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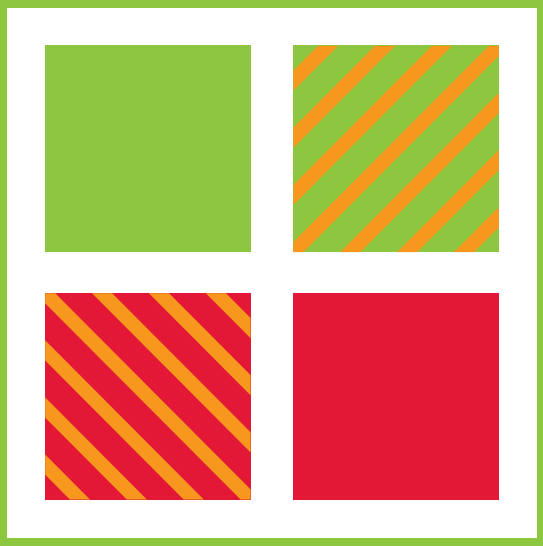
ALIVE IN THE SWAMP

ASSESSING DIGITAL INNOVATIONS IN EDUCATION

Michael Fullan and Katelyn Donnelly

July 2013



About NewSchools

NewSchools is a non-profit venture philanthropy firm working to transform public education for low-income children. Through funding and guidance of entrepreneurial organisations, we aim to make sure every child receives an excellent education.

About Nesta

Nesta is the UK's innovation foundation. An independent charity, we help people and organisations bring great ideas to life. We do this by providing investments and grants and mobilising research, networks and skills.

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In November 2012 Nesta published *Decoding Learning: The Proof, Promise and Potential of Digital Education.* Using the lens of eight well-evidenced learning acts, this report explored how educational technology could achieve impact – provided, of course, that we stress the pedagogy as much as the technology.

Alive in the Swamp builds on this focus by adding the ambition to deliver change across a school system, in each and every classroom. This ambition is the right one, which is why we were thrilled to be approached by Katelyn Donnelly and Michael Fullan with a request to publish this report.

In essence, the authors ask one very simple question – 'what does good look like?' They answer the question by providing an Index, a way of assessing any digital innovation in learning, which stresses all the elements needed for system impact. For example, in addition to improving learning outcomes educational technologies must be delightful to use and easy to implement.

Our hope is that this Index will go on to be debated, refined and used – not least by Nesta as we continue our efforts to make good on the promise of technology to improve learning.

Helen Goulden

Executive Director, Nesta's Innovation Lab.

ABOUT THE AUTHORS

Michael Fullan

Michael Fullan, O.C. is professor emeritus, OISE, University of Toronto. He has served as the special adviser to Dalton McGuinty, the premier of Ontario. He works with systems around the world to accomplish whole system reform in education in provinces, states and countries. He has received several honorary doctoral degrees. His award winning books have been published in many languages. His most recent publications include: *Stratosphere: Integrating technology, pedagogy, and change knowledge; Professional capital of teachers* (with Andy Hargreaves), and *Motion leadership in action*.

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Katelyn Donnelly

Katelyn Donnelly is an executive director at Pearson where she leads the Affordable Learning Fund, a venture fund that invests in early-stage companies serving schools and learners in the developing world. Katelyn is also an active advisor on Pearson's global strategy, research and innovation agenda as well as a consultant to governments on education system transformation and delivery. Katelyn is the co-author of two recent education system publications: *Oceans of Innovation* and *An Avalanche is Coming.* She serves as a non-executive director and strategic advisor for several start-up companies across Europe, Asia and Africa. Previously, Katelyn was a consultant at McKinsey and Company.

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ALIVE IN THE SWAMP

ASSESSING DIGITAL INNOVATIONS IN EDUCATION

CONTENTS

FOREWORD: **SIR MICHAEL BARBER**

In *Alive in the Swamp,* the authors Michael Fullan and Katelyn Donnelly have made a real breakthrough for which all of us around the world interested in improving education systems can be grateful.

For years – ever since the 1970s – we have heard promises that technology is about to transform the performance of education systems. And we want to believe the promises; but mostly that is what they have remained. The transformation remains stubbornly five or ten years in the future but somehow never arrives.

In the last decade we have begun to see some important research on how technology might lead to transformation. Organisations such as the Innosight Institute in the US, Nesta in the UK and CET in Israel have enhanced our collective knowledge in ways that help inform policy. Even so, policymakers have struggled because the nature of the technology itself changes so fast that they understandably find it hard to choose when and how to invest and in what.

The breakthrough in *Alive in the Swamp* is the development of an Index that will be of practical assistance to those charged with making these kinds of decisions at school, local and system level. Building on Fullan's previous work, *Stratosphere,* the Index sets out the questions policymakers need to ask themselves not just about the technology at any given moment but crucially also about how it can be combined with pedagogy and knowledge about system change. Similarly, the Index should help entrepreneurs and education technology developers to consider particular features to build into their products to drive increased learning and achieve systemic impact.

The future will belong not to those who focus on the technology alone but to those who place it in this wider context and see it as one element of a wider system transformation. Fullan and Donnelly show how this can be done in a practical way.

Both the authors are well known to me and it has been my pleasure to work with and learn from them in a variety of contexts. Their different backgrounds and perspectives have proved the ideal combination for this piece of work and they share one vital characteristic: they are both among the leading lights of their own generation in thinking about how to ensure education systems rise to the challenge of the 21st century.

Sir Michael Barber

May 2013

PREFACE: **TED MITCHELL**

***Alive in the Swamp* vividly articulates the key components needed for digital innovations to be transformational in a practical, easy-to-use tool that has applicability across the spectrum, from leaders of large school systems to education entrepreneurs. As education systems across the world continue to struggle with learner engagement, student achievement and equity, this work is more relevant and necessary than ever before.**

Luckily, over the past several years, we have seen a proliferation of disruptive digital learning innovations, many of them represented in the NewSchools Venture Fund portfolio, which are dedicated to, and focused on, fundamentally altering existing education structures and improving learning outcomes. While the existing innovations are exciting and racing toward a better future, there is still a long way to go to translate innovations into changed facts for millions of learners. This paper offers practical suggestions on how entrepreneurs and systems leaders can evaluate innovations to identify the ones with the most potential for transformation and improve those that need improvement.

Michael Fullan and Katelyn Donnelly's innovation index is a step forward for the education field, allowing for easy analysis of any innovation on the basis of technology, pedagogy and system change, and the interrelationship between the three. Furthermore the index puts the focus of digital innovation on evidence of what works for the learner and how to ensure that change is embedded in the entire system, not just niche projects in a handful of schools. The index will help us drive forward to an education 2.0 world that allows students to progress at their own pace, focuses on an activity based assessment of a large suite of skills and empowers teachers to be mentors, motivators and change agents.

Certainly the potential of digital technology to change the nature of learning is still emerging but there is a plethora of opportunities, as well as evidence of what works, to better inform new products and system implementation. Those that use the lessons of the past and build them into the designs of the future will find success.

