



Developing an Innovation Ecosystem for Education

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Cisco is a technology company with a passion for innovation and education. So we were fascinated and inspired by "Learning from the Extremes," a recent paper from Charlie Leadbeater and Annika Wong. Its core argument is that the developed world has much to learn from entrepreneurial approaches to providing learning opportunities found in the developing world. This is an important and valuable insight for education leaders around the world.

In our work with education leaders we often see a significant gap between inspiring stories and examples, and the reality of leading and driving improvement education while managing political, cultural, and financial pressures. Those pressures have never been more challenging.

We have recognized that leaders who want to transform education systems, who are on the road to "Education 3.0," need to steer not only their formal school system but also a wider ecosystem of new providers, cultural organizations, and new opportunities for informal learning. They need to be able to harness the power of innovative approaches, to learn from what works.

Leadbeater and Wong looked at innovative responses to very different circumstances and contexts to see whether these provide ideas about how we could solve common root problems and support different modes of learning. They look at how we can incorporate innovative principles and practices within the structures and approaches needed to operate a whole system effectively.

In this paper, Valerie Hannon, Alec Patton, and Julie Temperley set out a comprehensive view of the context within which education systems and system leaders operate, and offer a practical approach to building in current and emerging innovative practices.

They deal with both formal and informal learning, and offer a new ways of thinking about learning providers. They give insights into the impact of and opportunities offered by digital technologies. Their aim is to provide education leaders with a practical framework to develop innovation strategies for their own transformation agendas.

Digital technology gives enormous opportunities for powerful and effective collaboration. We have already seen the power of technology-enabled collaboration within education, and how it helps to improve teaching and learning. System leaders also need to recognize the value of new collaborative approaches. This paper challenges education leaders and governments to think differently about the provision of education and to create opportunities for new and broader partnerships. It sets out a practical framework for doing just that.



Michael Stevenson, Vice President, Global Education, Cisco

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Executive Summary

Pressures on education in the 21st century

The argument that education needs to change in order to adapt to the needs of the 21st century has been exhaustively rehearsed, but is no less valid for that. One driver, digital technology, both exerts pressure for change (because the new technologies demand a new set of skills) and provides opportunities for transforming pedagogy (because it provides access to information, networks for communication, and new means of presenting learning). Globalization also exerts social and economic pressure, and provides opportunities for wider, richer learning.

On the other hand, economic recession, demographic pressures, and environmental stability are primarily felt as pressures rather than opportunities-though in responding to them, educators are coming up with innovations that enrich learning and help them in dealing with specific challenges.

Engaging with learning, not just with school

These pressures and opportunities require people to acquire new kinds of literacy (including information literacy, cross-cultural literacy, and ecological literacy) as to be lifelong learners, because technology, politics, economics, and the environment are changing so quickly. This demands a shift away from focusing on engagement in school, to engagement in **learning**. It also requires an examination of what sorts of environments are most conducive to learning in (and for) the 21st century.

Innovation in education: mapping the current landscape

This paper proposes a framework which attends to the latest thinking and research about innovation, and which will be of practical use to system leaders in education. The framework works in two stages. The first stage maps out the landscape of education provision within a jurisdiction, distinguishing between **formal learning** and **informal learning** contexts, and education provision delivered by **existing providers** and **new entrants**.

Innovation in education: new insights and new resources

The second stage of the framework applies new resources and new sources of insights to the education landscape. Specifically, it applies the new resource of **digital technologies**, which have the potential to radically transform learning, though they are not often used to their full potential. It also addresses **learner ownership**, because when learners feel ownership of their learning, they are able to apply their own insights about how they learn best, and become 'co-producers' of learning rather than just 'consumers.'

Towards a learning ecosystem

Applying the framework makes it clear that education systems have much to gain by fostering connections between formal and informal learning, between existing providers and new entrants, and between 'service providers' (mostly teachers) and 'service users' (mostly students). In order to bring about this interconnected 'learning ecosystem,' system leaders need to reposition themselves so that rather than being primary providers of education, they provide a platform for a diversity of providers.

Introduction

Organized Learning in the 21st Century: Pressures and Opportunities to Change

The argument that education needs to change to adapt to the learning needs of a future which remains uncertain has been exhaustively rehearsed. Although there is considerable debate about the extent and urgency of the problem and the kinds of changes to pedagogy, curriculum, and assessment required, there is nevertheless a growing consensus that highly developed education systems are, on current trajectories, unlikely to be capable of the kind of step change which is urgently needed.

Contextual differences mean that these arguments play out somewhat differently around the world. In high-performing education systems like Finland and South Korea, the urgency to look for alternatives to traditional forms of organized learning to raise standards of attainment is less acutely felt than in a place where systems are struggling, such as the United States. And in Australia, the pressure to reduce or spread the cost of building, maintaining, and running schools, or at least the rate of increase in investment in them, is for the time being less politically fraught than in the United Kingdom.

At the heart of this debate is the role of schools. Schools are the dominant vehicle for organizing learning wherever in the world you look, and the challenge to the existing model for schooling is very real. In the developing world, some innovators in education are questioning the very idea of schools as the right (or the exclusive) solution to the challenge of educating their young people.

So what are the pressures that are calling organized learning as we know it into question? Here is a brief summary as a background and context for later discussions:

Digital technology

As long ago as 2000, it was estimated that the amount of knowledge in the world doubled during the previous decade and at that time was said to be doubling every 18 months.¹

Changing even faster is the ease of access to information from any device with an Internet connection. Until very recently, that meant a computer in a fixed location or, at best, a laptop. Now it might be a smart phone or a tablet. Internet-connected devices are expected to become ubiquitous to the point of invisibility over the next decade.²

How we communicate and connect with each other is changing, too. The world's most popular social networking site, Facebook, has over 500 million active users worldwide,³ and 43% of 9- to 12-yr olds in the UK have a profile on a social networking site.⁴

Global economic recession

Before the 2008 financial crisis, the world could be divided into two broad categories: 'developed' nations, which could afford to invest heavily in education, and 'developing' nations, which could not. Today, education budgets are contracting across the developed world; governments face the challenge of transforming education systems built for the 19th and 20th centuries, while cutting spending. Meanwhile, most developing countries have no possibility of the kind of investment in public services historically enjoyed by the developed world.

¹ D. Wetmore, 'Time's a Wastin,' **Training and Development Magazine** (ASTD), September 2000, pg. 67

² Oliver Burkeman, 'The Internet is Over,' **Guardian**, 15 March 2011

³ From Facebook website (<https://www.facebook.com/>)

⁴ Sonia Livingstone, 'Social Networking, Age and Privacy,' EU Kids Online, 2011

Globalization

Chinese-American educationist Yong Zhao writes that 'as a social institution, education has been mostly a local entity [...] serving the purpose of the local community or the nation, preparing workers for the local economy, and passing on local values.'⁵

Today, however, our local communities and local economies are globally connected. Of particular concern for policy makers has been the fact that jobs have also become globalised and can be quickly transferred from one side of the world to another, sometimes with the job holders travelling with them, but more often leaving someone jobless, replaced by someone better qualified and less costly to employ.

Meanwhile, education itself is globalizing: Millions of students are studying outside their home countries, while online learning plays an increasingly important role in education (and, as we mentioned above, this has both an informational and a social component).

