A Taxonomy of School Evolutionary Changes

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To Sue, who made so much of this book possible.

Suggested Citation

Lee, M and Broadie, R (2015) A Taxonomy of School Evolutionary Changes, Broulee Australia Retrieved (   ) from http:// www.digitalevolutionofschooling.net

Contents

Acknowledgements

Figures and Tables

Figures

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Chapter 1

Introduction

Wider societal and in particular technological changes are having a profound impact on the nature of schooling.

That impact is particularly evident in those schools that over the last 15/20 years rightly divined the immense educational opportunities opened by the World Wide Web and who have embarked on the journey to realise those opportunities.

Twenty years on those schools in different parts of the developed world have normalised the everyday use of the digital in school ecologies designed to provide an education in keeping with society's ever-rising expectations.

Their schooling stands in marked contrast with most of the world's other schools.

Schools that have normalised the use of the digital are experiencing a mode of schooling not only fundamentally different to the old in so many ways, and in so much of its thinking and effectiveness, but vitally is of a form that positions the schools to continue evolving at a pace consonant with technological change and with society's ever-rising expectations.

While the young of the developed world, their parents and society in general have long normalised the use of the digital the vast majority of schools lag well behind society's current usage with most not only still operating within the traditional paper based paradigm but daily falling ever further behind the pathfinders and society.

That said there are across the world later adopter schools that have, some time after the pathfinders, also recognised the educational imperative of providing a schooling for the digital and networked world. While still some

way behind the early adopters have made considerable progress in closing that gap.

The reality is that schools across the world sit at different points along a continuum, an evolutionary continuum that will continue to grow ever longer and where the gap between the schooling at each ends will widen.

Governments in most instances still like to project the image that all of 'its' schools are basically the same.

Globally schools, education authorities and governments also perpetuate the perception that the basic form of the school is somehow immutable and unchanging, and that all that is required to a school's effectiveness and relevance is some simple tinkering with the existing structure. Daily one reads of the latest simplistic 'silver bullet' fix mooted by the governments of the world.

Governments globally moreover invariably project an inflated belief in their ability to shape schools as they wish, as if they were working with a blank canvas. Many seemingly imagine that with a simple change in policy or a new piece of legislation schools will overnight transform their whole workings to meet their dictates and all will be changed by the next election.

They forget that even small schools are highly complex human organisations, each with its own ecology and culture all strongly impacted by the wider societal and technological developments and expectations. At best those in the schools can only ever hope to accommodate some of their government's aspirations while at the same time seeking to shape the megatrends at play.

Some governments most assuredly have not in most instances grasped the reality that when organisations go digital and networked – be they banks, travel agents, hospitals or schools – they undergo a pronounced ongoing organisational transformation - regardless of the government policy of the day - and vitally take on a life of their own, evolving at a pace largely consonant with the developments in the digital technology on which their operations are based.

They have seemingly yet to understand that in going digital the organisations move from a world of constancy and continuity and into one of ongoing, often rapid and uncertain change and evolution, where there is natural growth and evolution strongly impacted by external developments and that each organisation must shape its own future.

What is particularly telling and a strong indication of how little real impact governments have over the evolution of schools once they go digital is the content of this Taxonomy. What it reveals is that schools across the world, in

very different settings, with markedly different governments, in seemingly unique situations are all experiencing the same kind of evolution, moving through the same development stages, with each stage having remarkably common attributes.

Few in government or educational administration appear aware of these universal attributes and the associated implications let alone play a part in assisting the evolution.

The shaping has to come from within the organisation, the school itself.

There are strong signs that the traditional mode of school development in the world of constancy and continuity that saw

Figure 1.1 Traditional policy development
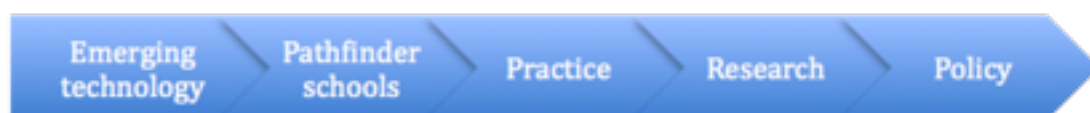
has been replaced when schools go digital by

Figure 1.2 De facto policy development.

The pathfinder schools are now in many respects the educational leaders, the de facto policy makers charting the ways for the later adopter schools, the policy makers and indeed government, rendering much of the traditional policy making and educational research irrelevant.

They are translating the emerging evermore sophisticated digital technology into classroom practice at such a pace that most educational researchers and educational administrators struggle to comprehend the significance of the development let alone shape it. When schools normalise the everyday use of the digital, as the pathfinder schools have, and the students are using their own suite of technology in class there is a very strong chance that the day a game changing piece of hardware, software or app is released it will have been acquired and used that day by one of the students. Virtually every student in the school will be using the latest updates of the applications software, Web 2.00 software and apps. For the pathfinder schools, their teachers and students, gone are the days of central ICT staff deciding which software they will support.

That is the world of the pathfinder school leaders and teachers.

In contrast the policy makers in their central offices will invariably still be working with dated technology tightly controlled by risk adverse network managers. It continues to amaze how much Windows XP and Vista is still used in those environments.

The traditional policy development processes for schools have passed their use-by date. It is vital the senior decision makers understand the new reality.

Top down, externally imposed change has largely been shaken off and disregarded by those schools that have gone digital, are moving at pace along the evolutionary path and which have a far greater understanding of the appropriate practice than most in the central offices.

Each school, albeit working within an evermore networked, interdependent world very much needs to shape its own ecology and future.

The pathfinders, and indeed the astute education authorities, have recognised this in their 15/20-year journey to their present situation.

Peter Drucker very astutely observed, " I never predict. I simply look out the window and see what is visible but not yet seen (Hesselbein and Goldsmith, 2009, p xi).

In researching the complementary publication to this taxonomy, *Digital Normalisation and School Transformation*, and examining the journeys of transformation and the change that has occurred in those schools that have or nearly have normalised the whole school community use of the digital, the

authors were struck by the remarkable similarity of the schools' evolution. It mattered not what country the school was within, whether it was a primary or secondary school, small or large, state, religious or independent, regional or urban or above or below the socio-economic norm.

Importantly, contrary to common belief, there was no discernible link between the resources provided in a school and its facility to achieve digital normalisation. Indeed if anything, the more affluent schools, that were not obliged to think out of the box appear more inclined to stay with the status quo. While greater research is needed a number of schools interviewed commented that their modicum of funding had prompted them to collaborate more closely with their homes and community.

Significantly all had addressed near on 50 common key variables in their journey, moved through the same evolutionary stages; and all had successfully addressed the key variables in a manner befitting their particular context.

The pathfinders often commented on the seeming chaos in their school, most not appreciating that schools across the developed world at the same evolutionary stage were experiencing the same kind of 'chaos'. Indeed it soon became apparent that those schools at the digital normalisation stage of their evolution had far more in common with other schools at that stage elsewhere in the world than often the school along the road.

It was soon evident we were looking at a pattern of school evolution and a suite of stage indicators that was being replicated at least in the UK, US, NZ and Australia and most likely the other developed English speaking nations: a pattern that not only could provide later adopter schools a vital insight into the evolutionary stage, where they were at and what they should bear in mind in shaping their evolution, but which also raised vital questions about how it has come about that such disparate schools were evolving in such a common manner.

The universality of the experiences, and the very real possibility that those schools are evolving naturally is something very new for educators to understand and work with. The same kind of development has been evident with the universal mores the young developed in their daily use of the Net (Tapscott, 1998). However the implications for schooling and governments are far greater.

Governments globally like to believe they are in full control of their very considerable investment in schooling. As indicated by the research their control of schools is at best limited.

If, as the authors believe, we are now witnessing an evolutionary development that has at least a significant self-growth component it behoves all to better to understand the development, its implications and what can be learnt from the application of complexity science to organisational evolution (Pascale, 1999).

It is imperative that those with considerably greater research resources than us and with a significantly greater interest in understanding the evolution occurring secure that better understanding.

In a world of political spin, technology corporation hype and instant fixes it is often forgotten how much time the visionary, highly proactive schools have taken to reach their current position. Surprisingly little consideration is given to the thought and effort they needed to expend over the years in shaping the suite of closely interrelated human and technological variables vital to achieving digital normalisation.

It is very easy to forget that all schools in a 15-20 year period will invariably have changes of leadership, an appreciable turnover of staff and will experience their ups and downs. That is the normal life of a school.

In commenting on the commonality of the attributes displayed by the schools that observation should not be construed as to suggest the evolutionary process is a neat linear progression with schools moving from A to B to C. Far from it. The evolution might well be two steps forward, one back and then a pause before moving forward again. The evolution might well be spotted with some school operations evolving at pace and others continuing as they have. That again is the reality of schooling.

In that kind of environment it may well rightly take years for your school to move as far along the evolutionary continuum as you desire, not months as some would have you believe.

School Evolutionary Continuum and Stages – In Context

The concepts of there being a school evolutionary continuum, with key stages within and the idea that most schools will need to move through each of the stages before they can evolve further are, as mentioned, novel.

While earlier writings with Professor Michael Gaffney (Lee and Gaffney, 2008), Dr. Arthur Winzenried (Lee and Winzenried, 2009), Professor Glenn Finger (Lee and Finger, 2010), Martin Levins (Lee and Levins, 2012) and Dr Lorrae Ward (2013) have all addressed the idea of there being a school evolutionary continuum with ever-evolving stages there has been little else published on the concept and most assuredly little mention of it is made in educational policy documents.

A quick Google search will reveal very little written on the evolution of schooling. While much has been written on organisational evolution in the management literature schooling has received scant attention.

The perception of constancy in schools is still very strong.

In many respects that is understandable. In 2014 all the indicators suggest most schools in the developed world are little different to those experienced by the parents or the teachers in their youth. While mention has been made of the very considerable spread of schools along the evolutionary continuum and the fundamentally different mode of schooling to be found in schools operating at the digital normalisation stage, those schools are still a relative rarity.

If one graphs the position of schools in the developed world in 2014 along the continuum most would be at the lower end. Many are still working in the traditional paper based operational paradigm and have yet to have all their teachers using the digital everyday in their teaching.

It is only in the last decade that schooling as we have known it began to fundamentally change, and that structural change did not begin until around 2002/2003 when the first schools in the developed world succeeded in getting all their teachers to move from the traditional paper teaching base to one that was predominantly digital. The move coincided with what Friedman (2006) termed the 'triple convergence', with global industries movement to a flatter playing table (Friedman, 2006) and interactive whiteboards (IWBs) and data projectors reaching a level of maturity and a price point where schools could finally afford to place one in every teaching room (Lee and Winzenried, 2009).

Up until then, despite decades of attempted innovation schooling, and in particular the teaching, had basically remained unchanged. Any dents made in the traditional structure were soon rectified. Despite the hype the digital instructional technology remained the province of a minor portion of the total teaching staff and had limited transformative impact.

From around 2002/2003 onwards the proactive schools built upon the facility of the evermore sophisticated, user friendly digital technology to achieve digital take-off (Lee and Gaffney, 2008), to go digital and in turn networked, all the while transforming the total fabric of the school (Lee and Finger, 2010).

One is thus looking in the structural transformation at what is a relatively recent development, even with the pathfinders.

The Research

Governments globally, and indeed bodies like the OECD, are strongly inclined in their research to look at schooling in totality and as such rarely single out those schools that don't fit the norm, such as the early adopters.

The authors by contrast have focussed their work particularly over the last decade on the efforts of the pathfinders and the impact of the digital technology thereupon, and have sought to use those schools' experiences to provide lessons and guidance for the later adopter schools.

Mal Lee's contribution comes extensively from the six publications he has researched and prepared for publication by ACER Press on the various facets of the school evolutionary process (Lee and Gaffney, 2008), (Lee and Winzenried, 2009), (Lee and Finger, 2010), (Lee and Levins, 2012) (Lee and Ward, 2013) but in particular work that he has done with schools in the UK, US, NZ and Australia in researching his forthcoming *Digital Normalisation and School Transformation*.