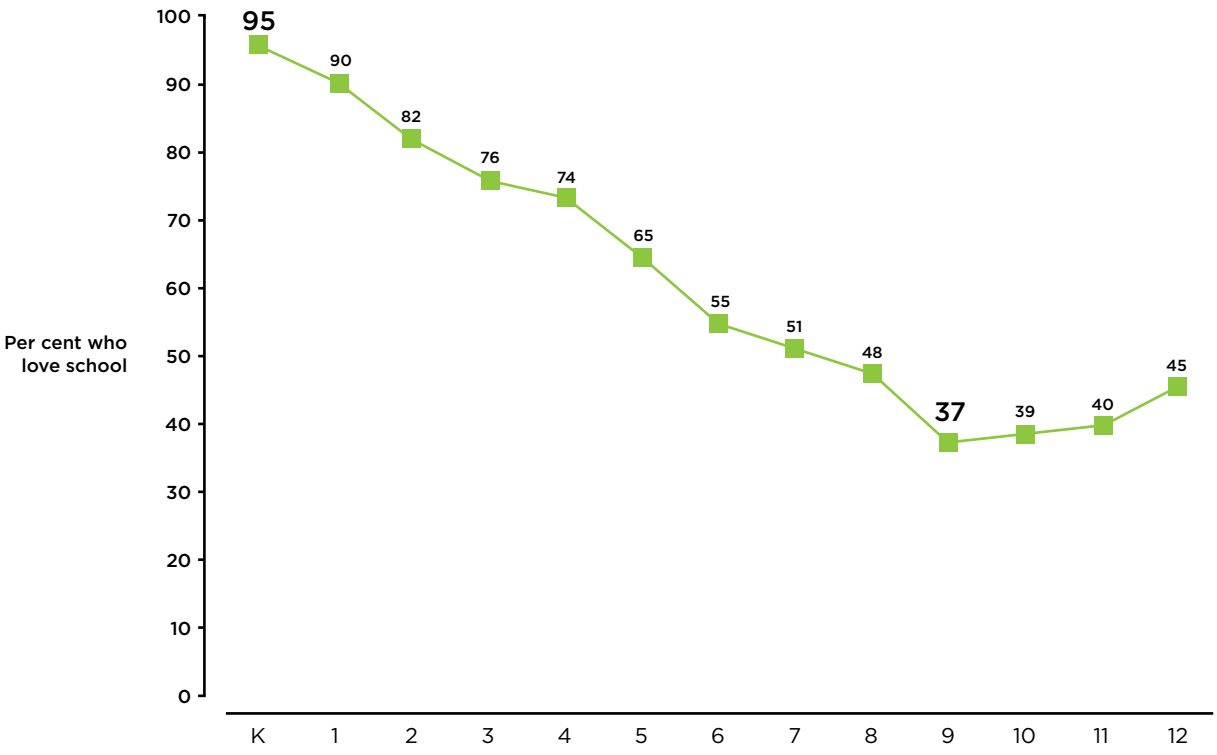
Ted Mitchell

CEO, NewSchools Venture Fund

1 EXPLOSIONS GALORE

Two powerful forces are combining to procreate the swamp. One is a relentless 'push' factor; the other is a prodigious and exponential 'pull' phenomenon. The push factor is how incredibly boring school has become. We show one graph in *Stratosphere* from Lee Jenkins that indicates 95 per cent of students in Kindergarten are enthusiastic about school but this steadily declines bottoming out at 37 per cent in Grade 9. Part and parcel of this, teachers are increasingly alienated. Satisfaction is plummeting in the US among the teaching force; and those wanting to leave the profession are approaching one in three. Students and teachers are psychologically and literally being pushed out of school.

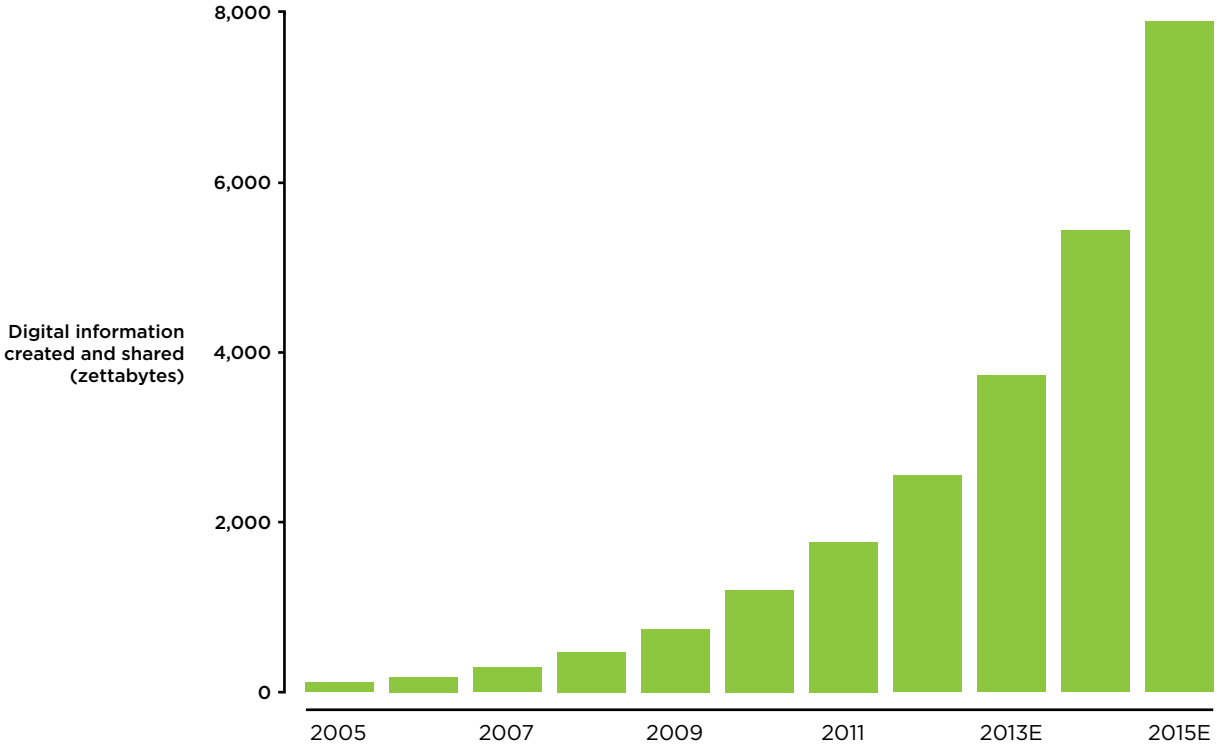
Figure 1: **Loss of enthusiasm by grade level**



The counterforce is the 'pull' of rapidly expanding digital innovations that are the result of lean and not so lean start-ups, as small-scale entrepreneurs and behemoth businesses and financiers populate the digital swamp. The result is an exciting but undisciplined explosion of innovations and opportunities. There will be more development and spread of digital innovations in 2013 than at any other single time in history. In fact, the NewSchools Venture Fund found that in 2012 alone, 74 early-stage companies focused on US primary

and secondary demographics received a total of $427 million in funding. The sheer size of investment and attention is unprecedented for education technology. 2013 promises to be an even larger year for founding and funding. At the same time that there are new platforms being built specifically for education, the amount of global digital information created and shared is growing at an increasing rate and has increased ninefold over the last five years. The Internet is becoming a powerful access portal and content is increasingly an open and free commodity. The impact on education and learning, however, is still murky.

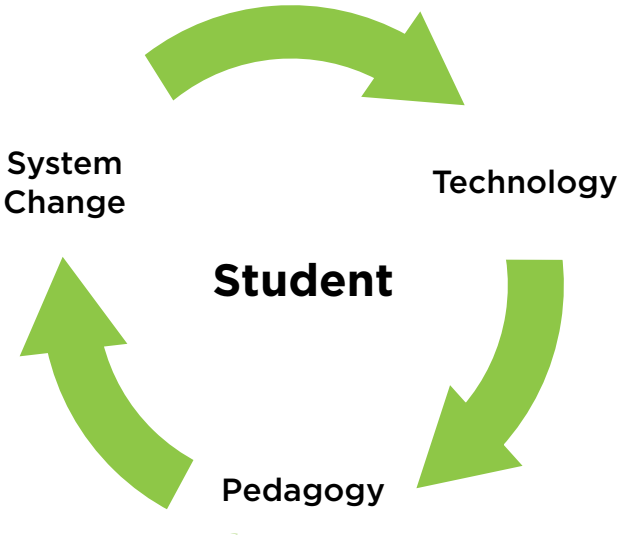
Figure 2: **Global digital information created and shared, 2005–2015E**



*1 zettabyte = 1 trillion gigabytes. Source: IDC IVIEW report 'Extracting value from chaos'. June 2011

As in all revolutions, opportunities and problems present themselves in equal measure. In *Stratosphere* we said that three forces, each of which has had an independent history over the last 50 years, must come together. One is **technology** (the PC is almost 50 years old); the second is **pedagogy** (which has been around forever, of course, but the science and art of learning is a recent phenomenon and has indeed been outpaced by technology); and the third is **change knowledge** (again a forever proposition but the first studies of implementation were in the mid 1960s). For revolutionary learning results, we need to combine how we learn with how to ensure engagement, with how to make change easier. Our white paper essentially argues that these three powerful forces must be combined to catapult learning dramatically forward.

Figure 3: **The three forces of stratosphere** (Fullan, 2013)



Up to this point, technology has not impacted schools. We agree with Diana Laurillard that technological investments have not been directed at changing the system but only as a matter of **acquisitions.** Billions have been invested with little thought to altering the learning system. There are also potentially destructive uses of technology on learning; we must beware of distractions, easy entertainment and personalisation to the point of limiting our exposure to new ideas. We focus not simply on the technology itself but on its use.

In *Stratosphere* we suggested four criteria that new learning systems must meet:

I. Irresistibly engaging for students and teachers.

II. Elegantly easy to adapt and use.

III. Ubiquitous access to technology 24/7.

IV. Steeped in real life problem solving.

We cite only a few studies here to show that digital innovations are prowling the swamp like omnivores. We consider this a good thing. The future is racing with technology. The gist of our report is that pedagogy and change knowledge will have to dramatically step up their game in order to contribute their essential strengths to the new learning revolution. Additionally, the complex and dynamic relationship between technology, pedagogy and change knowledge will need to be developed and nurtured if we are to get 'whole system reform'.

Pedagogy, for example, is increasingly being bypassed because of its weak development. Frustrated funders, entrepreneurs and learners do and will bypass pedagogues when they find them wanting. But this is dangerous because wise learners will always benefit from a mentor or active guide. We get a snippet of this from John Hattie's meta analysis of over 1,000 studies in which he assessed the impact of learning practices on student achievement. One particular cluster calculation revealed the following:

Teacher as facilitator (effect size .17)
Included: smaller class sizes; simulations and gaming; enquiry–based learning – setting students a question or problem to explore; personalised instruction; problem–based learning; web–based learning.

Teacher as activator (effect size .60)
Included: reciprocal teaching – where student and teachers are both 'teachers' learning from each other; regular, tailored feedback; teacher–student verbal interaction; meta cognition – making explicit the thinking process; challenging goals – setting ambitious and achievable learning goals.