So young people must learn to live and work with people from across the world. Yong Zhao calls this ability 'global competence,' which requires new knowledge and skills, but also new dispositions and awareness, with significant cultural and social implications. As well as understanding other cultures, developing global competence offers up for scrutiny our sense of our own identities, core values, and cultural practices.

Demographics

In Europe, the working age population is projected to shrink by almost 50 million by 2016, while the number of over-65s is projected to increase by almost 67 million.⁶ People will need to work longer, meaning that they will need to continue to learn new skills throughout their lives. This pattern is repeated across the developed world, with Japan at the top of this particular league table.

Developing countries, on the other hand, are experiencing rapid population growth which, along with urbanization and economic and technological advancement, is serving to increase significantly the demand for education. Low (or no) standards of education for the generation before mean that often there are insufficient qualified teachers to meet this need. In regions ravaged by AIDS or war, the problem is especially acute.

Environmental concerns

In 2009, the UK's Chief Government Adviser on Science, John Beddington, warned that the world was facing a 'perfect storm' brought on by the combination of climate change, energy shortages, food shortages, and water depletion.⁷ Insurance company Munich Re reported that 2010 saw unprecedented damage from natural disasters, while NASA found that 2010 and 2005 were the hottest years since records began in 1880.⁸

In 2008, the world tipped from predominantly rural to predominantly urban: Most of the world now lives in cities - 3.3 billion according to the UN Population Fund, set to rise to 5 billion by 2020,⁹ by which point China intends to have built 400 new cities.¹⁰

⁵ Yong Zhao, **Catching Up or Leading the Way?**, ACSD, 2002

⁶ Konstantinos Giannakouris, 'Ageing characterizes the demographic perspectives of the European societies', **Eurostat**, 2008

⁷ Quoted in Jonathon Porritt, 'Perfect storm of environmental and economic collapse closer than you think,' **Guardian**, 23 March 2009

⁸ Munich Re (<http://www.scientificamerican.com/article.cfm?id=insurance-ranks-2010-worst-for-climate-disasters>); NASA (<http://www.nasa.gov/topics/earth/features/2010-warmest-year.html>)

⁹ 'State of the World Population 2007: Unleashing the Potential of Urban Growth,' UN Population Fund, 2007

¹⁰ Neville Mars and Adrian Hornsby, **The Chinese Dream: A Society Under Construction**, 010 Publishers, 2008

As **New York Times** columnist Thomas Friedman has observed, the ‘flat world’ whose arrival he announced in 2005 is becoming increasingly hot and crowded.¹¹ But the world’s citizens are functionally eco-illiterate, and education systems do not deem this to be a priority.

For the most part governments have been slow to reflect these global pressures in their broad approach to education. Schools around the world look pretty much the same now as they always have. Curricula are recognizable to several generations and in some places show signs of becoming even more ‘traditional.’

However, individuals and organizations around the world are studying and developing new ways of thinking about learning, which point to new opportunities and open up possible alternative futures for educating our young people.

Engaging with learning, not just with school

Among the world’s richest countries, there is growing concern about student disengagement. This manifests itself most obviously in dropout rates, but focusing on dropouts masks a bigger issue, because it only takes account of the visibly disengaged. There is a much larger group of people who do well in school but do not become self-motivated, self-directed learners - so-called ‘disengaged achievers’¹² who may appear to thrive in a highly controlled, assessment-driven environment but struggle when left to their own devices in university, or when looking for a job. The 21st century requires people to be lifelong learners (because technology, politics, economics, and the environment are changing so quickly), and this demands a shift away from engagement in school, to engagement in **learning** - what England’s Learning Futures project calls ‘deep engagement.’¹³

New environments for learning

The reframing of engagement as engagement in **learning** raises two questions. First, are our schools geared towards cultivating engaged learners? And second, should we assume that attendance at school is a prerequisite for learning? The Organization for Economic Cooperation and Development (OECD) is addressing both these questions in a large-scale study of what it is calling ‘innovative learning environments.’¹⁴ It uses the term ‘learning environments’ rather than schools in recognition of the fact that schools (in the commonly understood sense of the word) need not necessarily be the default locations for learning in a given community. The project has identified examples of innovative learning environments from across the world - out of this ‘universe’ (the project’s term) it will be selecting a set of examples that will be closely observed and analyzed by researchers over several years in order to increase our collective understanding of the kinds of environments that are most conducive to learning in (and for) the 21st century.

New kinds of literacy

It has become clear that the pressures of the 21st century demand not just a new range of skills, but a new range of literacies - that is, areas in which we need to be able to both comprehend and express ourselves fluently. Perhaps the most obvious is information literacy - as information becomes both increasingly abundant and increasingly contested, the ability to find and evaluate information, as well as to express it in a variety of media, is becoming even more important.

Another type of literacy that is becoming critical is cultural - what Yong Zhao calls ‘cross-cultural competency,’ which he defines as ‘the ability to move across cultures comfortably and fluently.’¹⁵

¹¹ Thomas Friedman, **Hot, Flat and Crowded**, Farrar, Straus, and Giroux, 2008

¹² David Price, ‘Learning Futures: Engaging Students,’ Paul Hamlyn Foundation, 2010

¹³ Price, 2010

¹⁴ Read more about the Innovative Learning Environments project here: <http://bit.ly/niSbma>

¹⁵ Yong Zhao, **Catching Up or Leading the Way**, ACSD, 2002



Then, there is ecological literacy. The human race has long operated on the assumption that the availability of natural resources is limited only by our capacity to obtain them, and that any negative impact that humans have on the wider ecosystem will be negligible. One could argue that these assumptions served us well during the great economic expansion of the 18th and 19th centuries, but during the 20th century the human impact on the planet became impossible to ignore. In 2002, Nobel laureate Paul J. Crutzen coined the term ‘anthropocene,’ arguing that we have altered the planet to such an extent that we have brought about a new geological age - the ‘age of humans.’¹⁶ Since then, the International Commission of Stratigraphy¹⁷ has convened a working group to weigh up the evidence for declaring a new geological age.

The fact that this discussion is even taking place indicates how powerful we have become as a species. Unfortunately, our knowledge does not match our power. This means not only that our understanding of ecosystems is severely limited, but also that we are incapable of seeing ourselves as part of a complex, interconnected, and interdependent system within which our actions have unpredictable consequences across the globe.

Professor Paul Clarke, a pioneer of ecological literacy, connects the need for new literacies to the need for new learning environments:

I have been developing both practically and theoretically, the idea of sustainable community. This involves stepping beyond the constraints of the school environment and connecting to the wider community, service, and business sectors, then reconnecting schools into these new configurations. In doing this I have become interested in the way in which we might use the metaphor of growing, literally and metaphorically, as a focusing idea to develop our communities.¹⁸

This is a vision of education driven by engagement as much as by institutions, where learning takes place in a variety of environments (and people do not assume that they cease to be ‘learners’ when they become adults).

So what can governments and the leaders of education systems do to respond to these pressures and opportunities? Changes to education and especially to schooling are clearly required, but to understand how to effect the type of change that is needed, we must turn to new thinking and research into how innovation works.

