes observational studies of student physical behavior with simultaneous virtual activities, academic and student surveys, and consideration of both formal and informal learning spaces mapping the virtual and the physical.

Only a few interviews have commenced at the time of writing, and some of the results appear hereunder.

VIEWS OF EXECUTIVE-LEVEL STRATEGIC ESTATES PLANNING AT AN AUSTRALIAN UNIVERSITY (INTERVIEW IN ASSOCIATION WITH ROB ELLIS)

Learning space is temporal, formal, and informal—innovation in the context of a university takes students across faculties rather than knowledge being "owned" by faculties. Learning spaces are defined as both the virtual and physical spectrum. These are shared within portfolio contexts. The executive for campus development and international has a vertical role in the context of the vice chancellor/president through to the faculty executive deans.

Strategic planning is now a plan for how to respond to changing circumstances and deliver in response to those changes.

Governance in this context is dealing with a "big messy organization." It is not possible to continue a "command and control" framework; it is now necessary to have a "shared understanding." This is carried out within a portfolio leadership framework, e.g., provost, pro vice chancellor (PVC) innovation, PVC student services, etc., or a "shared governance model."

The governance framework integrates the physical and the virtual—the chancellery is strategic and the faculties academic. Corporate services are operational but strategic facilities development is carried out within the chancellery. The "old" execution model creates a division between strategy and operations.

The strategic campus development responsibilities include major capital investments and their places on campus as well as off-campus footprints. For example, a new biosciences development is carried out at the committee level, and there is enough information transfer including at a virtual level. Much of the virtual development is occurring in these laboratory-intensive environments. The campus development executive chairs the Project Control Group but the Biosciences Steering Committee—for a number of building projects within a specific precinct—is chaired by others.

IT is one step back from the executive table through the learning environments infrastructure operations branch. There needs to be strong input in the project design phase, and this is carried out via a professor of IT who understands the complexities across the university. Additional project

input is through professors who have discipline-specific IT experience.

Within the AUD 2 billion capital works program, the priorities are determined by some specific projects due to their precise requirements, e.g., veterinary science has an accreditation round to comply with by 2019 that will bring this forward in the program. The university is also exploring a new engineering research precinct in its strategic plan. Further, deans present business cases for redevelopment, which can affect the priorities.

One of the key areas that should be addressed in strategic infrastructure planning is allowing more time to make decisions, i.e., the need for more planning (for example, a proposed railway station near campus being suddenly mooted by the city authorities). The university has a campus development framework to assist in decision making around campus developments and priorities. The framework is preferred to a master plan as each project can be assessed against these criteria as it becomes a priority, with the university having the ability to change locations, footprints, and timelines without being locked into a predetermined plan.

Further the Australian federal government still needs to firm up higher education budget strategies. As a final point it is thought that there is also no way to reduce the complexity of universities.

VIEWS OF A SPACE PLANNING MANAGER AT AN AUSTRALIAN UNIVERSITY (IN ASSOCIATION WITH ROB ELLIS)

The university's organizational structure is arranged around four pro vice chancellors, the vice chancellor, deputy vice chancellor (DCVC) academic, deputy vice chancellor research, and Corporate Services (includes infrastructure). Within infrastructure is campus and space planning. This is in parallel to capital projects management and the delivery and maintenance of buildings.

Learning space 10 years ago was formal lecture and tutorial space; now it has a much broader scope that still includes flat-floor lecture theaters and tutorial spaces but also much more of an awareness of lab spaces and informal spaces. It's really about interaction between students. One student noted, "I learn half my stuff from the lecturer and the other half from my peers, fellow students."

Students now have a lot more group work so there is a lot more interaction, and 10 years ago there was little in the way of student interaction spaces and group study spaces. There is now a strong focus on developing these, both centrally within the learning hub but also across satellite hubs and new building projects. Learning space is seen as both the formal Syllabus-Plus booked spaces and the on-campus non-booked informal experience spaces.

To determine space needs audits are carried out every second year. Syllabus Plus advises what space is booked and then this is compared with how much is actually used. Every second year there is an observational walk around, an hour-by-hour audit over a week.

A typical week during term time is a million seat hours, with bookings around half-a-million seat hours and the actual utilization in terms of attendance at 250,000 seat hours. Comparing the university with others shows that's quite normal. But then the other unsustainable issue is that the million seat hours are only during term time so already total capacity is halved because over a full year you've actually got two million available.

About eight years ago an executive dean was very keen on centralizing space so the university brought much of the teaching space into a central system except for some highly specialized areas such as laser labs, areas with very specialized equipment that are school specific. With Syllabus

Plus timetabling, the university has moved to more of a constantly updated web-based system that is now under control of the DVC academic.

Regarding the quantity of informal spaces, even with the new Central Hub, the university was probably only building about a third of what was needed—the main issue with the hub is not enough seats; it's pretty full most of the time. The university is now looking for instance at the needs of the engineering, maths, and computer science faculties, and it has been working its way through the buildings seeking opportunities for informal space, isolated places to again bump up the seating for informal use. The view is that the campus is still behind and more opportunities are needed.

The Central Hub manager is very keen on data, having come from a retail background, and so has been using computer log-in hub data, both on who the students are personally and on their school or faculty. And so there are good numbers virtually plus a physical count as well on quite a regular basis. The place was observed as being "full" at eight o'clock when checked one Saturday night. Checking this out on Monday, 600 students were actually counted at ten o'clock on Saturday night. We wonder where they come from but it's not just international students; a lot of local students who haven't got a decent home to study in, especially as a group, are there, and so it's meeting a real need.

In the planning stages of the hub, a "road show" went around the faculties before final approval. And, just a day after it opened, the deputy head of sciences said, "We thought this hub was the worst idea you ever had when it came up in planning and now we think it's the best idea that infrastructure's had. There's been a big change in the whole attitude towards teaching and towards supporting students." It should be remembered that the term "student experience" back then was a fairly new expression, whereas now it is a very high priority in universities.