We see that 'teacher as activator' (or change agent) has an impact size over three times greater than 'teacher as (mere) facilitator'. Several comments are warranted. First, Hattie was not focusing on technology. Second, we can note that simulations, gaming and web–based learning do not fare well. Our guess is that the reason for the low impact is because they were employed with poor pedagogy. In other words, the 'guide on the side' is a poor pedagogue. Third, a lot more has to be done in fleshing out the nature of effective pedagogy in its own right, as well as how it relates to the use of technology to accelerate and deepen learning.

For now, we can conclude that teachers as activators or change agents will be part of the solution. Much more work has to be done to examine what this might mean in practice. In fact, we are part of some initiatives to delve into what we call the 'New Pedagogy' that involves a learning partnership between and among students and teachers with teacher as change agent – and students in charge of their own learning under the active guidance of teachers. This work has just begun; and part of our purpose in this paper is to stimulate further development in exploring the relationship between technology and active pedagogy and how this integration can be enhanced by using change knowledge that focuses on whole system reform.

If we consider digital innovations, the field is currently characterised by either weak or undeveloped pedagogy, or strong technology and pedagogy confined to a small number of schools; that is, the best examples tend to be small–scale exceptions that are not representative of the main body of schools. Additionally, there is in general a lack of strong efficacy evidence demonstrating the impact of the digital innovations on student learning. Robust academic meta–analysis research, such as that by Steven Higgins et al., shows a current lack of causal links between the use of technology and student attainment.

Pushing the envelope in the direction of larger–scale reform will require the integration of technology, pedagogy, and system change knowledge as explored by Tom Vander Arks' *Getting smart: How digital learning is changing the world,* and our own book, *Stratosphere.* In a recent report, Vander Ark and Schneider focused on *How digital learning contributes to deeper learning.* In all these cases, the press is on for learning skills essential for the current century in three domains: (1) the cognitive domain (thinking); (2) the intrapersonal domain (personal skills of drive and responsibility); and (3) the interpersonal domain (teamwork and other relational skills) – see the National Research Council.

Once more, and understandably, the examples identified by Vander Ark and Schneider are small–scale exceptions to the mainstream.

We set out, then, to establish an index that would capture the overall dimensions of technology, pedagogy and what we might call 'systemness'. We found only one (and very recent) attempt to take stock of digital innovations in education, Nesta's report *Decoding learning: The proof and promise of digital education* by Luckin et al. The report helpfully unpacks learning themes around eight dimensions: learning from experts; from

others; through making; through exploring; through enquiry; through practicing; through assessment; and in and across settings. These distinctions rightly place learning up-front, but there are too many to grasp in practice and they overlap conceptually.

Further analysis in the report is very useful. Innovations are classified as 'teacher led' (n= 300 sources) or 'researcher led' (n=1022). Using the criteria of 'quality of evidence' it ended up with a sample of 86 teacher–led innovations, and 124 research–led innovations.

Decoding Learning then begins the process of considering how the eight domains can be connected but it found few instances of linked learning activities in the sample.

We agree with its conclusion that digital innovations have failed in two respects: they have "put technology above teaching and excitement above evidence."(p.63).

In thinking about how to reverse this situation, a simpler approach might be more helpful — one that is quite close to the strategising that will be required. There need to be policies and strategies that will simultaneously i) conceptualise and operationalise the new pedagogy; ii) assess the quality and usability of specific digital innovations; and iii) promote systemness. In other words, we considered what might be necessary in order for technology to go to scale and to produce systemic change.

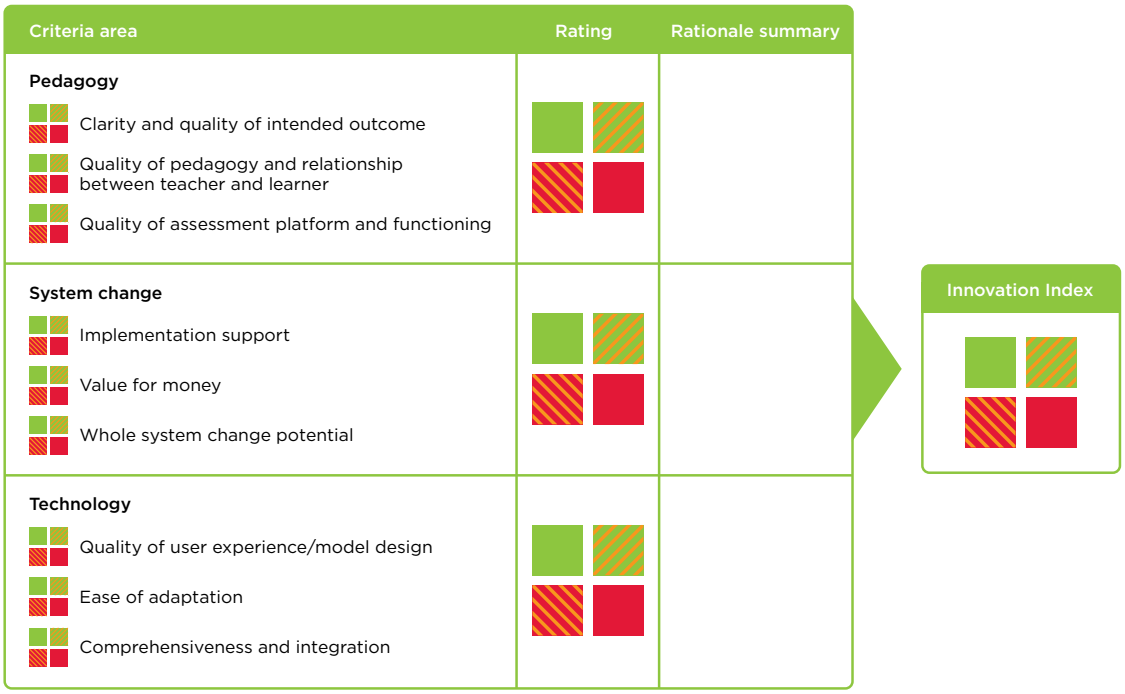
Section 2 is the result.

2 THE INDEX

In response to the changes in digital technology and a renewed focus from entrepreneurs and educators on improving learning outcomes, we have developed a comprehensive Index to be used as an evaluative tool to predict the transformative power of the emerging digital innovations. The Index allows us to systematically evaluate new companies, products and school models in the context of all that we've seen is necessary for success.

The Index is best applied to innovations that focus on the K-12 demographic in the US – in the UK, primary through to secondary – and have a school-based application. We designed the Index and tested it on 12 innovations spanning technology–enabled learning tools like Khan Academy and Learn Zillion and school–based models such as School of One and Rocketship Education. We chose innovations that have been publically mentioned and supported by premier funding. Appendix A elaborates on the Index in terms of 'what green looks like' and 'what red looks like'.

Figure 4: **Score card: Innovation Index**



- **GREEN: Good –** likely to succeed and produce transformative outcomes
- **AMBER GREEN: Mixed –** some aspects are solid; a few aspects are lacking full potential
- **AMBER RED: Problematic –** requires substantial attention; some portions are gaps and need improvement
- **RED: Off track –** unlikely to succeed

We believe that student-centered learning requires a blended combination of critical drivers as laid out in *Stratosphere.* It will require the interaction of pedagogy, system change and technology. Technology, for example, can provide feedback, or support effective feedback for teachers to improve their pedagogy, and the system to monitor and improve student achievement. Training of system actors will need to focus not just on the use of the actual technology but on how it can support collaboration and effective interaction. Each of the three components should be leveraged and interconnected in a way that produces results for learners and reverberates throughout the system.

The Index breaks each of the three components into three subcomponents for evaluation. We use the tool by starting at the subcomponent level to get a granular perspective on each of the key elements and questions and then build up to a synthesised view and big picture that includes a rationale of judgements, particularly where key elements fall in the interrelationships between components and subcomponents. We believe this allows for easier diagnosis of gaps and problems as well as identifications of spots of excellence. The tool should also make evaluation systematic and easy to use for almost any innovation, providing the widest spread of applicability and reliability.

Each component and subcomponent is given a rating on a four-point scale: green, amber green, amber red and red. We picked a four-point scale because social science research has shown that three or five-point scales cause gravitation toward the middle and the judgements becomes less powerful. We've taken this approach from the work of Michael Barber and the prime minister's Delivery Unit in the United Kingdom.

Each colour is an output based on the evaluation of a series of underlying questions. A green rating is assigned when the innovation is outstanding in fulfilling the best practices underlying the subcomponent. To achieve a green, the innovation would need to be truly world class. An amber green rating is assigned when the innovation has many criteria fulfilled and is on the way to outstanding. An amber green rating may signal that there are a few areas for further refinement and improvement. An amber red rating is assigned when the innovation has a few aspects that fulfill the subcomponent but is mostly problematic and off track for success. A red rating is assigned when the innovation misses most criteria completely and is off track to make progress.

We recognise that the evaluation system is qualitative. Some subjectivity is thus inevitable because evaluation is based on human judgement. However, when the Index is applied in many settings and over a large sample, the users of this framework develop a keener sense of shared judgements both individually and, crucially, as a community. As the Index is applied and more and more judgements are shared, subjectivity should decrease. Human discretion is necessary to achieve applicability and comparability across myriad products and services.