Learning from international research and evidence about innovation

Between 2008 and 2010, a sea change occurred in the ongoing debate about innovation in education in most developed economies. The combined forces and effects of the international banking crisis, world recession, and the huge deficits that opened up between income and public expenditure meant that the argument for substantially increased government investment in public sector spending, including for innovation, was effectively silenced.¹⁹

Even in those developed countries where the economic effects were less keenly felt, the political and cultural reactions to the causes of the crises affected public attitudes to the institutions, including government, which had presided over them. Voters across the developed world in quick succession handed politicians the challenge of governing with very small majorities and in many cases in coalition arrangements that were either entirely new or very differently balanced.

¹⁶ Gaia Vince, ‘Geologists press for recognition of Earth-changing “human epoch,”’ **Guardian**, 3 June 2011

¹⁷ The organization in charge of determining the time spans of geological ages

¹⁸ Paul Clarke, ‘Finding Balance: Cultivating a Future’ 9 May 2011

¹⁹ Philip Inman, ‘Spending cuts loom across Europe as deficit hawks gain the upper hand,’ **Guardian**, 9 June 2010

These new political and economic conditions - an increased need for consensus and no money to spend - rose up to meet a discourse that was already well established amongst researchers and practitioners in innovation: how to design public services that deliver different and better outcomes at a lower cost.

Three publications in 2010 between them illustrate the field:

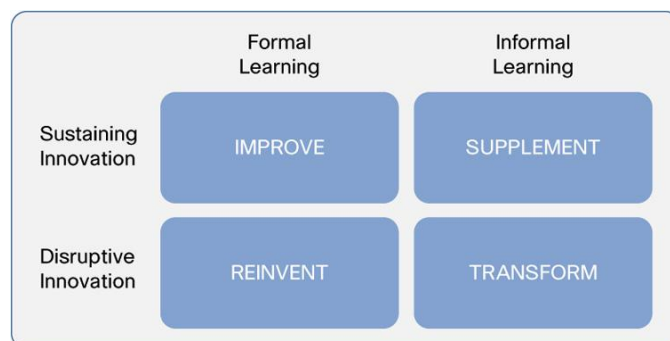
- Charles Leadbeater and Annika Wong, **Learning from the Extremes**, Cisco Systems, Inc., 2010
- Sarah Gillinson, Matthew Horne, and Peter Baeck, **Radical Efficiency; Different, better, lower-cost public services**, Innovation Unit and NESTA, 2010
- Steven Johnson, **Where Good Ideas Come From: The Natural History of Innovation**, Allen Lane, 2010

Learning from the Extremes advanced the argument that pursuing improvement to the current model of schooling will never by itself satisfy the learning needs of young people in the 21st century. Leadbeater and Wong take us on an inspiring journey around education in India, Brazil, and Kenya, highlighting the imagination and energy being invested by communities and social entrepreneurs in order to bring learning opportunities to young people. Rarely if ever are large sums of money available - and rarely if ever is central government exclusively involved.

Institutions recognizable as public schools do of course exist alongside the more innovative models, but the extent of improvement required for such schools to provide a suitable standard of education 'amounts to an insurmountable task.' (p.8) Low baselines and cultural and infrastructural challenges mean that, for instance, simply ensuring that enough suitably qualified teachers are recruited and trained would take decades - much longer than the children in these countries and communities can afford to wait.

So as well as continuing to improve schools, which they accept as a practical and political necessity, Leadbeater and Wong also point to three other kinds of change: supplementing schools, reinventing schools, and transforming learning. This taxonomy grew out of their analysis of the range of educational practice they discovered in their research. The changes are set out in their Education Innovation Grid, Figure 1.

Figure 1. Education Innovation Grid



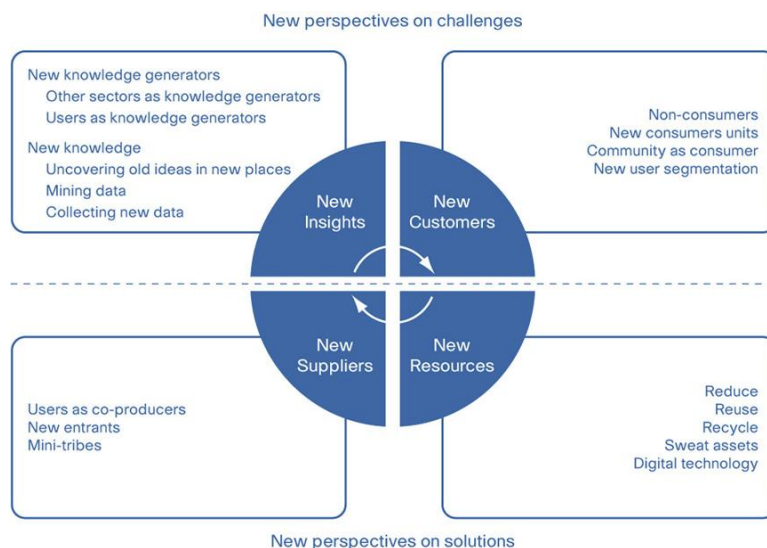
Where **Learning from the Extremes** helps us to understand and explore the outcomes of innovation in education, **Radical Efficiency** provides us with some clues as to what inputs or interventions might help to stimulate it.

Radical Efficiency holds out the promise of different and better public services provided at a lower cost. Efficiency in public services traditionally focuses on achieving ‘more for less’: using fewer resources and maximizing outcomes from existing arrangements. Radical efficiency instead:

Turns the role of provider for public services on its head. They are no longer solution deliverers crafting better answers to decades-old questions about mass consumption of standardized services. They are pioneers of a new kind of public service with a new perspective on the challenges they face... (p. 12)

From a database of 100 examples from around the world of innovations that improved outcomes for users at very little or no cost, 10 were selected for in-depth research and analysed for common patterns that point to why they were so successful.

Figure 2. Radical Efficiency



In the resulting radical efficiency model, the four drivers identified for innovation are new insights, new customers, new resources, and new suppliers. Together these amount to the following new perspectives, shown in Figure 2:

- **New perspectives on challenges** - changing the lens or viewpoint brought to bear on the problems that public services seek to address; and
- **New perspectives on solutions** - looking to alternative providers, including users themselves, and rethinking the resources available to meet need.

In examples of radical efficiency, erstwhile users of services frequently assume a more active role in their delivery, which serves to enhance the benefits of the service for these and other users and to reduce the costs of provision. Cost benefits come in the form of short-term savings arising from a reduction in the number of interventions made by professionals, as citizens take more of a role in managing their own solutions. Where services are delivered in the community rather than in expensive public buildings, decommissioning of space can provide opportunities to save money too.

But it is in the improvements to long-term outcomes that the greatest saving opportunities lie. Where citizens have a greater say in services, outcomes relating to health and well-being, educational attainment, economic activity, crime, antisocial behavior, and so on, improve. Savings made on health provisions, welfare payments, and the criminal justice system far outweigh any investment made in seeding the ideas in the first place.