The other aspect of it is how much the Central Hub links with the library, and in hindsight it probably should have been even more linked with the library. A lot of the spaces were actually defined as library spaces whereas the place-making movement—in terms of having more than one reason for being there and supporting informal learning with retail and student services and being adjacent to the library as well—should be the preferred model.

In terms of innovation the vice chancellor has wanted to return to the traditional Humboldt research university-type experience in that all students would have exposure to a small group every year as part of their studies.

So it's not doing away totally with lectures—large lectures—but it is getting a much more personal experience. Each of the faculties has taken that on board in terms of what it means for their coursework, and Facilities has responded in terms of what it means for room layouts and spaces on campus. Also this is linked very closely in terms of what it means for technology.

Thus innovation really has been about rethinking the layout and the associated technology. We have come a long way from a siloed approach where a new room would be fitted out and then technology would come along afterward and just add specific bits and pieces.

Now the process is much more integrated. There is a teaching space committee that has both infrastructure and technology. With any new set of teaching spaces there is regular input from an academic perspective followed by a post-occupancy evaluation to try and bring together the lessons learned from the latest batch of rooms. It is now much more integrated in terms of how material is presented, recorded, and managed by both students and staff within the learning space and then that follows through into the informal spaces that are provided.

There's still very strong support within the university community for face-to-face learning that is also supported by a lot of students but with online backup. For example, some students watching their lecture online after they'd already heard it in class were using the online experience to reinforce some things and try to get a better understanding.

Regarding space utilization and the possible use of online alternatives, the university is now using its mathematical modelling people in the maths school to determine the real capacity. They are also working on actual enrolled numbers rather than planning numbers, which again is making a difference.

In terms of governance, with the vice chancellor promoting the small group experience, there is now a clear direction from the top. All of the faculties have supported this direction with their approach. From this a teaching space master plan has been developed that has come up with a number of key principles. These have also been applied to our newly developed teaching space precincts.

One of the advantages of our campus is that it is 14 hectares, compared with Newcastle University at 240 hectares, so that there is a greater intensity of capacity resulting in a much more constant use of space. The teaching space group meets fortnightly to work through that and links with the DVC academic, illustrating the governance model.

In teaching laboratories there is a problem with the term "generic" because a number of people have said generic means that it doesn't work for anyone. So the term "flexible" is used, and this came about when looking at a new geology lab. This process included a biology lecturer, and this was an undergraduate first-year lab. At the end of the session the biology lecturer said, "I could use this layout; all I'd need is an extra couple of seats in the corner and it would work perfectly for me."

This resonated at a visit to Monash University's immersive geology lab, which is furnished with just round and elliptical tables. Users bring out their mats and rocks when they have their classes. As it happened the first class to be put in there was Chinese literature. So there is now quite a disparate group of users within a building.

This was leveraged to an agricultural science campus after initially skeptical academics visited the University of Technology Sydney and the University of Sydney's Perkins Building and came back absolutely enthusiastic about a new way of doing things. There is still a lot of education in teaching staff that needs to happen but if that is taken seriously it is possible to get some great results.

In terms of barriers or next steps, it is the education of teachers in terms of their approach; this needs more work—there are some who are really excited and others who are not. The team is still not really thinking as a DVC academic thinks—the team needs to begin thinking as a DVCA would think about teaching.

In terms of developing a user brief, co-creation processes for other teaching spaces and satellite hubs around the campus have been used.

There is also a cultural change manager helping both staff and students understand future directions and how to best realize who is getting good feedback on the needs and issues.

VIEWS OF DIRECTORS OF ESTATES (IN ASSOCIATION WITH ROB ELLIS)

There is an immediate need to balance online learning and traditional teaching. Further, there is now a need to ensure the flexibility of spaces to adapt to various modes of teaching. The physical campus environment is becoming a 24/7 operation over 52 weeks of the year with greater integration of student living. There is also an increasing focus on the

reconfiguration of lecture theaters and the library's changing role in interactive learning.

Curriculum restructures are continuous, with some universities increasingly moving toward branch campuses in CBD locations (e.g., the University of Tasmania expanding from Sandy Bay toward the Hobart CBD) into existing converted buildings supplemented by a virtual campus. There is also an increased move toward specialized universities.

The emergence of these "next-generation" spaces is contested as it devalues the lure of lectures—the trend to teach once to larger groups is seductively more economical (albeit in a passive not active context). Many universities suffer from not having automated timetable scheduling of flexible spaces. It is thought that this could be managed through a web-based room booking system that overtakes auto-scheduling.

Cloud-based learning on campus will require more modification to teaching and learning spaces to facilitate a blended learning approach. Online should not replace the physical campus environment.

EMERGING PERSPECTIVES OF AUSTRALIAN UNIVERSITY CIOS ON LEARNING SPACE AND CAMPUS PLANNING (CONDUCTED BY ROB ELLIS)

To realize university missions, strategic outcomes for research and education can be achieved in a relatively shorter timeframe through technology-enabled solutions than through those tied to the built environment.

Technology is not just a service and cost area in universities; it is a strategic strength and should be treated and measured as such. For technology to be utilized as a strategic strength, alignment and maturity among key aspects of the university system are required. In governance, the senior committee of the university should include an advocate who holds strategic information and communication technology knowledge. This knowledge should be embedded in the concepts of strategic goals and plans such as learning space development and campus planning.

Using learning space as an example since it is both physical and virtual, funding allocations for its development should be assigned holistically to project outcomes, rather than initially being separated into different tranches. Project outcomes for learning space development should be derived from student, teacher, and curriculum needs. These should determine learning space requirements through questions such as

- What *innovations* should be considered in the learning space design? What are the student/teacher/disciplinary drivers?
- What *flexibility* in design is required for the different pedagogies required in class and online?
- What *capacity* of learning and teaching space is required for the curriculum, students, and teachers? How much time in class; how much time online?
- How much *integration* of the physical and virtual learning space design is required at the feasibility stage? At the development stage?
- What are the *sustainability* and *scalability* implications of the design?
- What are the criteria by which the learning space will be *evaluated*?
- What are the physical and virtual supports and services required during post-occupancy?
- What is the *life-cycle* cost of the learning space and its elements?

