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The Future of the Tertiary Education Sector: Scenarios for a Learning Society

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This paper presents scenarios for tertiary education twenty years or so from now. On the basis of these stories about the broad tertiary sector, the paper closes with some speculation on the possible role(s) of these institutions in the long-run future. The scenarios are not predictions, nor forecasts of what is likely to happen. Rather they are stories that evoke a range of possible futures. Exploring a multiplicity of possible futures opens up a bigger canvas for imagining what kind of future we want and which strategic choices might make it more probable that we get there. However, before actually developing scenarios for the future of tertiary education in the learning society it is important to examine how such stories are constructed.

This introductory step is necessary because unlike established fields of enquiry, such as economics or biology, thinking about the future does not have a well defined methodological base.[2] For economists or biologists today the hardest task is not figuring out how to think about markets or living things but how to understand what we see and discover. Thinking about the future is not the same. It is a field that is only beginning to establish accepted methods. Which is why this paper begins with a fairly in-depth introduction to futures thinking before moving on to developing long-run scenarios for the future of tertiary education in the learning society.

Part 1 – Thinking about the future

People think about the future all the time. In the morning when they wake-up and start planning the day ahead. At the dinner table when they discuss where to go on vacation or which university the children should attend or what will happen to the stock market. Most of these reflections are short-term, a few hours, days or months. Such conversations naturally mix together what people hope for with a wide range of expectations – from the probable to the improbable. Degrees of probability are handled more carefully by professional forecasters trying to predict tomorrow's weather or next year's economic growth. Professionals tend to focus on getting to the highest probability prediction that available data and models can provide. They generally steer away from considering the broader, less predictive question of what might be possible as well as the more normative question of what is desirable.

But the search for greater predictive accuracy involves certain trade-offs. On the one hand there is a risk of adopting forecasting methods and models that depend too heavily on what happened in the past. Yesterday's parameters may do a good job at tracking past events but experience shows that this approach consistently misses major inflection points and transformative changes. On the other hand a preoccupation with what is likely to happen tends to obscure things that may be unlikely but still possible and potentially more desirable. At best the safety of extrapolation ignores what is not predictable, at worst it lulls us into a false sense of having exhausted the available options. Thereby

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[2] A few good entry points into the field: Dator, Jim, Advancing Futures, Prager, 2002; Slaughter, Richard, Integral Futures - A New Model For Futures Enquiry and Practice; Bell, Wendell, Foundations of Futures Studies, Vol. 1, Transaction Publishers, 1997.

narrowing the set of available choices. This, in turn, can impair strategic decision making because it limits the capacity to imagine non-predictable avenues for reaching desirable futures.

Scenarios

Scenarios or stories about distinct futures have the potential to overcome some of the pitfalls of predictive approaches.[3] What scenarios lose in terms of calibrated probabilistic accuracy can be made up for by a greater openness to initially unlikely but nevertheless possible outcomes. This is why scenarios have often been used as a tool for strategic thinking.[4] Scenarios are also well suited to helping decision-makers think about institutional change, particularly when qualitative variables make it difficult to use other methods for analysing the future. However, scenarios face a number of drawbacks, in particular how to imagine and then select a few distinctive and pertinent stories about the long-term future from among the thousands that are possible.

There are two familiar methods for solving the problem of how to choose scenarios. The first takes an initial starting point, for instance population or economic output, and then develops scenarios on the basis of a range of growth rates – low, medium and high. This method can be called the baby-bear, momma-bear and papa-bear approach (Bear for short). The second approach focuses more on preferences and implicit expectations in order to sketch scenarios that capture what people consider to be: the most desirable, the least desirable and the muddling through but most likely. This method can be dubbed the good, the bad and the ugly approach (GBU for short).

Both of these methods have the virtue of selecting stories that are readily accessible since the factors that determine the main characteristics of each scenario are usually quite familiar or easy to grasp. So, for instance, we are well acquainted with Bear scenarios for universities that are distinguished by differences in enrolment growth rates – low (baby-bear), medium (momma-bear) and high (papa-bear). Or GBU scenarios that are distinguished by the preferences of people whose values, for instance, lead them to consider the "good" scenario to be one where universities are exclusively citadels of a pure search for knowledge, the "bad" scenario to be one where universities are exclusively driven by the commercial imperatives of funders from the private sector, and a muddling through or "ugly" scenario, usually seen as the most likely, that combines both pure and commercial options.

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[3] For good discussions of scenario methods, primarily from a private sector perspective see: Godet, Michel, Creating Futures: Scenario Planning as a Strategic Management Tool, Economica, 2001; Ogilvy, James A., Creating Better Futures: Scenario Planning as a Tool for a Better Tomorrow, Oxford University Press, 2002.

[4] Strategic in the sense of choosing where to go. The strategic choices involve the selection of overarching, sometimes long-run, goals. And strategic choices are the ones that make a significant difference in the direction of travel, towards or away from strategic goals.

Complicated scenarios mix and match a variety of trends (Bear) and preferences (GBU) to produce multiple and multifaceted stories about the future. Like scenarios that combine extrapolation of low, medium and high growth rates in both enrolment and technological change with a selection of specific values that privilege monastic or commercial traditions. This kind of approach easily generates a twelve scenario matrix as per below.

Matrix 1: Mixing Bear and GBU Scenarios

GBU:	Commercially driven		Knowledge quest driven	
Bear:	Low rate of technological change	High rate of technological change	Low rate of technological change	High rate of technological change
Low enrolment	*Scenario 1*	*Scenario 2*	*Scenario 3*	*Scenario 4*
Medium enrolment	*Scenario 5*	*Scenario 6*	*Scenario 7*	*Scenario 8*
High enrolment	*Scenario 9*	*Scenario 10*	*Scenario 11*	*Scenario 12*

Obviously more variables can be added such as Bear scenarios regarding rates of globalisation or GBU scenarios that reflect different preferences for elite versus mass universities, exclusionary versus inclusionary, etc.. This approach multiplies the number of potential scenarios. It is also possible to merge scenarios by, for example, putting scenarios one and three above together to imagine a dual system that combines commercially and knowledge driven institutions all faced with low enrolment and low technological change.

Taking either of the two familiar approaches – the Bear or GBU – to constructing scenarios has the crucial virtue of generating stories that are easily accessible and comprehensible. These scenarios are rooted in expectations and values that are usually considered self-evident. More complicated mix and match scenarios trade-off some ease of access in favour of a bigger menu of possible outcomes. However, even complicated scenarios are generally built up from the options provided by Bear and/or GBU methods. As a result the exploration of what is possible, as distinct from what is considered probable or desirable, usually remains incomplete.

Possibility Spaces

Partial coverage of the full set of possible futures is inevitable, we can not imagine every feasible outcome. Diagram 1 one illustrates this challenge. Obviously the largest set consists of what is possible. Within the set of possibilities are all probable futures and some of the desirable ones (since desirability is in the eye of the beholder this set contains both good and bad scenarios – depends on your point of view). There are certainly a few desirable futures that do not fall within the realm of the possible. As for GBU scenarios they stay within the set of desirable/undesirable possibilities. And Bear scenarios, being growth rate based extrapolations, although not necessarily linear, may wander across the possible, desirable and impossible.

The problem illustrated by Diagram 1 is that Bear and GBU scenarios do not necessarily cover the full range of pertinent possibilities. The question then is: are there methods that can improve our exploration of the strategically relevant range of possible futures?

Diagram 1 – Locating Bear and GBU Scenarios
in Terms of Possible, Probable and Desirable Futures

Conceivable
Futures

Desirable
Futures

GBU &
Bear Futures

Probable
Futures

Possible Futures
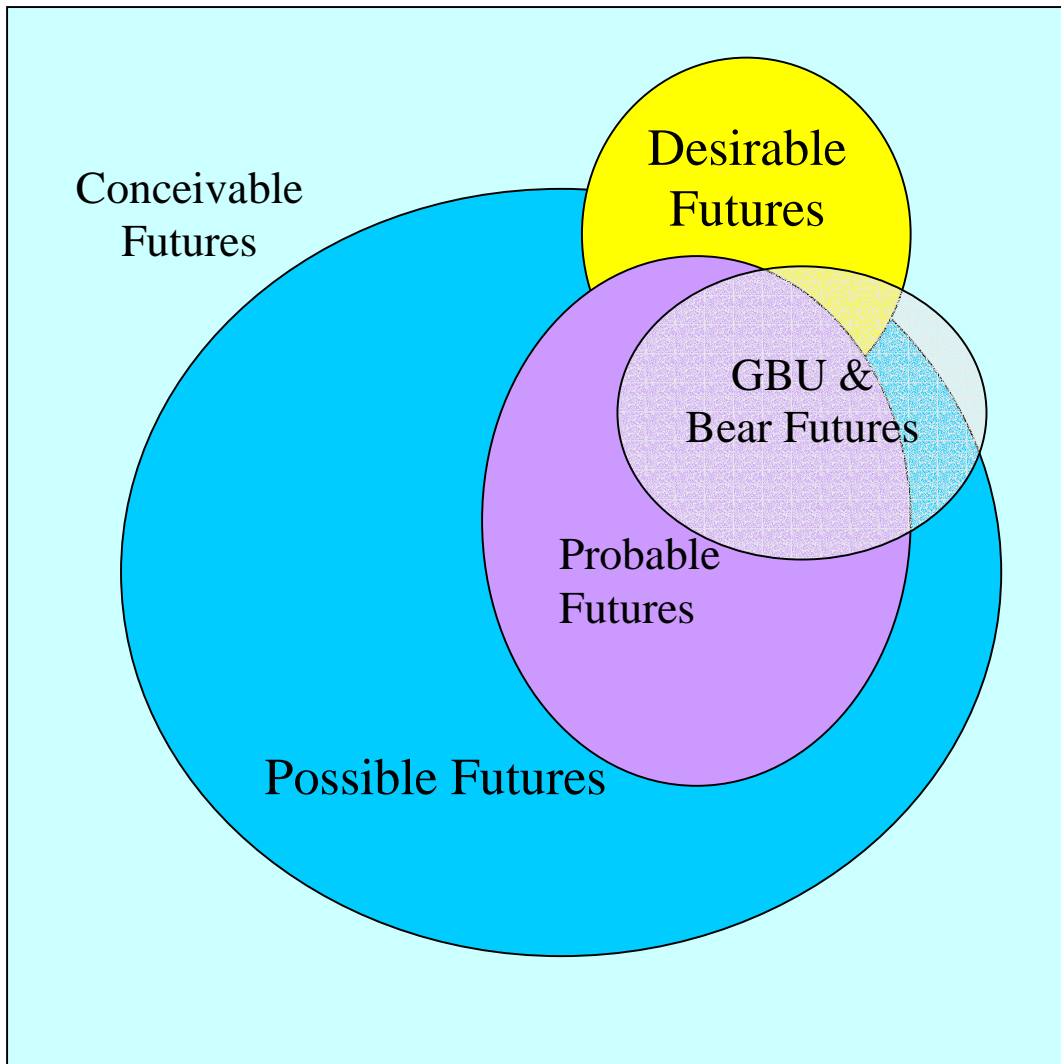
One way to begin to tackle the challenge of exploring possibilities more rigorously is to pose the problem independently of either the Bear or GBU methods. The "possibility space" approach elaborated below offers one way of generating a larger set of possible futures for consideration in scenario building. This is a three step method for building scenarios. The first step is to determine or define the key attribute (variable A) of the scenario's subject. The second step is to sketch a space, perhaps multidimensional, using the primary determinants of change (a, b, c) in variable A. And the third step is to identify distinct scenarios within the possibility space.