Roger Broadie's contribution comes extensively from his long term consultancy work with schools and education authorities in the UK, his leadership of the European Education Partnership, and through strategic initiatives with companies involved with developing the use of ICT in education, including Apple, Cisco, Frog, Intel, Macromedia/Adobe and Sun, but in particular his work as architect, leader and judge of NAACE's 3rd Millennium Awards (http://www.naace.co.uk/thirdmillenniumlearningaward) which has scrutinised the work of the pathfinders in the UK in depth.

In so doing we have had that rare opportunity not only to obtain an insight few others have had but we've been able to track the evolution occurring in those pathfinder schools, particularly over the last five years. Some of these schools have moved through three evolutionary stages in that time such can be the speed of evolution once the schools go digital and networked.

It was this insight that alerted us to the global significance of development occurring and why we saw the need to share the concepts of the evolutionary continuum, the stages, the indicators therein and the likelihood that most schools will need to experience each of those stages before they can continue their evolution.

While understanding the slowness of many in identifying the evolution occurring the reality is that teachers, principals, educational administrators, education researchers and policy makers globally do need to far better understand the

- school evolutionary process

- pace and often uncertainty of that development

- immense implications flowing

- imperative of better attuning their operations to a world of constant change and evolution where the school ecologies are evolving in a remarkably similar way globally.

The pathfinders that have taken the route to digital normalisation have done so because they are convinced that doing this has had a hugely significant impact on learning within and beyond the school. There is a major gap in research on the impact due to the near impossibility of separating the impact of the digital from the impact of all the associated changes in teaching and learning that accompany its adoption.

One research group that has understood this dilemma well and which coincidentally has also been tracking the impact of the digital upon the transformation of the learning of the young since 2003 is the US based Project Tomorrow group (http://www.tomorrow.org/speakup/speakup_reports.html). Its Speak Up reports, with their very extensive survey base, provide a vital insight into the dramatic impact the digital has had in transforming the learning and aspirations of the young, sadly primarily outside the school walls. Their report, that *From Chalkboards to Tablets: The Emergence of the K-12 Digital Learner*, published June 2013, while US based, affirms the global pathfinder schools' reading of the necessity of schools adopting an operational mode that allows them to evolve at a pace consonant with societal, and in particular student expectations.

While as mentioned the research in this area is limited, there is much insight that industry and the corporate world can provide educators, and in particularly those charting the evolution of schooling.

The rapid evolution schooling is experiencing today as schools go digital and in turn networked is a development industry experienced from the 90's onwards. Studies like those of Lipnack and Stamps (1994) on the networked organisations, The *Information Paradox* by Thorp (1998) and *Surfing the Edge of Chaos,* by Pascale, Millemann and Gioja (2000), while written some years ago, document the kind of organisational transformation and needs schools should bear in mind as they undergo a similar change.

Purpose of the Taxonomy.

The desire with this Taxonomy is to assist all associated with the development of schooling and the teaching of the young globally - be they teachers, school and education authority leaders, educational researchers, policy makers, governments, parents, grandparents, carers, students or indeed any interested in schooling in the community – to better understand the evolution of schooling and the many implications that flow from that evolutionary process.

An unintended flow on from the perception of schooling as immutable and that all schools are, and will continue to be the same is that schools globally have no measure and no international bench marks they can use to adjudge where they are at and where they have yet to travel in their development. Schools globally proclaim their innovation – often with the support of the technology corporation providing the kit – with no ready measure to test their claim.

The Taxonomy provides that vital international measure and the benchmarks that all within the school's community can use.

The intention is to provide school communities an awareness of where their school sits on the evolutionary continuum, an understanding of the stages ahead and the suite of variables their particular school will likely need to address in their particular context.

Vitally the Taxonomy should provide school, educational authority leaders and policy developers a greater insight into the importance of each school developing and shaping an ever-evolving school ecology that provides the desired holistic education for its particular context at a particular point in time. It should help them understand the point strongly made by Professor S.E, Higgins from Durham that schools can't expect to successfully implant a later stage ecological development into an earlier stage culture.

Hopefully the Taxonomy prompts not only the individual school communities, but also researchers, policy makers and educational administrators to discuss and analyse the many implications and the associated ramifications that flow from schools globally following a generally similar evolutionary path.

It is suggested that the more one delves and grasps the significance of this global development the greater is the understanding that the implications could be considerable.

Mention has already been made of the implications flowing from the 'natural growth' and evolution. But allied are the implications for school-based

autonomy, education authority services, the creation of ever-evolving school specific ecologies, the role of the principal, the collaboration with the home, the skill and mindset development of empowered school staff, the curriculum and the realisation of the desired educational benefits - to name but a few.

It is appreciated the Taxonomy is based primarily on the evolution of schooling in four English speaking developed nations. While the suspicion is that the evolutionary continuum will be similar in other developed western nations at the time of writing that research has yet to be done. As the evolutionary stages relate more strongly to the changing perceptions and actions of the people involved than they do to technology or fixed educational infrastructure, there is also the possibility that these stages can be applied to all developing nations.

Conclusion

This Taxonomy must be viewed as an ever-evolving entity.

It is one of the reasons we opted for the PDF form, and why there is a complementary website at http://www.schoolevolutionarystages.net.

This is a 2014 edition.

It will need to be regularly updated.

The key in reading is to treat the information as indicative and for all associated with schooling to better understand the ever-evolving macro scene.

One of the unfortunate attributes of the traditional paper based school was its strongly hierarchical nature, with only those atop the apex understanding the macro scene and the rest of the school community not being heard or being unwittingly impelled to adopt a strongly micro perspective.

Schools successfully operating at the digital normalisation stage and beyond require all in the school's community to far better understand the total workings of the school and to be able to meaningfully contribute to its evolution.

The hope is the Taxonomy helps with that understanding.

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Chapter 2

Digital Normalisation

The key to its realisation

Twenty years on from the launch of Mosaic and the vision for future schooling communicated at that time in the 'Information Super Highway' rhetoric, the first schools globally have finally reached the point on the evolutionary continuum of normalising the use of the digital.

All within those schools have adopted a distributed mode of control of the teaching process and are collaborating with their homes in the provision of a holistic, networked education for the 21st century and have normalised the use of the digital technology in all facets of the school's operations, educational and administrative, in and outside the school.

All the key players within the school's community, the students, parents, teachers and support staff, are using their choice of personal digital technology naturally in all the school's operations to the extent they rarely give thought to the actual kit they are using.

On reflection it has taken the schools appreciably longer than many of us in the 1990s envisaged and even so we are only talking a fraction of the developed world's schools.

Most as indicated are a long way from reaching this stage in their evolution.

Notwithstanding that small cadre of schools, and those following close behind, are now able to provide an important insight into

- what is entailed in achieving digital normalisation

- the stages the vast majority of schools will need traverse and

- the suite of variables to be addressed in creating an ecology that enables the school to provide the desired quality education for all and to do it over time as society's expectation continue to grow.

All the schools studied have moved through the following evolutionary stages.

Figure 2.1 Schooling's evolutionary stages

As mentioned the pronounced structural transformation of these schools didn't begin until around 2002/2003 and the movement through the stages significantly escalated only over the last five years. Notwithstanding all had done the vital groundwork beforehand and readied the human and technological foundations.

In interviewing those schools that had or nearly had reached digital normalisation what soon became apparent was the commonality of the major variables all had addressed in reaching their current position. Indeed after approximately 60 interviews with all manner of schools in the UK, US, NZ and Australia the point was reached where no new major variables were mentioned. The 70+ schools that have gained the Naace 3rd Millennium Learning Award similarly display commonalities in the variables they have addressed, while being very individual in the approaches adopted.

Many of the variables were those that had come to the fore in five earlier studies that involved the analysis of the work of the pathfinding schools (Lee and Gaffney, 2008), (Lee and Winzenried, 2009), (Lee and Finger, 2010), (Lee and Levins, 2012) (Lee and Ward, 2013).

Significantly there was however a set of key variables that assumed greater significance the further schools moved along the evolutionary continuum.

What was also apparent is that the further schools moved along the continuum the more tightly the variables were linked and we became very conscious we were examining the key facets of an ever-more tightly integrated more educationally focussed ever-evolving school ecology.

While as mentioned all the schools addressed the variables in their own distinct manner. In rechecking the veracity of the observations and the variables identified all affirmed the importance of addressing the total set.

The latter is a key point to bear in mind as you consider the below mentioned nearly 50 variables and look to apply them to your current situation. While for convenience we have listed each singly the reality is that all are tightly interrelated.

They are a set that need be approached as a totality.

Within this Taxonomy we've largely just named the key variables. Most are we hope are self-explanatory. All are addressed more fully in the forthcoming *Digital Normalisation and School Transformation.*

School Transformation

> • Ongoing evolution of the school's organisational form, attuning to meet ever- changing context.

> • Natural growth and evolution flowing from adoption of digital operational base.

> • Networked mindset. Strikingly apparent in all schools which had normalised. It was noticeably absent in schools that had yet to get all teachers using the technology in their everyday teaching. They were still insular in their thinking.

> • Normalised whole school community acceptance of of-going evolution and change.

> • Preparedness to question and vary traditional approaches to schooling

> • Escalating growth in networked resourcing and use of school community capital

Educational philosophy encompassing all students' learning

> • Provision of apposite holistic and networked 24/7/365 21st century schooling. Noteworthy was that every school interviewed stressed they were providing a 21st century curriculum often regardless of their specified curriculum or testing regime.

> • Authentic home – school collaboration. Pooling of home educational expertise and digital capability with that of the school. Respect for the home and the contribution it makes is fundamental to successful digital normalisation and collaborative teaching.

> • Escalating focus on desired 21st century educational benefits and their realisation – both in and outside school.

• Collaboration in learning – trend pointing to ever greater collaboration between all the 'teachers' of the young in the 24/7/365 teaching from birth onwards.

Leadership

• Strong shaping vision focused on improving learning. Though the affordances of technology and the digital world are taken strongly into account their visions are driven by educational understanding not by technology.

• Strong leadership. The vital role of principals/heads able to shape the desired ever-evolving school.

• Leadership's high expectations.

• Political acumen of the leadership – well versed in the art of keeping key stakeholders onside while protecting their own backside even when making major changes that run counter to prevailing policy.

• Big picture strategic plan – that provides focus but also the flexibility to vary the plan as the need arises.

• Riding the megatrends. Capability of the leadership to read, and ride the megatrends and when apt to move off and to the next.

• Protecting the teachers from overload, that can come from individual enthusiasm and external sources, by prioritising what the school will address.

• Trust. Moving from the traditional default position of distrust in all except those in school's leadership group – to trust in all. Key facet of the empowerment. Fundamental to total school digital normalisation.

A culture of change

• Developing and maintaining a strong culture of change within the organisation, where calculated risk taking was promoted. In most situations the culture was facilitated by the school leadership, but in some was also assisted by the local education authority, though we are also aware of examples where the culture of change was achieved despite the local education authority.

• All the schools openly acknowledged mistakes made in their evolution, some major and expensive. Ongoing, often rapid and uncertain change and evolution perceived as the norm.

• Readiness to evolve, transform, change the organisational form of the school.

• Time – needed to grow, evolve in form and develop.

Devolved decision-making

• Significant school-based decision-making. Virtually all of the schools studied had very considerable control over their own operations with invariably a single line budget enabling them to use the monies allocated as desired. There were some however which have 'managed' to be largely semi-autonomous even though in theory they and their budget was centrally controlled.

• School specific solution. Recognition of the imperative of developing a solution apposite for the particular school in its context at this point in time.

• Empowerment of all the 'teachers' of the young - the children themselves, the parents, grandparents, carers, teachers and the wider school community. Entails all being respected, trusted, given a voice and having their 'teaching' contribution systematically enhanced.

Highly professional teachers working as a team

• Teachers' quest to constantly enhance the quality, appropriateness and effectiveness of their teaching

• All pervasive educational focus – ensuring the digital is deployed as best as possible to assist achieve the school's shaping educational vision.

• Distributed control of and responsibility for the teaching, with the educators ceding their unilateral control.

• Pronounced shift to in school, tailored whole staff development. Finding the time.

• Teachers' focus is on application of the student's technical capability in higher order teaching, for the first time in history not teaching the mechanics of how to use the instructional technology.

Students taking responsibility for their learning and that of others.

• Students accorded greater responsibility for shaping own learning and teaching in and out of school.