For instance, patient hotels in Sweden save on average 60% of direct costs for accommodating and caring for recovering patients and their families. Instead of taking up an expensive hospital bed, chronically ill or long-term patients stay in a specially designed hotel along with family members and patients. Being in a community like this increases patient well-being and reduces the amount of time it takes for them to recuperate after treatment. (p.41)

In education, an example of radical efficiency is England's Open University (OU). New customers - non-users who couldn't afford expensive full-time residential higher education - were offered the opportunity through the OU to access lectures and seminars broadcast by the public television service, using previously unused bandwidth. From 25,000 enrollments when it launched in 1969, 250,000 students are currently enrolled in the OU, including overseas students, prisoners, and children in secondary schools.²⁰ Lectures are broadcast on the Open University's own YouTube channel and learning resources are downloadable from iTunes. Unit costs per student are significantly lower for the OU than for traditional universities, and employment rates are higher than average. 75% of OU graduates go on to find full-time employment.²¹

In **Where Good Ideas Come From**, Steven Johnson offers historical and environmental perspectives on understanding how innovative ideas come into being, as a springboard for thinking about how to create more opportunities for ideas to develop and how to grow and foster more conducive conditions for innovation in organizations and systems.²²

Johnson makes a compelling case for rejecting the idea of the lone genius experiencing a 'eureka' moment. Instead, he offers numerous examples of how what he calls the 'slow hunch' matures and connects to grow and develop into ideas that have come to assume enormous significance, regardless of how the individuals who came up with them recall the process afterwards. For instance, it transpires that all the puzzle pieces of natural selection can be found distributed, but entirely recognizable, throughout Darwin's notebooks dated months before his supposed light bulb moment reading Malthus in his study in October 1838.²³

Critical to the generation and incubation of ideas are collaborative, sometimes chaotic, spaces in which ideas can meet, mingle, and become something new and different. History, Johnson argues, is littered with half ideas which meet other half ideas (sometimes in the same person's head, often in others' heads) which together are greater than the sum of their parts. Ideas are a network - literally. They are a network of neurons firing in new ways, creating new pathways inside the brain of the person having the idea. And they form and are fostered in networks. From 17th century coffee houses to the Internet, spaces for collaboration have been a necessary condition for innovation.²⁴

To illustrate this, Johnson tracks the development of key ideas through history, contrasting the role of individuals versus networks, market versus non-market (Figure 3).

²⁰ Owen Bowcott, 'Open University may be in its 40s-but students are getting younger: Milton Keynes-based university attracts under-25s seeking part-time study and lower tuition fees,' **Guardian**, 3 January 2011

²¹ <http://www.open.ac.uk/media/40thanniversary/>

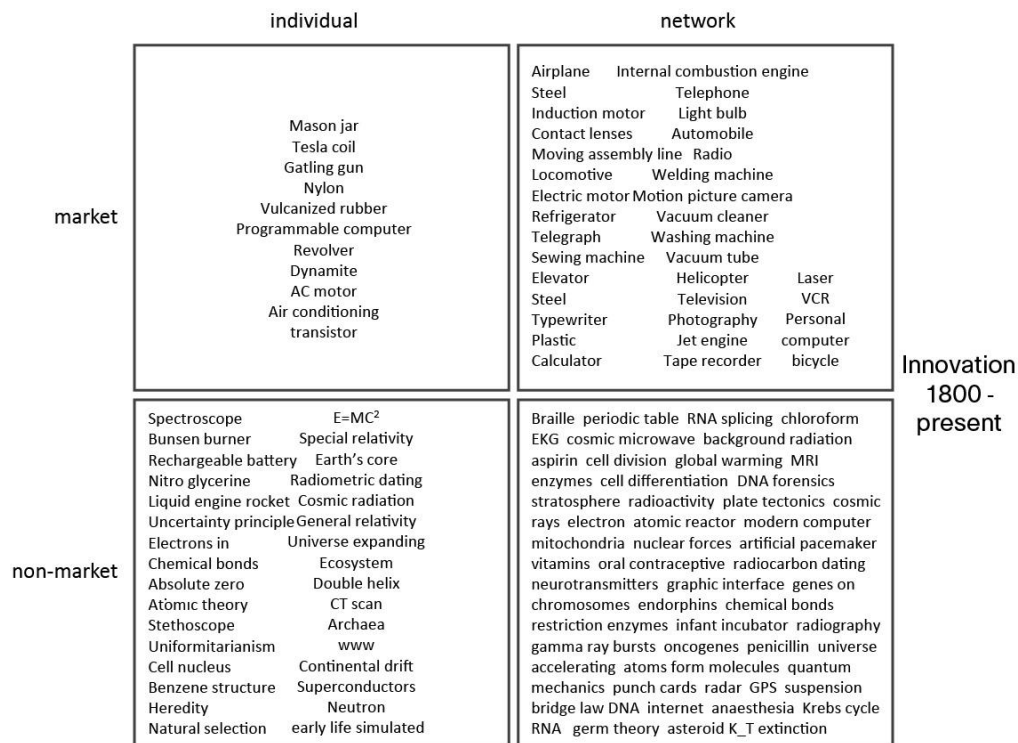
²² For an excellent summary of Johnson's argument visit <http://www.youtube.com/watch?v=NugRZGDbPFU>

²³ 'In October 1838, that is, fifteen months after I had begun my systematic inquiry, I happened to read for amusement Malthus on **Population**, and being well prepared to appreciate the struggle for existence which everywhere goes on from long-continued observation of the habits of animals and plants, it at once struck me that under these circumstances favorable variations would tend to be preserved, and unfavorable ones to be destroyed. The results of this would be the formation of a new species. Here, then I had at last got a theory by which to work.' Charles Darwin, from his autobiography, 1876,

<http://www.ucmp.berkeley.edu/history/malthus.html>

²⁴ http://www.ted.com/talks/steven_johnson_where_good_ideas_come_from.html

Figure 3. Innovation Development



This most recent phase shows the proliferation of scientific discoveries and technological innovation taking place in the networked, non-market space.²⁵ In the period from 1400 to 1600, most innovation took place in the individual, non-market space. From 1600 to 1800, as much activity was taking place in the networked, non-market space. Since 1800, the market has become far more active, but it is networks and not individuals which are generating the majority of ideas. Activity in the networked, non-market space far outstrips that of any other quadrant in this period. Johnson summarizes the phenomenon: 'Fortune favors the connected mind.'

Taken together, **Learning from the Extremes**, **Radical Efficiency**, and **Where Good Ideas Come From** offer a rich resource to inform thinking about how innovation in education might be encouraged and supported within the economic and political constraints of our time and with a fighting chance of success.

Putting the research to work

This paper (and an associated set of tools) proposes a framework which attends to the latest thinking and research about innovation and will be of practical use to system leaders in education.

Synthesizing the key ideas from each of these three texts, supplemented by some of the earlier thinking about new opportunities for learning, suggests a two-stage model or frame for thinking about how leaders of education systems, working at national, state, or local levels, can act to create spaces and opportunities for innovation in education.