Diagram 2 illustrates this approach with an example of technological possibilities – specifically the pervasiveness of electricity. The three steps for arriving at this possibility space are as follows:

Step 1. The subject of the scenario is technology pervasiveness (variable A) – which is defined in terms of how widely a particular technology is diffused. When a technology is first invented or commercialised it is possible that it will not be picked up at all. Alternatively it might become very widely diffused, entering all aspects of life – from the workplace to the home.

Diagram 2 – Possibility Space Illustration – Pervasiveness of Electricity[5]
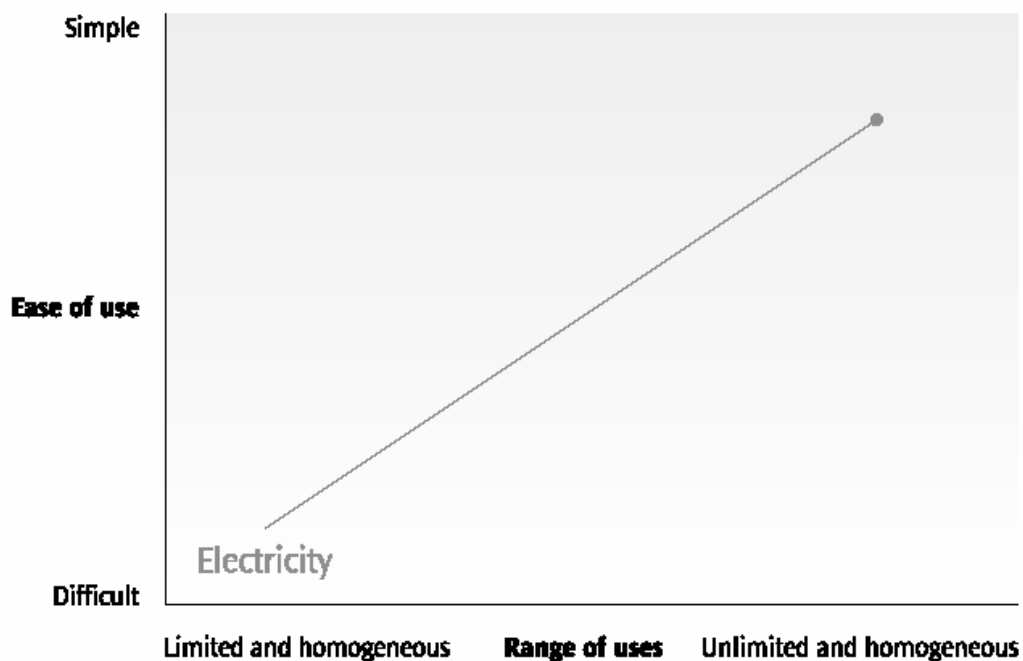
Step 2. Two of the key determinants of the extent of a technology's pervasiveness are how easy it is to use (a) and how many uses to which it can be put (b). So, as Diagram 2 illustrates a technology like electricity, as it becomes easier to use and is applied to more and more different uses, moves from the lower left quadrant of the possibility space to the upper right.

Step 3. Different scenarios can be developed by considering different points in the possibility space. Of course we know what happened to electricity but we do not know what is going to happen to many more recent technological breakthroughs. Will

[5] Miller, Riel and Bentley, Tom, Unique Creation, National College for School Leadership, 2003, p. 9.

information technology really succeed in becoming like electricity – so easy to use and ambient that we do not even know the name of the operating system anymore?

Many people think so, but that is not the point here. Rather the aim is to illustrate how this possibility space method opens up a wider set of possibilities for constructing scenarios. Diagram 3 tries to illustrate the relationships. The possibility space simply creates an alternative range of options from which to construct strategic scenarios. Once again, this is due to an approach that allows the possibility space to explore the future relatively independently of initial views regarding probability and desirability. However, crucially, the point is to then work from the wider set of possibilities to back towards futures which are deemed more likely and preferred. This is what accounts for the overlapping of the trend (Bear), preferred (GBU), possibility and strategic futures depicted in Diagram 3.

Diagram 3 – Strategic Scenarios and Possibility Space Futures
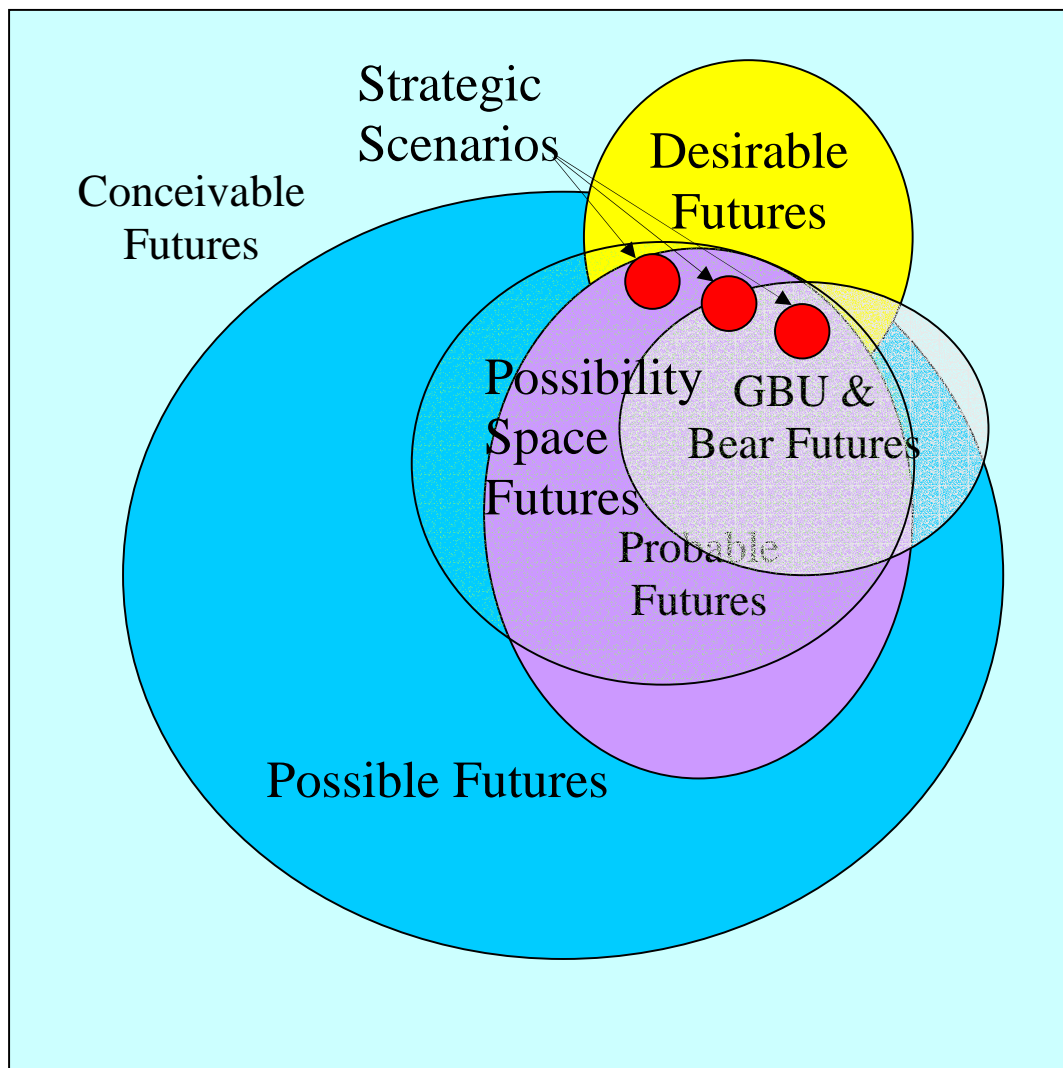
The task is still imagining the future – projecting forward into time. What possibility spaces do is make it easier to be imaginative. It is one way of being systematic and explicit about the hypothetical "what if". Model builders and forecasters also explore this type of question, only their efforts focus at prediction work within the constraints of what is practically quantifiable.[6] Possibility space analysis applies much of the same methodology to the challenge of expanding the set of possibilities used in the development of scenarios. The next step, as Diagram 3 illustrates, is to use the stories that emerge from this more open ended tool to develop scenarios that reconnect with the probable and desirable. The strategic scenarios in Diagram 3 are entirely within the overlapping spaces carved out by what is deemed possible, probable and desirable. And, as is also evident from Diagram 3, roughly one and a half of the strategic scenarios cover the same territory as GBU and Bear scenarios, but one and a half do not. This is the value added of using a possibility space approach.