Thus, in quantitative terms, a given innovation could receive a score of three to 12 for each subcategory, or nine to 36 for the Index as a whole. To keep the ratings consistent, under each subcomponent area we have further defined and outlined what questions should be asked and what green or good and red or bad, looks like. The next section will delve into those details in the order that they are present in the Index.

PEDAGOGY

Clarity and quality of intended outcome

The first subcomponent area under pedagogy is clarity and quality of intended outcome. Here we ask several questions: How clearly are the learning outcomes of the innovation defined? Are the learning outcomes explicit and defined for the school, the student, the parents and the school system? Is the clarity of outcome shared by student, teacher, parent, school and school system? This is an important category because to make transformative system improvements we need to know, with precision and clarity, what the learning goals are. Digital technologies that do not align with what is to be learned will likely not translate into increased attainment.

To achieve a green rating, generally each activity, overall lesson and broad course of study should have clear, quantified outcome(s). These learning outcomes and goals should be communicated and shared effectively within the school and, of course, with students, teachers, parents and the broader system. The innovation should be able to demonstrate strong benefits for customers and/or students.

In the very best situations, trajectories are produced for key outcomes so that progress towards goals can be tracked and measured in real time. Where possible, modelling is used to quantify the impact on key national indicators of student attainment and benchmarked internationally. We have seen examples of substantual trial results being produced in education systems like Ontario, where the student and teacher together have been clear about learning goals and the corresponding success criteria in relation to their learning outcomes.

In red rated innovations, exercises and modules do not have outcomes identified. When outcomes are identified, they lack specificity and clarity. It is problematic when there is insufficient linkage to key leading indicators and a lack of progression trajectories. Confusion abounds in learning environments where teachers and actors are unaware of the impact of the innovation and the benefits to students. We have found that when there is no tracking or monitoring system in place to ensure learning is taking place and adaptations are made, the innovation is unlikely to succeed in producing outcomes.

Pedagogy itself

The second subcomponent in pedagogy is the quality of the pedagogy itself, defined as the underlying theory and practice of how best to deliver learning. Our Index asks the following questions under this component: How refined is the pedagogical underpinning? Does the pedagogy reflect the latest global research, including the emphasis on enquiry, constructivism and real–world examples? Are students encouraged to learn through enquiry? How is the teacher's role defined? Is the role reflective of the 'teacher as activator' relationship? Can teachers effectively manage all the students? How is the learner engaged? Is there a student–teacher partnership? Is the pedagogy consistent across the system? Is there a shared understanding among all the teachers involved? Does the model include an emphasis on the necessary psychological and intellectual processes? Is there a mechanism to ensure the pedagogy is updated? Can teachers and students provide defensible evidence of positive links to learning?

While the new pedagogy, particularly in a digital context, is still being defined, we think that it is important that the innovations contain pedagogy that reflects the most advanced, evidence–based techniques to date. We find that innovations should have a theory of

learning that is stated explicitly in the technology, model design, and training of teachers. It is important to note that many teachers struggle to define and use an evidence–based pedagogy regardless of whether it sits in a digital innovation.

In any case, the model should include a view that the teacher is a change agent in the classroom. This means problems and questions are placed in real world contexts; the emphasis is on intellectual risk taking and trial–and–error problem solving; and there is a healthy partnership between the student and teacher that is built on enquiry and data. Innovations that achieve a green should take note of Professor John Hattie's meta analysis work on teaching – thus, we should be able to see signs that the teacher's role is defined as an activator of learning and his/her job is centred on servicing and pushing deeper the thoughts from the learner. Teachers should be seen in partnership with students and exhibit behaviour that shows openness to alternatives – a constant behavior of seeking evidence and adaptability and flexibility when new evidence is raised.

Further, for green innovations, students are engaged through enquiry, and learning is personalised with the goal of unlocking the passion of the learner. Students feel psychologically supported by teachers who are trained to focus on the personal experience of the individual student and to help uncover values and motivations.

Red rated innovations may employ a pedagogy that lacks innovation and often relies on the traditional rote method of 'tell and test' or 'experience and evoke'. In other cases of poor pedagogy, we have found that a theory of learning or a consistent standard of teaching is absent, difficult to detect and sometimes totally incoherent.

In these cases, pedagogy is weak and it is not clear how technology can assist and accelerate learning. There is a tension between the student and teacher based on misaligned incentives and teaching style. Teachers, or the implementers, are teaching using a method that works for them and is without evidence base. Students are taught 'to'; curriculum and school design are imposed; and students feel unsupported by the school and/or teacher.

This 'teaching and learning' subcomponent is clearly one of the most important areas – and the one in which innovations are either successful or completely fail. Often the pedagogy simply isn't focused on or researched; too many evaluations focus on the technology. We need, instead, to be explicit about and to assess the theory of learning employed.

Quality of assessment platform

The third pedagogy subcomponent is the quality of the assessment platform. Both summative and formative assessments are vital for engagement, learning and progression. Here we ask the following questions: What is the quality of the built–in assessment systems? Is it adaptive? Does it include an optimal amount of detail? Is it clear how the outcomes will be measured? How does the teacher use the assessment system to motivate and activate the learner? How does the student use the assessment system to monitor and motivate his or her own learning?

To achieve a green, the assessment platform should be adaptive and integrated. Ideally, the system is completely adaptive, interactive and integrated seamlessly into the innovation. It must be rigorous and accurate and be integral to learner engagement. The assessment results should leverage the techniques of big data analysis, data visualisation and international benchmarking of standards. In some of the best cases, the student is unaware of being assessed. We've seen best practice models of these systems in terms of situation simulator games and first generation models such as Khan Academy's learner progression to badge.

Top assessment systems will continuously reinforce learner engagement. In *The Progress Principle,* Teresa Amabile and Steven Kramer show the power of positive progress loops. They write that small wins on a daily basis produce a meaningful increase in positive emotions and internal motivation. This is true for both learners and teachers. The best innovations should embed these loops into the digital technology itself and the way it is used by teachers.

Assessments that provide questions, collect responses and then feedback their correctness to the learner are solid traditional models. However, the next generation of assessments will likely focus on activities which result in a product or performance. In this model, the assessment system should be able to identify features of student behaviour and make observations on it, not in terms of binary correctness, but in the form of useful information on the ways in which the learner has engaged with the activity.

Green assessment platforms should collect dramatically large and ubiquitous samples of data across users. This data collection should be built into daily activity and used to drive and inform improvements in the innovation. The analysis of the data into useable, actionable outputs is critical. Additionally, to ensure continuity at the level of the individual student, assessments should start with access to the learner's previous history and data and not be ignorant of previous activity.

Best in class innovations cover both formative and summative assessments; and the assessment system should show each stakeholder (student, teacher and parent) an optimal level of detail and an analysis of performance in real time.

We also know that data and performance feedback only has impact to the extent and ability with which it is used. Top rated innovations have mechanisms, or a process, for the teacher to use the assessment system to motivate the learner. The system should guide the learner to experience incremental daily accomplishments and stimulate a sense of progress while also appropriately targeting other areas for further refinement.

Innovations that receive a red often lack an assessment system altogether. If there is an assessment system in place, it may be unclear, lack robustness or be misleading. In poor assessments, only crude outputs are measured. Teachers who use the assessment system do not properly interpret the results or merely use it as a simplistic way of grading students.

In red rated innovations, students do not have access to assessment results and are unable to monitor their own progress. Additionally, poor assessment systems include instances when assessment is used only to monitor a few broad indicators – and when teachers 'teach to the test'.

SYSTEM CHANGE

The digital swamp is full of innovative ideas and products that have outcomes in a limited environment. However, we have yet to see true transformation at scale. In this section we examine the necessary criteria for an innovation to produce a whole system revolution.

Implementation support

Schools and education systems are frequently bombarded with new strategies and tools but the key to stickiness is not just the design of the innovation, it is the process of being embedded in the learning environment and the learning day. As whole system reform experts repeat endlessly, strategy and product design gets you 10 per cent of the way and the remaining 90 per cent is implementation.

For the implementation support subcategory we use the following questions: What is the nature of the implementation support provided? What support is provided for technology functions and what parts are included? Is it inclusive of software, hardware, maintenance, electricity and connectivity? For how long is the implementation support or servicing in place for? Does the innovation include teacher training and professional development? Are teacher development goals explicit? Is there appropriate follow–up and mentoring? Is the support based on a culture of learning, risk–taking and learning from mistakes?

In green cases, the innovative product or service incudes full implementation support that acts in constant partnership and dialogue with the school system, teachers and students. The technology support is timely and effective on all aspects: software, hardware, maintenance, electricity and connectivity. Often schools will need physical infrastructure upgrades, additional server capacity and basic software assistance. The more comprehensive the implementation support and the more viral and intuitive the use of the innovation is, the more likely it will be successfully sticky.

Best in class innovations include a continuous professional learning component for teachers to ensure the change is embedded in the learning day and that the activity of the teacher reinforces the innovation and produces the desired outcomes. Collective learning among teachers and across schools is an especially powerful indicator. The innovation should exemplify teachers as vital change agents integral to the success of the student, and show why the professional development is a necessary investment in their career development and success.

