

Education for the Digital Age Mātauranga mo te Tau Mamati

Case for Change and Next Steps

Harnessing the power of digital technologies to help transform learning, teaching and administration across the education system

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Executive Summary

Context

Education is a vital contributor to New Zealand's cultural and social well-being and an important driver for economic participation and productivity.

Educators today face unprecedented opportunities and challenges as they strive to equip students with the skills they need for success in a globalised, technology-driven world.

New Zealand performs well in international comparisons, but has significant challenges to address. Our system is characterised by growing disparity and inequality, with many children and young people learning in environments that do not provide the support necessary for them to succeed.

This disparity is exacerbated by the changing nature of work and employers' ever-increasing demands for new, more sophisticated skills. Jobs that can be automated are being automated; human skills that cannot be replaced by computers are highly sought after. In New Zealand, as elsewhere in the world, educators struggle to provide the kind of education needed to prepare students for the demands of a rapidly changing world.

Case for change

In the right conditions, technologies can powerfully support better educational outcomes. They can enhance effective teaching, help address inequities, expand and create new learning opportunities, and provide the capability to serve increasingly complex teacher and student needs. When facilitated by skilled educators, technologies enable every student to follow a personalised pathway from early childhood to life-long learning that is tailored to their changing goals, interests and learning needs.

This case for change argues the need to harness the power of digital technologies to help transform teaching, learning and administration across the education system. It follows agreement by New Zealand's education agencies and organisations to collaborate on planning and investment, taking an evidence-based, future-focused approach.

Creating the conditions for success

Technologies on their own cannot lift achievement or reduce disparity. Research shows that technologies have significant potential to transform education only when the following conditions are in place:

- a **vision and goals** developed in partnership with the education sector and wider community for a future-focused education system
- teachers and leaders with the **pedagogical and technical capability** to integrate digital technologies in ways that lift achievement
- a **willingness to embrace 'new knowledge' and digital competencies** and be flexible in how learning is assessed and qualifications recognised
- **learning partnerships** in which educators, parents, communities and business collaborate in innovative curriculum design and delivery, and share responsibility for lifting achievement
- **flexibility in the way resources are used** to target need, respond to learners' aspirations, and adapt to changing demands.

We propose to take a proactive but measured approach to investment, with strategies to create the conditions necessary for success and staged investments in technologies, starting with those most likely to support system transformation.

While getting the conditions right is critical to success, every constituent of the education sector will continue investing in technology initiatives regardless. Therefore, the more quickly a planned, deliberate investment strategy is implemented, the fewer ad hoc, unconnected investments will be made.

Unlocking technology's potential to contribute to system transformation

Technologies afford opportunities to enhance practice in almost all domains of education.

We have grouped these opportunities under five broad headings:

- embed digital in future-oriented teaching, learning and assessment
- strengthen connections with families and whānau, communities and employers
- help leaders and educators build their capability
- better support decision-makers
- make better use of resources across the system.

Portfolio of proposed technology investments

This paper proposes technology investments that will establish the core digital foundations needed to support the effective adoption of technologies for teaching and learning.

Taken together, these investments will provide the underpinning digital enablers to unlock the opportunities listed above:

- enable an **integrated, connected online learning environment**, accessible to educators and to students and those who support them anytime, anywhere
- design **new approaches to curriculum and assessment** that leverage technologies to expand what can be learned and assessed, and enable assessment to be a seamless part of learning
- enhance decision-making by ensuring **high quality data is easily accessible** to educators, stakeholders, and decision-makers, including data on the education workforce
- provide **core digital services and infrastructure** to reduce costs, improve efficiency, and free up educators and providers to focus on delivering a quality education
- **improve agency communication channels and systems** to make it easy for the public to interact with the education system, improve agency efficiency and reduce costs.

Implementing these would provide opportunities to trial new ways of working, such as actively engaging and co-designing with the sector so the right solutions address the right problems.

Delivering this portfolio will be a complex endeavour. This will include implementing a deliberate strategy to leverage digital technologies to deepen and accelerate student learning and system performance, and new governance structures to facilitate effective cross-sector working and timely decision-making.

Introduction

Purpose of this document

1. This document supports proposals by the Ministry of Education and education agencies to harness the potential of digital technologies to help transform teaching and learning.
2. This document comprises three main sections and appendices, that:
 - confirm the case for change and the need to invest – Case for Change, from p 8
 - describe the opportunities to harness the potential of digital technologies for transformation, and their expected outcomes – Transforming Education for the Digital Age, from p 12
 - outline the next steps for establishing a change portfolio of work, including governance – Next Steps, from p 26.

Note: Source references are in numeric notes at the end of the report; additional textual information is in the footnotes labelled alphabetically.