Since the commencement of this project, emerging outcomes have already identified that

- Most universities do not have alignment in or mature components of their systems that integrate information

and communication technology sufficiently well to achieve their mission statements.

» Fragmented concepts of learning space pervade most institutions; stakeholders tend to think either of the physical or the virtual as a duality, rarely as an integrated whole.

» More alignment among governance, strategy, funding, and management processes is required for universities to achieve the benefits from technology that can be achieved in the context of their mission statements and campus planning.

PART 5 – Possible Higher Education Futures to 2030

UNIVERSITY TYPOLOGIES FROM THE LITERATURE

Around six or seven models of university typologies have been observed in the above literature review. These are consolidated hereunder and combined in various ways to develop a more overarching typology.

OECD MODEL

These OECD scenarios correlate to some degree with other typologies hereunder. These will be compared and a resulting model suggested. They include:

Scenario 1: Trend Toward Open Networking
Scenario 2: Focus More on Serving Local Communities
Scenario 3: Responds to the New Public Responsibility
Scenario 4: Envisages Higher Education, Inc.

Figure 38: **Four future university scenarios**

***Scenario 1* – Open Networking**

- Highly internationalised network
- Institutions collaborate in research – industry – student mobility
- Greater range of options to students and researchers
- Premier institutions still network with each other
- Knowledge generated becomes available to all
- Open knowledge
- Student exchanges / study abroad
- MOOC's platforms

***Scenario 3* – New Public Responsibility**

- Publicly funded but increasing public management – market forces / financial incentives
- Boundaries between public / private blur
- Postgraduate fees fully paid by the student
- Focus on quality of teaching / employability
- Increase differentiation – focus on strengths and local community
- Research less cross-border
- Accountability, transparency, efficiency, effectiveness, responsiveness & vision
- Rising public debt has shifted cost to consumers
- More autonomy = greater intrepreneurship
- Research funding more competitive / project focus

***Scenario 2* – Serving Local Communities**

- Research continues to be internationally collaborative
- Teaching and research focussed on their local communities where funding derived
- Teaching-focussed environment
- Research largely left to governments and more prestigious universities
- Backlash against globalisation
- Government research focussed on strategic security, natural sciences, life sciences & engineering
- Arts and humanities remaining a prime role for universities

***Scenario 4* – 'Higher Education Inc.'**

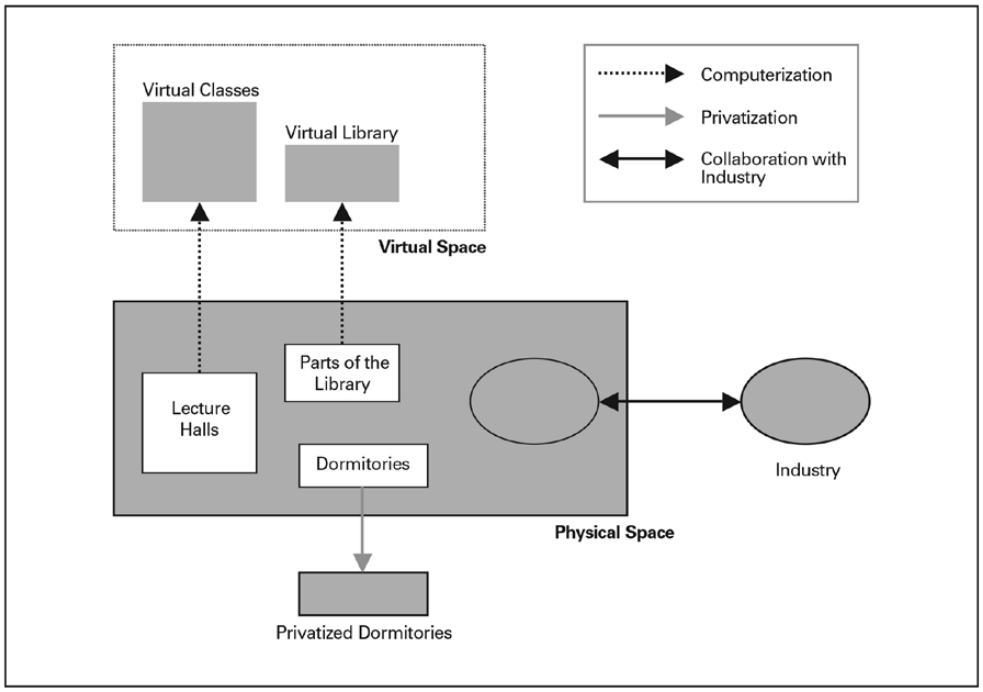
- HE institutions compete globally
- Research and teaching become disconnected – become separate 'core businesses'
- Vocational education increases its market share
- Many universities open branch campuses abroad and franchise educational programmes
- Emerging economies begin to specialise in their competitive advantages such as India in technology and agronomics in China
- Emerging economies also offer educational services to the developing world – trade liberalisation in education

(Source: Developed by author based on OECD 2007)

HASHIMSHONY AND HAINA MODEL

This model neatly suggests how the virtual and the physical might be implicated.

Figure 39: **Forces for change determining the size of the university**



(Hashimshony and Haina 2006, p. 11)

Since the time of writing that article, these developments have begun to happen in significant ways in Australia, particularly digitizing the library, turning those spaces into learning commons, and "outsourcing" student accommodation off campus.

Increased links to industry are also emerging in some cases and consolidating and maturing in others. In particular, work-integrated learning is becoming more important as "job-ready" graduates are sought by employers.