• Marked shift to more personalised, collaborative mode of learning and teaching – in and outside school walls.

• School's recognition of young children's digital understanding of the workings of their own technological kit.

• Providing all with in the school's community, including the children the right of, and responsibility for, choosing their own suite of digital technology they want to use at school

• Recognition that children in normalising the use of their own suite of digital and network technology become free agents able to take their clientele anyway in the networked world.

Creation of ecology

• Development of a tightly integrated, ever evolving whole school ecology that consistently fosters the desired teaching and learning.

• Recognition of the home/out of school 24/7/365 use of the digital and the desirability of building upon that capability and access to resources in C21 schooling.

• Organisational integration – driven often unwittingly by ever-greater digital convergence.

• Focus on using digital to enhance organisational efficiency, effectiveness, synergy and productivity.

Technology for purpose pervading and supporting all operations

• Tight nexus between desired educational benefits and use of the digital, with the educational benefits always being the key focus.

• Appropriate digital technology in every teaching room that assists all teachers shift from a paper to predominantly digital teaching base. Of note all but one of the schools used interactive whiteboards to achieve that shift.

• Networked resourcing. Extension of home – school pooling into the school's local and networked community.

• Appropriate whole campus/classroom access to the requisite network infrastructure

• 'Personal' digital kit in hands of all within the school's community – the staff, the students and the homes – at least from around age 10 upwards.

• Equity – ensuring no student was left without his/her own technology, to use 24/7/365. All schools addressed the relatively small percentage in need of kit 'in house'.

• BYOT (Bring your own technology) – underscoring BYOT and not simply BYOD (Bring your own device).

At that this stage we're not in a position to prioritise the importance of these variables, but in our analysis of each of the evolutionary stages we have flagged those developments the schools found to be stage 'game changers'.

Suffice it to say that if you don't address all the listed variables your evolution could be markedly impaired.

In identifying this set it is important to stress they are only indicative. Other schools elsewhere in the world might well identify others.

Notwithstanding a number of observations can be made with some surety, as follows.

Tenets of managing organisational change

There was the overarching sense that the schools, and in particular their leadership were well versed in the basic tenets of school organisational change but were astute enough to apply them in an ever-evolving setting.

All had a strong shaping educational vision that was increasingly focussed as the school became evermore integrated.

A strong culture of change was evident in all, with all openly admitting to making mistakes, often considerable and expensive in their journey.

There was a strong recognition of the importance of empowering all within the school's community, all its staff - teaching and support, its students, its parents, grandparents, carers and the community in general in creating the desired school ecology.

Significantly in contrast to the traditional school change literature that advocated 'freezing' the desired change the schools appreciated they were now working with ongoing evolution and a 'normalised approach' might only be apt for a time, before needing to be varied.

Technological infrastructure.

The first given is that the school has to have the requisite digital infrastructure in place to allow the normalised use of the digital across the school campus and ready open access to the school's digital communications suite by all interested members of the school's wider community.

You have to have the reliable electrical power.

You'll need ample and ever-greater bandwidth with a network able to accommodate ever-greater use.

Every teaching room requires the apposite instructional technology with the students and teacher/s having ready use of presentation and creation technologies as well as access to the Net.

Conscious all will ultimately be using their own mobile technology extensively throughout the school, one will need an apposite whole of campus Wi-Fi coverage.

Without these your evolution will be somewhat curtailed.

Total teacher usage.

If the school has not succeeded in getting at least a critical mass of the teachers using the digital in their everyday teaching the school won't move along the evolutionary continuum.

Rather it will stay locked in its traditional paper based mode, falling ever further behind the pathfinders.

All the pathfinders studied bar one used interactive whiteboards as the instructional technology to facilitate the movement of their teachers from a paper to digital teaching base.

If yours is a school that has not succeeded in securing that critical mass, and preferably whole staff usage of the digital then that has to be your priority.

It is your entry to the school's journey along the evolutionary continuum.

Number, interrelatedness, integration and complexity.

All the schools have in their journey had to simultaneously address a large number of closely related variables in successfully creating ever-evolving school ecology.

These are increasingly complex, evermore tightly integrated ecologies made evermore so by the drawing into the teaching all the teachers of the young, in and outside the school walls.

Never will a simple 'silver bullet' solution or magic panacea administered by a 'transformative' superintendent move the schools to the position the pathfinders are in today.

That point was reached as the result of the concerted effort, over time by astute proactive professional educators, consciously addressing the total suite of variables.

Individual school solutions.

Vitally all the schools employed solutions that suited their particular context.

None reached that position because of any top down, imposed or 'one size fits all' model of change.

A few of the case study schools had had the support of astute, proactive education authorities that recognised the vital importance of supporting the development of school specific solutions.

Most of the schools achieved digital normalisation without any meaningful support from government or their education authority. Indeed many did so in the face of opposition from their central bureaucracy.

Principal as Conductor.

All had an astute school principal, with a high degree of digital acumen who shaped the ever-evolving school ecology.

In essence they were highly skilled conductors communicating the vision and expectations for the school, aware of the finer details of the score, able to orchestrate the school's daily operations to achieve the desired educational benefits.

Vitally as indicated in Chapter 1 they were also the person primarily responsible for translating the apposite developments with the technology and in society in general into the everyday practice of the school.

Most were sadly obliged to play that highly challenging role within the local policy and legislative parameters without the support of a knowing central office.

That major responsibility was made even more challenging by the recognition the schools were undergoing a fundamental transformation in form, rendering meaningless many of the old operational parameters and policies.

The pathfinder principals were invariably obliged to play by the old rules of the game while adjusting to the new.

It required considerable (small 'p') political acumen and that vital ability to cover the schools, the teachers' and their own backside as the school moved along the evolutionary continuum.

Time required.

Undoubtedly one of the more salutary lessons to emerge was the appreciation of the time it had taken these visionary, strongly proactive schools to reach their current stage

When coupled with the earlier comments about the complexity of the task, and the realisation – made that much easier in hindsight – that schools didn't have the apposite digital instructional technologies until relatively recently that length of time should not be a surprise.

However in the world of instant gratification, the 24/7 news cycles, short-term political decision-making and technology company hype the prevailing spin is that school evolution can be achieved virtually overnight.

It can if one has a greenfield site, an astute head, and hand picked experienced staff with the desired mindset in a non-union school. But the reality is most schools will, like the pathfinders take years of astute and concerted effort to reach the digital normalisation stage.

The sooner that reality is promoted, and made known to the decision makers the more it will be possible for all schools to move along the evolutionary continuum.

The short-term fix mentality ought be expunged.

Ups and downs.

Closely allied is appreciating the everyday reality of school evolution, taking place over the years, with ever changing staff, that will invariably cause its ups and downs.

As indicated evolutionary change is most assuredly not a straight linear progression from A to B to C. It might be two steps forward, one step back. At times it can be messy and seemingly chaotic. Teachers can vacillate before making the final decision to replace the old with the new.

The evolution is unlikely to be uniform in all facets of the school's operations, with 'challenging' staff always a potential issue, as will be the loss of key staff and the changing of long established practises.

Digitising the school's operations.

An important but rarely considered part of the school evolutionary process that plays a significant role in developing the desired culture, school ecology and the school's productivity is the graduated digitising of all the school's operations.

In brief in seeking to achieve digital normalisation and position the school on par with general societal expectations the school ought ultimately to be providing and using a digital administrative, financial and communications suite that the school's community uses everyday.

Central to that development in all the pathfinders was the creation of an integrated digital communications suite built upon an open, working school 'website'. The 'website' may have many components including traditional website, VLE and various online systems including such systems as Google docs, YouTube, Facebook and Twitter.

The digital, as industry has long discovered, can markedly assist the effectiveness, efficiency and productivity of organisations.

Vitally, as the pathfinders have found, the digital finally provides schools the chance to achieve synergies impossible with the paper technology.

Cultural – not so much technological – change.

Hopefully as you scan the many key variables you'll recognise that although the digital technology has a profound impact, movement along the evolutionary continuum and the creation of the desired school ecology is primarily a human challenge that entails fundamentally changing the culture and mindset of the school.

The technology is the relatively simple part but as the works by Cuban (1986) and Lee and Winzenried (2009) reveal the instructional technology has invariably been the prime, and often sole, focus.

The focus, as the pathfinders attest, must be the desired education and the creation of a culture that places that to the fore.

Trust.

A key facet of the desired change in the school's culture – that is likely to be dismissed in a first sighting of this key variable – is trust: the trust the school leadership is prepared is to accord all within its community, its staff, teaching and professional support, the children, their homes and interested community members.

Digital normalisation requires the school to trust every member to choose their personal technology and to use it normally and aptly in ever facet of the school's operations.

In the traditional strongly hierarchically organised school the leadership rarely trusted the teachers, let alone the children or their parents.

The ICT experts rarely trusted anyone.

The history of the use of instructional technology in schools has until only recent years been based on mistrust, mistrust of the teachers and the children (Lee and Winzenried, 2009).

Indeed it could be argued that many if not indeed most governments and education authorities don't trust the professionalism of their principals and teachers and go to extreme lengths to micro-manage their every move.

The culture within those schools that have reached the Digital Normalisation Stage is completely antithetical.

It is founded on the professionalism of its teaching and support staff and their ability to convert the key technological and societal developments into apposite practice.

The desire is to empower all members of the school's community and to respect the contribution all can make to the ongoing evolution of the school and the holistic 24/7/365 teaching of the young.

It is a pronounced culture shift that will only come in time with the astute consideration of all the near 50 key variables.

Conclusion.

In addressing the key variables the pathfinders, largely unwittingly did so in a phased manner moving, as mentioned, through a series of stages that readied their move to the next.

This is the vital lesson the pathfinders can now pass on to the later adopter schools.

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Chapter 3

The Evolutionary Continuum and Stages

The concepts of there being an ever-evolving evolutionary continuum and common stages through which schools have moved – and are likely to have to move - are as indicated novel to most associated with schooling.

The perception of school immutability has been strong for so long. But it only takes a visit to the pathfinders, or indeed just a visit to their school website, and then to a school or the website of a school still operating within the traditional paper based domain to recognise the profound difference in the schooling each is providing.

While schools can continue to shield themselves from the real, ever –evolving world and provide an insular, increasingly dated and irrelevant education the authors, with over a hundred years plus joint experience in visiting and talking to a great many schools are very much of the view that schools globally want to provide the best possible education for their students.

That quest obliges schools to reflect on the profound transformation that has occurred with all manner of other organisations when they moved from their paper base and went digital and networked, and the organisational transformation that has occurred globally in the early adopter schools. That many schools have not yet done this indicates a deficit of understanding of just how much better an educational offering is available in digitally normalised schools. The authors are aware of reports that where schools are close to each other and there is parental choice, parents and pupils are beginning to notice the significant difference and to make choice of school accordingly.

The journey of the pathfinders not only provides an important insight into the variables needing to be addressed but vitally provides later adopter schools an invaluable insight into the

> i. concept and nature of the school evolutionary continuum
> ii. evolutionary stages through which the pathfinders have moved
> iii. key attributes of each of those stages
> iv. very real possibility that they will need to pass through the same stages; addressing many of the same issues that had to be addressed by the early adopters
> v. current position on the evolutionary continuum of the school and the time it will take to move the school along the continuum.

They are concepts, which if accepted in full or even in part oblige all associated with the provision of schooling to possibly rethink their approach to school development.

Vitally they oblige each school community, its staff, students and parents and its board/council to ask where their school sits on the continuum and what is required to further the school's evolution.

Indicative nature

It bears reiterating that the evolutionary stages and stage indicators are only intended to provide you with a guide.

They are drawn from the experiences of a relatively small group of early adopter schools, from four developed English speaking nations. Moreover what we have provided is a synthesis of those schools' experiences and observations in 2013. The reality is that even with the pathfinders some of the stage indicators appeared earlier or indeed later, often depending on their situation and staff mix. It is possible to move very rapidly through the stages with the right leadership.

We are moreover extrapolating from a past that has gone. While for example all the pathfinders but one used front projection IWBs as the main catalyst for shifting the teachers from a paper to digital teaching base there are today variants of that technology that might better perform that role. The roles that IWBs performed might also be provided by quite different technology; for example the ability to use images, and for students to interact with those images, might now happen through tablets, while use of IWBs by students to present to others could still remain a function provided by projection.