Extracting Scenarios from Possibilities –
A Functionalist Approach

Having enlarged the set of available possible futures for consideration when developing scenarios the next challenge is to select particular scenarios from the vast space of possibilities. The question is how? Of course there are still the Bear and GBU approaches that could be applied immediately to the broader set of possibilities. These extrapolation or preference based perspectives can be used to make a selection from within the larger possibility space, either by taking the starting point and rates of change as givens or by imposing a specific set of values for differentiating end-points.

However, it may be worthwhile to put off for a little longer consideration of probabilities and preferences and continue for one more step with the neutrality of the possibility space methodology by focusing in an abstract manner on the functions and/or organisational attributes of the scenarios' subject. For example, continuing with the case of electricity, imagine that it is a technology that has not yet traced its path across time. Now, for the sake of illustration, here are three hypothetical functions and two basic organisational patterns that can be used to develop scenarios. The three imaginary functions of electrical

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[6] The rules of good econometrics stipulate that a clear theoretical model should be developed before any empirical testing. But it is not the empirical testing that makes standard modeling less appropriate to thinking about possibilities. Rather it is simply that the objective is usually to find a model that provides a good "fit" with past data and on that basis offer probabilistic predictions about the future. Rarely is the aim to explore potential, particularly non-predictable or "non-ergodic" change. On the other hand the explicit goal here is not to forecast but to fill out the range of scenarios based on a more exhaustive analysis of what may be possible. Hence the lack of quantification rooted in past phenomena – at least initially – is a virtue. Particularly since using a quantifiable forecasting model to produce scenarios is really just a more complex Bear type approach – one where the parameters are tweaked in ways that mix baby-bear, momma-bear and papa-bear rates of change. Modeling can help analyse which variables matter and, once the possibilities have been rigorously explored, modeling can be an important tool for deepening the analysis of the factors that might influence rates and directions of change (for instance see the "radar chart" in Unique Creation, p. 21 which points the way towards quantifying a possibility space scenario for the learning society).

power are as: weapon – tool of war; local replacement for steam and water power in factories; and autonomous source of power for all kinds of consumer products. The two organisational attributes are centralised and decentralised generation of electrical power. This imaginary counter-factual "what-if" of the future of electricity generates six scenarios as per the following functional/organisational matrix:

Matrix 2: Example of Electricity Use Scenarios – Function and Organisation

	Organisation	
Function	Centralised Generation	Decentralised Generation
Weapon	Scenario 1	Scenario 2
Industrial Power	Scenario 3	Scenario 4
Consumer Power	Scenario 5	Scenario 6

Diagram 4 shows how the six scenarios mapped onto the possibility space already sketched in Diagram 2. Taking this next step underscores the contingency or dependency of the scenario's subject – the pervasiveness of electricity (variable A) – on changes in the underlying determinants of change (ease-of-use (a) and range of uses (b)). Specifying the location of a particular scenario within the possibility space is then determined by how that scenario relates to variables (a) and (b).

Diagram 4: Examples of Functional Technology Scenarios
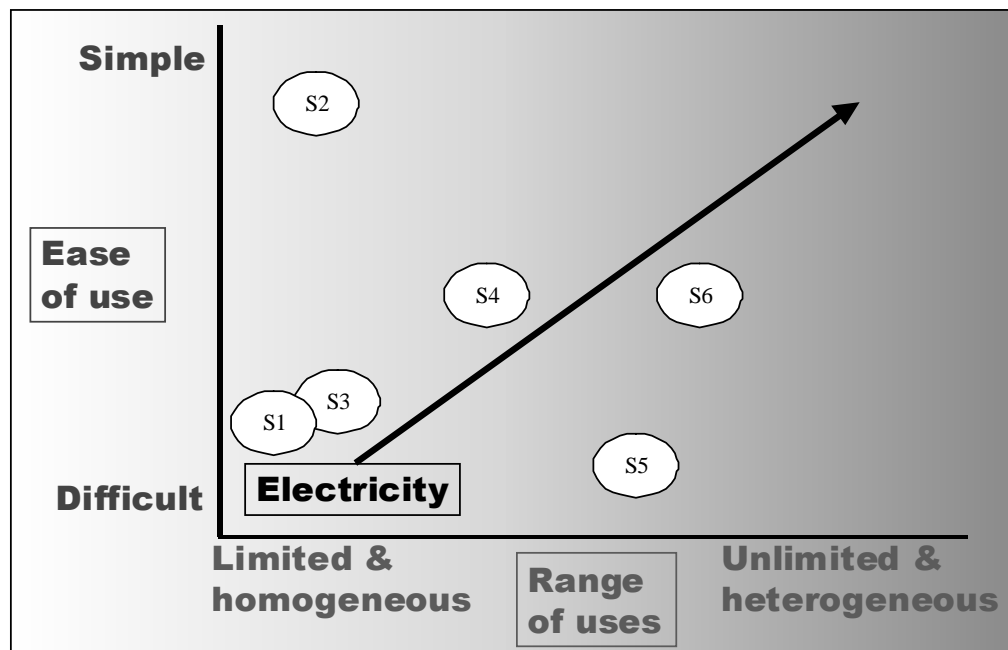
Continuing with the pervasiveness of electricity as an illustration, Diagram 4 shows scenarios S2, S4 and S6 mapped higher on the scale of ease-of-use. On the perfunctory

grounds that decentralised generation implies that technical barriers to use have been reduced. While scenarios S4, S5 and S6 are deemed to exhibit a wider range of uses. Again without developing a real case, because as a decentralised tool for industry (S4) and a general tool for consumers (S5, S6), electricity is bound to be used in many different ways. In S1, where electricity is held exclusively by the military as a specialised weapon dependent on the centralised generation of power there would be little need to develop ease-of-use, while the range of uses is very narrow. Hence S1 is in the lower left of the possibility space.

Of course we know that electricity did not follow any of these scenarios because it diffused across all three functions together and, despite the recent appearance of simpler and more efficient techniques for decentralised power generation, the ease-of-use problem was largely solved through centralised provision of electric current. Nor can any of these scenarios be considered strategic in the sense suggested by Diagram 3. No effort has been made to reconnect scenarios S1-S6 with probabilities and preferences in order to expose desired goals and likely means for getting to them. But the point here is not to develop counter-factual scenarios about a specific technology.

The aim of this introduction is to set the stage for the development of scenarios for tertiary education *in the learning society*. With that goal in mind there is one more introductory step before constructing the scenarios: what is meant by the "learning society"? The next sub-section offers one, from amongst many that are possible, definition of the learning society as a "knowledge intensive" society. This definition is crucial in order to be able to inscribe the scenarios for tertiary education in the 21st century in the context, or not, of a learning society.

Context: Imagining the Learning Society – Trends in Knowledge Intensity

Context is a crucial determinant of what is possible. Situating institution specific scenarios within different contexts opens up a whole new range of possible resources, functions, outputs and feedback for that institution. As a result it is important to specify the context within which the scenarios for a particular subject, for example tertiary education, are placed. The specific context used here is one which is at the forefront of political goal setting – the knowledge or learning society.[7]

What is the learning society? Since 1962, when Daniel Bell wrote of post-industrial society, much effort has been put into trying to define variations on the term knowledge-society. The definition offered here, as a context for the institutional scenarios, does not claim predictive certainty. Rather, based on a highly detailed possibility space scenario

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[7] "The Union has today set itself a new strategic goal for the next decade: to become the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion." Presidency Conclusions, Lisbon European Council, 23-24 March, 2000. See: http://ue.eu.int/Newsroom/LoadDoc.asp?BID=76&DID=60917&from=&LANG=1

of "transition scale change"[8] elaborated over a five year period at the OECD, the aim is to focus on the contextual dimension that is perhaps most pertinent to a discussion of tertiary education: the knowledge intensity of everyday life. What does this mean and why is it particularly relevant to tertiary education?

For the purposes of this paper a learning society is defined as one where there is a significantly higher level of learning intensity to daily life. What does this mean? It means that when, where, how and why we learn becomes much more generalised and intensive. Learning intensity is a composite indicator that picks up both the stock and flow dimensions of tacit and explicit knowledge across four categories of knowing – know-how, know-what, know-who and know-why/where/when (judgement).[9] The aim is to take into account all knowledge used over the course of a typical day by an individual whether in their home, on the job, in the street, at play or where-ever, when-ever. What distinguishes a learning society from an industrial one is the higher average per capita learning intensity.