Professional development focuses on the teacher learning how to assess the impact he or she has on every student; how to provide feedback that assists students' progress; and how to master the motivation of students. Professional development is constantly monitored and refined on an as needed basis. The focus of the professional development should be on capacity building through rapid learning cycles, fast feedback, continual reflection and good coaching, particularly as it directly relates to the innovation.

Poor implementation support can cause an innovation to crumble. A red rating is appropriate when an innovation is dropped into the school without support or when implementation is left up to the teachers, schools and school system to figure out on their own. Sometimes there is a lack of focus on implementation because it is assumed the design of the product is intuitive and doesn't require training; and sometimes it is because pressure on funding causes procurement personnel to drop implementation related line items in an attempt to reduce costs. Other times the innovation may be one among a variety of innovations that come and go in a sea of what some people call the 'disease of initiativitis.'

Professional development involving teams or groups of teachers – what Hargreaves and Fullan have called 'professional capital' – is especially critical. Professional capital is a function of three components in interaction: human capital (qualifications of individuals), social capital (the quality of the group in action) and decisional capital (the quality of personalised decisions being made by individual teachers and teams).

To summarise, there are two areas of support required: one is technical; the other is pedagogical. There is a real issue of efficacy when there is no technology support or the support is lacking coordination, timeliness and reliability. We have been to many schools that are not equipped with the necessary (and in many cases simple and inexpensive) physical infrastructures to support technology. This often leads to unused materials and wasted class time as teachers scramble to download files properly and handle uncharged devices.

On pedagogy, study after study has concluded that the impact of digital technology has been stifled when there is no emphasis on the pedagogy of the application of technology as used in the classroom. This phenomenon has been recently documented by Steven Higgins et al. in a large meta-analytical study on digital learning. When teachers are not taught how to use an innovation, how to adapt to the model, and provided with on-going support, they revert to their traditional behaviours and practices. And, if professional development is stacked at initial launch, it risks neglecting the need for continuous reinforcement and upgrading. Professional development must address both technical and pedagogical knowledge and skills; and, as we have stressed, this must be a collective endeavour.

Value for money

For digital innovations to be systemically embedded they must be able to demonstrate a keen sense of value for money, particularly given the increasing budget constraints of large public education systems. Schools and systems are under tremendous pressure to manage and even reduce costs. The product must be priced at a point the system can afford for the demonstrated value of learning it brings. There is a distinct possibility that digital innovations in the immediate future may be cheaper, deeper, easier and faster; that is, they may accelerate learning at a much less expensive cost.

To evaluate value for money we asked the following questions: Are there overall school cost savings realised by the innovation? Is the product of sufficient value, demonstrated by learning outcomes, to justify change? How expensive is the product or design change itself? Are there hidden costs such as infrastructure upgrades? Does the product accelerate quality learning?

For an innovation to receive a green rating for this subcategory, from a school perspective, the innovation should, for example, be able to produce twice the learning outcome for half the cost of previous methods. This four times benchmark may in fact lack ambition. Perhaps we should expect more. The school and learner are significantly better off with the innovation and would actively choose to allocate scarce resources towards its purchase.

For an innovation to receive a red rating, the innovation would add excess cost to the learner and the school without proving real value. As the value in learning is not demonstrable, it is difficult to tell how the learner will be positively impacted by the innovation. The innovation would receive a red if the consumer – and perhaps end learner – would not allocate resources to purchase the innovation. Many of the innovations that have been heavily subsidised could also be more on the amber side as it is unclear whether they are truly scalable or sustainable outside of their pilots and without the large-scale support of philanthropy dollars. For example, School of One has received $70 million from New York City to develop its unique playlist system to match students' needs with appropriate digital modules. Unless this system can be scaled without too much adaptation, it is unlikely to be a financially viable option for most schools.

Whole system change potential

The last and perhaps most difficult subcategory, is whole system change potential. Here we start with the notion of 'simplexity' – or that a small number of key factors must be embedded within large groups of people. As described in *Stratosphere,* for effective whole system change there must be four elements:

- Motivation for people to engage in change.
- Continuous learning from failure and wrong paths.

- Ability to leverage and learn with the collective group.
- Emphasis on the very large scale.

Within this area we ask the following questions: Does this innovation have the ability to scale system–wide? Is the scaling plan based on world–leading change knowledge? Will clusters of schools learn from each other? Will teachers learn from each other? Is capacity building a central component of the strategy? Are innovations developed and scaled in laterally?

In the best cases, the innovation scales virally to schools throughout the system. The change and product design is so absorbing, so automatically useful and so easily embedded that it spreads like wildfire. For green rated innovations there is little central management support necessary to ensure innovation is maintained. In fact, clusters of schools learn from each other and continue to build and improve with the innovative product/service – the type of behaviour we have seen during the Ontario school system reform.

Another example, documented by Santiago Rincón–Gallardo and Richard Elmore, is the Learning Community Project in Mexico that used social movement theory to bring educational change to thousands of schools as a social change. Using a system of training and supporting tutors, the strategy spread from 30 schools to 6,000 over a period of eight years, with results to match. Literacy rates for the affected schools increased significantly relative to its comparators. This strategy provides a best–in–class example of changing the teacher–student dynamic in going to scale in a low–cost effective manner. Moreover, the strategy did not use technology – the point being that even greater, faster, less expensive results could be obtained with the judicious integration of technology.

In short, green innovation implementation teams have a robust understanding of 'simplexity' (small number of key components which are deeply integrated) and stick to their priorities as they strive for scale.

For a red rating, the innovation is difficult to scale throughout the system. There is burdensome management; systems are necessary to maintain, scale and embed the innovation. Innovation is directed entirely top down; schools are directed how to learn new developments. Similarly, when the innovation is expected to grow bottom up and the system struggles to adapt; that could be a cause for a red judgement.

Another example of poor system change behaviour is when feedback from other schools is not considered or used. Similarly, if the innovation causes the district and/or school system to be overburdened with too many priorities and it becomes distracted away from core goals; that would be cause for a red rating.

When all three subcategories in system change are examined together – implementation support; value for money; and system change potential – they provide a comprehensive, critical means for us to evaluate. Implementation support is vital for effective change to be embedded in the school or learning delivery system; value for money is critical for the innovation to be widely adopted; and whole system change potential, in concert, leads us to a critical judgement on whether the systemic linkages between schools and the system management will be improved as a result of the implementation.

Finally, we must stress that the changes we are describing represent a fundamental shift in the culture of schooling on almost every dimension imaginable: the roles of students, teachers and administrators; the culture of the school in terms of collaborative learning; the culture of the district and the larger infrastructure, with much greater vertical and horizontal permeability; the relationships to parents, the community and business, and so on.

TECHNOLOGY

The last category delves into the underlying technology and product model design. We believe that technology acts as the enabler in an innovation to make learning quicker, clearer, faster and better. These categories help us get closer to the way the end learner interacts with the product.

Quality of user experience/model design

The first subcategory is the quality of user experience/model design. To evaluate this area we ask the following questions: How is the technology experience for the end user? Is it easy to use and intuitive? Is it irresistibly engaging and elegantly efficient? Does the technology incorporate latest design principles for user experience or does it look dated?

On the green side of the spectrum, the technology should be absolutely irresistibly engaging for the learner. The interface should be well designed, using the most current formatting and based on data–analysis of learner needs and studies of learner effectiveness. The learner should have little difficulty learning various functions as the tools are intuitive and questions are answered in an easily navigable 'help' menu or section.

In the best innovations, digital tools are participatory, engaging, co–creative, and collaborative. The innovation might also contain some gameification elements that immerse the learner and maintain his/her interest. In an ideal world, these would be linked to the assessment system we described in the pedagogy section. The content of the system should be accurate, engaging and tailored to learning outcomes. Digital learning tools, if designed effectively, can powerfully promote deeper learning by expanding access and options and personalising skill building.

On the red side, the technology lacks engagement for the learner. The user experience and design elements feel heavily dated. In the worst cases there are frequent stop points, downloads and interruptions. The learner and user cannot find the applications and tools easily. The modules feel clunky and not fully integrated.

Ease of adaptation

The second subcategory in technology is ease of adaptation. This classification addresses the ease and speed of updating, modifying and customising the innovation. To evaluate the criteria area we use the following questions: Is the technology adaptable? Is it highly connective? Can the technology be accessed on any device? Can it be accessed any time?

Innovations receiving a green rating in this category will have technology that is connected to high–speed Internet, allowing for real time adaptation of the programme to the learner. Green innovations might also have built–in access to the resources of the global Internet, when appropriate. Users should only need to enter security information once and be able to access information on the cloud 24/7 from any device. Students should be able to access the platform or content wherever and whenever they want.

On the red side, the technology is disconnected from the Internet and is unable to be adapted in real time. There is little to no communication between devices, terminals and users. In worse case examples, access to resources is limited to that immediately within the programme and there is minimal connectivity to resources in the broader community.

Comprehensiveness and integration

The third and last subcategory in technology is comprehensiveness and integration. For the technology to be effective in the classroom, it needs to be integrated into all relevant aspects of the learning environment and learning day. To evaluate this area, we asked the following questions: Is the technology integrated and seamless? Is the content comprehensive? Is the assessment system integrated into the pedagogy and curriculum? Is 24/7 access and learning enabled?