In brief, use the stage indicators as a guide and eventually opt for solutions apposite for your situation.

Ever-evolving continuum

The evolutionary continuum will continue to evolve and grow ever longer.

The early digital normalisation stage appeared on the radar only in 2012, but already there are signs emerging that some of the schools having normalised the use of the digital are evolving at such a pace they could well move to another stage by later 2014.

Of note is that several of the more prescient tertiary observers suggested that once schools reached the digital normalisation stage the nature of schooling would be transformed at an ever greater pace.

The signs point to that being a very real likelihood thus further widening the divide between the schools at each end of the continuum.

Movement through the stages

All the pathfinders moved through each of the developmental stages before they were able to progress to the next.

Do the later adopter schools need to do the same?

The theory would suggest that if one starts with a greenfield school, with a head possessing a high degree of digital acumen, able to hand pick an experienced staff with the apposite networked mindset, that need not be so.

However in reality there will be very few schools in that situation and all others have to work with the principal, staff, homes, community and vitally the school culture they currently have. Moreover they'll need to work from where they are currently at on the continuum. The impact of the leader can however be great, so appointment of the right leader can be comparable to a greenfield site if they can rapidly get staff to imagine things can happen differently. The authors know of examples where this can happen even in schools considered by the authorities to be failing, where a leader can use the introduction of digital to so rapidly change the teaching and learning environment that it can be a significant positive factor in turning round the school.

Conversely principals lacking the apposite skills can markedly stymy the schools movement through the stages.

The consensus of the schools with whom the authors spoke was that the vast majority of schools will need to move through each of the stages readying itself for the next.

It might in time be possible for some schools to take advantage of the lessons learned by the pathfinders and find ways of truncating the evolutionary process but the authors would suggest embarking on a path that takes the school through all the stages. The main factor that controls the time taken is how fast the teachers are able and willing to change their working practices, as a team. If progress is too fast for too many of the staff the negative reaction of these staff can become too strong for the enthusiasm of the leader, the rest of the staff, and the pupils to overcome. The school leader, who may need to force through some initial changes against opposition, can only judge this, having the courage to judge that sufficient of the staff will rapidly come 'on-side'.

That said we are talking the theoretical here and in schools one has to deal with the reality. If for example a school that is debating the choice of opting for a BYOD or BYOT approach, and knows the lease on the school laptops is up for determination by the year's end the leaders might validly opt to make the jump directly to BYOT, with all eyes wide open to the consequences they will need to lead staff through.

Lessons for the later adopter schools

One of the more salutary observations from the pathfinders, those who have been examining their development and the research of Higgins et al (2012), is not to make the mistake so often made by the later adopter schools and 'cherry pick' variables to address.

In Chapter 2 we stressed the plethora of interrelated variables the successful schools had addressed in creating the desired school ecology.

The propensity is for later adopter schools – and indeed politicians – to extract a few 'stand out' variables and to try to use them as a magic quick fix panacea.

Typically they pick out a particular technology and imagine by using it all will change. Writing in 2014, there are large numbers of examples of schools that have bought class sets of iPads only to discover that without a clear vision of how to use them and without having addressed other variables they are getting little impact from them.

What is now clear is one cannot transplant a solution from a later evolutionary stage and imagine it will take in an earlier stage culture.

The principal and the evolutionary process

Mention is not specifically made of the role of the principal in any of the evolutionary stages but it is evermore apparent that without an astute head, with the requisite digital acumen who is prepared to lead, the school's movement along the evolutionary continuum will be very slow at best.

All of the pathfinders had a 'CEO' who was able and on many occasions prepared to play the lead role.

The absence of such a figure could well be an issue in those schools that operate in a highly democratic mode that relies on whole staff consensus.

It most assuredly will be an issue in those schools where the head lacks the wherewithal to lead and orchestrate a rapidly evolving, evermore complex school ecology.

The Evolutionary Stages of Schooling - Key Indicators

Below are the six identified stages, the distinguishing features of each of those stages and the suite of indicators for each of the stages.

TRADITIONAL PAPER BASED STAGE

- Educational agenda strongly shaped by tests

- Culture where the professional educators unilaterally control the teaching

- Organisationally and teaching-wise school's operations strongly impacted by the use of paper-based technology

- Strongly hierarchically organised where executive invariably controls the school's operations

- Classroom teachers and professional support staff disempowered with resulting micro outlook

- Schools characterised by constancy and continuity

- Paper technology reinforces status quo, the use of the physical place and the operations happening within the school walls

- Highly insular in outlook with the focus being within the school walls and the educational professionals unilaterally controlling all facets of the teaching and learning

- Solitary teachers, working with mass class groups, invariably behind closed doors dominant mode of teaching

- Teacher centred pedagogy most common

- Out of school teaching and learning left by default to parents and children

- Expectation that government or parents will provide the school virtually all the monies the school requires, to spend, as it desires

- Token at best collaboration with homes

- Vast majority of the young had normalised the use of computers and mobile technology outside school, at home and on the move

- Pronounced home-school digital divide

- Student use of digital within school limited at best to a few hours a week

- Equity of digital access invariably poorly understood, not researched and used as excuse for inaction

- Segmented silo like operation with limited links between units

- Paper, pen and the traditional teaching board the dominant instructional technology in most classrooms

- For ten years plus as ICT starts to be introduced:

  • control of the digital by ICT experts in school
  • ban on the use of student technology within the school
  • heavy censorship/filtering of Net usage
  • dominant use of computer labs for all digital teaching
  • adoption of standard operating system, technology, applications software
  • Microsoft = ICT
  • development of the school's internal network, with all schools having own URL
  • efforts by 20% - 30% of early adopter teachers to integrate use of the digital in all teaching
  • preoccupation with occasioning change via latest technology
  • use of the digital technology within the school administration/ finances

- Loose or little connection between school's educational agenda and deployment of the technology

- Digital and website usage peripheral to school's teaching, administration and communication

- Paper based, one-way communication with parents and community

- Teacher development invariably mass, 'one size fits all' approach, commonly delivered externally

DIGITAL TAKE OFF

The next four evolutionary stages are the precursors to schools as organisations achieving full digital take off and in turn digital normalisation.

Early Digital Stage

In using the term digital in this and the next phase we're referring to the movement from a paper to digital operating base and the concomitant changes that occur both attitudinally and operationally within the school with that shift.

- Apposite shaping educational vision for digital and networked world

- Appreciation of the importance of digital technology in providing desired teaching

- Control unilaterally by professional educators

- Delivered within physical place called school

- Insular mindset

- School operations largely restricted to finance provided by government or parents.

- No formal recognition of or support for children's out of school use of digital or learning

- Hierarchical control of school's operations the norm

- Leadership expectation that all staff will use the digital in teaching and administration

- Increased use of formal or informal staff 'digital instructional' technology mentor/s

- Desire – often unwitting - to move from paper to predominantly digital teaching base

- Recognition each school, with its unique setting has to shape its own solution

- All staff provided/have own digital teaching toolkit

- Teachers expected to handle key administrative duties digitally

- Appropriate suite of digital technology in every teaching room

- Deployment in each room of an easy to use whole of class presentation technology – such as an IWB or data projector - that enables teachers to transition from paper to digital teaching mode placed in all teaching rooms

- Teacher centred pedagogy most common

- Critical mass of teachers using the digital in everyday teaching

- Rapid increase in the students' school use of the digital

- Heavy censorship/filtering of the Net usage common

- School's administration largely digital

- Home-school communication predominantly one way, paper based

- Ever rising expectations by growing group of teachers using the digital in their teaching

Digital Stage

- All or nearly all teachers using the digital in their everyday teaching

- Students' using digital in everyday teaching

- Whole school in class digital usage coupled with digital administration begins moving school from paper to digitally based operational mode

- Concomitant shift from constancy to ongoing evolution, change and natural growth

- Insular mindset still dominant

- Government or parents provide virtually all funding for school's use

- Increasing moves by staff to extend the education beyond the school walls

- Students in need of digital support researched and identified. School explores in house solutions to address equity concerns

- Digitally empowered parents and students seek greater voice in school's use of the digital

- Virtually all children have normalised the use of an ever-evolving suite of digital technologies

- Escalating student efforts to use own technology in school, with associated hassles

- The shift to a digital operational base and digital convergence occasions ever-greater organisational and operational integration

- Use of a suite of in and out of house, personal and group teacher development and support strategies

- Significant home school educational and digital divide

- Early moves to shift to digital communication with homes

- ICT team responsible for choice, configuration, deployment maintenance and replacement of all hardware and software

- School – or school using parent monies – funds all digital technology used by school

- Moves to ensure all students have ready in-school usage of/access to prescribed mobile personal computers

- Access to the Net tightly controlled and filtered

- Standard operating system, instructional technology and applications software

- All other technology banned

- Closed, password protected school website

Early networked stage

In this and the next phase we're referring to the transformation that occurs when schools reach the stage where they recognise that their digital and networked facilities removes the school's long-term reliance on students attending a physical place for learning and the necessity of continuing to operate as a largely insular organisations.

They now begin to recognise the plethora of opportunities for human networking, and genuine collaboration with all the teachers of the young from birth onwards.

This and the next stage recognise the physical networks open the way for ever-greater and more effective human networking.

- Principal/school leadership promote the provision of a holistic C21 networked, evermore collaborative education that transcends the physical school walls

- Recognise the importance of a strong shaping educational vision

- Growing leadership/teacher recognition of extent and impact of the young's normalised 24/7/365 use of the digital upon learning outside the school

- School evermore aware of the natural growth and evolution flowing from its going digital

- Dismantling of internal school walls and adoption of more integrated school ecology

- Appreciation of developing an interdependent school within networked environment

- Shift to flatter organisational/operational structure

- Staff adopting networked mindset

- Increasing teacher recognition of the educational opportunities for networked collaboration – and the ease of doing so with the digital

- Escalating collaboration between school, its homes and community – with school taking the lead

- Schools begin shift to a more networked resourcing model where they pool the school's resources, with those of the homes, the community and wider networked world

- Willingness of key staff to begin distributing control of the teaching process

- Pooling of home and school educational expertise and digital capability

- Concern for equity with school ensuring all children have requisite personal technology and ready home Net access

- Move to more collaborative mode of teaching that puts learner at centre

- Growing empowerment of all staff, teaching and support

- Adoption of increasingly focussed 'just in time' personal and group whole of staff development and support strategies

- Areas of rapid and pronounced change impacting upon whole school ecology

- Leadership concern to ameliorate the growing pressure of change and on staff

- Change seemingly chaotic, spotted and non-linear but indeed common globally within schools at same stage of their evolution

- Moves to ensure all students have ready usage of/access to personal computers as well as class digital presentation facilities

- Enhancement of Wi-Fi networking and bandwidth

- Shift from paper based to digital communications with home and community

- Increasing centrality of a core, working and integrating school website

- Schools seeking to make greater use of online and networked teaching

- Early moves to educate the parents on the change in schooling occurring and the part they need play

Networked stage

- Leadership committed to a shaping educational vision that provides an internationally competitive, holistic 24/7/365 education for life and work

- Staff adoption of networked mindset

- School operating within networked paradigm where it reaches out beyond the school walls in its educational quest, begins dismantling the old walls and increasingly questions past practises and seeks to involve all the teachers of the young in the education of the children

- Normalised use of a networked, interdependent model of school resourcing

- Positioning of the school to readily accommodate change and sustain the desired evolution

- Continuing development of tightly integrated school ecology that embraces the in and out of school contributions and learning

- Emergence of networked learning community that increasingly integrates the in and out of school student learning in the provision of an ever greater 24/7/365, anytime, anywhere education

- Recognition of the imperative of empowering and trusting all staff, teaching and professional support, with all able to assist the holistic evolution of the school

- Ongoing use of a suite of personal and group, face-to-face and online whole of staff development and support strategies directed to supporting school's educational vision

- Normalised in house use of 'digital instructional mentor/s', working under various titles

- Flatter school organisational structure

- School and its community operationalize the 24/7/365 provision of digital technology to the diminishing number of students in need

- Desire to use the digital in all operations to enhance effectiveness, efficiency, synergy and productivity

- Tightening link between the schools shaping educational vision and its use of the digital technology in the school's communuity

- Escalating collaboration between the school, its homes and community

- Pronounced school wide shift to more collaborative, networked and personalised mode of teaching

- Ongoing moves to enhance parents' contribution to the holistic 24/7/365 teaching of their children

- Escalating use of parent and community resources in addition to those provided by government

- Distributed control of teaching among all the teachers of the young

- School's digital technology leadership focussed on facilitating ready Net access and use by all within the school's community

- Digital technology and Net core to all the school's operations

- School's website has been opened to all interested and is central to the school's operations, teaching, communication and ongoing development

- Normalised use of an integrated, multi-faceted, multi-way digital communications suite

- Willingness to move to a position of trust and respect for the children and their homes

- Preparedness to accord children responsibility for choosing own suite of digital technology that they want to use in class

- Embarkation on strategy to normalise the total in class use of the student's own choice of technology

DIGITAL NORMALISATION

The digital normalisation stage is reached when schools that have adopted a distributed mode of control of the teaching process and which are collaborating with their homes in the provision of a holistic, networked

education for the 21st century normalise the use of the digital technology in all facets of the school's operations, educational and administrative, in and outside the school.