Background to this document

3. In 2015, 11 education agencies and organisations endorsed a digital strategy for the education system – Transforming Education for the Digital Age 2015–2020. The strategy was intended as a guiding document for the education agencies. It provides a useful starting point, focusing on the enabling potential of technologies, but was not intended to describe the broader leadership and pedagogical changes required for whole system change.

4. The strategy was developed in partnership with:

CareersNZ

Education Council of
Aotearoa New Zealand

Education New Zealand

Education Payroll

Education Review Office

Ministry of Education

Network for Learning

New Zealand Qualifications Authority

REANNZ (Research and Education

Advanced Network New Zealand)

Te Kura (The Correspondence School)

Tertiary Education Commission.

Case for Change

Education contributes significantly to cultural, social and economic well-being

5. Education plays a critical role in developing the skills that enable New Zealanders to participate actively in civic society and contribute to New Zealand's economic prosperity.

6. Education is an important driver for economic participation and productivity. Educators^a are responsible for developing knowledgeable and skilled individuals who have the desired intellectual, social and cultural competencies to be successful in life, including work.

For students, education develops knowledge and skills that allow them to live an enriched life. ... It creates access to opportunities, forges identity and culture, and frequently leads to lifelong benefits in terms of health, wealth and life satisfaction.¹

7. The stronger the education system, and the longer students stay in education, the more education contributes to reducing costs to government such as for financial assistance, and health and corrections services.²

8. The Government's education manifesto recognises that learning for the 21st century must be relevant to the lives of New Zealanders today and the technology they will interact with. The manifesto includes a focus on the skills that will provide students with the opportunities to thrive in all aspects of their lives.³ Achieving this depends on an education system that develops creative, resourceful learners^b with the competencies and skills needed to participate actively in a modern, digitally powered economy and attain rewarding work.

Globally, education faces a significant challenge determining what teaching and learning should look like in a rapidly changing world

9. The rapid development of digital technologies and the globalised nature of economic systems are creating an entirely new set of educational challenges for the world to adapt to.⁴ As a system, we need to embrace the expanding body of knowledge about how learning occurs and embrace those practices that have the greatest impact of raising achievement.⁵

10. The learning sciences^c are expanding our knowledge of how people learn and underscores the importance of "rethinking what is taught, how it is taught, and how learning is assessed".⁶

^a The term 'educators' includes school and early childhood teachers, tertiary sector educators and instructors, and providers of other forms of learning.

^b The term 'learners' encompasses people of all ages in all forms of learning (that is, early child education, compulsory schooling, tertiary education, and on-job and other forms of lifelong learning).

^c Learning sciences is an interdisciplinary field that studies teaching and learning in a variety of formal and informal settings.

11. Citizens of the future need to master a suite of adaptable competencies such as complex problem-solving, cross-cultural communication and collaboration; and to navigate an increasingly digital and automated world.⁷

The capacity to manage information and solve problems using [technology] is becoming a necessity as ICT applications permeate the workplace, the classroom and lecture hall, the home, and social interaction more generally.⁸

12. The digital revolution is transforming our work, our organisations, and our daily lives. It is changing the way children and young people play, access information, communicate, and learn. Digital fluency is now accepted as necessary foundational knowledge, alongside literacy and numeracy, that all students (and educators) must have to be successful 21st century citizens.

New Zealand performs well in international comparisons ...

13. New Zealand's education system is highly regarded internationally. Studies such as the Trends in International Mathematics and Science Study consistently place New Zealand in the top 20 OECD countries for reading, writing, mathematics, and science.⁹

14. The OECD's 2016 Survey of Adult Skills puts New Zealand significantly above the average in numeracy and literacy proficiency and at number one for proficiency in problem solving in technology-rich environments.¹⁰ The Worldwide Educating for the Future Index (2017) compares New Zealand favourably with 35 countries, acknowledging the groundwork laid to "prepare students for the demands of work and life in a rapidly changing landscape".¹¹

... but significant challenges need to be addressed

15. The OECD and others suggest that, for a variety of reasons, the real contributions technology can make to teaching and learning have yet to be realised and exploited.¹²

[H]igh-performing countries (notably Australia, New Zealand and Finland) have experienced a statistically significant decline in performance levels rather than an improvement. ... [P]atterns of results from longitudinal surveys of achievement ... suggest ... there are limits as to how much more productivity can be squeezed out of school systems operating within the current paradigm.¹³

Disparity and inequity

16. Our system is characterised by disparity and inequality. For example, in 2016, 88% of Pākehā students achieved at least NCEA Level 2 or equivalent compared with 74% of Māori students and 79% of Pacific students.¹⁴

Our top students are doing as well as students anywhere in the world, but that group is smaller, and while we have made some gains, the gap between our top performing students and those who are not doing so well remains.¹⁵

17. A critical determinant of success is the extent to which students experience teaching that honours their identity, language, and culture.¹⁶ These results show that many students are in environments that do not provide the support necessary for them to achieve.