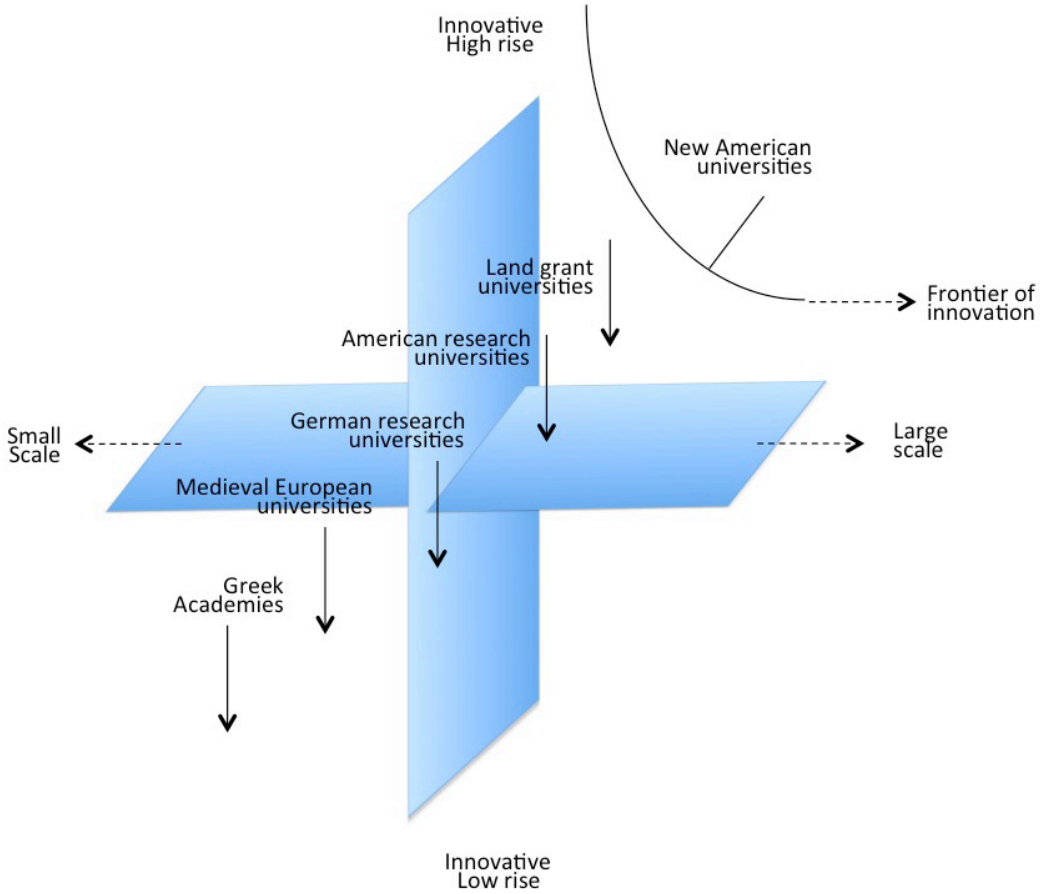
CROW AND DABARS MODEL

The genealogy of universities illustrated here by Crow and Dabars (2015) neatly suggests how the evolution of universities is now shaping the emergence of the New American University.

Scaling up this concept across the university-wide system will be problematic.

Further densities of university campuses are also implicated depending on the siting of the university: CBD, CBD edge, urban, rural.

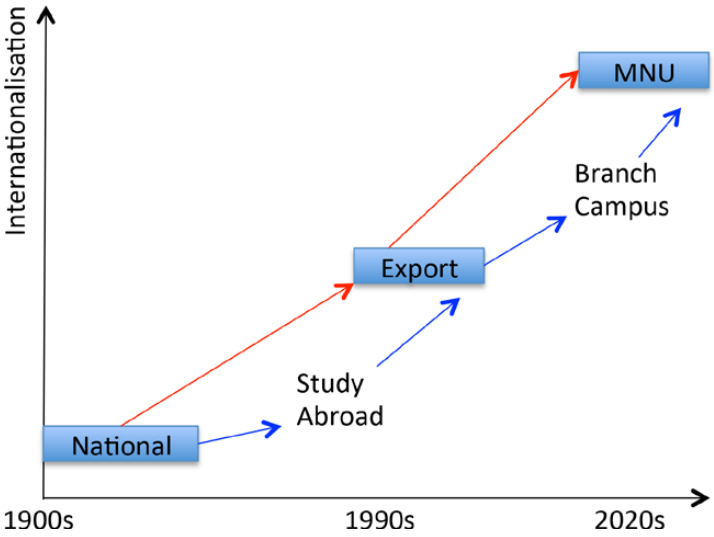
Figure 40: **The New American University and its origins**



(Crow and Dabars 2015, p. 104)