A key indicator of integration is whether the technology department or unit and the curriculum and instruction units at the district or state level are 'siloed' or interrelated. We have found that in the green examples of system integration (and this is the trend) techies are becoming increasingly interested in pedagogy and teachers are increasingly interested in technology. Red examples occur when the technology departments operate as separate islands of expertise. Green examples exist when both technologists and pedagogues see themselves and each other engaged in mutual and collective learning. The same could be said about students: they learn from technology specialists as well as teachers; and they (the students) sometimes teach the experts.

For world–class, green innovations, all elements of the technology, pedagogy and system change knowledge are integrated. Teachers should understand how the technology functions; know how to use it as a tool to engage and enhance student learning; and feel confident they can integrate it into the classroom. The system should seamlessly integrate the innovation as the teacher is seen as essential; the product is irresistible; and on–going capacity building ensures the changes happen by contagion.

The innovation is technologically ubiquitous and every learner has equal access and opportunity. The technology is embedded in the school day and enables teacher interactions with the students. In green cases, as mentioned in the pedagogy section, there should be an integrated assessment system that monitors progress and provides rewards and excitement. The technology should contain comprehensive sets of materials and supporting learning mechanisms.

In red examples the elements of technology and pedagogy do not complement each other and there is often friction. Users must frequently log into separate systems and terminals that do not interact. In red rated innovations, the technology is crudely added into the school day and teachers individually adapt to the technology using their own techniques. Content and assessment is split and often not aligned.

In the technology category, we analyse and sum up the quality, consistency and adaptability of the innovation and make a categorical judgement of roughly where on the spectrum the innovation falls.

Overall, there is considerable interdependence and richness that occurs between and among the three categories. When making categorical judgements, it is important to keep in mind the relationship between the three areas and to avoid duplication, either positively or negatively. We suspect many of the most insightful judgements will come from observations about the strengths and weaknesses of the linkages between model points.

3 INITIAL LEARNINGS AND FINDINGS

We have initially applied the Index to a group of 12 recent innovations to get a flavour of the emerging strengths and weaknesses in the field as well as what gaps exist for further refinement of the Index. One apparent trend is that many of the innovations are weak on pedagogy and implementation support and that two groups of innovations, divided by their primary delivery mechanisms – namely, school–based vs. technology–enabled – had different strengths and challenges.

Our first emerging observation is that both pedagogy and implementation/system criteria are a consistent and reliable challenge across most innovations. In other words, they are the weakest part of the triangle of technology, pedagogy and system support. Entrepreneurs find it more exciting and absorbing to design and build digital innovations than to grapple with a new pedagogy, not to mention the daunting task of addressing systemness policies and support for implementation. The 'New Pedagogy', as we have defined it, consists of a new learning partnership between and among students and teachers with teachers as change agents and students in charge of their own learning.

We have also observed that much work remains to be done to delve into the meaning of the new pedagogies. We suggest that this will mean:

I. Clarifying the learning goals, especially related to 'deep' learning.

II. Being precise about the pedagogy that will deepen learning in relation to these goals.

III. Seeing how technology may accelerate the learning.

IV. Using assessments of the learning to inform improvements and to provide evidence of efficacy.

Even the tasks in this list do not address the systemness component. We and our colleagues have developed a good deal of knowledge in the system domain and suggest here that the next phase of digital innovation development must address how the integration of learning and technology can occur across the system – in regular schools, so to speak. Barber, Donnelly, and Rizvi's work on *Oceans of Innovation* points to the need for systems to simultaneously engage in continuous improvement and systemic innovation. In the meantime there is an enormous 'system gap', regardless of the source of innovations.

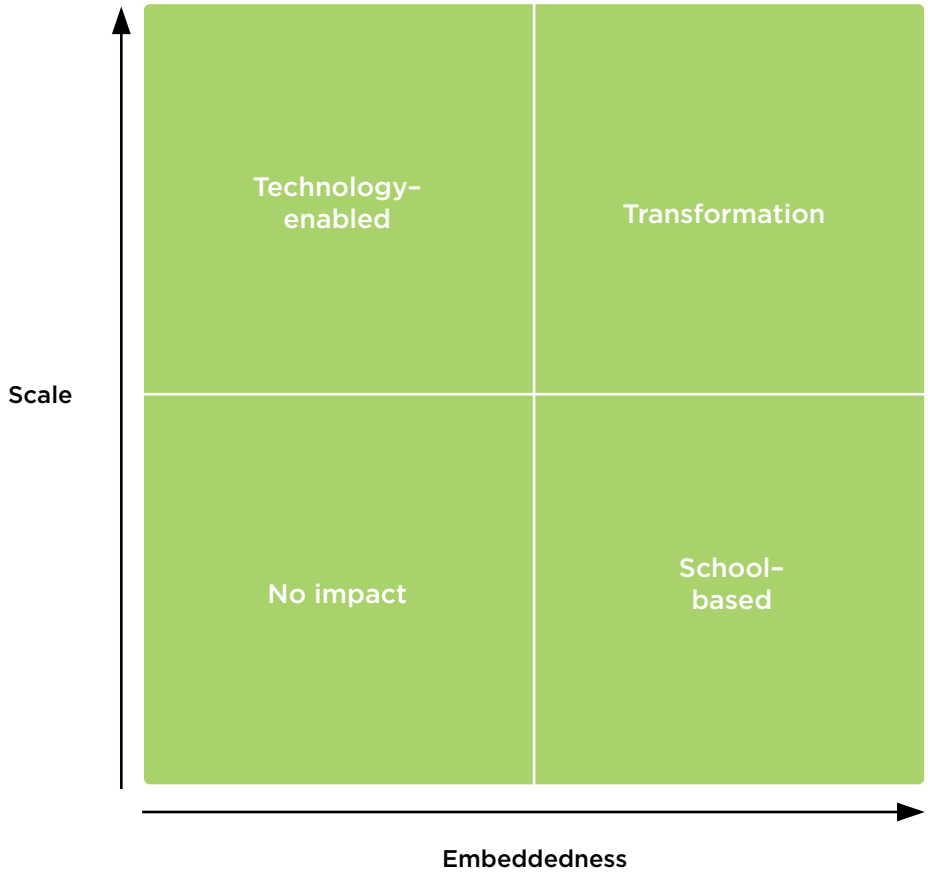
In this report we found that breaking out the innovation by primary mode of transmission, school-based or technology–enabled, was helpful to illuminate the complexity of the system change challenge. School–based innovations are often transformative, whole school design models that reconceptualise the entire learning environment and learning day, for example, School of One, Rocketship and Carpe Diem School. In each example, the school day, the role of the teacher, the use of technology and the method of pedagogy have been rethought completely. School–based innovations often have a highly technical component, for example, School of One's learning 'playlist' which creates a learning schedule for each student on a daily basis, taking into account a student's mastery of the material, the available resources to deliver learning and a student's learning preferences. School–based

innovations are often confined to a few select schools that are run entirely within the same management structure, like Rocketship.

The other category is technology–enabled innovations, usually distributed via the Internet or through proprietary software. These innovations include technology tools such as learning management platforms, online adaptive learning paths, video lecture sets, school data management software and a connected social network for sharing ideas. Khan Academy, LearnZillion and Edmodo are notable in this category. Technology innovations often master one specific aspect of learning or the school (e.g., 3–6 grade maths curriculum, after school study help, digital take-home reading materials, or student behaviour management).

While both the school–based and technology–enabled innovations are potentially powerful, neither has shown the ability to embed into all, or even most, aspects of a school and to spread across all schools. But this is what is needed to truly change the whole system. We believe the diagram below helps clarify what we mean. The horizontal axis represents the degree of embeddedness, or the extent to which the digital innovation is fully implemented and effectively absorbed by teachers and students. It shows how embedded the intervention is in all the elements of learning – assessments, content, curriculum, communication tools, collaboration spaces, report cards, teacher development and learning platforms. The vertical axis is the representation of scale – or the impact of the innovation on the number of schools and students.

Figure 5: **Innovation system gaps**



Source: Barber and Donnelly

More often than not, with school-based digital innovations, the problem is scale. Schools are accountable for student outcomes; they can often control the basic infrastructure and the professional development of their teachers. However, systemic change is a big challenge. How does one school scale to five schools and, most importantly, how does it scale to 500 or 5,000? We have yet to come across a strong example of a technologically related school-based innovation that has scaled beyond an initial pilot with much success.

Scale across schools is usually a strong suit for technology-based innovations as tools are often open and accessible on the Internet. Teachers looking for solutions pick up the tools and use them in their classrooms and recommend them to colleagues so they gain early traction. However, there is an open question about drop-off rates. Several of these innovations, namely Khan Academy and LearnZillion, have begun class-based implementations but these trials are still early stage. The iterative improvement and implementation process is just beginning and thus difficult to evaluate.