Rapidly changing nature of work and the skills required for global citizenship

18. Disparity and inequality are compounded by rapid changes in the nature of paid work, which are demanding new skills of all workers and having negative impacts on less-skilled workers. Many jobs are disappearing as they are automated, while new, more-complex jobs are emerging with the development of new technologies.

19. A 2016 report by the Future of Work Commission¹⁷ noted that the absence of skilled workers was the number one issue the business community raised with the Commission. Employers struggle to recruit New Zealanders with the skills they seek,^d and, across the system, education providers struggle to meet the demand for new skills.

Modern workplaces require teamwork, planning skills, communication skills, improvisation, agility of mind, and a large foundation of knowledge.¹⁸

20. Many educators acknowledge their lack of skills to meet the challenge of 21st century teaching and learning, particularly in relation to digital technologies:

Some teachers assume putting devices in front of students is all that is needed. Not enough skills to develop efficient use of devices are taught.¹⁹

21. A recent open letter to New Zealand by almost 200 New Zealand companies reflects the changing nature of the skills they seek.²⁰

As employment is increasingly redefined by technology and new skills, the job market needs to respond in new ways to find talent. Skills will replace fixed knowledge and new jobs will replace the old. These new jobs need to be adaptable and offer applicants the ability to learn on the job. The pace of change is rapid.

As such, we confirm that for a range of specific, skilled-based roles in our companies, we do not require tertiary qualifications. These may be roles in technology, sales, marketing, customer service, management, manufacturing and operations to name a few.

22. This signals a shift from education as something students complete to prepare them for life and work, to education as a life-long endeavour. The Future of Work report (2017)²¹ noted that “ The most important single driver of inclusion, resilience and adaptability in the future of work is education and training. We live in a world where the notion of completing your training and educational journey at the end of high school is wholly inadequate.”

23. The need for new skills extends beyond the workplace. Nurturing the skills for active and compassionate global citizenship is just as necessary²². Social and emotional skills are critically important for both educational and post-school outcomes²³.

Lack of ways to easily share innovation and teaching practices

24. Great examples of innovation exist (such as the innovative timetabling that supports community impact projects at Albany Senior High School, Hampden Street School’s

^d Immigration New Zealand’s skills shortage list continues to highlight the shortage of people with science, technology, engineering, and mathematics (STEM) skills.

initiatives to support students take responsibility for their own learning, and Hobsonville Point Secondary School's cross-curricula approach to NCEA). But uptake of promising innovation is localised and adoption of good teaching practice is inconsistent. Educators have few ways to share expertise effectively with others.

Data rich, information poor

25. The sector creates a lot of data, but because it often comes from multiple sources, is of variable quality and hard to access, the data is difficult to convert into useful information for informed decision-making. In addition, many educators, leaders and administrators lack the tools, fluency, and pedagogical knowledge to use data to change policy and practice.

26. In some areas, we also have inadequate data; for example, about national recruitment and retention trends in the education workforce, making it hard to address staffing gaps.

Demographic changes – rapid population growth alongside isolation

27. Population growth in Auckland along with decline in rural areas such as Northland and East Cape is putting significant pressure on our ability to deliver a quality education to all students ('disparity by location'). The scarcity of land in Auckland on which to build new early childhood, schools, kura, and higher education centres, and the challenge of attracting and retaining skilled educators, will require approaches to education delivery that are less dependent on physical infrastructure and personnel.

28. Digital technologies are likely to be part of the solution, providing "super-fast access to learning networks and smart tools for instructional resources to both teach and learn in ways not confined to the physical properties of classrooms if, indeed, the unit of a bounded classroom is applicable at all" (ibid).

Inequitable access to digital technologies and effective online learning tools

29. Not all students have access to the powerful digital tools that others take for granted. While many students and their families have access to digital devices for learning and the internet at home, some do not, and these families are often in communities where the potential negative impact is the greatest.²⁴ Even less expensive devices are more than many families can afford, and the pressure is exacerbated by the need to replace devices every three years as they reach the end of their usable life.

Transforming Education for the Digital Age

Digital technologies have significant potential to transform education ...

30. Digital technologies can enhance effective teaching, help address inequity, expand and create new learning opportunities, and provide the capability to serve increasingly complex educator and student requirements.

31. Technology can make it possible for educators, students and communities to collaborate more easily, support reductions in long-standing equity and accessibility gaps, and support development of personalised approaches that meet the needs of every student.