GALLAGHER AND GARRETT MODEL

Figure 41: **The emergence of the Branch Campus model**

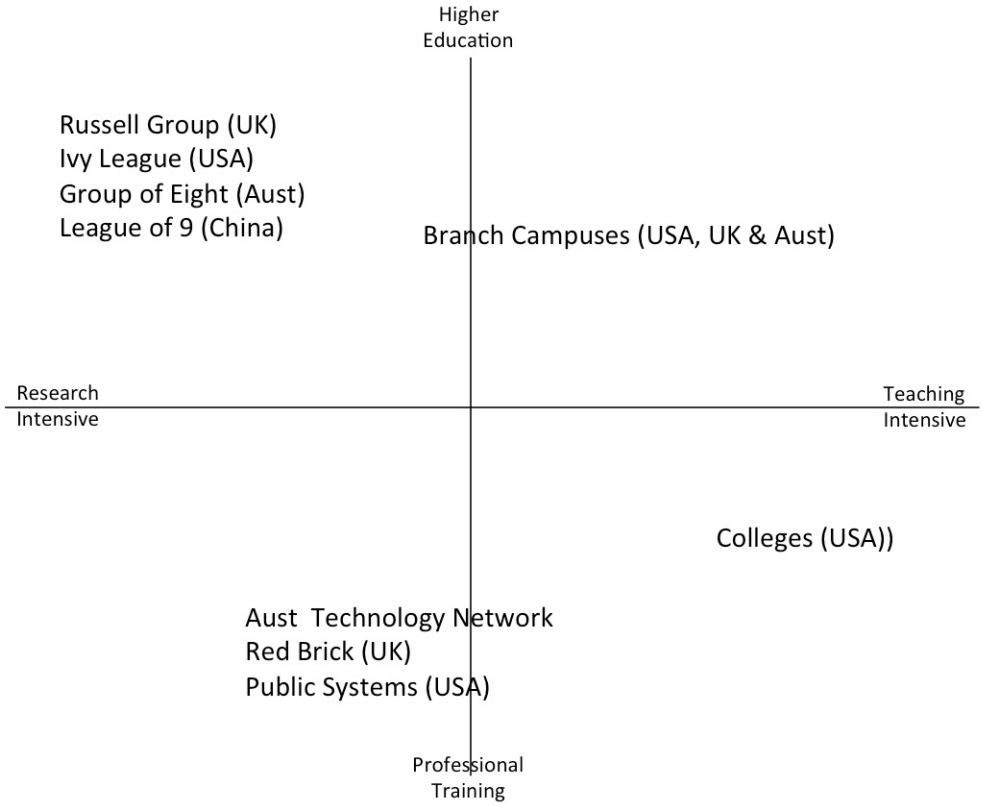


(Gallagher and Garrett 2012, p. 3)

This model sees universities evolving from nation-serving institutions through an export of education model (via incoming international students to existing campuses) toward an offshore branch campus model. Laureate is the most classic case of the branch campus model.

RESEARCH INTENSIVE VS. TEACHING AND BRANCH CAMPUSES (FISHER)

Figure 42: **Research intensive vs. teaching; professional training vs. higher education**



(Source: Author)

This diagram illustrates the international comparators of higher education learning vs. professional training/teaching and research intensive vs. teaching intensive. It is this matrix that could be developed further on a global scale of university context and development.

FOUR EVOLUTIONARY FORMS (ERNST & YOUNG)

This model seeks to establish four typologies, namely:

Type 1: Current state—status quo
Type 2: Streamlined status quo
Type 3: Niche dominators
Type 4: Transformers

All currently exist, but have not been evaluated for performance per se.

Figure 43: **Four possible evolutionary scenarios for universities**

INCREMENTAL CHANGE	**Type 1 – Current State** » Dominant model as broad-based teaching and research » Supported by large asset base » Large, predominantly in-house back office *Examples* » Expected slow pace of policy change » Some focus on quality of teaching	**Type 2 – 'Streamlined Status Quo'** » Contimue as broad-based teaching and research » Transform delivery of services » Transform organisations *Examples* » Change in ratio or support staff to front line staff, i.e., much lower support staff numbers
STEP CHANGE	**Type 3 – 'Niche Dominators'** » Fundamentally reshape & refine services & operating 'markets' » Comcurrent shift in business model, organisation and operations *Examples* » Aalto University (focused disciplines) » BPP University, UK (professional accredited quals with industry)	**Type 4 – 'Tramsformers'** » Private providers & new entrants » Carve out new positions in the traditional sector » Create new markets which merge parts of higher education sector withother sectors *Examples* » Venture Garage, Aalto University » Coursera

(Ernst & Young 2012)

AN AVALANCHE IS COMING (BARBER, DONNELLY, AND RIZVI)

Barber, Donnelly, and Rizvi (2013) suggested five typologies:

» *the elite university*
» *the mass university*
» *the niche university*
» *the local university*
» *the lifelong learning* mechanism

AMALGAMATION OF TYPOLOGIES (FISHER)

If, for example, transformers and niche dominators are coupled with other key factors such as those covered elsewhere in this report, a framework for testing could look like the diagram.

This takes into account the various change drivers established in the methodology development phase of the project, coupled with some of the typologies listed above.

TEST OF UNIVERSITY CRITERIA MIX

The author has either been on the staff, been an undergraduate or postgraduate student, or carried out master planning at the following six institutions that cover three of the Australian university models. The three models include

- The Group of Eight
- The Australian Technology Network
- The Innovative Research University Cluster

A fourth informal grouping could be formed with the rural and regional universities.

The six examples, designated as Group of Eight A and B, Australian Technology Network A and B, and Innovative Research Network A and B, have been judged on the above criteria as an exercise in trialling the methodology outlined.

These are the personal judgments of the author and are not meant to signify actual ratings of the individual universities.

This is simply a possible tool for establishing and comparing the future direction of universities of many typologies, with each having characteristics unique to that university's mission.