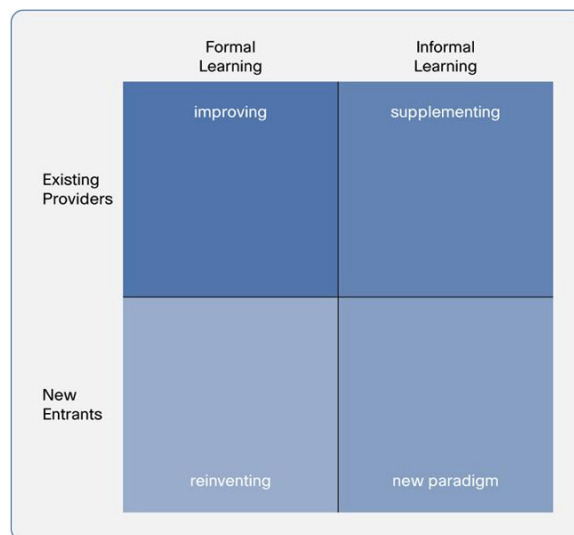
²⁵ 'Networked' refers to innovations that evolved through collective, distributed processes, with a large number of groups working on the same problem. Market/non-market distinguishes between those who wish to capitalize directly from the sale or licensing of their inventions, and those who wish their ideas to flow freely into the 'infosphere.'

Accompanied by a set of tools and activities, the model is intended to support system leaders to navigate the very real tension they experience between the need to maintain continuous improvement to the current education system and the need to look to the future and invest in developing education to reflect the rapidly changing needs of learners in the 21st century.

As well as building on the evidence set out in this paper, the model was developed and tested through an inductive process using around 50 examples of innovative practice in education drawn from a global field, and with groups of system leaders in countries around the world.²⁶

Stage 1

Figure 4.



Stage 1 of the model (Figure 4) builds on the Education Innovation Grid (Figure 1) in **Learning from the Extremes**. The contexts for learning - formal and informal - are helpful for locating learning both inside and outside classrooms and schools. The effects of interventions in each of the quadrants - improving, supplementing, reinventing, and new paradigm - are helpful for understanding how moves in different places produce different outcomes.

We replaced transforming with new paradigm in the bottom-right quadrant to draw a clear distinction between reinventing and transforming. In **Learning from the Extremes**, this was signaled through a subtle linguistic move: improving, supplementing, and reinventing **schools**, but transforming **learning**. We agree with the principle, but want to go further. By indicating a new paradigm, we invite users to reject completely the concept of school for this quadrant and thus avoid any confusion about whether schools can feature here.

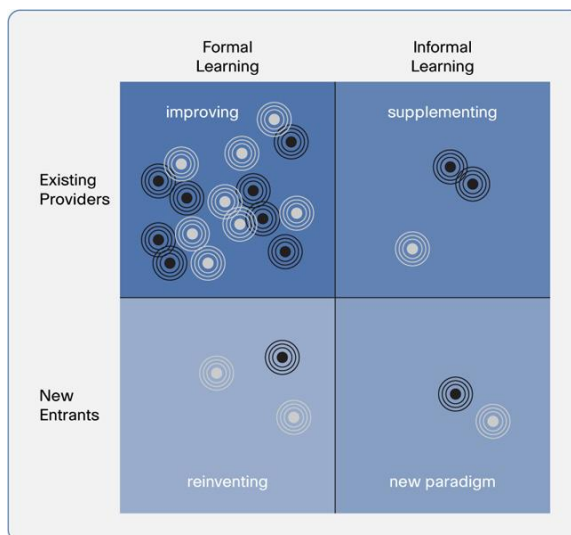
²⁶ The model and associated materials were co-developed and tested with groups of system leaders from England, Australia, New Zealand, China, South Korea, and Finland.

We propose an alternative, more empirical approach to the categories on the vertical axis. Although sustaining and disruptive innovation are accurate descriptors of the likely outcomes of interventions, they assume a level of insight into the end point which is difficult to predict at the outset.²⁷ Additionally, although the term ‘disruptive’ can be helpful conceptually, it can be unhelpful politically. So to harmonize with the conditions set out at the top of the grid, we reflect two other key characteristics - the likely source of innovation; i.e., either existing providers or new entrants. System leaders can now use the model to consider and explore the roles of different actors in their context in innovating in education.

So at stage 1 we have a model which offers a framework for thinking about contexts, inputs, and outcomes of interventions that system leaders could make, intended to stimulate and foster innovation.

Taking the idea of representing relative levels of activity in **Where Good Ideas Come From**, system leaders can reflect on their current distribution of energy, where they are spending most of their resources, and what their existing programs prioritize.

Figure 5.



For instance, in this system the vast majority of energy is being spent in improving the existing school system (Figure 5), leaving very little capacity for activity in the other quadrants. It would be reasonable to conclude that, based on this analysis, the scope for innovation in this system might be very limited indeed.

However, this might change dramatically if conditions were altered to encourage more new entrants to enter the scene. They would be unlikely to try to compete in the crowded ‘improving’ quadrant and might concentrate instead on making an alternative offer in other spaces, introducing more innovation into the system.

The point, however, is not to drive **all** activity towards the lower-right quadrant. Rather, we suggest that in acknowledging the balance that systems must strike between radical shifts and short-term priorities to improve today’s schools, a thriving ecosystem of innovation would see an appropriate mix of activity across all four quadrants.

²⁷ For more on ‘sustaining’ and ‘disruptive’ innovation, see Clayton M. Christensen, Michael B. Horne, and Curtis W. Johnson, **Disrupting Class: How Disruptive Innovation Will Change the Way the World Learns**, McGraw Hill, 2008

Stage 2

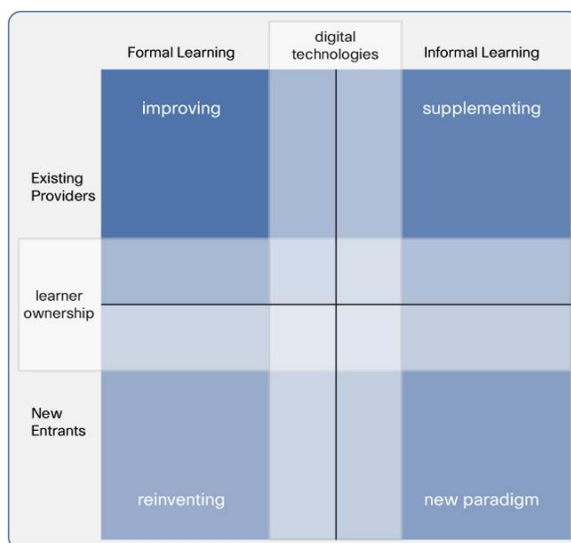
Stage 2 of the model takes the big ideas from Radical Efficiency and applies them to the education context, taking seriously the need for system leaders to think about innovation as a means of reducing costs in education, including the cost of failure. In the research underpinning the Radical Efficiency model, savings are generated by using **new insights** from users and others to reconceptualize the challenge and using **new resources** to provide better solutions.

In education, there is a powerful, fresh source of **new insights** which has hardly been tapped in the past: the insights of learners themselves who, for the most part, have been treated as the objects rather than subjects in the process of learning. Learning opportunities involving co-construction and deep engagement by learners pay enormous dividends in terms of improved outcomes.²⁸ We have collected these together under the umbrella heading **learner ownership**.

New resources are now available in the form of **digital technologies** - significantly, mobile technology, which offers extraordinary scope and which learners integrate into their daily lives with ease, and yet which features hardly at all in most mainstream education.

In the research to develop and test the model, learner ownership and/or digital technologies featured in almost every example of innovative practice that made a difference for learners. We have come to think about these as 'game changers' - features whose introduction is likely to increase the potential for innovation in any of the four quadrants, especially when combined (Figure 6).

Figure 6.



Overlaying learner ownership and digital technologies onto the model illustrates how these enhancements can increase the scope for innovation in each of the four quadrants.