32. Technologies are already having significant effects on educational practices²⁵ and we expect the pace of change to accelerate. The rapid advance of new technologies has great potential for supporting improvement and innovation. Just as mobile devices and the internet have had an impact on teaching and learning practices in the last decade, technologies such as virtual reality, augmented reality, artificial intelligence/machine learning and holograms will change educational experiences in the future.

33. Investments in modernised ICT infrastructure – a national ultra-fast broadband fibre network, the schools network upgrade programme, Wi-Fi, and the Network for Learning – have laid the groundwork for the next phase of technology development.

... but technology cannot – and should not – be the primary driver of change

34. While digital technologies have the potential to support better teaching, learning and assessment, they cannot on their own address poor student outcomes and inequalities. The quality of teaching practice is still the greatest in-school determinant of student achievement.²⁶ Research shows that effective teaching and learning practices should guide the use of technologies.²⁷

35. An extensive literature review demonstrates that five conditions must be met to harness the potential of digital technologies to help transform teaching and learning:²⁸

- a **vision and goals developed in partnership** with the education sector and wider community for a future-focused education system
- teachers and leaders with the **pedagogical and technical capability** to integrate digital technologies in ways that lift achievement
- a **willingness to embrace ‘new knowledge’ and digital competencies** and be flexible in how learning is assessed and qualifications recognised
- **learning partnerships** in which educators, parents, communities, and business collaborate in innovative curriculum design and delivery, and share responsibility for lifting achievement
- **flexibility in the way resources are used** to target need, respond to students’ aspirations, and adapt to changing demands.

The executive summary from the review is in Appendix C. (The full report is available on request.)

Creating the conditions for system transformation

36. The review shows that getting the conditions right and harnessing the right drivers for change is critical to success,²⁹ and confirms that, on its own, technology does not achieve educational improvement.

37. When digital devices are deployed without careful planning and effective teaching, they are, at best, a substitute for pen-and-paper instruction.³⁰

38. The education agencies agree that a coherent and systematic approach that is ambitious for students is required.^e Such an approach is necessary for a substantial lift in system performance that supports every student to succeed. This means deploying technology as a catalyst and enabler for better teaching and learning, rather than as a driver of change in its own right.

Right and wrong drivers of education reform

Right drivers	Wrong drivers
Capacity building	Punitive accountability
Pedagogy	Technology
Collaboration	Individualistic solutions
Systemness	Ad hoc initiatives

Source: M Fullan and S Rincón-Gallardo. 2017. *California's Golden Opportunity: Taking stock*. Motion Leaders (p 1).

Opportunities to harness the potential of digital technologies to help transform education and learning

39. Building on the literature view, we worked with subject-matter experts to assess the current state and develop a possible future state. From the future state we identified opportunities to harness the potential of digital technologies to help transform education and learning (see the intervention logic map in Appendix B).

Embed digital in future-oriented teaching, learning, and assessment

40. Digital technologies can amplify effective teaching, learning and assessment practices when all students have access to digital devices and challenging, engaging digital content, and when educators are confident and competent users of technologies to advance learning.

- Investments needed**
- An integrated, connected online learning environment accessible to learners, educators, parents and whānau, and the wider community anywhere, anytime
 - Equitable and ubiquitous access to digital technologies and the opportunities they afford for powerful learning

^e The agencies are Education Council of Aotearoa New Zealand (EDUCANZ), Education New Zealand, Education Review Office, Ministry of Education, New Zealand Qualifications Authority, and Tertiary Education Commission.

41. Despite widespread adoption we are not realising the potential of digital technology to raise student achievement.

42. As a system, we are yet to exploit increasingly sophisticated technologies that can support personalised student pathways, assessment for learning, and the way qualifications are achieved and recognised.

43. Digital technologies can connect students, educators, parents and whānau, education leaders and employers, making it easy to collaborate across institutional boundaries, share information and data, and share specialist expertise. Partnerships with the technology industry and other educational stakeholders can be a particularly effective way to co-design resources.

Investments needed *continued*

- Challenging and engaging online curriculum resources, including resources designed for Māori and Pacific students
- New approaches to digital assessment that enable progress and achievement to be assessed in real time, support personalised responses, and assess for a wide variety of knowledge and competencies
- Research and development to build an evidence base, support innovation, and enable new technologies to be exploited for their educational value

Te Aho o Te Kura Pounamu (Te Kura)

Since 2014, Te Aho o Te Kura Pounamu (Te Kura) has collaborated with digital designers, web developers, learning management system experts, instructional designers, curriculum experts, students and whānau to create interactive online resources for Years 9 to 13. Students are actively involved in the design, and their feedback is used to review and refine the resources.

44. Learning analytics can help students acquire knowledge and understand complex concepts, freeing educators to spend more time facilitating deep learning^f and providing more intensive support to struggling students.