Diagram 5: Average Learning Intensity of Daily Life

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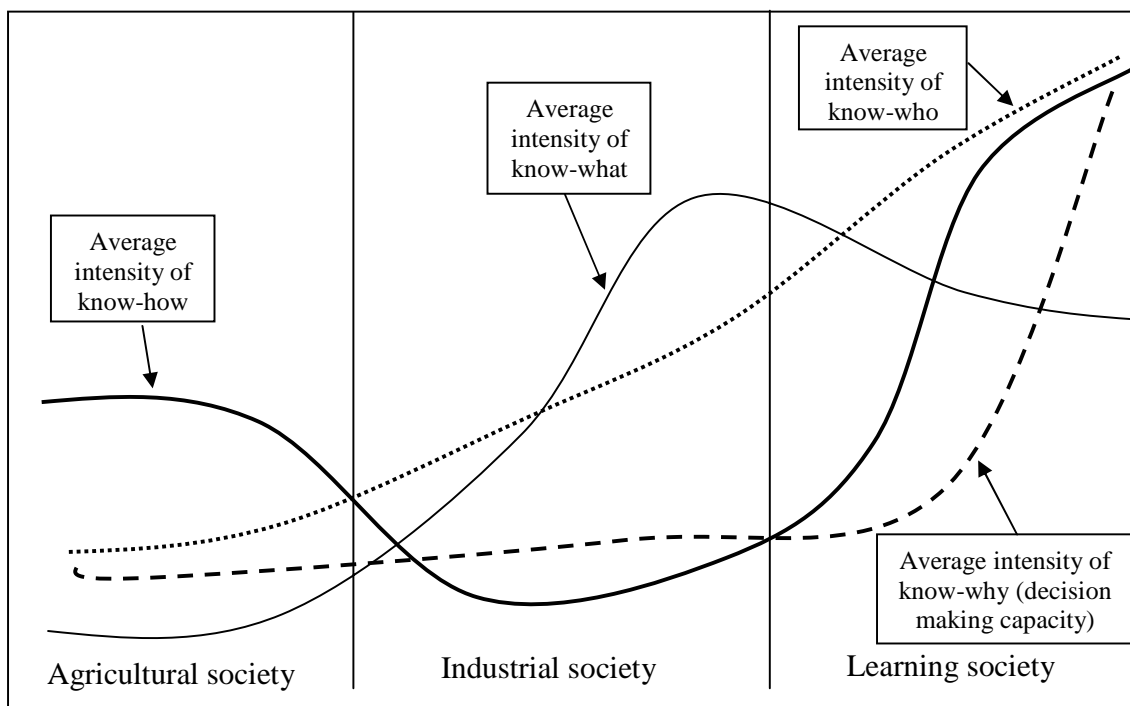
[8] For a detailed exploration of the possibility, not probability, of radical change over the first few decades of the 21st Century see the OECD International Futures Programme's 21st Century Transition series: http://www.oecd.org/dataoecd/12/42/1903212.pdf.

[9] Lundvall, B. and Johnson, B (1994) The Learning Economy, Journal of Industrial Studies, 1(2):23-42. Also: Lundvall, B., (1996), The Social Dimension of the Learning Economy, DRUID Working, Paper 96-1, University of Aalborg. Also see Appendix 1 for more detail about these variables.

Diagram 5 is a speculative effort to track learning intensity over time. The aim is not to provide a historically detailed accounting of the trends in these variables. Rather this diagram is intended to help us *imagine* how a distinctive learning society might be different from previous social orders. And, as will become apparent, it is a way of constructing a new context (possibility space) for stories about the possible functioning of tertiary education.

Starting with the agricultural era, the trends depicted in Diagram 5 suggest that the average learning intensity of the society is low. Not because knowledge is scarce per se – there is plenty to learn when it comes to farming, living in a village, and attending to subsistence needs – but because over the life-cycle learning is not constant. At the outset of life there is a highly intensive phase where knowledge is passed on, in a direct and experiential fashion, from one generation to the next. But afterwards, given the lack of discovery of new knowledge, learning intensity declines. Certainly there is life-long refinement and improvements in mastery of know-how, but there are few entirely new or highly diverse applications of know-how. There are specialist producers, black smiths and cobblers, etc., but as a proportion of the population these experts in a specific and exclusive know-how are relatively limited. As for know-what, know-who and know-why, all of these areas remain low intensity from a life-cycle perspective due to the non-continuous nature of the learning. Meaning that once a person knows the people in their village (know-who), the lay of the land and seasons (know-what), and their very limited scope for personal choice (know-why), they settle into a low knowledge intensity life.

Turning to industrial society the average level of learning intensity is higher than in agricultural society but not because of an increase in the intensity of know-how. Urban living with its passive mass-consumption and factory life under Taylorist principles tends to strip out know-how from the majority even while it raises it for the specialist expert few. As the average intensity of lifelong know-how discovery declines, the average know-what climbs. This is not because the know-what acquired from reading a newspaper is greater than the know-what needed to avoid eating poisonous mushrooms collected in the forest. Rather it is that in industrial society there is a ceaseless inundation of know-what, most of it junk we forget almost immediately. Nevertheless it boosts the average intensity of know-what acquisition (flow) across the life-cycle. Know-who climbs too in industrial society, but not by too much as long as the networks of interdependency that develop when people live and work remain largely limited by physical place. As for know-why, as long as concentration of power, hierarchical management, and the passivity of mass-production and mass-consumption, continue to dominate, then increases in the stock or flow of discernment remain modest.

In a learning society the knowledge intensity of daily life skyrockets. It may be difficult to imagine such a future, it is as big a challenge as the one that faced thinkers in the agricultural era before the full onset of industrial life. Practically speaking how could people be continuously engaged in developing their know-how, know-who, know-why, while becoming better managers of know-what? One story about how this might be possible is being developed as part of the Schooling for Tomorrow work on 21st Century

Transitions.[10] Succinctly this scenario explores what life might be like when the process of identity creation is bottom-up. In such a society, which has by no means converged to a single model of socio-economic organisation, the key to success is using much greater degrees of diversity, interdependency and complexity to manage risk and achieve goals. Naturally, because it is much easier to imagine, this way of doing things is diametrically opposed to the techniques of hierarchy, simplification, uniformity and control used during the industrial era. Despite the modernist penchant to believe that breaking with industrial habits is possible, even desirable, it is difficult to see how to make such profound changes. However, by taking the idea of a much much more spontaneous, interconnected, and differentiated society seriously, this scenario pushes the boundaries of our thinking about the behavioural and institutional attributes that might sustain a radically higher learning intensity to daily life.

Three main messages seem to be emerging from this scenario of the learning society. One is that the capacities needed to exercise the freedoms of a learning society are only beginning to appear and face stiff opposition from ingrained habits and the dominant seats of power. Second, we are also in the very early stages of creating the institutional underpinnings of the market (trust and transparency) that corresponds with the functioning of an economy dominated by unique creation (one-off products defined largely by the extent of refinement of a "prosumers" tastes).[11] And third, perhaps most critically for education, the behaviour and skill requirements of the learning society look to be as radically different as the industrial era's literacy and voluntary obedience as the agricultural era's illiteracy and violence. To underscore the implications, the notion that national competitiveness and job creation depend on winning the race to the top of the "academic" league tables misses, almost completely, the centrality of non-technocratic, non-hierarchical behaviour to the forging of one's identity and the creation of unique products.

Offering the learning intensive society as a potential context for scenarios of tertiary education is one way of bringing broader societal aspirations and policy imperatives into the picture. Scenarios that involve radical breaks from current practices need to be cast in a context that makes it imaginable that such significant change is possible, even if it is ultimately deemed improbable and/or undesirable. And radical change, as the failed revolutions of the 20th century tragically taught, is the outcome of incremental changes that transform the way people live their everyday lives. So even though a possibility

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[10] The second phase of the CERI Schooling for Tomorrow Toolbox project is working on a three sets of tools: methods of developing scenarios; specific scenarios; and ways of using scenarios for policy development and implementation.

[11] See two recent articles: Miller, Riel, "The Future of Public Sector Reform: Towards a Learning Society?" in Adaptive Public Services: The Next Phase of Transformation?, DEMOS & Hewlett Packard, December 12, 2003, London. And, Miller, Riel, "Getting the Questions Right: Challenges for 21st Century Policy Makers", Optimum Online, The Journal of Public Sector Management, Vol 33, No. 3, Fall 2003 (http://www.optimumonline.ca/article.phtml?id=183) .

space scenario is meant to leap far into the future, it needs to be seen as part of an ensemble of societal changes that give rise to the possibility of new possibilities.

Part 2
Tertiary Education in the 21ˢᵗ Century:
Two Sets of Scenarios

The second part of this paper offers two sets of scenarios. The first set presents space scenarios for the tertiary education sector in a learning society. The second takes the more familiar institutional viewpoint for telling stories about the long-run. In the conclusion some suggestions are made about directions for further work, particularly with respect to the development of strategic scenarios.

Possibility Space Scenarios for Tertiary Education

Consistent with the methodology outlined in Part 1, the following possibility space scenarios are constructed using a three step process. The first step is to define the central variable of change and some of the key influences on the *possible* evolution of this central variable. The second step involves an assessment of the primary functions played by the institutions under consideration, in this case those of the tertiary education sector. And lastly, generating scenarios by combining the possibility space and functional/organisational attributes in a way that allows for a mapping of possible changes. At the outset it is important to stress, once again, that this is not an exercise in prediction and hence it is not intended to suggest that these scenarios capture the only or most probable future. The aim is to help question current assumptions.[12]

Defining a Possibility Space for Tertiary Education

Generically, tertiary education is about the production and consumption of knowledge. It is a complex of institutions, often configured in quite different ways, with privileged resources and control over: knowledge discovery (flow); accumulated knowledge (stock); and knowledge diffusion (distribution). If we are willing to take this as a definition of what tertiary education is about, then the subject for the scenarios (variable A) is change in the ways in which tertiary education deals with the flow, stock and distribution of knowledge. In other words, the aim is to construct scenarios that help us to imagine how the functions and/or organisation of tertiary education (variable A) in the production and consumption of knowledge might possibly (without initially considering probabilities or preferences) be different some twenty-five to thirty years from now.