²⁸ The Nature of Learning: Using Research to Inspire Practice, OECD, 2010

Schools which harness the power of learner ownership to transform their approach to teaching and learning are likely to feature more project- or enquiry-based learning, greater and more meaningful student voice, and peer-to-peer teaching and mentoring. Schools like this look and feel more innovative and do very well by existing measures. Teachers and learners generally exhibit positive learning relationships and experience a sense of well-being.²⁹

Similarly, schools making excellent use of technology - for instance interactive whiteboards, visualizers, and so on - can create stimulating and engaging learning environments in which young people thrive and achieve.³⁰

Combine these two and give young people the scope to design their own learning experiences using digital technologies, and exciting new learning opportunities are created, even while staying in the improving quadrant.

Case study: Kunskapsskolan

Students at Sweden's 33 Kunskapsskolan schools are supported by teachers and parents to develop and pursue a personalized educational plan. This begins with long-term attainment goals set when they begin at the school, and is updated at weekly tutorial meetings to review and reflect upon their progress, and to set new short-term aims and challenges.

Like many schools, Kunskapsskolan uses an online virtual learning environment which is accessible to students, teachers, and parents. Students plan their day-to-day schedules and record their progress using an online log, while teachers upload students' results, tasks, and comments in the school's online Pupil Documentation System. This streamlines the logistics of Kunskapsskolan's personalized learning model, while making it easy for parents to keep up with what their children are doing at school.

When not in class, students are free to do much of their work at home, or they can opt to study in one of Kunskapsskolan open-access 'learning spaces.' These spaces provide a range of facilities - from lecture halls to small study spaces - for students to use, giving them further autonomy in their approach to learning.

Kunskapsskolan schools are consistently above average on Sweden's national assessments, and outperform other Swedish schools serving similar demographics.³¹

Similarly, a new entrant in the informal learning space harnessing both digital technologies and learner ownership can create extraordinary learning opportunities.

Case study: Hole in the wall

In 1999, computer science professor Sugata Mitra put a rugged computer into a 'hole in the wall' in a slum in Kaskaji, New Delhi. The computer was loaded with software which encouraged self-led, collaborative, play-based learning. There is no training for the kids, and no compulsion. The educators simply set up the computer (which looks quite a lot like a cash machine) and let the kids work out how to use it.

Since then, Mitra and his team have continued to develop the concept, and to introduce it in towns and cities both in India and internationally. Results have often been remarkable: In one town, known for its singers, children (with no adult help) worked out how to record their own songs within 24 hours.³²

²⁹ John Hattie, **Visible learning: A synthesis of over 800 meta-analyses relating to achievement**, Routledge, 2009

³⁰ B. Somekh et al, 'Evaluation of the ICT Test Bed Project,' Manchester Metropolitan University, Nottingham Trent University, and Becta, June 2007

³¹ <http://www.kunskapsskolan.se/performance/academicoutcomes.4.52155b18128a87c7cfd80009598.html>

³² Sugata Mitra, 'The Child-Driven Education,' TED, 2010

Hole in the Wall is, at its heart, driven by digital technology - but what makes it work is the fact that children use it for themselves, because it harnesses their intrinsic motivation to learn. They own their learning as individuals, while learning to collaborate with their peers.

Let's look in a little more detail at why this might be the case.

The Role of Digital Technologies in Education

Earlier, we outlined the pressure that digital technology is exerting on education by transforming our environment from one of information scarcity to one of information superabundance. But digital technology is not only transforming what young people need to learn - it is also expanding how they can learn.

One of the most striking examples of the new opportunities afforded to education by digital technology is the work of financial analyst Salman Khan. In 2006, Khan made a few YouTube videos in order to tutor his cousins in maths, and he discovered that strangers began watching them and commenting that they found them useful. Since then, Khan has recorded over 2100 videos, which have been viewed over 43 million times. He now manages his website, the Khan Academy, full time. The website is a charity, and all the content is free to access. Users can learn at their own pace, and solve computer-generated problems tailored specifically to them based on their earlier performance.³³

This is an example of the phenomenon of 'Napsterization' - that is, transformation from a straightforward delivery-consumption model to a web-enabled sharing model (in the way that Napster transformed recorded music from something that you bought in a shop, to something you downloaded and shared with strangers across an online network). Inevitably, free online resources like this will change the relationships between learners and teachers - potentially leading to much greater personalization and much more time for teachers to work one-on-one with learners.

We are also seeing the first stirrings of the phenomenon of 'gamification.' Videogame designers have become the modern world's leading experts on how to keep people excited, engaged, and committed - and around the world, educators are beginning to work with them on transforming how people learn both in and out of school. This has led to a growing number of educational computer games (for example, the 'Global Conflicts' series, in which players take on roles including an investigative journalist in Jerusalem, a representative from the International Criminal Court in Uganda, and a representative from 'European Leatherwear Industries' investigating child slavery in Bangladesh³⁴), but it has also led some people to apply 'game dynamics' to learning more widely. For example, Quest to Learn, a school in New York, is pioneering 'mission-based learning,' in which students carry out extended projects modeled on the 'missions' that characters carry out in computer games. These missions integrate real-world learning with virtual reality, computer games, and online social networking.

Harnessing digital technology need not entail extra expense for schools - in fact, using free resources like the Khan Academy in order to teach shortage subjects can actually save money. Schools are also taking advantage of more 'conventional' online tools: At the Science Leadership Academy in Philadelphia, students run their own science groups on Facebook.³⁵ These become repositories for useful information, with revision material, videos, links to articles, and discussions to which other schools can contribute. South Korea is on track to replace all textbooks

³³ <http://www.khanacademy.org/>

³⁴ <http://www.globalconflicts.eu/about>

³⁵ <http://www.scienceleadership.org/>

with digitized materials by 2015. Using smart phones, tablet PCs, and smart televisions, school students of all ages will be able to view the content of existing textbooks. Nationwide academic tests will also be held online.³⁶

The way that digital technology is harnessed in these instances not only 'improves' learning - it also fundamentally changes learners' relationships to each other, to their teachers, to the rest of the world, and to the very material that they are learning.

The Importance of Learner Ownership

The idea that for learning to be effective, learners should be active agents in their own learning has its roots in (i) constructivist theory, which argues that knowledge is accumulated through associations and understood through schema acquired and adapted by learners during their lives, so understanding is unique to an individual;³⁷ and (ii) social constructivism, which builds on this idea to include the role that others can play in supporting an individual learner to take the next step in developing their knowledge and understanding. More experienced or capable peers, or a teacher, can encourage and support the learner forward in a process known as scaffolding - creating the right learning environment for the learner to take up the challenge of moving beyond their existing experience.³⁸ But the individual learner herself needs to take the steps and to make the new knowledge her own. No one else can do that for her.

In most empirical research, the ideal environment for achieving this turns out to be a blend of interactive teaching and discovery-based learning.³⁹ Neither on their own seems to be quite enough. What cannot be assumed, though, is that the person delivering instruction needs to be a teacher, or even an adult. There is also a large body of evidence to suggest that peer-to-peer teaching offers a powerful learning opportunity. This is not just because of the change in the nature of the relationship between teacher and learner, although that's interesting and important too. The critical insight from this research is that it is the person doing the teaching who stands to gain the most from peer-to-peer learning models.⁴⁰

But the principle of learner ownership is not just bound up with technical understandings of how young people learn, although clearly with something as high stakes as education it is helpful to have a secure evidence base to call upon.