45. We can expect the rapid development of technologies to continue to have an impact on educational practices. An agile **research and development** approach would enable the evaluation and spread of innovative practices as educators adopt technologies such as augmented reality and virtual reality environments, gamification, biometrics, social scanning, data analysis and artificial intelligence in the service of learning.

46. A research and development programme could also be used to evaluate and share new approaches to education delivery made possible by digital technologies.

^f 'Deep learning' describes developing the "learning, creating and 'doing' dispositions young people need to thrive now and in their futures. The goals of deep learning are that students will gain the competencies and dispositions that will prepare them to be creative, connected, and collaborative life-long problem solvers and to be healthy, holistic human beings who not only contribute to but also create the common good in today's knowledge-based, creative, interdependent world": M Fullan and M Langworthy. 2014. *A Rich Seam: How new pedagogies find deep learning* (e-book). Pearson.

Strengthen connections with families, whānau, communities and employers

47. Digital technologies can help enable educators, students, parents and whānau, and the wider community build strong, powerful partnerships to support learning.³¹

48. Many early childhood services, schools and tertiary education organisations already use mobile technologies to share information, but there is considerable potential to use technologies to deepen and sustain partnerships for learning. Such partnerships can support personalised learning pathways, with students able to co-design their programmes in partnership with expert educators, parents and whānau, and others who support their learning, such as employers.

Investments needed

- Ways for educators to ensure all parents and whānau are well informed and able to engage as partners in their children’s education
- Integrated online learning environments that make it easy for learners, educators, parents and whānau, and the wider community to connect and collaborate
- Better ways for learners, educators and the public to get information and interact with education providers, the Ministry and agencies.

Botany Downs Kindergarten

Botany Downs Kindergarten uses a digital platform to plan, document, and share children’s learning. “As we document, we are able to point out children’s working theories, their collaboration work and their dispositions to persist.” Sharing children’s learning is helping families understand and celebrate the purposeful learning the children are engaged in.³²

49. A 2017 Ministry survey of over 630 parents, and focus groups of 75 parents, identified significant variability in communications between and within schools, and opportunities to improve the channels parents and whānau use to seek information. Some parents reported it was hard to keep track of the many digital channels used to provide information, and that the information is not always kept up to date.

50. Parents also want better information about their child’s progress. Parents said they want more information on how their children are achieving, what they are doing in class, how they are doing socially and what extra help they need to succeed.

Help leaders and educators build their capability

51. The most critical in-school factor that affects student achievement is the quality of teaching practice to which students are exposed.³³ One of the most powerful ways for teachers to improve their practice is to collaborate with others to inquire deeply into their practice and its impact on learning.³⁴

Investments needed

- Interoperable online learning environments and collaboration tools that are available to all educators and are reliable and easy to use
- Professional learning opportunities that build confidence and capability in using digital technologies to enhance learning

52. Advances in the learning sciences and in education research are driving an increasing focus on identifying and adopting those teaching strategies proven to have the highest impact on learning,³⁵ yet not all educators can confidently apply this knowledge to integrate digital technologies into effective teaching practice.

53. Digital technologies enable educators to collaborate locally and globally with expert practitioners, researchers, and high-performing colleagues to continually improve their practice.

54. Collaborative endeavour is a key driver of educational improvement.³⁶ Digital technologies can enhance professional learning, enabling collaboration and access to online learning opportunities. Technologies can expand educators' opportunities to hone skills in their areas of expertise and build new skills in collaboration with others. Educators' own learning pathways can be better supported, giving them access to professional learning opportunities tailored to their specific needs.

55. A characteristic of high-performing education systems, such as Finland, is that educators are valued as knowledgeable and skilled researchers, and take responsibility for building their own and others' capability.³⁷ Investing in research and development, with a deliberate focus on building the research capability of educators and leaders could better prepare educators to adapt their practices in times of rapid change.

Provide better support for decision-makers

56. High-quality information about student progress and achievement is critically important to inform students, educators and education stakeholders about how students are doing and how well the wider system is supporting their learning.

57. While data are available to educators, leaders and policy makers, this does not always translate to the "information richness" that would support better teaching and policy development because of the way data are collected, stored and accessed.³⁸

58. We lack easily accessible information and the necessary systems to target investment and tailor services to meet need. Not all educators and leaders have the tools, data fluency and pedagogical knowledge to use data to adapt their practices.

Investments needed

- Ways to enable data to be shared easily and securely by those who have a right to it, when they need it
- Ways to enable data to be collected once and used many times
- Sophisticated digital tools to measure progress and achievement as students learn, including new measures of valued outcomes (such as key competencies)
- Ways to capitalise on the power of data analytics to support informed decision making across all facets of the system
- Building the capability of educators and leaders to analyse and respond effectively to data

59. The education system comprises self-managed education providers, each responsible for its own information. The systems they use are not interoperable, which means critical information does not easily follow students as they move from one education setting to another.