It entails all the key players within the school's community – the students, parents, teachers and support staff – using their choice of personal digital technology naturally in all the school's operations to the extent they rarely give thought to the actual kit they are using.

The focus is on the functionality and desired benefits and not the tool.

The school recognises that a suite of ever evolving technologies will be used 24/7/365 in all facets of the people's lives – and not simply for education. In using the technology everyday all will teach themselves the technologies general workings and ready themselves to use the apposite functionality when required.

It is likely that normalisation will go through several stages, similarly to the Digital Take-Off stages.

Early digital normalisation stage

- The total school community - the staff, students and parents and the wider community – naturally, almost invisibly use their personal choice of digital technology in every facet of the school's operations, educational and administrative

- The school, staff, students and parents no longer distinguish between the online and physical experiences.

- Evermore sophisticated and powerful digital technology underpins all school operations, educational and administrative, in and outside the school walls, 24/7/365 fundamentally and continually transforming the nature of the schooling provided.

- The pace of school evolution and transformation is accelerating

- School and its community has embraced on-going evolution, adopted a networked mindset, believing 'anything is possible' and is willing to take risks to continually provide the apposite C21 education for its students.

- All school operations, educational and administrative, in and outside the school walls are increasingly integrated, intertwined, networked, focussed, complex, higher order, productive and automated, and directed to shaping the desired school ecosystem.

- Increasing need for the principal, in conjunction with the school's executive, to daily orchestrate the school's more tightly integrated, 24/7/365 operations and to ensure every facet is continually focussed on realising the school's shaping vision.

- An increasingly focussed school educational vision shapes the school's growth as the pace of evolution increases and the reliance on the physical place called school lessens

- School adopts a big picture growth strategy with the flexibility to accommodate rapid often uncertain and non linear evolution

- School cultivates and supports a culture of change, risk taking and encourages leadership within all areas of the school

- Tightening nexus between the school's shaping educational vision and the whole of school community use of the digital technology

- School becoming de facto policy developer as it attunes all operations to accommodate the increasingly rapid and pronounced digital transformation, unwilling to wait for external advice or direction.

- School's operations based on a position of trust in and respect for the staff, students, their parents and the wider school community.

- School and in particular the teachers distribute the control of teaching recognising the out of school learning, collaborating 24/7/365 with all the teachers of the young, with other the professional teachers, the students themselves, the parents, carers and grandparents, the local community and businesses.

- The school increasingly aware of the potential of a tightly integrated digitally based ecosystem that simultaneously addresses 24/7/365 all the variables that impacts each child's learning to markedly enhance student attainment.

- School more consciously develops and selects staff, teaching and professional support, with the wherewithal to contribute fully in an ever evolving, increasingly higher order mode of schooling.

- Empowered teachers, singly and collaboratively use their professional autonomy to harness the ever emerging opportunities, to realise the school's shaping vision

- School's teaching program is increasingly distinguished by its dynamic, ever evolving suite of integrated, whole of school, area and class specific teaching initiatives that transcend the classroom walls and which complement the core instructional programs

- Palpably exciting, attractive, relevant, often messy, seemingly chaotic, but professionally rewarding 24/7/365 teaching and learning environment

- School recognises and seeks to build upon the learning undertaken 24/7/365 by the students outside the school walls.

- Increasingly movement of the individual learner to the centre of the 24/7/365 teaching and individualisation of each child's teaching.

- Increasing collaboration between the school, its homes and the school's wider community in the holistic 24/7/365 education and support of the children merging the in the in and out of school teaching.

- The staff, students, parents and the school's community identify with the school, 'own it' and expect to be involved in its on-going operation and enhancement.

- Teachers developing within the ever evolving school ecology a professional mind and skill set, a suite of attributes apposite for a digital and networked mode of schooling, that build upon the traditional skills but which enable them to continually take advantage of the on-going digital transformation.

- Staff increasingly provided the digital toolkit of their choosing, following the same principles as applied to the children's choice of kit.

- The students have normalised the sustained in-school use of their current preferred personal technologies, bringing to the different classes the technology required, ranging from using none through multiple devices.

- Students responsible for understanding the general workings of their chosen technologies and associated software, as well as for its choice, acquisition, care, maintenance and upgrading

- Teachers, freed from teaching the digital technology mechanics apply the student's digital competence from the early childhood years onwards in higher order teaching where the use of the digital is embedded in authentic situations and the focus is on applying the functionality.

- School in general terms no longer provides the personal technology for students, but rather takes advantage of that owned and used by the students 24/7/365.

- School has normalised the processes for catering for any students needing assistance to secure the apposite personal digital technology.

- Successive student cohorts and their parents have different and increasingly higher order expectations of digital normalisation, expecting evermore of the technology and its use within the school.

- School is increasingly attracting students whose parents want a digitally relevant education, in an apposite, astutely shaped school ecosystem.

- School concentrates on providing the requisite digital and network infrastructure and facilitating the total school communities 24/7/365 use of its services.

- Virtually all school administration, communication and marketing digital, with the school website and the associated digital communications suite integral to the school's 24/7/365 operations.

- School technology team, and in particular its 'chief digital officer' – however labelled - focuses on providing the total school community an ever evolving ecosystem that is apposite, focussed, tightly integrated, readily accessed, ultra- reliable and evermore productive and supporting that community in its use.

- The choice of digital technologies and in particular the adherence to a particular platform assumes lesser significance as the focus moves

increasingly on to the desired educational outcomes and the school recognises all manner of digital operating systems can be employed. School becomes technology agnostic.

- The school's teaching is in many areas, particularly those impacted by the digital technology, ahead of often dated, externally set 'one size fits all' curriculum.

- School making increasing use of free or inexpensive cloud based teaching resources and opportunities, and reducing their spending on packaged teaching resources, print and online.

- School provided increasing and extensive ready use of a body of social and material capital by its community that never appears on the school's accounts.

- Use of a multi-faceted approach, 'just in time' and in context approach to professional development that makes extensive use of in house 'face to face' and online training to meet the whole of school, area specific and individual needs.

What is your school's situation?

The obvious question that you have probably already answered is where does your school sit on the evolutionary continuum?

Conscious of the ever-greater importance of the school as a teaching and learning community contributing to the ongoing enhancement and evolution of the school this is a question that should also be put to the total school community.

All within your school community need to understand the evolutionary nature of schooling and related global commonality of the development, as well as where the school sits now and what lies ahead.

There are two possible approaches to this as an exercise, to identify the stage the school is currently at or to imagine the stage that the school could aspire to reach in a two-year timescale. A small trial of doing this kind of exercise with schools suggests that looking forward, as part of a visioning exercise that

generates discussion and understanding of the variables may be the best approach.

The number of variables and the length of journey can appear daunting, but if a school's educational philosophy is already moving towards independent learning and a more collaborative approach this can overcome fears that might be generated by the practical worries of the changes it will be necessary to make in order to achieve the vision. Teachers can become locked into imagining that it is not possible for teaching and learning to happen differently. Radically changing the digital environment can persuade teachers and pupils that their previous failure to achieve does not now apply as the environment has changed so much. This imagination of being able to do things differently can be powerful.

Conclusion

The strong suggestion is that your school use the evolutionary stages and stage indicators in conjunction with the detailed analysis of the key threads detailed in Chapter 4.

In combination the two should provide your school's community a quick understanding of the current situation and the task ahead, as well as providing the education professionals with the more nuanced information they require.

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Chapter 4

The Threads

In analysing the evolutionary stages and the indicators within each it soon becomes apparent the indicators can not only provide an important insight into the school's holistic development but if cut differently can also provide an appreciation of the evolution occurring within key facets of the school's operations.

In brief a different cut allows schools and their decision makers to drill into most facets of the school's operations and ascertain where the school is at within each on the evolutionary continuum.

We identified below some 24 such areas, or what we have called threads that are woven through the school's total fabric. In time with additional research and analysis we hope to identify a few more but as you'll see from the accompanying spreadsheet and the detailed coverage of each of those threads the current set covers most of the school's operations.

The importance of most of the areas addressed below will be well known to all associated with schools but there is likely to be a number that are not and which assume significantly greater importance as the school moves along the evolutionary continuum.

Once again while we have drawn out each of the threads for individual scrutiny as you track the evolution within each you'll appreciate their relatedness to the other threads and the imperative of addressing them all simultaneously as you seek to shape the desired school ecology. Within the majority of the threads we have been able to identify indicators for all six evolutionary stages but in some the evolution appears to stall for a time and you may see little change from one stage to the next.

You'll also note that the same indicators are often used in a number of the threads. That is the reality of an evermore integrated organisation, where the one development impacts on numerous facets of the school's evolution. We have written this so you can read each thread separately.

Once again we would urge you view the stage indicators as indicative. They may well be slightly different in your situation.

These are threads elaborated upon.

While hopefully self – explanatory the abbreviation

PB – refers to the paper based stage

ED – the early digital

D – the digital

EN – the early networked

N – the networked

DN – the digital normalisation stage

To view the attributes for each stage within each of the threads below examine the accompanying spreadsheet at http//www.schoolevolutionarystages.net.

The hope is that the spreadsheet format will enable the reader to quickly position their school within each thread and appreciate the interconnectedness of the threads.

List of threads

- *Educational vision.* Traces the increasing focus and dependence upon the school's shaping educational vision.

- *Educational control.* Documents the shift from the school's unilateral control of the teaching and learning to an increasingly distributed mode of control that recognises and actively involves all the teachers of the young.

- *From paper to digital to networked operational base.* Tracks the move from the traditional paper based paradigm to one that is increasingly digital and networked.

- *Digital use in teaching.* Traces the uptake, and in time normalised use of the digital in the teaching of all staff.

- *Digital use by children – in and out of school.* Charts the gradual recognition by teachers of the young's use of the digital outside the classroom and the increasing moves by teachers to capitalise upon that usage and capability.

- *Student Equity.* Documents the changes in the schools and teacher's thinking from it being an insurmountable barrier to a normal facet of student care.

- *Changing operational mindset.* Identifies the movement from a highly insular, 'stand alone' operational mindset to one that is increasingly networked and collaborative.

- *Connection between educational vision and deployment of technology.* Tracks the evolution from the stage where there is little or no connection to where there is an ever-tighter nexus between the educational agenda and the deployment of the technology.

- *School organisational transformation.* Traces the evolutionary transformation of school operations, and indeed the nature of

schooling occurring as the school employs an evermore digital and networked operational base.

• *Home – school – community collaboration.* Describes the schools pronounced movement from insular, stand-alone organisations where there is scant or no real collaboration with the homes and community to an ever greater authentic collaboration with all.

• *Role of home in teaching and learning.* Documents the increasing moves to involve the student's homes in the 24/7/365 holistic teaching of their children and to enhance that contribution.

• *Empowerment of teachers.* Traces the shift from regarding classroom teachers as line workers, whose professionalism is underdeveloped to fully empowered professionals able to meaningfully contribute to the ongoing evolution of the school.