As a first step towards specifying a possibility space for this scenario subject Diagram 6 locates the three dimensions of tertiary education – the stock, flow and distribution of knowledge – within the much broader context of the overall sea of knowledge. Diagram

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[12] For a more detailed discussion of the "utility" of futures thinking see: Miller, Riel, "Where Schools Might Fit in a Future Learning Society", IARTV, Victoria, Australia, November 2003.

6 contains two main spheres. One represents living knowledge, which covers the stock of what people already know and, for the time being, have not forgotten. [13] The second sphere represents the flow of knowledge, which involves both new and old (re)discovery. Where living knowledge (stock) and discovery (flow) overlap is the knowledge people are either learning about or preserving within easy mental grasp.

Diagram 6: Tertiary Education in the Stock and Flow of Knowledge
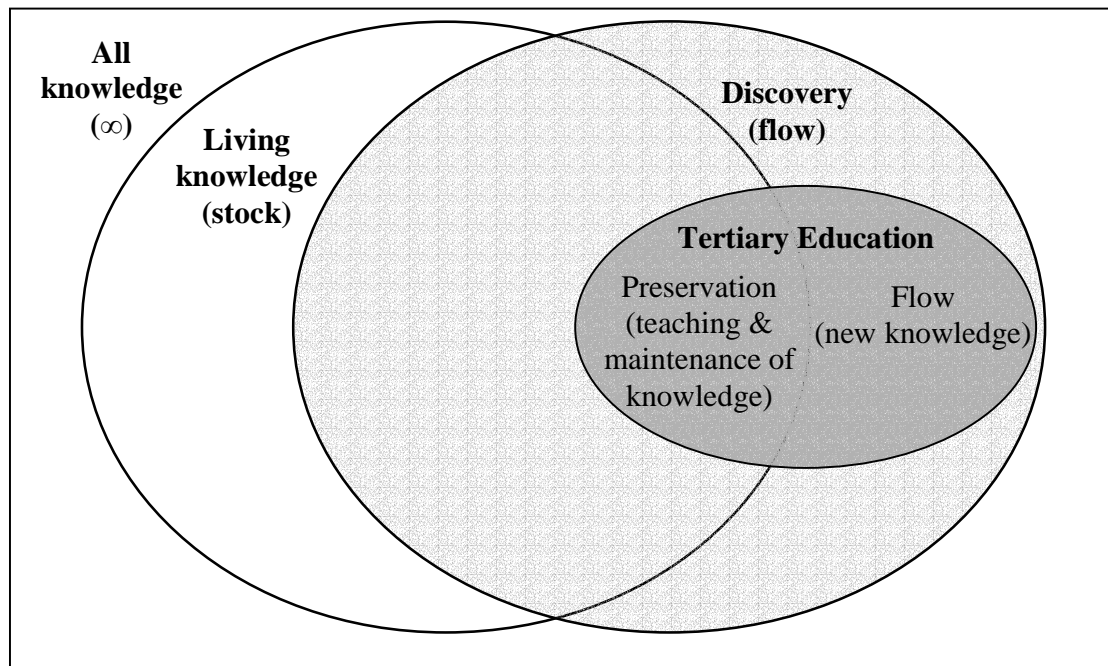
Tertiary education covers both sides of the knowledge flows: sustaining/preserving living knowledge and discovering/exploring new knowledge. Teaching and research are discovery activities. When students and researchers learn from prior knowledge they discover and preserve living knowledge. When researchers discover entirely new knowledge (or rediscover lost or forgotten knowledge) their investment flows into the accumulated stock of knowledge (more or less transparently, i.e. accessible, comprehensible, owned).

Despite the "modernist" temptation to privilege the discovery of the totally unknown, it is crucial to stress the less linear, more humble view that new is not necessarily better. Exploring uncharted territory is certainly worthwhile, but 'a priori' it is not of greater

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[13] Information, the raw data of the human record, can be living knowledge if it someone keeps it in their mind or can recall it as part of their know-how, know-what, know-where or know-why. But much information is not living, it is simply accessible data. And much information, like living knowledge, is lost as time rolls over the records and memories of our daily lives.

utility than the recursive reassessment and preservation of knowledge.[14] Indeed, the crescent of living knowledge which is not covered by on-going maintenance (the lighter shade crescent outside the flow circle in Diagram 6) represents knowledge that is not being renewed. This knowledge runs the risk of dying, slipping away into the realm of the forgotten. Some of it, like bigotry and superstition can be bid good riddance. Other lost knowledge, like a language or how to cook, are lamented. And some lost knowledge is easier to rediscover than others.

Which points to the third dimension of tertiary education, its role in the distribution of knowledge. Here institutional specificity matters since distinctive institutional configurations and practices will have different implications for knowledge distribution (access/possession/maintenance). For instance in most OECD countries during the industrial era tertiary education has generally played a leading, often dominant role in determining the structure and allocation of knowledge. Through their choices about what knowledge is deemed worth preserving and exploring teachers and researchers in the institutions of the tertiary education sector (hereafter tertiary sector or TES) shape the distribution of "legitimate" or recognised knowledge. This power over what makes up the constituent elements of the flow of "legitimate" knowledge is significantly reinforced and extended, in ways that often play a decisive role in determining the stratification of economic and social life, by the certification authority that has been given to the tertiary sector.

Historically and in practice, following on from the rights granted to universities as interpreters of the truth according to god/king, tertiary sector institutions continue to control the resources, quality criteria, ambitions and borders that define a large share of the most valuable (although not necessarily valued) knowledge in OECD countries. This is despite the fact that living knowledge and discovery are everywhere and the institutions of the tertiary education sector have no inherent claim to be the arbiters of both what is knowledge and who will be able to claim they possess certain knowledge. However, the point here is not to enter into a discussion of the fascinating and important topic of how stratification is created and reproduced in OECD societies. Rather the aim is to construct a space where the knowledge flow, stock and distribution roles of the TES can be located in such a way that new possibilities are easier to imagine. Diagram 7 is a possibility space diagram that attempts to capture the three dimensions of stock, flow and distribution of knowledge in a way that allows scenarios for tertiary education to mapped in an open ended manner.

The vertical axis is a way to locate tertiary education within the context of differences in the degree of learning intensity of society – the macro context within which the

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[14] Much is happening in the field of "scientific method" see, for instance, Jackson, E. Atlee, "A First Look at the Second Metamorphosis of Science", Santa Fe Institute Working Paper, 95-01-001, 1995. Or looking at policy see: Buchanan, Mark, "Complexity Tools in Evaluation of Policy Options for a Networked Knowledge Society", DG Information Society, European Commission, June 2003.

production and consumption of knowledge occurs. In this way differences in the relationship of the TES to the stocks and flows of knowledge can be used to differentiate the scenarios. The scale of this axis is calibrated from low to high according to the indices already developed in the previous section regarding society wide learning intensity. From a "ceteris paribus" point of view, a more knowledge intensive society offers greater scope for the institutions of the TES to act as developers and brokers of knowledge. However, if the nature of the knowledge that constitutes the stocks and flows of a more knowledge intensive society does not correspond to the kinds of knowledge that the TES has traditionally controlled, then there might be a mismatch where the coverage of the sector shrinks and there are conflicts as the old bastions of power resist the upstarts (this process was typical of the shift from agricultural to industrial society). Here is where positioning on the horizontal axis comes into play.

Diagram 7: Tertiary Education Possibility Space
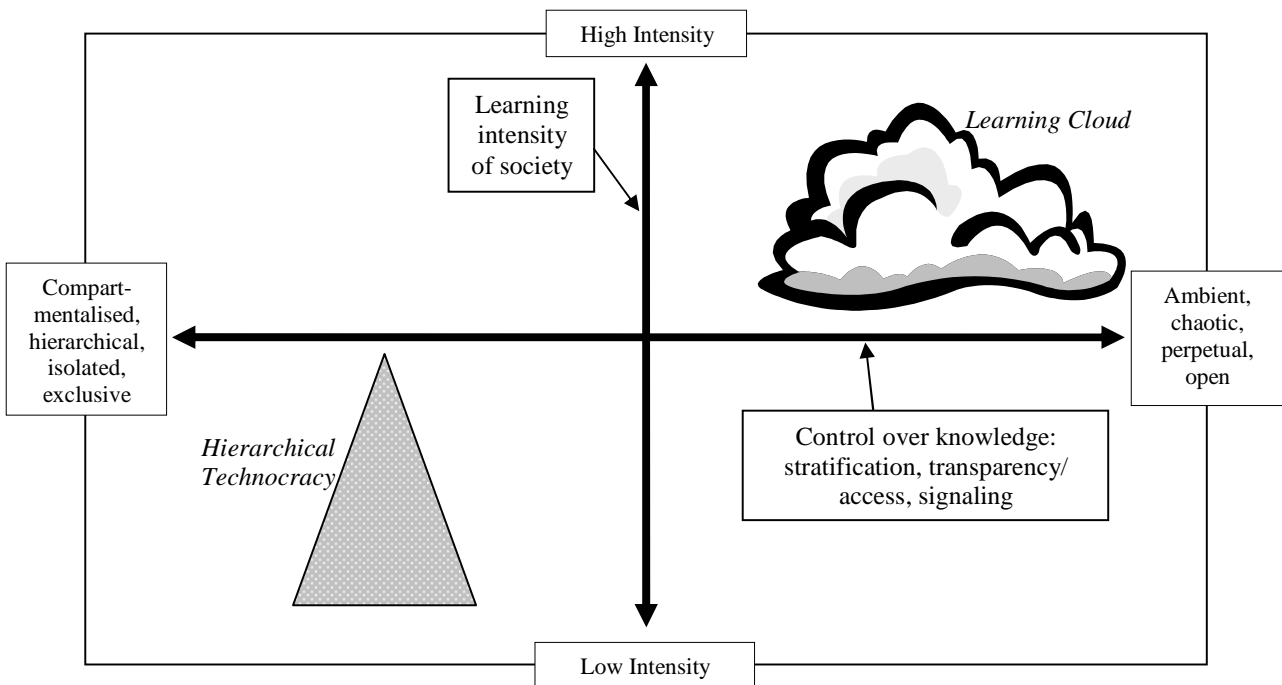
The horizontal axis takes the distributive perspective by capturing how knowledge is allocated or stratified in a particular society. This helps to construct scenarios that are differentiated on the basis of how the tertiary sector connects with the distribution of knowledge (this is not meant to imply any particular causal relationships). The metrics used to set the scale for this axis relate to the ways in which knowledge is controlled, in particular three aspects: the degree of stratification of what is deemed legitimate knowledge (how "truth" is identified and rewarded); the extent to which knowledge is transparent/accessible (related to openness, the attributes of common languages and discourses, the way intellectual property rights are organised); and, the way in which signals or information are generated regarding what a person knows (validation of competency versus credentialism). Thus the range covered by the horizontal axis is from:

- control over knowledge that generates a compartmentalised, hierarchical structure of knowledge, where expertise is rooted in credentialism and practice is exclusionary and highly defensive of "turf"

to

- control over knowledge that is non-compartmentalised, sources from all available knowledge in ways that overcome ex-ante boundaries and allow for perpetual and open recognition of what people know regardless of how they acquired that knowledge.