60. For students, this lack of coherence and interoperable systems hinders their progress; at best, wasting time at each transition point (such as moving class or education setting); at worst, causing progress to slip and risking vulnerable students ‘falling through the cracks’.

61. For educators the lack of information can mean starting from scratch to assess each new student they teach, wasting valuable teaching and learning time and creating unnecessary stress for learners. Constant re-testing of students already at risk can reinforce their sense of failure.

62. Significant potential exists to harness the power of technology to improve the collection and analysis of information across the system, drawing on the power of data analytics to help users make better decisions more easily.

63. Learner-centred systems can give students access to their online learning portfolios and records of learning throughout their learning journey from early childhood through to employment, engaging students more powerfully in their own learning and helping them track their own progress.

Learner-centred systems – Open Polytechnic

In July 2015, the Open Polytechnic launched iQualify, an online platform driven by powerful analytics that delivers online learning programmes to its students, and is available for other organisations to use. Students can login to iQualify from their phone, tablet, or laptop and create their own learning resources next to course materials. The platform supports media-rich content designed to deliver motivating and engaging learning experiences for students who study in their own time and place.

64. Interoperable systems can enable data to be collected easily, in standardised formats, providing a persistent record of core student data readily available to students and those who support them.

65. An open transparent system can also provide rich information to education stakeholders and across social agencies to guide a coherent, joined-up approach to support.

Make more flexible and effective use of resources across the system

66. Technology can be a powerful catalyst for new forms of educational delivery, enabling resources such as teaching time, funding, learning support, and physical infrastructure to be targeted to need. Technologies can give students greater agency and expanded choice in their education, better support the role of educators, and collapse traditional institutional boundaries.³⁹

67. The ability for students to choose what they learn, when and from whom is currently constrained by where they live, how old they are, and practical issues such as subject time-tabling, the availability of specialist teachers, and how funding is allocated in the system. So far there are only limited examples of technology being used to unpack the constraints of current education provision to expand choice, better target investment and reduce inequities.

68. Technology can help reshape learning environments, giving students a broader range of learning opportunities, such as blended learning (a mix of face-to-face and online learning), and the chance to access programmes from many sources, unconstrained by location or circumstances. For example, in spite of their limitations, the use of Massive Open Online Courses (MOOCs) continues to grow,⁸ giving students free access to courses offered by the world's top universities. A recent report on HarvardX and MITx showed that during four years, 2.4 million unique users participated in one or more open online courses, with 71% of participants from outside the US.⁴⁰ New Zealand universities are increasingly offering MOOCs.

69. New technologies offer greater sophistication, consistency, interoperability and security, improving efficiency and saving time for students and educators. New technologies present new ways to deliver education, reducing the dependency on physical infrastructure. This could help address the lack of suitable land and buildings for new schools and tertiary providers in rapidly growing cities, such as Auckland.

Teachers will become much more the overall organisers, the explainers, and ultimate evaluators of progress. They will become pastoral leaders. A lot of the heavy lifting of the primary work of teaching will take place on a one-to-one instructional basis, between the individual and the machine.

At the moment we could do with about three times the number of teachers in schools ... they are desperately short of time to do the job properly. They just get by. And so if we had computers doing a lot of the repetitive teaching work it would mean that teachers would be able to do the job so much better.⁴¹

Investments needed

- Interoperable online environments that support online and blended learning approaches and enable specialist resources to be shared widely
- Automated and streamlined administrative processes to free up educators to increase focus on teaching and learning
- A well-maintained, modern digital infrastructure, including a core set of digital services to improve efficiency, reduce complexity, and reduce the cost carried by education providers and agencies

⁸ MOOCs are free web-based distance learning programmes designed for large numbers of geographically dispersed students. A MOOC may be patterned on a college or university course or may be less structured. Limitations include relatively low completion rates, uneven quality of pedagogical practice, and the need for students to be digitally literate to participate.