Figure 44: **Combined university typology matrix**

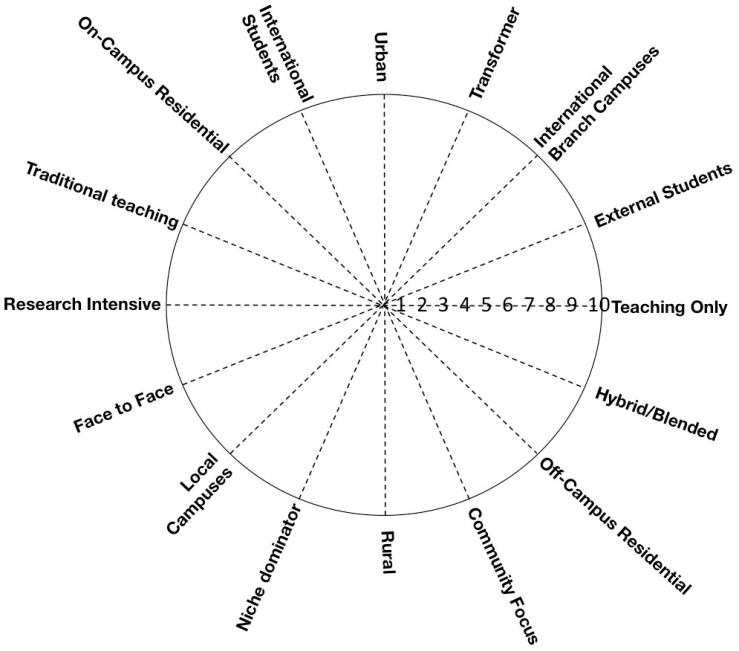


Figure 45: **Group of Eight A**

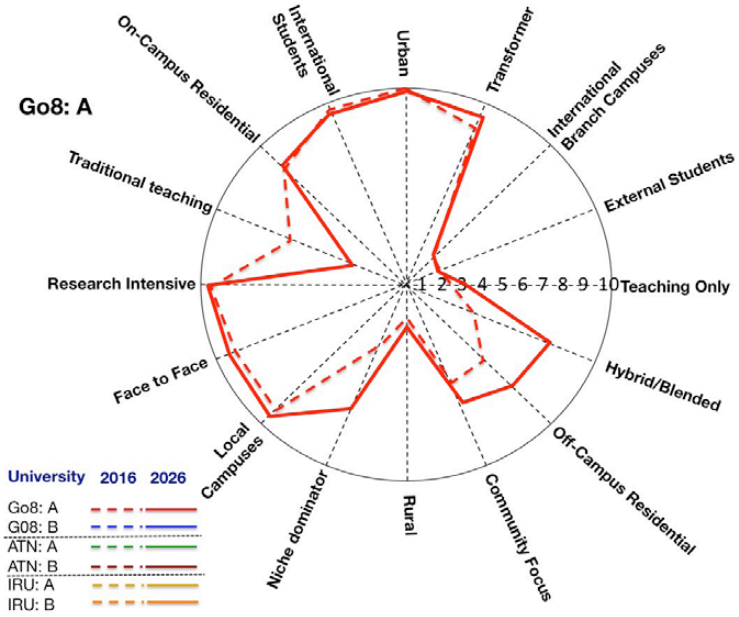


Figure 46: **Group of Eight B**

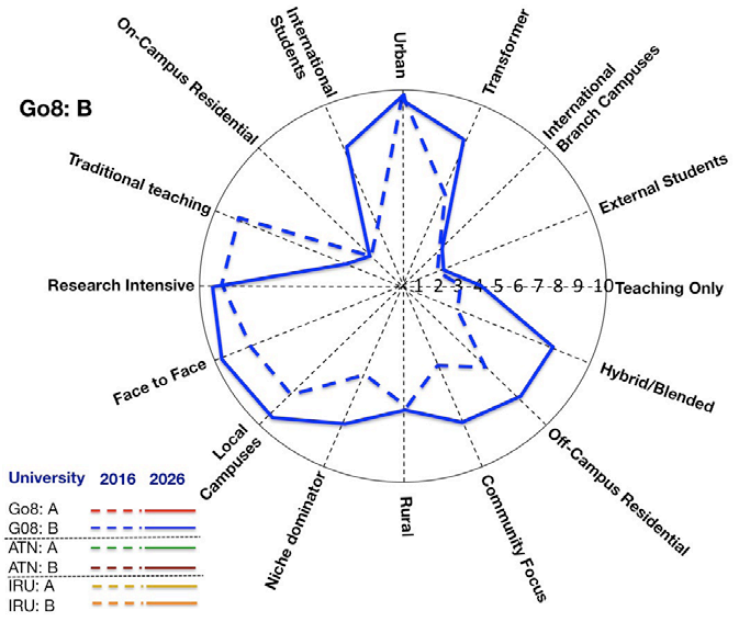


Figure 47: **Australian Technology Network A**

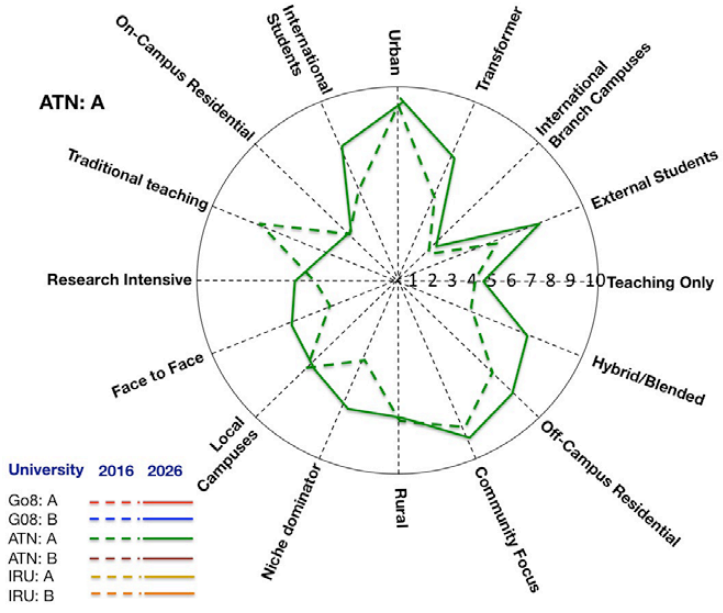


Figure 48: **Australian Technology Network B**

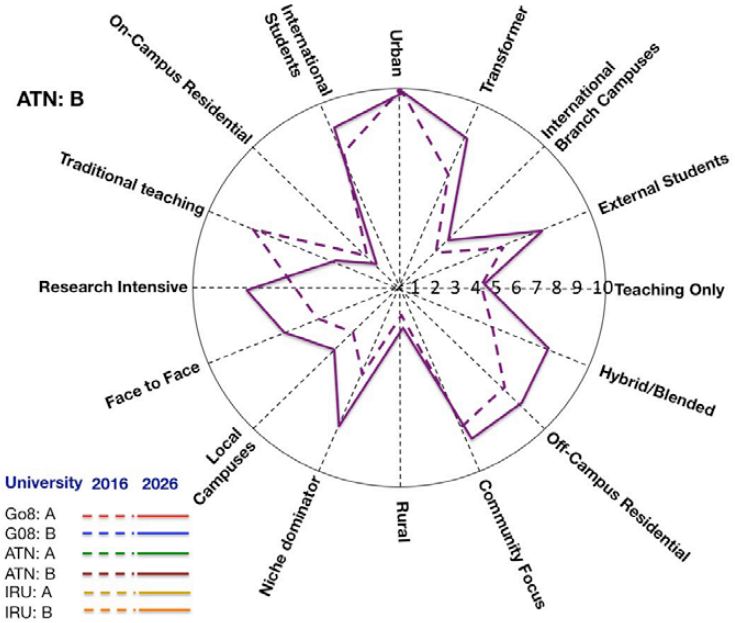


Figure 49: **Innovative Research Network A**

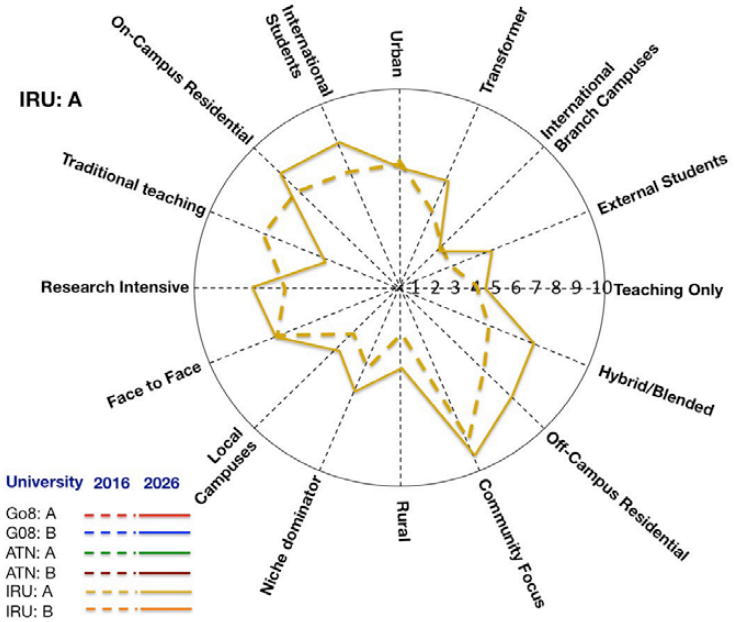


Figure 50: **Innovative Research Network B**

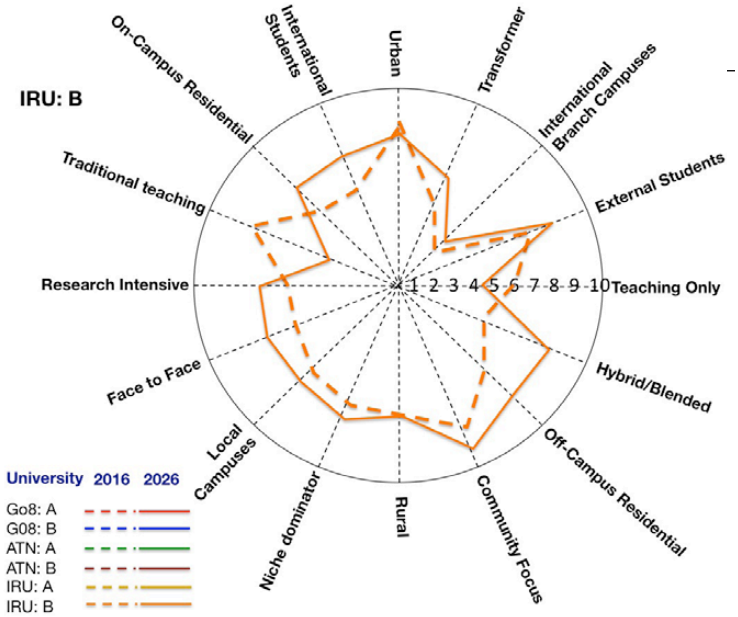
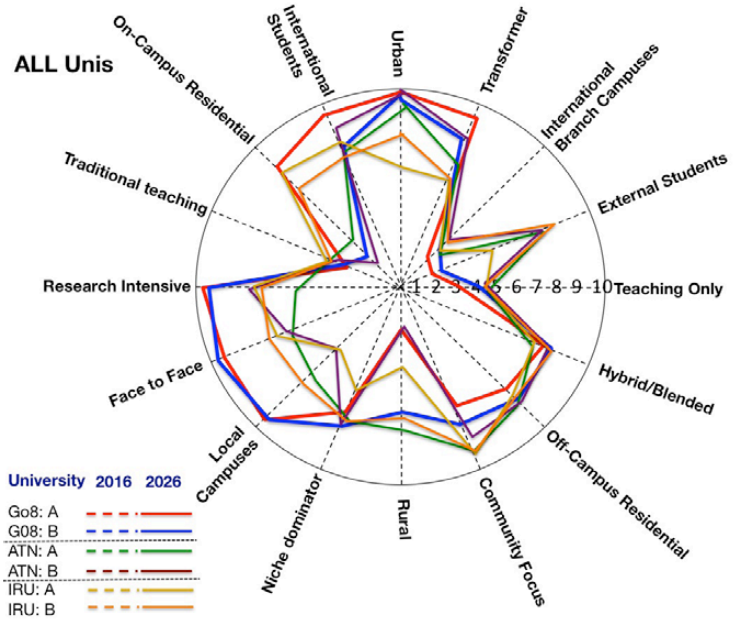


Figure 51: **All universities mapped across the matrix for 2026**



PART 6 — University Campuses as Complex Adaptive Assemblages—summary of key issues for campus planning to 2030

The following is a summary of key issues that are likely to impact the development of university campuses over the next 10 years.

COMPLEX ADAPTIVE ASSEMBLAGES

This study and the author's personal campus planning experience over some 40 campuses worldwide emphasize the complexity of university strategic campus planning in aligning with the university mission.

The theoretical concept of "complex adaptive assemblages" (Dovey 2016) suggests that this complexity is combined with the ability of (many) universities to adapt and that this adaptation has to integrate the needs and future aspirations of all the component parts, i.e., the assemblage of parts.