• *Empowerment of students and parents.* Tracks the shift from the stage where the students and parents had little or no genuine voice in the school's operations to the point where the school is collaborating with them in both the teaching and ongoing school enhancement.

• *The Learner.* Identifies the growing moves to position the learner at the centre of evermore collaborative teaching.

• *Pedagogy.* Traces the as yet relatively slow shift from a predominantly teacher centred, ass mode of teaching to one that is more student centred and personalised.

• *Control of ICT Kit.* Follows the pronounced shift from the school's unilateral control of the personal instructional technology to a situation where the user has prime operational responsibility for that technology.

• *Digital technology support and management.* Identifies the move from the school 'ICT experts' controlling all facets of school ICT usage to devolving much of that control and focussing upon and facilitating the whole school community's use of the digital.

- *School website usage and access.* Documents the movement where the school's Web usage is peripheral to being central to all school operations.

- *Net access.* Traces the shift from a tightly controlled and filtered use of the Net by the schools to an increasingly unfettered use.

- *Home- school – community communication.* Documents the demise of paper-based communication and the shift to an increasingly sophisticated digital communications suite.

- *School administration.* Identifies the shift from a highly segmented largely paper based school administration to an evermore integrated digital operations.

- *School funding/resourcing.* Follows the movement from a pronounced reliance on public monies to a model that makes ever-greater use of public, private and community resources.

- *Staff development and support.* Documents the ever-evolving nature of staff development, moving from the extensive use of external, and one-off programs to the adoption of more individual, just in time, multi-modal, school specific staff approaches.

- *Parent contribution to teaching.* Traces the move to remove the traditional home – school teaching divide and to collaboratively merge the teaching of the home with that of the school.

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Chapter 5

Natural School Evolutionary Growth?

At the same time as school educators are coming to grips with the concepts of a school evolutionary continuum, evolutionary stages, stage indicators and the likelihood of most schools having to move through the evolutionary stages they need also to get their minds around the notion that schools upon

becoming digital organisations will in many respects grow naturally. In so doing they will continue to display in that growth and evolution many common developmental attributes, regardless of country, context or vitally their government.

As one reflects upon the remarkable commonality of experiences of the pathfinders, the same suite of variables all have addressed in reaching the digital normalisation stage, the common stages they have moved through and the remarkable similarity of the attributes all showed within each of the stages one does have to ask why that is so.

Why might it be that schools spread across the developed world that have had no association are demonstrating such common evolutionary characteristics?

Their context, level of schooling, resourcing and mode of governance and style of government are all different.

All have had and will continue to chart their own course in unchartered territory.

All at times have experienced seemingly unorganised chaos, and made major mistakes but notwithstanding have experienced a remarkably similar journey with there being no signs of that journey stopping.

The strong signs are, which can be found in both the wider organisational evolution literature as well as the evolutionary route of the pathfinders, that once organisations – largely regardless of purpose – go digital and work from a digital operational base, they will experience considerable natural growth as the digital technology and human understanding and expectations evolve.

However the related signs are that that raw natural growth has always to be shaped by the organisation and its leadership to ensure the organisation's desired agenda is realised.

This shaping has as mentioned in the other chapters been vital in the evolution of all the pathfinders schools, will continue to be as they move further along the evolutionary continuum and will be experienced by all the later adopter schools once they go digital.

One then has to ask what 'natural' forces are at play in shaping the common evolution? Are we seeing in the evolution of schools as organisations the same kind of evolution that is occurring with other complex organisations, with its close ties to the findings flowing from complexity science? The following four attributes of organisational evolution described by Pascale, Millemann and Gioja (2000, p6) largely hold true to what the authors found in the pathfinder schools.

The science of complexity has yielded four bedrock principles relevant to the new strategic work:

1. Complex adaptive systems are at risk when in equilibrium. Equilibrium is a precursor to death.[4]

2. Complex adaptive systems exhibit the capacity of self-organization and emergent complexity.[5] Self-organization arises from intelligence in the remote clusters (or "nodes") within a network. Emergent complexity is generated by the propensity of simple structures to generate novel patterns, infinite variety, and often, a sum that is greater than the parts. (Again, the escalating complexity of life on earth is an example.)

3. Complex adaptive systems tend to move toward the edge of chaos when provoked by a complex task.[6] Bounded instability is more conducive to evolution than either stable equilibrium or explosive instability. (For example, fire has been found to be a critical factor in regenerating healthy forests and prairies.) One important corollary to this principle is that a complex adaptive system, once having reached a temporary "peak" in its fitness landscape (e.g., a company during a golden era), must then "go down to go up" (i.e., moving from one peak to a still higher peak requires it to traverse the valleys of the fitness landscape). In cybernetic terms, the organism must be pulled by competitive pressures far enough out of its usual arrangements before it can create substantially different forms and arrive at a more evolved basin of attraction.

4. One cannot direct a living system, only disturb it.[7] Complex adaptive systems are characterized by weak cause-and-effect linkages. Phase transitions occur in the realm where one relatively small and isolated variation can produce huge effects. Alternatively, large changes may have little effect. (This phenomenon is common in the information industry. Massive efforts to promote a superior operating system may come to naught, whereas a series of serendipitous events may establish an inferior operating system —such as MS-DOS — as the industry standard (Pascale, Millemann and Gioja (2000, p6).

What are the implications of that natural evolutionary growth at the individual school, education authority and government levels?

As stressed at the outset the desire with this Taxonomy is to provide to schools and their community a better understanding of the evolutionary developments likely to occur when schools become digital and in turn networked organisations and move into an era of constant and ongoing change and evolution.

A key facet of that enhanced understanding is the recognition that the vast majority of the education system processes developed for use with schools operating in a world of constancy and continuity will not be applicable in a era of constant and rapid change and evolution, and will need to be replaced by those that are apposite.

The pathfinders would like to see that happen today.

We appreciate that can't be done overnight but it is important those responsible at the school, education authority and government level better understand the evolutionary continuum, the concept of natural evolutionary growth and its potentially profound ramifications.

It is a major global development that warrants immediate substantial research.

Natural Evolutionary Growth?

One of the more pressing needs is to better understand the seemingly natural evolutionary growth.

It is a development that we and other colleagues working in this area have noted for some time that is becoming evermore evident in those schools at the fore of the continuum.

In researching *Developing a Networked School Community* (Lee and Finger, 2010), *Bring Your Own Technology* (Lee and Levins, 2012) and *Collaboration in learning* (Lee and Ward, 2013) and the forthcoming *Digital Normalisation and School Transformation*, and working with the pathfinder schools there has been growing reference by the school leaders to allow time for developments – be it the move to a more collaborative mode of teaching, collaboration with the student's homes or the introduction of BYOT – to grow and evolve. There was an associated recognition of holding off placing unnatural constraints on that growth and so limiting the potential. This is also reflected in the commentaries provide by schools that have gained the Naace 3rd Millennium Learning Award.

In seeking to better understand the development we've liaised with colleagues globally working in this area and clarified our thinking to the point we feel secure making the following observations. All however need to be more fully researched.

With the advantage of hindsight we now recognise educators should have been more conscious of the profound impact the paper technology had upon the form and nature of traditional schooling. Educators and governments have studied the impact of the electronic instructional technology ad infinitum for the last century but as noted in *The Use of Instructional Technology in Schools* (Lee and Winzenried, 2009) seldom if ever examined the impact of the paper technology.

That impact becomes evermore evident as we contrast it with the digital and networked technology. Paper as a technology innately promotes constancy, largely obliges its users to be in close physical proximity, supports the controlled flow of information, and carries with its use significant ongoing costs and organisational inefficiencies.

The contrast with the digital is virtually antithetical with the digital technology ever evolving, evermore sophisticated and convergent, ever less expensive, with all its users able to access information anywhere, anytime 24/7/365. Significantly the users of the ever more sophisticated technology have ever rising expectations and soon identify ever greater opportunities to use the technology.

Digital transformation

As mentioned in the evolutionary stage indicators in Chapter 3 the first major structural transformation in schooling becomes evident when all or near all the teachers used the digital in their everyday teaching.

That is key.

Despite decades of research, innovation, effort and expenditure the form of the place called school remained basically unchanged structurally until the early 2000s.

While the digital technology was being used in much school administration and by a cadre of early adopter teachers beforehand, the transformative power of the digital didn't kick in until the stage where there was the requisite technology in all classrooms and a critical mass of the teachers using that technology in their everyday teaching.

It was that whole or near whole of staff uptake – particular at that stage of IWBs - when coupled with an astute leadership that began the structural transformation and the ongoing evolution.

The combination of that particular technology and the use of it by a critical mass of teachers is what transformed the school's operations, and vitally its pursuit of the apposite education built on a digital base.

In going digital and networked the teachers better understood the

- teaching and learning opportunities and advantages availed by the digital and the networked
- ease and low cost of using those facilities – from anywhere, anytime
- increasingly sophisticated digital technology would continue to evolve and provide ever greater opportunities
- young had already normalised its use 24/7/365
- young's attraction to the technology
- teaching and learning need not be restricted to a physical place
- digital convergence would evermore integrate the school operations
- digital will increasingly dismantle the traditional internal and external school walls and old operational boundaries and open the way for new operational parameters
- many educational and logistical benefits of genuinely collaborating with the student's homes

Lee (in press) elaborates upon each of these and more but you can appreciate from even this short list the transformative impact on the school.

As Naisbitt flagged way back in '84 (Naisbitt, 1984) the technology will invariably be used initially to replicate the old ways and then in time will be used in many different ways.

That is what we have seen with schools going digital and moving along the evolutionary continuum.

Teachers need time to become comfortable and confident in using the technology in their teaching, to recognise the possibilities, to learn from others, to lift their expectations and to appreciate they need not be bound to the ways of old.

However as their understanding, competence and confidence grows, as the technology develops, as the school as a collective recognises the possibilities and readies the path forward and as the school begins genuinely collaborating with its homes and develops a more networked mindset so the pace of the digital transformation grows.

This is what we have seen, albeit in those schools with astute heads and a strong shaping educational vision.

Accelerated digital transformation

The rate of evolution escalates and the school as a community begins to learn how to thrive on an-going basis with constant change and evolution.

It makes ever-greater use of the apposite digital technology in all facets of its operations, using it to help create the desired highly effective and efficient school specific ecology that increasingly draws all its homes and the community into the provision of the desired education on a sustained basis.

It is an approach that impacts on every facet of the school's ever-more integrated operations, its teaching as well as its administration and communication.

This is a natural and logical progression.

It thus in many respects ought come as no surprise, particularly when the school is lead by astute heads that the evolutionary pattern is evidenced globally.

All the schools are also being impacted by the same technological developments at much the same time.

Add to that one is looking at schools – which admittedly could be coincidental – in a largely common Anglo-Saxon culture, being lead by principals whose thinking would likely have been shaped by similar educational and school leadership literature.

It should be expected that as the base technology evolves globally, as the user's recognition grows and as astute principals enhance their facility to shape the desired school specific ecology, so we should continue to see a largely common evolutionary continuum with common key development stages.

• **Digital normalisation**

By the digital normalisation stage schools, their teachers and community have 'normalised' working in an ever-evolving, ever -changing scene with the digital technology disappearing in to the background and the focus being on realising the desired educational benefits.

In brief the schools and their immediate community have evolved to the point where they view the whole of school use of the digital as naturally as the

traditional school viewed the use of paper – with it playing a central role in all the school's other operations.

Those schools are positioned to build at pace on that normalisation and to grasp the opportunities possible only when all within the school have their suite of digital technologies they can use 24/7/365.

In brief as one reflects on the evolutionary path taken by the pathfinders globally and notes the strength and commonality of the forces at play it should not be too much of a surprise to observe the natural growth and the commonality of the experiences the schools have had and will continue to have.

Shaping the Evolutionary Forces

What is however vital to understand – as mentioned above – the raw natural growth has always to be shaped by the organisation's leadership.

All the pathfinder schools sought to shape the evolutionary developments to their own educational advantage throughout their long journey.

All have been highly proactive and have had astute principals who've appreciated the necessity of playing a lead role throughout the school's journey.

Their efforts stand in marked contrast to many, many principals, and indeed education authority leaders who have chosen over the last 15/20 years simply to continue to react to the evolutionary forces, to the megatrends.