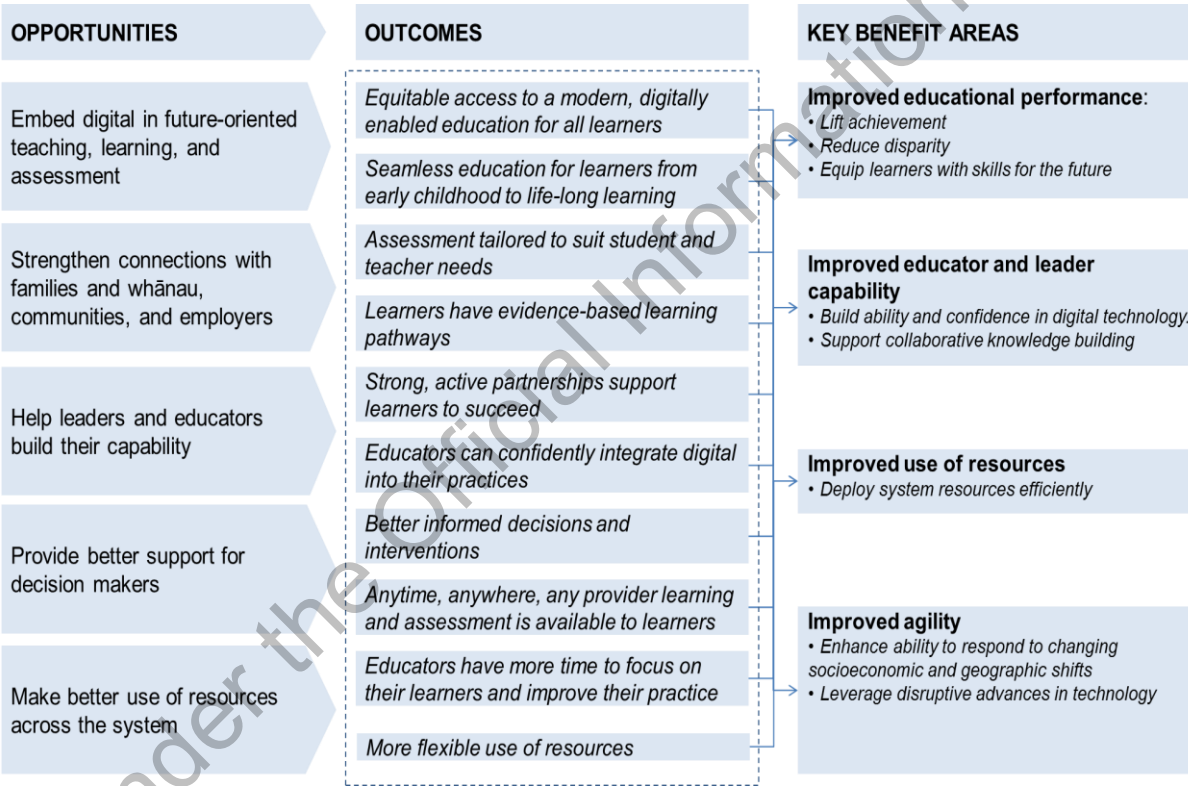
Outcomes from harnessing the potential of digital technologies to help transform education and learning

70. If we can take advantage of the opportunities described above, and assuming the necessary conditions for transformation are in place, we can deliver:

- improved educational performance
- improved educator and leader capability
- improved use of resources
- improved agility.

71. The link from the opportunities to the outcomes to the benefits is summarised in Figure 1 and the expected benefits expanded in the text following.

Figure 1: From opportunities to outcomes and benefits



Expected benefits

Improved educational performance

72. There will be a lift in performance across the system. Students will experience an increasingly seamless, student-centred teaching, learning and assessment experience tailored to their needs, interests, and aspirations.

Example: New Pedagogies for Deep Learning is facilitating collaborative capacity building

New Pedagogies for Deep Learning is a global partnership of educators successfully collaborating to explore the implementation of deep learning goals enabled by new pedagogies and accelerated by technology.⁴² As a result of this research-based approach in over 1000 schools across 10 countries, cluster leaders report a marked change in the way technology is being integrated and employed for learning. This collaboration is supported by an increasingly sophisticated ecosystem of tools and features geared toward facilitating collaborative capacity building.

In New Zealand, the Kahukura cluster of schools⁴³ is engaging in the international New Pedagogies for Deep Learning project, which leverages digital to enable real-world problem solving that builds key future-focused competencies.

73. Students will be supported by highly collaborative partnerships involving educators, parents and whānau, iwi, community, and business that collectively take responsibility for educational outcomes.

The Manaiakalani Education Trust is collaborating with stakeholder partners to support learners

Manaiakalani Education Trust activities support parental and whānau engagement in their children's learning and help develop their skills to facilitate this. While whānau are the Trust's principal partners, the Trust is also supported by an unprecedented variety of community, education, research, business, technology, and philanthropic partners. This has enabled the Trust to support parents to buy a personal digital device for each learner, provide wireless internet access at home and school, and support Manaiakalani teachers in their continuing innovation.

Manaiakalani has two main private funders: the Next Foundation, which is keen to spread innovative education practices, and a philanthropic family committed to Northland uplift. Together with the Innovation Hub in Tāmaki (the Manaiakalani Kāhui Ako) these funders support the Trust's ten 'outreach'⁴⁴ programmes in Hornby, the West Coast, Papakura, Mt Roskill, Kaikohe, Kaitiāia, Gisborne, Otaki, Hokitika and East Christchurch, so over 20,000 more students can benefit.