Dovey's chapter on complex adaptive assemblages sets out how such relationships dynamically respond to power, territoriality, and de-territoriality. This interactivity relates to the term "assemblage," which is translated from the French "agencement" as akin to a "layout," "arrangement," or "alignment." As Dovey notes, "it suggests at once a dynamic process and a diagrammatic spatiality" (p. 263).

Some of the elements (but not restricted to just these) that form that complex adaptive assemblage are addressed in summary form hereunder.

UNIVERSITIES AND GLOBAL TRANSFORMATIONS

There is likely to be an increased focus on the local community (for some institutions), balancing the public good with the economically rationalist pressures on universities. There is likely to be a greater flow of international students from Asia—especially postgraduates—into the Western world, with Australia, the United Kingdom, and the United States being the major recipients.

There will be further disruptions due to world affairs but also due to online learning evolution. Thus universities will need to be both agile and resilient in accommodating these drivers of change.

The student experience will be uppermost in the competition for enrollments. While MOOCs will slowly develop in the next 10 years as they are increasingly monetized, it is the advent of machine learning that will be a greater threat to the campus face-to-face experience (although machine learning may take more than a decade to be proven).

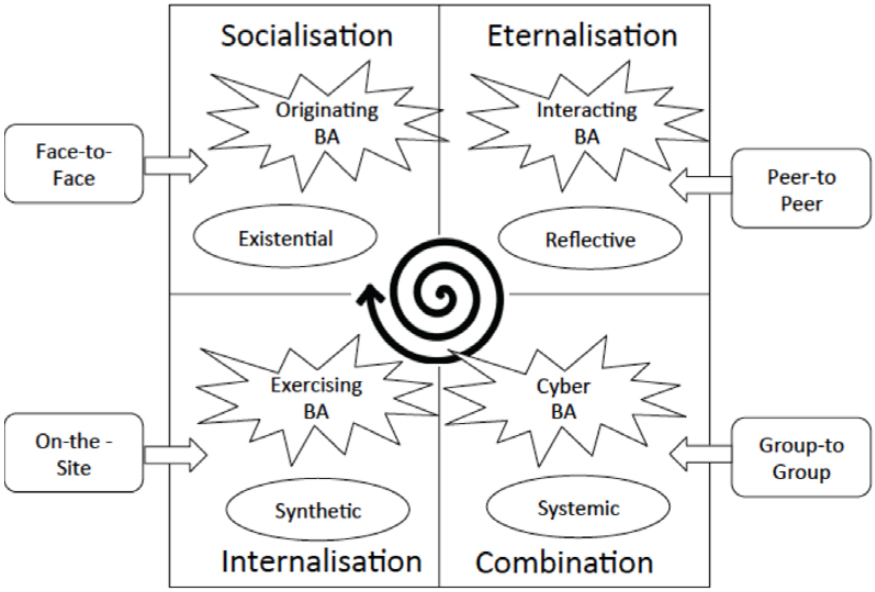
There is an increasing belief that online learning will not develop the soft skills graduates will need in their professional futures, and therefore an increased and focused smaller group face-to-face experience will evolve.

The student experience in terms of quality, supported, and affordable accommodation will still be a key part of the three to five years of a post-high school student's university life prior to graduating into professional life.

STUDENT EXPERIENCE—INFORMAL AND SOCIAL LEARNING

The social construction of knowledge with soft skills being a focus will be highly sought after. This will entail a growth in informal and social learning spaces, including maker and co-working spaces. This is exemplified by Nonaka and Konno's (1998) cycle of knowledge development and transfer. Note that "Ba" can be roughly translated from the Japanese for "place." (Note the possible link to "En," page 2 of this report.)

Figure 52: **The place-based social construction of knowledge**



(Nonaka and Konno 1998, p. 46) Note that BA = "Place"

FORMAL LEARNING

There will be an increasingly rapid move to blended and authentic learning using analytics to support student learning.

Possible machine learning will enhance this experience. There will be a transition from teacher-centered learning to learner-centered experiences through blended learning and the flipped classroom, coupled with entrepreneurial experiences linked to industry experiences through work-integrated learning.

IMPACT OF TECHNOLOGY AND THE VIRTUAL/ PHYSICAL NEXUS

While growth is slow there is likely to be an increase in MOOCs offered to partner institutions, and it is expected that MOOCs will manage growth in student numbers without the need for more physical facilities.

Makerspaces will evolve for 21st-century skills of making, doing, entrepreneurship, co-working, and start-ups. There will be increased online learning coupled with the emergence of machine learning.

There will be more nontraditional students in nontraditional institutions and nontraditional educational models, e.g., competency-based education. Half of students will expect course material and technology/MOOCs to be ubiquitous. A third already expect most tuition to be online.

STAFF/FACULTY

Librarians will engage even more with the curriculum to the extent that they may be "embedded" within faculties to be closer to academic and curriculum development.

Professional development for blended learning and flipped classroom experiences will become the norm.

RESEARCH DIRECTIONS

There is likely to be a 10 percent growth in research, with a focus on STEM, STEAM (includes arts), and STEMM (includes medicine).

Research, science, and technology parks are likely to grow as are bioscience hubs.

There will be stronger links to industry with some research activities moving off campus in support of this development. Work-integrated learning and internships will become the norm as will authentic learning and experience with entrepreneurial and start-up cultures.

INTEGRATED STRATEGIC PLANNING

SCUP has for many years advocated an integrated approach to strategic campus planning.

However, all too often university planning is carried out in parallel silos without the individually developed strategies coming together, either during the planning process or at a point when they can be integrated to illustrate the links between key elements on a campus.

If nothing else this study has served to illustrate the complexity of strategic campus planning and its connection to the university mission.

A final recommendation/outcome of this study is that there should be an integrated strategic campus planning committee at every university with representatives from the key elements listed in this closing chapter.

This activity can be organized around the practice of the "Campus Educational Overlay," which is a concept available from the author on request as the subject of a separate 40-page non-peer reviewed paper based on his experience with working, teaching, researching, studying, and consulting at over 50 universities in Australia, New Zealand, Asia, the Middle East, the United Kingdom, and the Unites States.

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