Indeed the more we analyse the natural growth of schooling and the imperative of shaping that growth the more we'd underscore the point made earlier about the vital importance of the principal.

The importance of a quality head, with considerable digital acumen, and a strong and clear educational vision appears in many respects greater than ever.

That capability was to the fore in all our case studies, as too was it in a comparable evolutionary study of 22 UK schools by Professor Peter Twining from the Open University (http://edfutures.net/Digital_technology_trends).

The pathfinder principals are the new de facto policy makers, with they, not those in the central offices, translating the latest technology directly into practice and showing their later adopter colleagues what is possible.

Importantly it is only the school leaders working at the front of the evolutionary continuum who are in the position to convert the latest

technological developments, societal megatrends and ever-rising human expectations into apposite practice and vitally who are positioned to liaise with those observers attuned to the latest developments to provide advice for the later adopters.

The principal as the school's CEO and chief conductor has moreover to be the ultimate shaper of the desired school ecology.

It is a new reality that the educational decision makers and researchers need to understand and factor into their operations if their work is to be relevant. One of the more prescient education authorities with which we worked sought assistance from local tertiary researchers in analysing its ground-breaking work only to be told it had to provide a control cohort of students unable to use the digital for three years, and a study group that had to use the same technology throughout the three years of the study! Needless to say the offer was declined.

The schools at the front end of the evolutionary continuum are operating within a fundamentally different paradigm to those at the other end.

Conclusion

The full implications associated with schools operating within a paradigm of digital normalisation should be understood by all associated with schooling.

The receivers of the educational service need to be educated in the new ways.

The providers at all levels need to understand and begin coming to grips with the many implications that flow from the change in mode.

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Chapter 6

The Implications

Considerable mention has been made in earlier chapters of the many and likely profound implications that flow from acknowledging the evolutionary nature of schooling.

You've probably already begun thinking of the ramifications for your school.

The authors' experience is that the more you delve and come to understand the workings of the schools at the various evolutionary stages the greater will be the implications you'll identify.

What we have tried to do in this chapter is to assist your thinking and to flag some potentially key issues you might not have considered.

We most assuredly will not try to address all the implications, and will in the main focus on the implications that flow from the greater understanding of the school evolutionary process. The more detailed analysis is provided in the companion work *Digital Normalisation and School Transformation*.

What we have done however is begin addressing the implications for all associated with a nation's schools, some of whom might initially imagine this evolutionary development won't impact them or their contribution.

These are still very early days and in many respects if this Taxonomy manages to get educators thinking seriously about the implications of the evolutionary process we will have succeeded.

What is imperative for all to understand – be you a parent, teacher, principal, educational administrator, researcher, policy developer or teacher educator - is that once schools go digital and networked they begin operating within a fundamentally different operational paradigm (Lee and Finger, 2010).

That shift of operational mode needs to be recognised as the game changer that it is.

That change increasingly renders obsolete so many of the givens that we have associated with schooling and obliges schools, education authorities, education researchers and governments to adjust their ways accordingly.

Constant change and evolution

The first key point to appreciate is that in going digital schools move to a world of constant, often rapid and uncertain change and evolution. Schools will never return to the relative constancy of previous generations as creativity and innovation in teaching and learning spreads out beyond the leaders to all involved, including the students. Even should technology development slow the individuals involved are very likely to continue to be creative in how they apply it. As we are all aware that technology development will continue apace for the foreseeable future this will stimulate and accelerate that creativity.

The message coming through from the pathfinder's experience is that it takes time and movement through the evolutionary stages for schools to fully

accept the new reality as the norm and to cease defaulting to the idea that a solution will stay in place for many years to come.

Solutions will increasingly be for a given context at a particular time in the school's evolutionary development. The old change literature spoke of 'freezing' the desired change. In a constantly evolving school the normalisation of an approach might only last several years before needing to be changed. Some developments might last only a few months before being superseded by approaches found to work more effectively, as can be seen for example in the evolution of websites into learning platforms/VLEs and then into social networking approaches.

Evolution – not revolution

It bears affirming that we are talking evolutionary, not revolutionary change.

While national planning documents, like that of the US Department of Education (2010) likes to speak of the need for a revolution and the throwing out of the old ways the reality evident in the continuum is that with complex human organisations like schools one is looking at an evolutionary process. It is process that entails changing the nature, culture and ecology of schools as the schools forever evolve.

Changes may appear revolutionary if one considers just the technology, such as the introduction of Internet access, interactive whiteboards or pupils using mobile devices, but the human purposes for which these things are used in the teaching and learning processes do not fundamentally change in a revolutionary way, they evolve and change in a graduated manner.

The individual school

As indicated at the outset the traditional focus, and indeed the focus of most governments across the developed world today is still systemic, with the schools seen as a collective, the assumption being that all are basically the same and are best 'enhanced' by top down 'one size fits all' solutions.

Historically long-term fundamental organisational evolution has never been achieved by such an approach.

What the pathfinders and the evolutionary continuum affirm is that that kind of structural change has to be made from within individual schools.

The experiences of the pathfinders in their school evolutionary process proclaims very strongly that every school is unique, with its own context, sitting at a particular point along the evolutionary continuum and requiring its own developmental solution.

This requires a fundamental refocus by most associated with the development of schools, particularly at the system level.

Ironically across the developed world while governments still tend to view all schools as the same those governments are at the same time generally moving to give schools ever-greater autonomy in their decision making. All but a few of the pathfinder schools had a single line budget and were free to use their total pool of monies as they believed appropriate.

The focus should be on the evolution of individual school, and what will promote and support the evolution of each school as a distinct entity.

School ecology

Allied ought be the recognition that each of those individual schools has its own distinct ecology and that in their ongoing evolution the ecology will need to be constantly shaped to ensure it always provides its students the desired education.

As schools move along the continuum their ecology will become evermore distinct, ever-more integrated in nature, will increasingly involve all the teachers of the young in and outside the school walls, became less reliant on the physical place called school and evermore dependent on the glue provided by the school's shaping educational vision.

School variability

While seemingly self-evident it is imperative all associated with schooling, be they users, providers or support bodies recognise the ever-greater variability of schools, and attune their thinking accordingly. We speak here of the variability of approaches not outcomes, approaches that can each create achievement outcomes that satisfy societal and government demands.

The direction and support given schools should recognise the new reality, and yet globally education authorities continue rolling out policies, conducting staff development programs and research projects that are premised on all schools, and all staff therein being in the same situation and thus requiring the same assistance.

Those liaising directly with the schools, like the parents, teacher educators and the student support agencies are increasingly aware of the variability but seemingly the message has yet to reach the more removed.

Perhaps it is time for schools to more loudly proclaim the importance of recognising the schools' distinct character and needs.

Shaping educational vision

In analysing the schools' educational direction setting as they moved along the continuum you'll have noticed how the shaping educational vision

- assumed ever-greater importance

- was school specific - but although not stated was also closely linked to the nation's shaping educational vision

- operated as a key shaper and integrator of all school operations

- looked to provide an ever-apposite holistic 24/7/365 schooling for the 21st century

While the pathfinders paid due attention to the local testing regime their overarching focus was the provision of that apposite education.

Student attainment

The performance of all the students will always be a priority.

It is simply that the pathfinders studied all opted to provide a holistic education they believed would best prepare their students for life and work in the 21st century; an education that would also prepare the students for the local assessment regime.

Not surprisingly all the schools studied were performing in the local tests above their socio-economic status while at the same time developing a wider intrapersonal and interpersonal skill set of the type identified by Pellegrino and Hilton (2012).

As years of research attest when a school has a strong educational focus, high expectations of its students, is well lead, has committed, empowered teachers, strong home-school collaboration and a culture that promotes learning the students will do well. Add to that list the astute normalised, 24/7/365 use of the latest technology and it is little surprise all the schools studied at the front end of the continuum had high academic attainment.

Natural growth

The concept of natural evolutionary growth has as already mentioned in Chapter 5, immense implications at the school, education authority, government and even the international level.

It is a variable barely mentioned in the school change literature and most assuredly one rarely addressed in education authority development strategies.

It is a force that needs to be well understood if schools are to shape their influence astutely. Its impact is particularly evident from the Early Networked stage onwards.

An astute principal made mention of allowing time for the natural growth to occur, to take form and if needs to give it an occasional nudge if it moves off course. It is advice all could well heed.

Time

It should be clear by now that normally it takes considerable time to move schools to along the evolutionary continuum.

The myth of swift seemingly overnight change should be killed. There may be swift developments in use of the digital, for example a school succeeding in getting the majority of staff to make use of an online environment they have implemented over a period of only a few weeks, but that represents just the starting point of the important changes in the educational processes and transactions that then ensues over a longer period of time.

Join in panning the employment of 'silver bullet' solutions (Thorp, 1998) and the spin invariably employed in selling these seemingly magic panaceas.

It takes highly skilled and proactive professionals invariably years of astute and concerted effort to achieve the desired school transformation.

Shaping the forces

An increasingly important part of that effort entails expertly shaping the major forces at play on the school to best effect.

Lee in *Digital Normalisation and School Transformation* writes of 'riding the megatrends' and the importance of school leaders being able to read the coming trends, to catch and ride those waves and when appropriate to get off and on to the next.

It is a new and vital skill required of all school leaders.

So too is the ability to listen to and collaborate with an increasingly digitally empowered parent community which in contributing their educational expertise and digital resources to the school will expect to have a significant ongoing say in the school's development.

Observe the trend lines

A related art is the facility to read the evolutionary trends.

Traditionally in a world of constancy one looked at the now.

In the world of ongoing change and evolution the key is to monitor the trend lines.

The Threads examined in Chapter 4 provide a vital insight into the evolutionary trends.

Pathfinders as 'policy developers'

By this stage you'll appreciate what we meant in Chapter 1 when we observed the pathfinder schools had become the de facto school policy makers.

They are the ones – often instantly – converting the latest technological and societal developments into everyday practice. The conversion is being done by skilled professional teachers working in a culture readily able to accommodate the apposite technology, not by some external ICT experts unaware of the particular school's context and ecology.

Moreover they are the schools being featured in the educational journals, at the conferences and to whom the later adopter schools will turn to for advice and direction.

Teachers and school leaders are seeking the advice of those thriving in the reality of constant and rapid change rather than some central office bureaucrat invariably out of touch with the work being done at the front of the evolutionary continuum. Of note is that one of the more astute education authorities we interviewed has factored into its annual operations bus tours to the pathfinder schools. Educators travel from across the Americas to attend.

It is a new reality that might not go down well with those in positions of central office 'power' but it is one that should be understood by governments, treasuries and policy developers.

As one can appreciate the pressure on those pathfinders and their communities is considerable, but with that attention and recognition comes immense pride and the desire by evermore parents to have their children experience that education. Nevertheless some pathfinders have already reached the stage of having to ensure cost-recovery by charging for the time of staff involved in the CPD of visiting schools, which matter should be realised by schools attempting to follow the leaders' best practice.

Role of the principal

Considerable mention has already been made of the vital lead role of the principal.

Our reading of the trend lines is that this lead role will become evermore important the further the schools move along the evolutionary continuum and the sophistication and complexity of the school ecology they are orchestrating grows. Lee has elaborated upon this changing role in the complementary publication.

The pathfinder principals are demonstrating a skill set very likely not possessed by all principals, or indeed mooted in the current leadership literature and the national standards for school principals.

They are a rare resource. They have unwittingly taken on a level of developmental 'responsibility' normally accorded significantly better-paid bureaucrats.

The question has to be asked – should the pathfinding principals be better paid than their colleagues at the bottom end of the continuum?

In keeping with the premise that all schools are the same globally principals in similar sized schools are invariably paid the same, regardless where their school sits on the evolutionary continuum.

Might it be time to consider more fully using this rare resource in multi-campus situations?

Thought ought be given to the new evolutionary scene and the imperative of having as principals those can lead ever-evolving schools.

The corollary is to ask what should happen to those unable to lead the school beyond the paper- based stage?

Control of the teaching process

One of the more telling developments as schools move along the evolutionary continuum is, as examined in Chapter 5 is the shift from a unilateral control of the teaching by the schools to one where that control is distributed across all the teachers of the young.