One of the aims of sketching the possibility space in this way is to provide a wide range of mixtures between the idealised extremes represented by the polar ends of each axis. Indeed, as will be clear when the four scenarios developed in the next subsection are mapped onto the possibility space, scenarios are just single points selected from a huge number of coordinates within the two dimensional (or more) space. In this sense there are many more scenarios that can be mapped on to a possibility space than can be readily described in one paper or recounted as stories. But it is exactly in this sense that possibility spaces are a scenario development tool, enabling a systematic and imaginative exploration of options.

Looking at Diagram 7 there is a triangle labelled Hierarchical Technocracy in the lower left quadrant and a Learning Cloud in the upper right quadrant. Turning first to the Hierarchical Technocracy there are clear similarities with the tertiary education systems built up over the last century in OECD countries. The industrial era has been marked by a remarkable degree of compartmentalisation and hierarchy, significantly assisted by post-secondary systems. Universities in particular have played a critical role in developing and controlling the acquisition of recognised specialist knowledge (a subset of all learning) and the extent to which the methods and fruits of learning – research – become recognised specialisms. Credentiallism has been hugely successful, perhaps the foremost politically legitimate mechanism for reproducing social stratification and discriminating against particular sources and types of knowledge (such as skills acquired "in-the-wild" like at home or on the street – think of homeworkers or drug dealer or credential poor unemployed).

At the opposite end, the Learning Cloud shatters the distinctions between professional and amateur, between credentialed and non-credentialed. Research is ambient, happening everywhere and from any source, globally, locally, individually, collectively. Learning, including teaching, also happens everywhere and in everyway not just in particular or privileged sites with uniform methods. Accumulation of knowledge, meaning discovery and the dispersion (distributive attributes) of this discovery are chaotic and openly recursive/serendipitous. Obviously the institutions needed to ensure the quality and trust for a learning cloud to function have yet to be invented. But that is exactly the point of a possibility space, it pushes the imaginative frontiers of scenarios in ways that suggest both new options and enabling policies.

Possibility Space Matrix for Tertiary Education Scenarios

When connecting changes in societal context with institutional changes it is crucial to build in mutual contingency. One way to do this is to construct nested scenarios. This is a two step process, first define a broad, societal possibility space and then nest specific institutional/functional scenarios within it. In this way the story is inscribed in a temporal transformative framework and addresses institutional attributes that are constant – allowing for the relevant continuity for the future of the scenario subject. [15] In a sense this is a structural model of obsolescence or renewal for an institution that is either left behind or keeps up with transformation.

As has already been argued, the scenarios can be built-up around two attributes of social and economic life that play central roles in shaping the proclaimed missions, actual functions and real practices of the institutions that make up the tertiary education sector: the intensity and organisation of knowledge in society. The scenarios outlined below are stories of four ideal-types, based on major changes in how the TES is involved with the intensity and organisation of knowledge. There are two open questions which can be used to locate the scenarios within the possibility space. One is: how central are institutions of the TES to the overall, society wide production and consumption of knowledge? The second question is: what role does the TES play with respect to stratification?

Posed in terms of functions and context, Matrix 3 presents two categories related to the learning intensity of society and two categories related to the ways in which the institutions of the TES coincide, correspond, and reproduce societal stratification. This generates four scenarios: Two where the learning intensity of the society is low and two where it is high; two where the role of the TES in stratification is important and two where it is not.

<div align="center">Scenario 1: Traditional</div>

In this scenario the institutions of the TES function within a society where the knowledge intensity of life has not shifted much and the role played by universities, colleges, etc. remains basically the same as in the past. From a functional perspective the TES continues along traditional lines as the primary source of upper-level: teaching, certification, research and legitimate claims of knowledge. Without much change in socio-economic context or the sector's roles, there is little incentive to alter the hierarchical and compartmentalised traits of most institutions. Even though in principle a

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[15] It is worth noting that an assumption is made regarding what tertiary education institutions are about, which is, as per Diagram 6 above, the flow, stock and distribution of knowledge. This assumption insists on a certain degree of functional continuity. Of course it is possible that the institutions of the TES give up entirely on the current knowledge related roles and shift to something else – such as sports facility operators. However the explicit aim here is think about how the TES might change given relatively constant generic roles but a wide range of potential ways of executing those roles. In particular the scenarios are not fixed in terms of possible changes in the scale and scope of the tertiary sector's socio-economic impact.

wide variety of different funding models and deployments of power and resources within the sector are compatible with a continuation of the traditional roles, there is little movement in most tertiary institutions. Overall the TES is in control of knowledge flows, directly or indirectly, since the vast majority of researchers are still university trained and the necessary, even if not sufficient condition, for knowledge to be deemed valuable still requires some form of benediction from within the TES.

Matrix 3: Scenarios for Tertiary Education in the Learning Society
Function and Context

	Socio-economic Context	
Functions	**Low knowledge intensity society** – know-how remains specialised in an economy still dominated by a division of conception and execution, hierarchy, command and control	**High knowledge intensity society** – skill heterogeneity (vast and changing range of non-categorised in-depth know-how) and non disciplinarity dominate, IPR has evolved considerably
Tertiary education perpetuates **exclusivity**, **specialisation**, compartment-alisation	Scenario 1 – The TES continues with its **traditional** roles in teaching and research, there is a wide range of organisational responses to the growing demand for specialist skills and research, but for the most part teaching follows mass-model of compulsory secondary, while research mixes profit and non-profit as before.	Scenario 3 – Tertiary sector does not transform, becomes a **marginal elitist** bastion and backwater, with a small role in overall learning and research.
Tertiary education decompartment-alises, becomes a vehicle, enabler of **diffusion – validation** of ambient research and learning	Scenario 2 – TES attempts to pioneer non-specialised, **open** and networked approaches to knowledge production but is sidelined by exclusionary, guild like professions, where specialist and compartmentalised hierarchies take over training and research, such that the TES is **marginalised**.	Scenario 4 - Large role for transformed TES as cross-roads or trust/transparency provider for society wide **ambient** research and learning. Key role is as network enabler and quality/trust enabler.

Scenario 2: Marginal Open

The second scenario tells a story of socio-economic continuity and institutional marginalisation. In this scenario the institutions of the TES attempt to transform themselves into more transparent, less compartmentalised producers of knowledge with the aim of creating open and rapidly evolving networks capable of supporting diverse,

interdependent and complex "communities of practice".[16] However, this approach towards knowledge is successfully opposed by professional and specialist "guilds" as well as private knowledge creators and managers of intellectual property rights. By fending off reforms to intellectual property rights systems the incumbent power brokers outside the TES are able to dominate learning and research. This perpetuates long-standing patterns of exclusivity and stratification, except with the TES now on the outside. In this scenario the TES is open but marginal in a socio-economic context where overall knowledge intensity is not much higher than at the end of the 20th century.

Scenario 3: Marginal Elitist

In this third scenario the socio-economic context changes rather dramatically, while the institutions of the TES and the way they function do not. As a result the TES becomes a bit of a marginal backwater, where the old monastic and exclusive approaches to knowledge try desperately to insist on their pride of place and past glory. The shift to a much higher knowledge intensity is accompanied by a move to knowledge networking that breaks down the old categories and controls. New institutions emerge that are able to establish transparency and trust in knowledge creation and sharing. Intellectual property and transaction systems evolve significantly to foster much greater differentiation in types of ownership and payment relationships. However in the face of these upstart methods for validating knowledge the TES resists and tries to maintain exclusivity. As a result only a small, relatively marginal elite still use the TES.

Scenario 4: Ambient

The final scenario sees the TES becoming one of the main institutional backbones of a much more knowledge intensive society. At the practical level of how the TES operates both the residential aspect and isolated hero researcher diffuse into the broader fabric of everyday life where perpetual research and learning are the norm. The certification role is transferred to a neutral competency validation system that banks people's human capital[17] allowing the TES to focus on establishing transparency (common languages) and trust (quality) amongst networks of learners (which includes teachers, students, researchers – most often all in one). As in the third scenario property rights and transaction systems evolve in ways that foster both the requisite knowledge commons and learning incentives needed to underpin an economy that is primarily about learning. As the cross-roads of diffused, society-wide knowledge production and consumption, the TES becomes ambient – the common language that helps to make the connections both within and between communities of practice.