In Radical Efficiency, the benefits of connecting with user insights - in this case, learner insights - are twofold. On the one hand, user insights enable providers of services to engage deeply, through, for instance, ethnographic research or co-production methods, with the actual rather than the perceived or diagnosed needs of users, and to co-design and co-deliver better solutions for them as a result. Done well in education, this deep engagement and design and delivery partnership changes irrevocably the relationship of the teacher to the learner and can completely overturn the teacher's approach to meeting the learner's needs.

³⁶ <http://www.eschoolnews.com/2011/07/01/all-korean-textbooks-to-go-digital-by-2015>

³⁷ Constructivist theory is most comprehensively and practically explored in the work of Jerome Bruner. See for example: J. Bruner, **Acts of Meaning**, Cambridge: Harvard University Press, 1991

³⁸ Social constructivism is significantly influenced by the work of Lev Vygotsky. A contemporary of Piaget, Vygotsky was a Russian psychologist living and working at the time of the Soviet revolution. He died at age 38 in 1934. His work on social development theory was eventually published in 1962, translated into English in 1978, and published as LS Vygotsky, **Mind and Society: The development of higher mental processes**, Cambridge: Harvard University Press, 1978

³⁹ See for examples: D. Muijs and D. Reynolds, **Effective teaching: evidence and practice**, Paul Chapman, 2001

⁴⁰ John Hattie, in *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*, Routledge, 2009, found that 'The more the student becomes the teacher and the teacher becomes the learner, then the more successful the outcomes.'

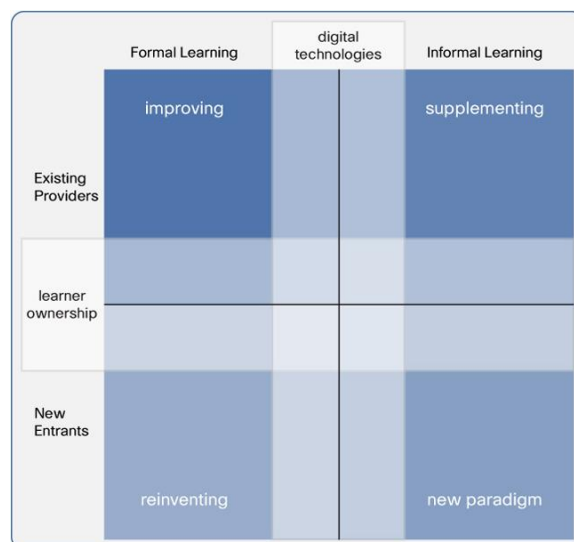
But even more powerful can be the effect that opportunities for deep engagement with teachers and co-production of learning have for the learner. The opportunity to contribute actively to the conceptualization and design of learning enables learners to select methods that they enjoy and will volunteer for and foci that are relevant and exciting to them. In the research about learner motivation and engagement,⁴¹ relevance and choice are the two characteristics most likely to feature in effective learning. And we know too that motivation and engagement are deeply connected to student achievement and well-being.⁴²

Case study: Matthew Moss

At Matthew Moss High School in Greater Manchester, students design and carry out extended projects based on their own passions. Past students have carried out projects ranging from researching the 1947 partition of India through family history, to rebuilding a disassembled car engine. Because students learn outside school and often create projects connected to their own families, parents can get involved in their children's work. Students document their research on blogs, which enables them to share interesting findings and useful resources with their peers.

Learner ownership at Matthew Moss extends beyond the individual's own learning and to the workings of the school. For example, students plan and manage their own school trips and are taught how to make purchases using the school budget. This prepares them for the responsibilities of adulthood, as well as strengthening their sense of belonging in the school.

Figure 7.



The innovation ecosystem model describes an environment in which two existing, if seriously underused, capacities can be highlighted, further developed, and then harnessed to enhance the education system's potential for innovation. This applies across the range of educational environments - from existing, very traditional schools striving to improve student attainment year on year to social entrepreneurs working in communities in countries around the world, developed and developing, to develop very different models.

⁴¹ See for example: B. Lucas and G. Claxton, **New Kinds of Smart: How the Science of Learnable Intelligence is Changing Education**, Open University Press, 2010

⁴² K. Weare and G. Bray, **What Works in Developing Children's Emotional and Social Competence and Wellbeing**, Department for Education and Skills DfES (UK), 2003

The question then becomes: How do system leaders hoping to develop an innovation ecosystem get from where they are now to where they want to be? What are the conditions they need to create for an ecosystem like this to grow and flourish?

Platform Thinking: How to Encourage an Innovation Ecosystem

All this fresh research and thinking about the nature of innovation points us in a new direction in relation to education: that is, that creating the conditions for a **flourishing ecosystem** of innovation should be our objective if organized learning is to adapt adequately to the pressures and opportunities for change.

This biological metaphor accords with a stream of thought, developing in parallel, which is exploring the scope for biomimicry in pursuit of social policy. Biomimicry is an approach based on the notion of borrowing engineering solutions from the natural world. In the past decade it has been most fully explored by architects and industrial designers, and more recently by car manufacturers such as Nissan.

How do flourishing ecosystems arise and sustain themselves in the natural world? One route is through platform creation. An excellent example is that of the coral reef. Darwin's exploration of this phenomenon revealed that the physical platform created by the skeletons of millions of soft polyps created a habitat within which literally millions of other species could co-exist and flourish. Whilst within it there is competition for resources, species also collaborate, with mutually supportive outcomes.⁴³

This biological ecosystem, sustained by the platform of the coral reef, is mirrored repeatedly in the world of digital technology. The Internet itself is a platform: Whilst it makes commerce possible, it remains itself outside it. And it supports many other ('stacked') platforms. It could be said that the history of the computer industry is characterized by a series of defining innovations which created platforms for participation by a wide range of companies and players.

The most obvious of these is iTunes as a platform for the iPhone and the iPad. Apple did not seek to monopolize the creation of apps for these devices, but created a suite of initial model apps, showing their power and demonstrating what could be done. Now tens of thousands of apps populate the system, created by a multitude of providers and powered by consumer demand.

The notion of platform provision is not exclusive to the technology industry nor the private sector. Platform building has been described as 'an exercise in emergent behavior.' An illuminating instance of this is the case of the development of GPS technology. Initially emerging from the work of US scientists tracking the path of Sputnik in 1957, a system was developed by the US military to provide navigation systems for their nuclear submarines. It might well have remained a restricted military capacity, but it was Ronald Reagan who declared that satellite-based navigation should be 'for the common good' and open to civilian use. Today, about 30 GPS satellites cover the planet, providing guidance for everything from mobile phones to digital camera to Airbuses; they form a vibrant diverse ecosystem, relying on the same platform (which only government could afford to develop and sustain).⁴⁴

⁴³ Charles Darwin, **The structure and distribution of coral reefs**, 1842

⁴⁴ The examples here are drawn from Johnson, *ibid*

How Does Platform Thinking Relate to Public Service Provision?