The willingness of schools, and vitally their teachers to cede some power and distribute the control of the teaching of the young with all who play a part is in many respects critical to schools movement along the evolutionary continuum.

Until schools and their teachers are genuinely willing to collaborate with their homes and work with them in the 24/7/365 teaching of the young – along the lines flagged in *Collaboration in learning: transcending the school walls* (Lee and Ward, 2013) – their evolution will be stymied.

Government 'control'

Governments like to feel they are in control of the schooling they provide, and vitally the very considerable investment they make in their schools annually.

Those pathfinders and those following close behind have as we have identified been relatively little impacted by government dictates.

Those schools are where they are in the main because the school leadership, over the last 10-20 years, has recognised the educational imperative of shaping their own development.

Some of those pathfinders have had the good fortune of working in an education authority that has long recognised that the best way forward is to support the individual schools and provide each with the requisite infrastructure, direction and support.

The others, while receiving significant government monies, fulfilling their government obligations and preparing their students well for the local testing regime have shaped their own course forward with little or no help from government or local authorities, and sometimes against some adversity from national and local authorities keen not to have their other schools 'de-stabilised' by approaches they consider impossible for others to manage.

Indeed the advice and support offered by government was often so dated as to be meaningless.

In some situations, like England it appears the government of the day is willing to cede some aspects of control to the schools thinking it can use its national curriculum, external exams and the likes of Ofsted to provide the 'real' control.

The reality, as seen throughout the Taxonomy, the extent of government control over the operations of human organisations like schools is limited.

Governments like the schools themselves need to recognise the value of moving from the current base premise of mistrust to one of trust. They would do well to attune their ways to trusting their educational professionals and school communities.

All micro management does is frustrate the natural evolutionary process.

CBI, the peak UK employer group tellingly made this observation in its recent report to the UK government, noting

> Setting schools free to deliver the outcomes we task them with reaching will ensure school leaders can work with their staff to build an ethos and culture that embeds aspiration and ambition. The existing system has hamstrung and micro-managed teachers and head teachers for too long. The drive to decentralise control needs to go further, faster and spread to the devolved nations.

> Teachers and school leaders are professionals – we should treat them as such, offering greater freedom in the classroom, better professional development and building a culture of improvement, linked to an effective system of performance management (CBI, 2012, p8).

Role of education authorities

The school evolutionary process and as mentioned the diminished contribution the traditional central offices are making to the development of schools should prompt governments, particularly at a time when so many are under financial pressure, to rethink the role of education authorities, the kind of resources they require in the new scenario and what resources might better be in the schools.

What at present is not clear is how the system leadership role of digitally normalised schools can be funded. Local authorities have traditionally been able to cream funding from the overall education budget but this becomes difficult or impossible when budget control is ceded to schools. Some schools on the slow end of the evolutionary continuum still expect CPD and school improvement help to be provided by authorities and have not realised the need to allocate their own funding to this. Hence there may be insufficient money available to fund the time of staff in the schools at the leading end of the evolutionary spectrum.

Research and school development

The school evolutionary process should also oblige many within the educational research community globally – and indeed those who fund the researchers - to ask how well they attuned to the development.

It should particularly ask how well the research methodology is attuned to assisting schools working with constant, often rapid and uncertain change and evolution?

The strong impression of many in the schools is that most researchers are still immersed in the world of constancy and continuity, tightly wedded to a set of academic conventions that are in many respects alien to the type of rapid evolution occurring. The suggestion of a three-year control group methodology reinforces that perception.

When one notes the investment in and worth of a three-year netbook research project when the findings of the study are released after the company concerned ceased its production of netbooks adds to that concern.

The implications for educational researchers are considerable, and like the future role of education authorities will come under ever-greater financial scrutiny. The section in chapter 7 on quantifying the impact of technology on learning explores the problems of researching the impact of technology on learning.

Conclusion

Over time as the pathfinders move along the evolutionary continuum, and evermore schools leave behind the world of constancy and continuity and operate within a digital and networked operational paradigm the implications for all associated with schooling will grow.

The above is a 2014 overview.

What we have simply tried to do is open eyes to the kind of issues to be addressed now and into the future.

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Chapter 7

Overall conclusion

As stressed the concepts we have identified and analysed in this Taxonomy are in 2014 novel.

They don't fit with most of the prevailing thinking about the nature and development of schooling.

They do however reflect the reality with schooling across the developed world and today there is already a vast and growing chasm between the types

of schooling provided at each end of the continuum that has yet to be factored into school development.

It is appreciated we have gone out on a limb but with a combined experience of over 100 years in school development at the both the school and system level we believe it important to highlight the fundamental changes finally happening in schooling.

This Taxonomy is not a theoretical treatise.

Rather it is a description and an analysis of what is happening in schools today.

The pathfinder schools in normalising or near normalising the whole school community use of the digital normalisation are ideally positioned to continue evolving at pace and to finally realise the dividends they set out to reap 15/20 years ago.

The schools at the other end of the continuum are at this time, usually unwittingly, falling ever further behind the normal societal expectations in relation to the use of the digital. Pascale (1999) explains the danger of organisations in equilibrium.

If yours is a school in the later position you can accept it. Indeed some schools may well bear that reactionary stance as a badge of honour. But be aware that lack of experience of digital normalisation will increasingly damage the career prospects of teachers in such schools.

If however your school is in that position and wishes to provide an education more in keeping with societal expectations and to move at pace along the evolutionary continuum hopefully the Taxonomy will provide your school community the insight required.

While the educational professionals ought as discussed play a lead role the success of the journey lies in increasingly in involving the school's homes and community.

We hopefully have communicated the size of the challenge, its complexity, the time required and variables needing consideration.

It is up to your school to decide if and how it wishes to proceed along the evolutionary path.

Quantifying impact on learning.

The taxonomy describes the development stages through which schools normalise the use of digital develop. It does not attempt to analyse what the

impact on learning is of schools doing this. Schools undertake these developments because they believe them, through trial, to be beneficial and to be instrumental in the raised achievement those results that they track carefully.

We feel it is desirable that educators should understand better the mechanisms through which the use of the digital environment and digital devices impact positively on learning, in order that they can seek to quantify and increase the impact.

This is a difficult area for research. The issue that makes it difficult is that use of digital approaches, except in very limited circumstances such as purely online learning with no human contact, or drill and practice where learning is immediately tested, is not isolated from the other aspects of the learning environment and is embedded in activities that are non-digital as well as digital. It is therefore very difficult to identify a causal relationship between the use of digital and raised achievement. This has seriously hampered researchers who have been unable to establish traditional control groups. In major studies such as the Impact 2 study from the UK technology agency Becta, the best that could be achieved was a positive correlation between use of technology and raised achievement, but no causal link that could be identified in research terms.

This difficulty was acknowledged by Vanessa Pittard then Head of the Technology Policy Unit of the UK Department for Education, in a presentation given in May 2011. She stated (in the report of the meeting published by Naace, with her consent)

> This is not about technology in its own right directly producing better outcomes but that of technology enabling better practice and this better practice impacting on outcomes; the question then is what practice using ICT produces most impact, particularly in relation to difficult to tackle educational issues.

This then poses the question of what technology enables or does to produce better practice, and whether these things can be quantified. The European Education Partnership analysis of this was conducted by in 2001 (http://www.eep-edu.org/InnService/Start/what_addval_start.htm). This agrees in large measure with what is seen in the ways that schools that have digitally normalised use of their digital systems and environments. The balance of mechanisms will depend on the nature of the school and hence where it sees most impact in use of digital; a school in a rural area with widely distributed pupils might concentrate on using digital to improve communication and collaboration out of school, whereas an inner-city school with resource-poor homes might focus on increasing pupil access to resources.

The mechanisms for impact of digital can also be correlated with descriptions of what constitutes outstanding teaching and learning and can be seen to support the elements of this in numerous ways. These might be phrased as follows and we invite you to decide which mechanisms of digital use enable which aspects of outstanding teaching:

- Evidence of all pupils making progress

- Excellent feedback.

- Inspirational teaching.

- Checking of understanding and assessment for learning.

- Setting high expectations.

- High engagement of pupils.

We therefore offer you the following mechanisms through which technology impacts on learning. Each of these provide for uses of technology that enhance existing practice, doing better things that could be achieved without technology but which are substantially more effective with technology, and also for uses that extend what can be achieved, through mechanisms that are not possible without technology. The areas of impact are listed in no particular order; indeed as suggested above schools will give higher or lower priority to getting impact in these ways dependent on their nature, locality and community.

1) Extending learning time. This applies to raising concentration and reducing time off-task in teacher-led learning situations as well as extending learning when students are not with their teacher.

2) Increasing communication and collaboration. This impacts through substantially increasing learning conversations and the number and range of people with whom students can converse and collaborate to aid their learning.

3) Increasing access to resources and tools. This is increasingly being combined with guidance and systems to increase the relevance and usability of resources and tools that are presented to students or which they find independently.

4) Increasing motivation to learn. This is a combination of inherent motivating capabilities of technology and the ability of technology to enable learning in

places and at time when students are more motivated to turn their attention to learning.

5) Enabling access for minorities. All students are in minorities at various times during their learning. These can be long-lasting minorities relating to language or disability, or short-term minorities such as being unable to grasp a concept that the rest of their class has already grasped.

6) Enabling games-based learning. Games produce a level of concentration and interaction that produces intensive learning and willingness to try and re-try in order to achieve. They are characterised by highly appealing presentation and ways of interacting with them, immediate feedback and high challenge. It might be considered that the impact results just from the higher concentration but there is growing evidence that the impact is much deeper than this neurologically.

7) Re-balancing teaching and learning. Technology can enable independent learning that requires less time of support from a student's teacher and can enable teachers to teach and guide more students. Technology can also improve the quality of teacher support to groups and individuals.

8) Increasing scalability and ability to be replicated. Technology can enable educational organisations to reach more students and to replicate the educational experiences provided by the best teachers more reliably.

9) Using more information channels into the brain. By enabling aural, visual, video, graphical and animated presentations of information to be combined with textual presentations, the ability of students to understand is increased.

10) Enabling publishing and audience. This makes good learning and work more visible to students, teachers and other people influential on students' learning. It also provides mechanisms for feedback to learners about the quality of their work. Given the importance attached to good feedback and peer tutoring in meta-studies of educational research this is a very important way that technology creates positive impact on learning.

11) Automating management and recording. This is relevant to both students and their teachers as the ability to see progress in learning generates confidence and willingness by learners to accept greater challenges. For the teacher it enables them to guide students towards appropriate work more precisely.

Schools wishing to gain some measures of how the technology they have implemented is improving learning could research any of the above mechanisms, qualitatively and quantitatively. Online learning environments are increasingly giving access to data on the use being made of them by

students and this might provide a rich source of data for researchers, that could extend to looking at human social networks in learning as well as individual learner behaviour.

To return to the statement made by Pittard, impact is likely to be greatest when technology is used in relation to difficult to tackle educational issues. In assessing the return on investment in technology, which is a matter of concern given the relatively high cost of technology, educational organisations need to differentiate between useful but relatively low impact uses of digital, and those uses that can have very high impact.

We are confident that schools that have normalised the use of digital will have had many conversations that have related the factors above to the increases in learning that they have seen happening in their exploration of new digitally enabled approaches. We encourage readers to do likewise in their schools so as to better develop the vocabulary to talk about impact of digital, to better appreciate the very large impact it has, so as to better explain it to parents and policy makers.

Support

We have created at http://www.schoolevolutionarystages.net a site where we'll regularly provide ideas to assist your journey.

It is can be freely be used by all interested.

Contact

If you wish to contact Mal Lee use – mailto:mallee@mac.com or Roger Broadie - mailto:roger@broadieassociates.co.uk.

Alternatively try our personal sites

http://www.malleehome.com

http://www.BroadieAssociates.co.uk

Consultancy

Both of us are moreover happy to provide consultancy support face to face or via Skype.

Mal Lee is located in Broulee, Australia.

Roger Broadie is located in Halifax, England

Taxonomy Updates

Conscious of the ever –evolving continuum, and the extra clarity provided as evermore schools move along the continuum the authors' intention is to update the work on a regular basis.

Indeed it is one of the main reasons for publishing the Taxonomy as a readily downloadable PDF document

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