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[16] For more on "communities of practice" as sites of knowledge sharing see: Brown, John Seely, and Paul Duguid, Universities in the Digital Age, in The Mirage of Continuity: Reconfiguring Academic Information Resources in the 21st Century, edited by Hawkins, Brian L. and Batin, Patricia, Council on Library Resources, Washington D.C., USA, 1998.

[17] See: Miller, Riel, Measuring What People Know: Human Capital Accounting for the Knowledge Economy, OECD, 1996. (Available in pdf at: http://www1.oecd.org/publications/e-book/9196031E.PDF)

Mapping the Scenarios in the Possibility Space

These scenarios can then be mapped back onto the possibility space depicted in Diagram 8 as a way to illustrate both the choices captured by the ideal-type options and the vast range of other points that are imaginable. These scenarios do not exhaust the stories we can tell about the future. However, it is worth noting that none of the scenarios are mapped to the upper-left and bottom-right quadrants. This is because it seems implausible (not within the set of possible futures) that there could be a learning intensive society with a compartmentalised, hierarchical, and exclusive approach to knowledge. Similarly it seems less feasible to imagine a society where knowledge is widely shared, pursued continuously and openly transparent to all if that society were not also knowledge intensive. Of course these are only possibilities and a good imagination might find a way to make a plausible case for these combinations – so scenarios might be developed for these other quadrants, but not here.

Diagram 8: Strategic Choices
Mapping the Tertiary Sector Scenarios on the Learning Society Possibility Space
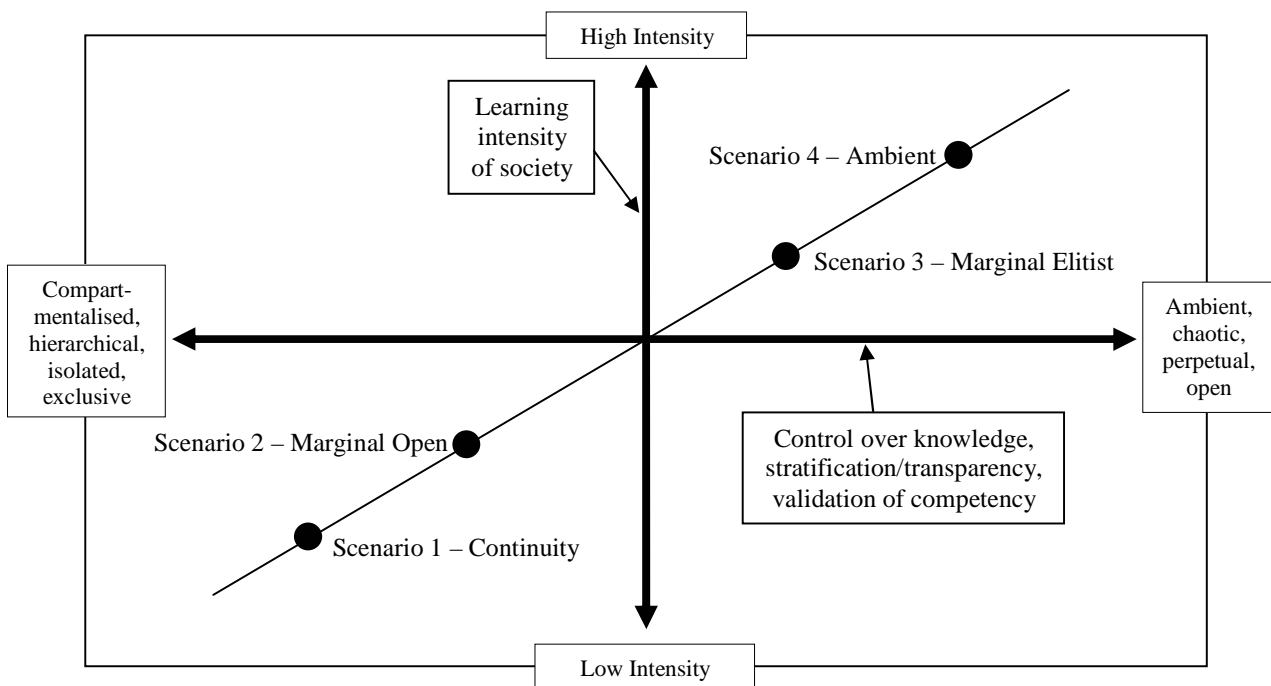
The four scenarios selected here are stories that answer the two questions posed above: First, how central are institutions of the TES to the overall, society wide production and consumption of knowledge. And second, what role does the TES play with respect to stratification? The scenarios respond to these questions as follows: in Scenario 1 the TES is a major part of the overall production and consumption of knowledge and continues to play a key role in perpetuating industrial era patterns of stratification. In Scenario 2 the TES is not a major player in the production and consumption of knowledge and it has become sidelined with respect to socio-economic stratification. In Scenario 3 the TES is once again fairly marginal to the production and consumption of knowledge although it maintains some residual hold over socio-economic stratification. Lastly, in Scenario 4

the TES is both a significant part of a much higher level society-wide production and consumption of knowledge and a key player in reconfiguring stratification patterns.

These stories have been constructed this way, so the "results" are no surprise. The questions that now come to the forefront are: to what extent do these scenarios capture the aspirations people express for the future (their preferences)? And, with an accent on the volitional or how choices might make a difference, what could turn the possible into the probable? The concluding section will suggest a few directions for continuing this line of research. First, however, the next section presents six scenarios for universities.

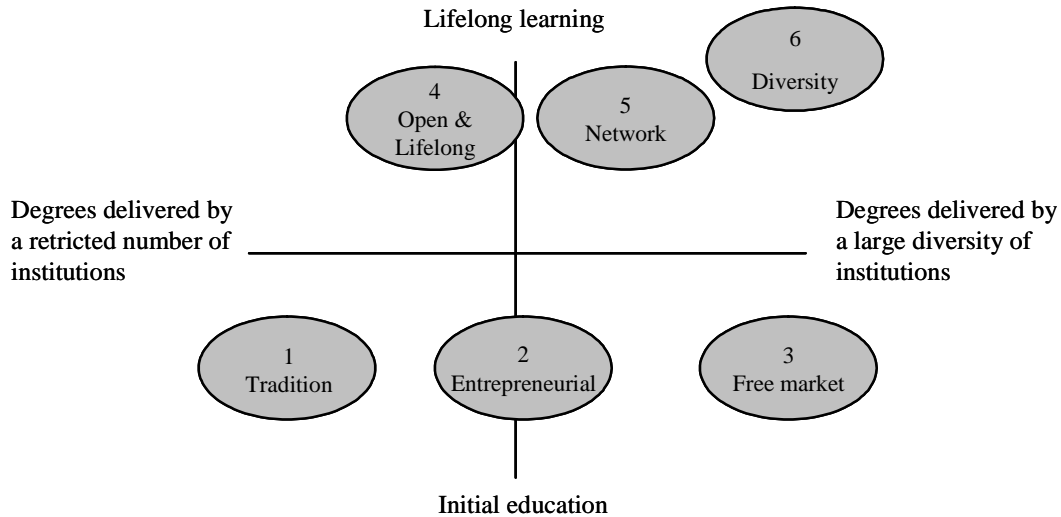## *Six Scenarios for Universities[18]*

Today's stories about tomorrow inevitably face the fundamental constraints of language and uncertainty. The ideas and words that will be used in the future have not yet been invented or lived. Nor is it possible to know the "facts" of a day that has not yet passed. As a result stories about the future are largely rooted in the present – the expectations, fears and hopes that form the path to the short-term future. And, more often than not, scenarios are parochial in the sense of being rooted in very specific historical and institutional experiences. Stories that are rich in detail and inspire strong reactions are ones that build on familiar fixtures of the current landscape. Telling the story of *our* or *my* future is tremendously appealing and is naturally full of local detail.

In a similar fashion, the scenarios presented below are familiar, reflecting fairly closely the burning historical and institutional issues facing universities in OECD countries today. Although it leads to reflect on the centrality of tertiary education institutions in the production of knowledge in society and in its stratification, it considers the future of the tertiary education sector from an institutional viewpoint and then considering the surrounding society. Compared to the former approach, it takes a bottom-up rather than top-down approach. It shall be noted, however, that the scenarios for universities are not limited to institutional design: besides describing the archetypical university, they aim to consider the other kinds of complementary institutions the tertiary education system shall accommodate as well as the changes it assumes in society.

Diagram 9 maps the six scenarios for universities. The two key dimensions used to design and organise the scenarios are the range of educational supply and the range of educational participation.

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[18] This section has been drafted by Stephan Vincent-Lancrin of OECD/CERI and presents scenarios that he developed with the help of colleagues in CERI and of fruitful discussions during an OECD/CERI experts' meeting held on 24-25 June 2003. The summary report of this experts' meeting is available at the Seminar as a background document.

Diagram 9: Six possible scenarios for universities

Lifelong learning

```
                    4                    5              6
                 Open &              Network        Diversity
                 Lifelong
```

Degrees delivered by
a retricted number of
institutions

Degrees delivered by
a large diversity of
institutions

```
            1                  2                    3
        Tradition       Entrepreneurial       Free market
```

Initial education

Other variables have been emphasised to select six stories among the thousands possible in the possibility space. The selection and emphasis of other variables have been done in order to ensure internal consistency of the scenarios, but also to propose differentiated enough scenarios – a necessary condition to generate interesting discussion. The six variables selected for constructing the five scenarios are: 1) the type of population covered by tertiary education, as well as correlated variables; 2) the nature of funding (predominantly public, mixed, predominantly private); 3) the integration of missions offered; 4) the international dimension of the system, 5) the homogeneity of status of faculty and institutions, and 6) the degree of take-up of e-learning. Matrix 4 presents the six different stories in summary form.

The six scenarios are the following.