Technology–enabled innovations have a different problem, mainly pedagogy and outcomes. Many of the innovations, particularly those that provide online content and learning materials, use basic pedagogy – most often in the form of introducing concepts by video instruction and following up with a series of progression exercises and tests. Other digital innovations are simply tools that allow teachers to do the same age-old practices but in a digital format. Examples include blog entries instead of written journals and worksheets in online form. While these innovations may be an incremental improvement such that there is less cost, minor classroom efficiency and general modernisation, they do not, by themselves, change the pedagogical practice of the teachers or the schools.

These early technology–enabled innovations are usually not directly accountable for student learning outcomes. They often cannot quantify the impact of their products and it is uncertain to know, for sure, the impact they are having at the classroom level. Edmodo is a good example of highly scalable technology but with less evidence of efficacy. The platform has achieved tremendous scale with 17 million users by February 2013 but it lacks access to student performance data, so measuring impact on learning is nearly impossible.

4 NAVIGATING THE SWAMP

New digital creatures are being born every day so the swamp is teeming with life. We suggest six ideas for navigating the swamp.

Recommendation one: **Use our Index**

There are only three main components and nine subcomponents in total. You can thus readily size up the situation. In short, work to maximise the integration of technology, pedagogy, and systemness.

Recommendation two: **Lead with pedagogy**

Work on clarifying the relative roles of teachers and students. Define the pedagogical partnership. Work on clarity and precision of the roles and the evidence relative to impact on learning. Put pedagogy in the driver's seat and use technology to accelerate learning relative to particular learning outcomes.

Recommendation three: **Develop capacity with respect to system support**

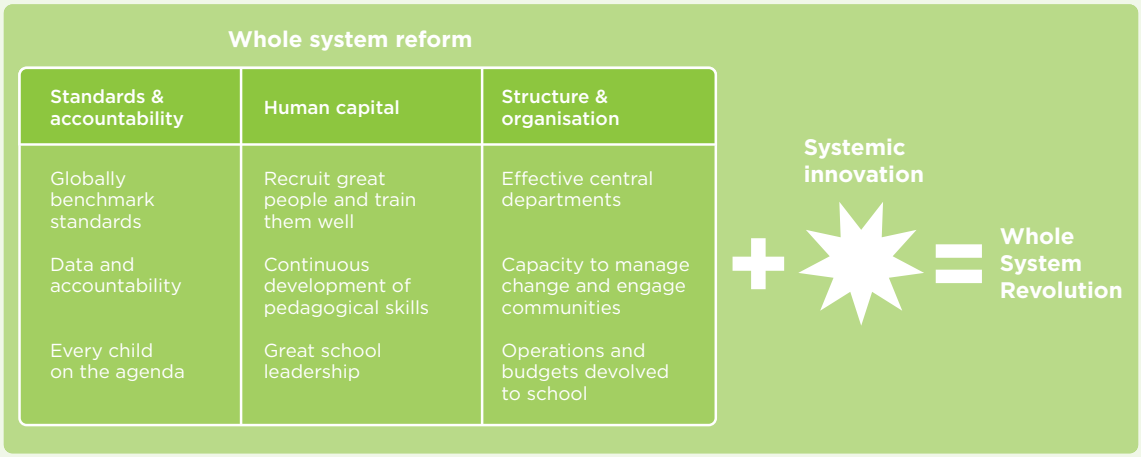
This includes implementation assistance, leadership (especially at the school level) and assessment and use of evidence on student learning. Ensure the support is comprehensive, integrated and relentless.

Recommendation four: **Focus on scale and embeddedness**

There are plenty of boutique schools and countless 'learning' apps and web-based tutorial videos. Don't get distracted by shiny, seemingly glamorous gadgets. Spend time and resources on the innovations that will be truly system transformative.

Recommendation five: **Be open to surprises**

The innovation field is dynamic. We are at the beginning of a stage of disruptive innovations where new ideas are being spawned almost daily. Therefore, treat the next period as a cycle of continuous improvement where one needs to simultaneously focus on quality implementation and openness to new ideas. Take a portfolio approach to innovation; allow for failure. As Barber, Donnelly, Rizvi point out, whole system reform plus systemic innovation can unleash the whole system revolution.



Source: Barber, Donnelly and Rizvi (2013)

Recommendation six: **Clarify what it means to be a learner in the 21st Century**

Be specific. Two examples of succinct, powerful and overlapping formulae come from Barber, and from Marc Prensky (personal communication). Michael Barber offers the following mathematical equation:

Well–educated= E(K+T+L)

Similarly Prensky offers:

e**TARA** :

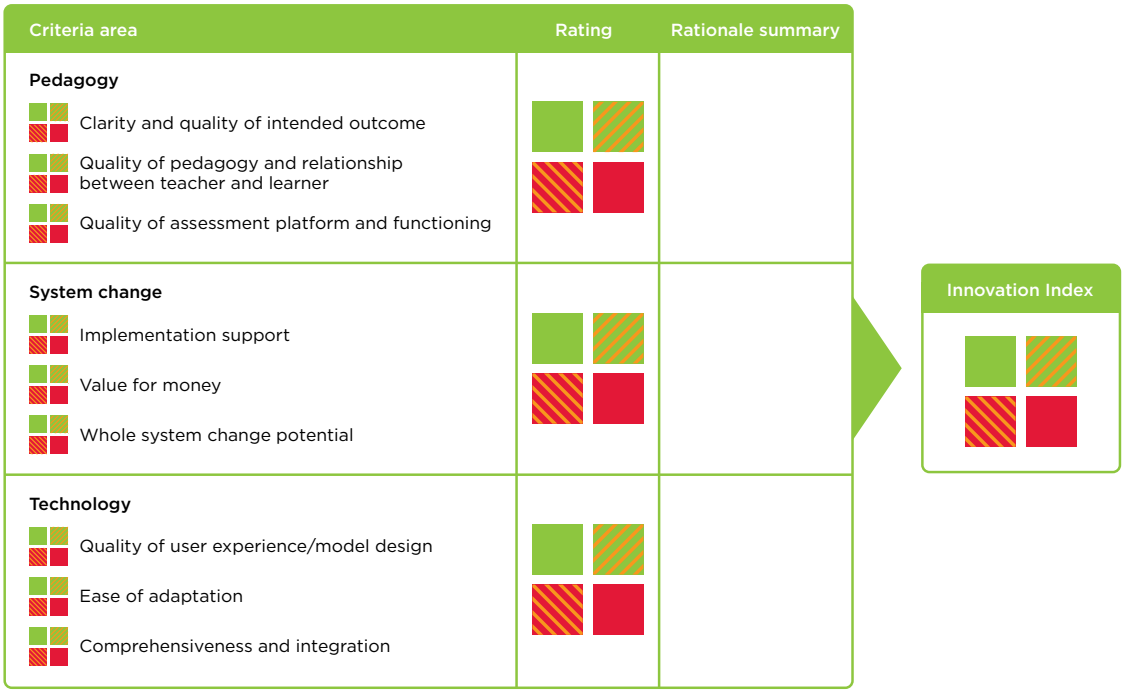
Effective **Thinking** : Effective **Action** : Effective **Relationships** : Effective **Accomplishment**

Note in both cases the powerful conciseness, the emphasis on action and the necessity of leadership on the part of all educated citizens. Leadership is becoming a feature of all educated people for the future.

In sum, the swamp is not all that complicated. We don't need a thesaurus of 21st century skills. We need a core sense of what it means to be educated and we need to steer our way through the learning swamp as we go. We need constant monitoring and a focus on driving outcomes for learners and focus on implementation. Keep it simple, keep it focused and keep learning. We do believe that 2013 signals an explosion of innovation in digital learning. Our intention has been to provide a tool to size up the possibilities in order to help people navigate the swamp.

APPENDIX A:
WHAT GREEN AND RED LOOK LIKE

Score card: Innovation Index



- **GREEN: Good –** likely to succeed and produce transformative outcomes
- **AMBER GREEN: Mixed –** some aspects are solid; a few aspects are lacking full potential
- **AMBER RED: Problematic –** requires substantial attention; some portions are gaps and need improvement
- **RED: Off track –** unlikely to succeed

Index criteria – Pedagogy (1/3)

Clarity and quality of learning outcome goals

Definition	What green looks like	What red looks like
• How clearly are the learning outcomes of the innovation defined? • Are the learning outcomes explicit and defined for the school, the student, the parents and school system? • Is the clarity of outcome shared by student, teacher, parent, school and school system?	Each activity, overall lesson and broader course has clear, quantified outcomes. The innovation is able to demonstrate strong benefits for customers and/or students. The learning outcomes are communicated effectively within the school and to parents, teachers and students. Trajectories are produced for key outcomes. Where possible, modelling is used to quantify the impact on key national indicators of student attainment. The student and the teacher are both clear about the success criteria in relation to their learning outcomes. (Best practice in Ontario).	Exercises and modules do not have specific outcomes identified. Outcomes identified lack specificity. There is insufficient linkage to key leading indicators and a lack of clear trajectories. School staff are unaware of the impact of the innovation and the benefits to students. There is no tracking or monitoring system to ensure learning is taking place and adaptations are made.