The foremost thinker evolving ideas around 'government as platform' is Tim O'Reilly.⁴⁵ O'Reilly argues that absorbing the lessons to be learned from innovation in technology can resolve the sterile debate between 'big' and 'small' government; between government being the (near) monopoly provider and a totally privatized market solution. His vision is one in which government provides appropriate platforms for many contributors, providers, and players to be able to contribute and interact in vibrant collaboration/competition.

O'Reilly recognizes that there are things that only government can and should do, and that platforms themselves need to evolve. However, he argues that the information age heralds new possibilities - radical departures from the existing model of government, which Donald Kettl dubbed 'vending machine government'.⁴⁶ We pay our taxes, we expect services. When we don't get what we expect, our 'participation' is limited to protest - essentially, shaking the vending machine.

What if, instead of conceiving of government as a vending machine (in which only a small number of producers could place their products), it became the manager of a marketplace? Metaphors have their limits - and perhaps too many have been evoked here. But the core idea is that to create the enabling conditions for the Learning Society,⁴⁷ the contributions, energy, drive, and creative imagination of many, many more participants need to come into play. That won't happen unless government rethinks its role.

O'Reilly argues that this would point in the direction of a stripped down set of functions: building essential infrastructure, developing core applications, and inspiring outside and alternative developers - but all the while enforcing the 'rules of the road.' Wikipedia, whilst an open source platform, still ensures a level of quality assurance of its entries through its editorial system. What would government have to do or become to create a flourishing 'App Store' system in learning - and thereby also build up levels of demand, through the existence of a richer array of opportunities?

Towards a Learning Ecosystem

It is already the case that jurisdictions across the world with responsibility for the provision of education systems have recognized that their role needs to evolve, and that the conclusions set out in reports such as the 2010 McKinsey Report⁴⁸ concentrate on the improvement techniques deployed over the last 10 years, rather than examining what is needed for the coming 20 or 30. The use of the heuristic introduced earlier can give an indication of the overall health of the innovation ecosystem. Extrapolating from the conditions which give rise to examples of dynamic improvement and transformation, some implications are apparent - and these accord with the learning which has emerged from the exploration of platform development.

In the case of the application of technology in social policy, Tim O'Reilly suggests the following lessons, amongst others:

- Design for participation - maximizing opportunities for crowd sourcing
- Be prepared to de-commission after recognizing failure
- Build a simple system and let it evolve
- Lower the barriers to experimentation

⁴⁵ See <http://ofps.oreilly.com/titles/9780596804350> and related articles

⁴⁶ Donald Kettl, **The Next Government of the United States: Why Our Institutions Fail Us and How to Fix Them**, W. W. Norton & Company, 2008

⁴⁷ For more on the Learning Society, see **The Learning Society**, Cisco, 2010

⁴⁸ **How the world's most improved school systems keep getting better**, McKinsey and Co., 2010

Similarly, Charles Leadbeater suggests some implications in his discussion of platform thinking.⁴⁹ He too is primarily focused on how new technology might be leveraged 'to imagine a future where most children learn most things using a tablet computer like an iPad, accessing text, questions, quizzes, and content from a remote cloud of applications.' In this specific area he suggests the following:

- Create and communicate a vision of what the platform is for and how it will evolve
- Build a consensus among a small group of influential partners and contributors who will be the core of the platform community
- Distribute tools and enabling technologies to make it as easy as possible for outsiders to develop applications to run on the platform
- Encourage the co-development of business models that range from free, to part pay, to fully commercial. Highlight these business opportunities
- Facilitate joint governance on the shared platform to make sure it continues to develop for the increased shared benefit of those using it

With appropriate adaptations, we think some of these lessons can be applied more broadly in how the state fulfils its responsibility to organize for the education of citizens in a manner appropriate to the new century. Working adaptively with jurisdictions, we invite them to reflect upon the generative power of a series of conditions (and the appropriateness for their own context). These include, amongst others:

- An inspiring vision for lifelong and engaged learning, with aims beyond personal wealth and economic competitiveness
- Low barriers of entry for new providers
- Freedom for merger and demerger activity
- Incentivizing student-led curriculum development
- Greater transparency for learners about the range of opportunities available
- Coalition building
- Investment in, and encouragement for, disciplined 'innovation zones'

There can be no prescription here: The evidence is insufficiently strong. Such is the nature of innovation. But we see the benefits of these approaches in other fields and sectors, and 'fortune favors the connected mind.' We particularly anticipate supporting systems keen to create platforms for the active encouragement of coalitions, and contributions from a wide range of entities, some of whom have recently entered what was formerly the 'schooling' space with unprecedented levels of investment and engagement. These include social enterprises; businesses; creative and cultural organizations; user groups; philanthropists; further and higher education organizations; and NGOs.

We recognize, however, that in the case of education, which is such a critical portal to full entry into the life of a society - and a prerequisite for democracy - governments must not and cannot abrogate certain responsibilities critical to their broader democratic and social goals. Amongst these are issues of equity and social mobility. For this reason the aim must be to enable policy makers to adopt an approach which will safeguard these aims, whilst simultaneously rethinking their role in the light of new knowledge about innovation. Here, an analytical approach is needed to develop a contextually appropriate blend of provision, commissioning, regulation, prescription, and quality assurance.

⁴⁹ Charles Leadbeater, 'Rethinking Innovation in Education,' CSE Australia, 2011

Conclusion

This is a debate that is just opening, and it is beginning to engage education system leaders around the world. So we want to avoid closing down the discussion.

Instead we offer for debate an example of what's happening in a jurisdiction which is self-consciously and explicitly grappling with the complex set of issues, challenges, and opportunities we set out here. Their story is barely beginning and they have lots of hurdles to overcome - it is by no means a perfect example, nor would its leaders claim that for it. However, it may be the crucible for significant learning about how to grow and nurture an innovation ecosystem, and exploring what government's role can and should be in it.

One Approach to Enabling an Ecosystem

New York City's iZone 360 encapsulates the City's approach to a holistic innovation strategy. It is an education innovation program that addresses all four quadrants of the model, as well as emphasizing both learner ownership and digital technology.

At the heart of the iZone 360 is a group of 'lab schools' tasked with testing out radical new methods of teaching and learning 'on behalf' of the entire system. Some of these are state schools (existing providers) while others are charter schools (new entrants). Among the areas in which they are innovating are 'blended learning' (combining face-to-face and online learning) and new approaches to dividing up 'learning time,' some of which blur the boundaries between formal and informal learning.

The iZone 360 is not a completely open space for innovation - innovations must support 'personalized mastery learning,' New York City's vision for 21st century learning - which incorporates (among other things) personalized learning plans for students, multiple possible modalities for learning from which students can choose, and learning and assessment that focus on developing a wide set of competencies.

While none of these is prescriptive, they all encourage pedagogical models which foster learner ownership. Schools are also leveraging digital technology - most notably the 'School of One,' where students follow personalized, computer-generated 'playlists' of lessons, rather than a set schedule. Generated by algorithms which ensure that all subject matter is tailored to the individual student's ability, these playlists enable every student to work at their own pace.

In order to make sure that innovations at the 'lab schools' are able to inform the work of practitioners throughout the city, the program draws on existing networks (and emerging ones) to gain insight from the lab schools and change broader structures in order to facilitate innovation (and early adoption) across the system, both for existing providers and new entrants.

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