Scenario 1: Tradition

Universities are mostly like today, catering to a relatively small share of the youth population for the purposes of job selection credentials. Universities pursue both teaching and research, as now, without excessive dependence or involvement with the private sector. Governments continue, in most OECD countries, to play a prominent role in funding, regulating and managing universities. Within a public accountability and equity framework there is little scope for profit-generating initiatives and the international dimension of the university "market" is modest. Lifelong and e-learning both develop largely outside of the university sphere.

Scenario 2: Entrepreneurial universities

Selective institutions cater largely to young people in their initial preparation for life. The key difference with the previous scenario is the strength of market forces in the sense that universities (public or private) can respond with greater autonomy to a variety of

funding sources. There is a more mixed public-private funding model, with university resources coming from a wide variety of sources. Along with the returns to the intellectual property rights that it secures, research is seen as very important and lucrative activity. However, in this scenario universities take a market-oriented approach to operations without losing basic academic values. Given the prestige and income accorded to research the teaching side remains quite elitist. As for lifelong learning it occurs within a university setting but in teaching only institutions with lower status. The three missions of the university – teaching, research and community service – are well balanced, although there is greater differentiation across institutions due to enhanced autonomy and greater responsiveness. Commercial approaches to international markets and e-learning are important. University resources as well as wages and prestige of academic staff improve. Links to the local economy are strong.

Matrix 4: Six Scenarios for the Future of Universities

	Scenario:	1	2	3	4	5	6
1	a) Selective/Initial education/Mostly young students	X	X	X			
	b) Open/Lifelong learning/All ages				X	X	X
2	a) Public funding	X					-
	b) Mixed funding		X		X		-
	c) Private funding			X		X	-
3	a) Teaching & research ("+": with strong research)	X	X+				
	b) Mostly teaching				X	X	
	c) Specialisation by missions			X			X
4	a) Mostly national focus	X			X		
	b) Importance of international focus		X	X		X	X
5	a) Homogeneous status of staff and institutions	X			X		-
	b) Polarisation in status of staff and institutions		X	X		X	-
6	a) Low e-learning	X					
	b) High e-learning		X	X	X	X	X

- : undetermined

Scenario 3: Free market

Market forces are the main drivers of this scenario with a private tertiary sector regulated by private companies as far as quality assurance and accreditation are concerned and mostly funded through market mechanisms. Market forces give rise to institutions that become specialised by function (teaching, research), field (business, humanities, etc.), audience (young students, part-time students, distance education, adult education, lifelong learning) while business firms grant degrees to their employees for their corporate training. Hierarchy between those very diverse institutions becomes very strong, with the apparition of a global super-elite, and more polarisation in the status of faculty. With the widening of student choice there is greater competition for students and tuition revenue comes to represent a more important share of overall income. Technology is widely used

in teaching methods. The international dimension of the market becomes important. And, since the majority of students and their parents are not interested in research, refusing to bear the costs, research moves out to public research centres and corporate R&D divisions. What research remains in universities becomes even more elitist while teaching to mass markets leads to greater standardisation and the patenting of curricula and teaching methods. Research becomes more demand-driven, specialised and secures important returns through intellectual property rights.

Scenario 4: Lifelong learning and open education

Universities are marked by universal access for all ages and much less research. The knowledge economy has flourished and higher education becomes a source for recurrent professional development financed by companies, individuals seeking recognised skill upgrading, and states. In an ageing society, more elderly people enrol for non-professional reasons. Universities become more learner- and demand-oriented, more teaching oriented, with short courses, more distance learning, and more e-learning. Governments or independent accrediting bodies are responsible for quality assurance and accreditation. Most research is done outside of the higher education system, with the best researchers moving to private companies, specialised institutes or the few remaining elite universities. Corporations and corporate universities have a large influence. Integration with the applied side of learning might go so far that all university education would follow the professional school model. Responsiveness to market forces is high in this scenario and there is considerable business oriented investment in e-learning.

Scenario 5: Global network of institutions

Post-secondary studies become demand- and mostly market-driven. The two main innovations are 1) that learners define their own course of study from across all available courses throughout the global post-secondary education network and design themselves their degrees; 2) that higher education institutions partner increasingly, including with industry. E-learning develops strongly in this scenario, as well as other means of education. The training content becomes more standardised and possibly embedded in technology and media (e.g. modular learning objects or edutainment through partnerships with game industry). The provision of and market for lifelong learning becomes very large, especially as education takes a multiplicity of new forms. Most research is carried out outside the higher education system, and faculty in mostly teaching institutions becomes less qualified than today but use more sophisticated teaching techniques. There is a strong polarisation in the status of academic, with academic superstars and developers of "learning tools" getting high status whereas the average teaching staff becomes less qualified and gets lower status. Programmes and courses matter more than institutions. Intellectual property rights for substance as well as for teaching methods give high returns to their owners.

Scenario 6: Diversity of recognised learning

In this scenario, the formal tertiary education sector disappears. People learn throughout their life, at work, at home, for personal and professional motivations, more and more by

themselves and by sharing their expertise with other people interested in the same field. Professional education requiring hands-on practice, like surgery, etc., is transmitted within businesses through an apprenticeship system or thanks to new sophisticated electronic devices. Technology is an enabler for the diffusion of information. People learn as much and possibly more than today but in a different way: learning takes the model of "open source" education, mostly free and non commercial, involving a lot of partnerships between individuals and institutions of all sorts. Global networking is thus important and goes beyond institutions. Knowledge and experience acquired in all life situations are acknowledged through formal assessments of credentials carried out by specialised assessment bodies. But given its pervasiveness, knowledge is less of a determinant for a career or in the stratification of society. While research becomes less specialised in fields requiring little money, like humanities or mathematics, a large share of research requiring high investments takes place in public research centres and in corporate R&D divisions.

Conclusion

The strategic question facing most OECD countries today is not if but how to pursue the major changes entailed by the transition to a learning society. The corollary for the institutions that make up the tertiary education sector is how they help or hinder the requisite changes. It is clear from historical precedent that the institutions and practices of the past have rarely, if ever, ceded their place to the upstarts and champions of a new order. Indeed the opposite has been the rule. Hence it is not an idle question to ask: will the tertiary sector, and its main champion – the university, be willing to play ball with new methods and institutions for producing and distributing learning? And will the policy makers who seek to serve the broader public interest fully explore possibilities that might radically alter the current order?

Although only time will answer these questions, it is already clear that the TES can, if it wants to, play a decisive role in facilitating transformation. For one thing today's educators could help to reassure those whose social status and risk management techniques are being threatened by the disintegration of the old monopolies and categories. Particularly since the deepest appreciation of how embracing complexity, diversity and dynamic communities of practice can work without ex-ante planning or pre-defined hierarchies of authority is amongst the practitioners of learning (some of whom are in the TES). But also because institutionally the TES is in a position to lend support to the emerging methods for establishing transparency and trust outside the bounds of yesterday's conventions. For instance promoting "open source" methods of research and peer recognition based on merit rather than official status would be important steps towards creating a more global and equitable knowledge sphere.

Then again, the possibility space scenarios for the learning society and tertiary education, sketched only briefly here, do more to open up options than to select points of strategic intervention. A full assessment of the potential of tertiary education to serve future aspirations will demand a few more iterations. Particularly if the ambition is to explore

not only possibilities but also to take a systematic look at both what is desirable and how to turn the possible into the probable. Indeed, if the primary objective is to improve the capacities of decision makers, especially the learners who must choose what and how to discover, then it is even more essential to engage in on-going, open-ended and rigorous exploration of possible, probable and desirable long-run futures.

Annex 1 – Measuring Learning Intensity

This annex offers a preliminary sketch of the variables that would need to be taken into account in order to begin to track learning intensity over time. First, the average learning intensity of a society overall is ALI = $\sum$LI/$\sum$population, where LI is composed of four variables know-how, know-what, know-who, know-why. Each of these variables can in turn be broken down into stocks and flows. Where stocks are the living or active part of a person's knowledge, while the flow is the rate at which they acquire and forget, i.e. allow the stock to augment or diminish. There is also a part of the flow that is about investment in maintaining the stock, i.e. keeping the stock of knowledge active. Thus the learning intensity of an individuals daily life is a composite variable that can be written as follows: LI=(KHs+KHf)+(KWs+KWf)+(KOs+KOf)+(KJs+KJf).

Here are brief descriptions of each variable:

KHs - Stock of know-how - the aggregate of everything a person currently knows how to do, from knitting socks and fixing a light bulb to doing equations and singing an aria – this is process knowledge, acquired technique not data accumulation – knowing how to find out what the temperature is rather than knowing what it is. Much of this knowledge is tacit rather than explicit. It is largely learned by doing.

KHf – Flow/rate of acquisition and loss of know-how – this is the overall rate at which a person is learning how to do new things, or improving their capacity to do things they already know how to do and what they are forgetting or letting lapse as they age or shift focus or area of primary interest.

KWe - Stock of know-what – this is the aggregate of a person's stock of information, the data they keep in their head – the names of all the states, the history of the company accounts, the specifics of a recipe for Veal Orloff, the url of an important web-site.

KWf – Flow/rate of acquisition and loss of know-what.

KOs – Stock and quality of a person's inter-personal network – their "know-who", this is their circle of family or friends and extended acquaintances, including common interest communities – who you can trust, who you can share with, who you can say hi to, who you can work with.

KOf – Flow/rate at which people acquire and lose connections, build and leave networks.

KJs – Stock of know-why, know-where, know-when – this is a person's stock of judgement, or wisdom – their autonomous decision making skill. This is the crucial element of refinement in when and how to use the other elements of knowledge. Mostly learned the hard way, through experience and almost entirely tacit.

KJf – Flow/rate at which people acquire or lose their capacity to make good judgements.

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