Index criteria – Pedagogy (2/3)

Pedagogy		
Definition	**What green looks like**	**What red looks like**
• How refined is the pedagogical underpinning? Does the pedagogy reflect the latest global research, including the emphasis on constructivism and real–world examples? • Do students learn through enquiry? • Is there a mechanism to ensure the pedagogy is updated? • How is the teacher's role defined? Is the role reflective of a 'teacher as activator' relationship? Can teachers effectively manage all the students? • How is the student engaged? Is there a student–teacher partnership? Does the model include an emphasis on the necessary psychological and intellectual processes?	Pedagogy reflects the most advanced and proven techniques to date. The theory of learning is stated explicitly in both the technology, model design and training of teachers. The model includes a view of the teacher as a change agent. Problems and questions are placed in real–world contexts and the emphasis is on intellectual risk–taking and trial –and–error problem solving. There is a healthy partnership between the student and teacher. The teacher's role is defined as activator of learning and centred on the learner. Teachers are open to alternatives, seek evidence and are adaptable when new evidence is raised. Students are engaged through enquiry, learning is personalised and directed at unlocking the passion of the learner. Students feel supported by the teacher. Learners are supported psychologically and teachers are trained to focus on the personal experience of the individual student and to help uncover values and motivations.	Pedagogy lacks innovation and current thinking and is often the traditional rote method of 'tell and test' or 'experience and evoke'. Theory of learning is difficult to detect and incoherent. Pedagogy is not consistent across technology, teachers and school model. There is a tension between the student and teacher based on misaligned incentives and teaching style. Teachers are set on teaching using a method that works for them and is without evidence base. Students are taught to. Curriculum and school design are imposed. Students feel unsupported by school or teacher.

Index criteria – Pedagogy (3/3)

Quality of assesment platform		
Definition	**What green looks like**	**What red looks like**
• What is the quality of the built-in assessment systems? Is it adaptive? Does it include an optimal amount of detail? • Is it clear how the outcomes will be measured? • How does the teacher use the assessment system to motivate and activate the learner? • How does the student use the assessment system to monitor and motivate his or her own learning?	The assessment system is completely adaptive, interactive and integrated seamlessly into the innovation. In some best cases, the student does not realise they are being assessed. Both formative and summative assessments are in place. Assessment shows every stakeholder an optimal level of detail (students, teachers and parents). Assessments measure student activity and behaviour, not just outputs. The assessment system is integral to learner engagement and their sense of engagement. The teacher uses the assessment system to motivate the learner, helping them feel small daily accomplishments while also appropriately targeting areas for further refinement.	Measurement of success is unclear or non-existent. The assessment system is not robust and, in some circumstances, misleading. Teachers use the assessment system as a simplistic way of grading students and do not integrate the results into student learning. Students do not have access to the results and are unable to monitor progress. The system focuses only on rigid outputs and teachers teach to the test.

Index criteria – System change (1/3)

Implementation support		
Definition	**What green looks like**	**What red looks like**
• What is the nature of the implementation support provided? • What support is provided to ensure the technology functions (all parts including software, hardware, maintenance, electricity and connectivity)? • How long is the implementation support or servicing in place for? • Is the support based on a culture of learning, risk-taking and learning from mistakes? • Does the innovation include teacher training and professional development? Are teacher development goals explicit? Is there appropriate follow-up and mentoring?	The innovation service/ product team provides full implementation support that acts in constant partnership and dialogue with the school system. Technology support is timely and effective on all aspects. The innovation includes professional development to ensure the change is embedded in the teaching force. The innovation sees teachers as vital change agents and integral to the success of the innovation. Professional development focuses on the teacher learning to know the impact he or she has on every student; to provide feedback that assists students to progress; and to master the motivation of students. Teachers understand that the training is a necessary investment in their career development and success. Professional development is constantly monitored and added on an as-needed basis. Focus is on capacity building through rapid learning cycles, fast feedback, continual reflection and good coaching.	The innovation is dropped into the school and implementation is up to the school system to figure out. There is no technology support, or the support is lacking timeliness and reliability. There is limited to no professional development for teachers. Teachers are unsure of their goals. Students and teachers do not understand the model and have no forum to ask questions. There are too many programmes and innovations being implemented at once.

Index criteria – System change (2/3)

Value for money		
Definition	**What green looks like**	**What red looks like**
• Are there overall school cost savings realised by the innovation? • Is the product of sufficient value, demonstrated by learning outcomes, to justify change? • How expensive is the product or design change itself? • Are there hidden costs such as infrastructure upgrades? • Does the product accelerate learning?	From a school perspective, the innovation produces twice the learning outcome for half the cost, or more, of previous methods. The school and learner are significantly better off with the innovation and would actively choose to allocate scarce resources towards its purchase.	The innovation adds excess cost to the learner and the school. The value in learning is not demonstrable and it is difficult to tell how the learner will be positively impacted by the innovation. The end consumer of the innovation would not allocate resources to purchase the innovation. There are hidden implementation and upgrade costs.

Index criteria – System change (3/3)

Whole system change potential		
Definition	**What green looks like**	**What red looks like**
• Does this innovation have the ability to scale system–wide? • How does the innovation implement in the whole system? Is there a plan for scale based on world–leading change knowledge? • Will clusters of schools learn from each other? Are developments developed and scaled in laterally? • Is capacity building a central component of the strategy? • Are teachers and schools learning together?	The innovation scales virally to schools throughout the system. Little central management is necessary to ensure innovation is embedded and maintained. Clusters of schools learn from each other and continue to build and improve with the innovative product/service. New developments in the innovative product/service are made collectively and the learning is done collaboratively. The innovation implementation team has a robust understanding of 'simplexcity' and sticks to its priorities as it strives for scale.	The innovation is difficult to scale throughout the system. Burdensome management systems are necessary to maintain, scale and embed the innovation. Innovation is directed entirely top down; schools are directed how to learn new developments. Feedback from other schools is not considered or used. The district and school system is overburdened with too many priorities and distracted away from core goals.

Index criteria – Technology (1/3)

Quality of user experience and model design		
Definition	**What green looks like**	**What red looks like**
• How is the technology for the user? Is it easy to use and intuitive? Is it irresistibly engaging and elegantly efficient? • Does the technology incorporate latest design principles for user experience?	The technology is irresistibly engaging for the learner. The interface is well–designed using the most current formatting and based on data–analysis of learner needs and effectiveness. The learner has little difficulty learning different functions as the tools are intuitive and questions are answered in an easily navigable help section. Digital tools are participatory, engaging, co–creative and collaborative. The innovation contains gameification elements that capture a sense of engagement and maintain student's interest (linked to assessment system).	The technology lacks engagement for the learner. The user experience feels heavily dated and there are frequent stop points, downloads and interruptions. The learner and user cannot find the applications and tools easily. The modules feel clunky and not fully integrated.

Index criteria – Technology (2/3)

Ease of adaptation		
Definition	**What green looks like**	**What red looks like**
• Is the technology adaptable? Is it highly connective? • Can the technology be accessed on any device? Can it be accessed any time?	The technology is highly connected to the Internet, allowing for real time adaptation of the programme to the learner and access to the resources of the Internet when appropriate. Technology is easily assessable from any device; users only need to enter security information once; and information is stored on the cloud for 24/7 access.	The technology is disconnected from the Internet and is unable to be adapted in real time. There is little to no communication between devices, terminals, users. Access to resources is limited to that immediately within the programme.

Index criteria – Technology (3/3)

Comprehensiveness and integration		
Definition	**What green looks like**	**What red looks like**
• It the technology integrated and seamless? • Is the content comprehensive? • Is the assessment system integrated into the pedagogy and curriculum? • Is 24/7 access and learning enabled?	All elements of the technology, pedagogy and system change knowledge are integrated. Teachers feel very confident that they can integrate the technology into the classroom and understand how it functions. The innovation is technologically ubiquitous and every learner has equal access and opportunity. The technology is embedded in the school day and enables teacher interactions with the students. The technology contains a comprehensive set of materials and supporting learning mechanisms e.g., assessment. The assessment platform is seamlessly integrated into the technology and any content and curricula are personalised based on student performance.	The elements of technology and pedagogy do not complement each other and there is often friction. Users must frequently log into separate systems and terminals that do not interact. The technology is crudely added into the school day and teachers all adapt to the technology in their own way. The content and assessment is split separately and is often unaligned.

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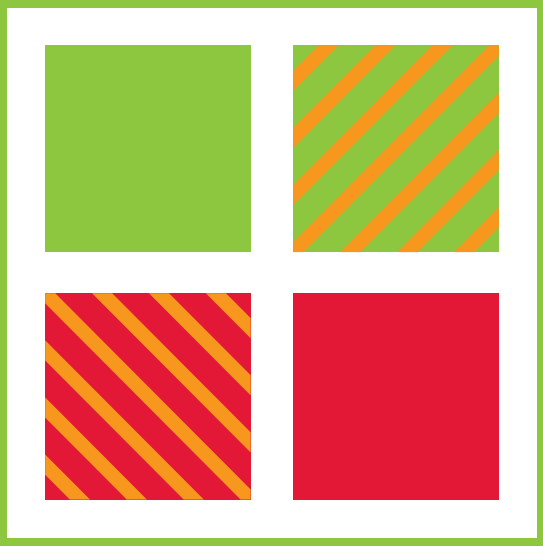

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