74. All students will acquire the knowledge and competencies they need for success in life and work. Employers will report that students arrive work-ready and able to demonstrate they have the skills employers need.

New Zealand Qualifications Authority is exploring new credentialing and assessment practices in response to changing demands

In recognising the need for greater flexibility in how learning is delivered and recognised, the New Zealand Qualifications Authority (NZQA) is undertaking three micro-credential pilot projects.⁴⁵

NZQA has assessed Udacity's self-driving car engineer nanodegree programme as equivalent to a 60-credit package of learning at Level 9 (master's level) on the New Zealand Qualifications Framework.

Otago Polytechnic has launched EduBits, a micro-credential service that recognises sets of industry skills and knowledge and, in partnership with NZQA, will award micro-credential EduBits as equivalent to a specified credit value on the qualifications framework.

The Lion Foundation's Young Enterprise Scheme (YES) is an experiential programme where students set up and run a real business. Now the YES certificate contributes 24 credits at Level 3 that can be used toward NCEA.

Students and schools are participating in the design of a new operating model and solution for NCEA examinations being available online by 2020. The vision for digital assessment is outlined at <http://www.nzqa.govt.nz/about-us/future-state/digital-assessment-vision/>

75. Regardless of their location, circumstances and learning needs, all students will have access to the digital resources and learning opportunities they require. Digital technologies will help reduce disparity.

Georgia State University is harnessing sophisticated digital resources to lift achievement and reduce disparity

Georgia State University⁴⁶ has used a student-centred approach underpinned by predictive analytics to defy its poor urban demographics and to improve retention and graduation rates.

The university database of 2.5 million student grades is used to provide individualised advice about which course or major a student is most likely to succeed in given their past academic performance. A walk-in mathematics tutoring centre has computers available for MS Excel projects and online assignments.⁴⁷

Every day, the university tracks 800+ different risk factors for each student using powerful data analytics. Between 2003 and 2014, the university increased its six-year graduation rate from 32% to 54% and more than doubled graduation rates for African American and Hispanic students.

Improved educator and leader capability

76. There will be a lift in educator and leader capability. All educators will be confident, competent users of technologies to enhance teaching and leadership practices.

Teacher development programmes building competence and confidence in digital pedagogy and practice

The changing demands of education and the rapidly expanding research-based knowledge of effective teaching and learning, make effective strategies for ensuring the continuous renewal of teachers' professional knowledge and practice essential.⁴⁸

In New Zealand, the Mind Lab Postgraduate Programme develops teachers' digital fluency and confidence in integrating technology into teaching and learning. By September 2016, 2,000 teachers had studied through the Mind Lab.⁴⁹

The Manaiakalani Digital Teacher Academy⁵⁰ provides new teachers the opportunity to build future pedagogies and the digital competencies. Manaiakalani also offers the Spark–Manaiakalani Innovative Teachers award to recognise teachers in their Community of Learning who have been contributing to the development of the Manaiakalani “Learn, Create, Share” pedagogy.

77. Collaborating educators will be capable researchers and innovators, continuously adapting their practice to take advantage of new technologies and responding to rich information about their learners' progress.

Leading education systems see teaching as a research-based profession

An extensive review⁵¹ of the world's top-performing education systems found valuing teachers as a research-based profession produces good results.⁵² In reflecting on the findings of this international comparative study, Linda Darling-Hammond highlighted the strong emphasis on teachers as researchers: “These successful jurisdictions see teachers as researchers who are always examining their practice, evaluating it, writing up their findings to share with other teachers”.⁵³

For example, Finnish teachers join a research-based profession where, as sophisticated diagnosticians, they collaborate in a culture of continual reflection.⁵⁴ Teachers are encouraged to expand their repertoires of teaching methods and individualising teaching to meet the needs of all students.

Improved use of resources

78. An increased range of education delivery including online learning will expand student choice, allow specialist expertise to be easily shared and reduce the dependency on dedicated physical infrastructure.

Swinburne University, Melbourne, and Seek are partnering to deliver online learning

Internationally, Swinburne Online is a joint venture launched in 2012 between Swinburne University in Melbourne and the private firm Seek. The online university now has more than 7,000 students enrolled in one of 12 bachelor's degrees. Swinburne Online's students are predominantly women aged 25–40 who find it difficult to access a campus for work or family reasons.

Swinburne Online offers an innovative form of online education for which there is strong market demand.⁵⁵ Swinburne Online is able to generate large amounts of data on how students use it. Gamification approaches are used to drive engagement – with students collecting points, badges, and ladders as they progress. “Nudge” approaches are used, and the data on engagement enables students to receive proactive support.

79. Streamlined and automated processes and the increased use of ‘intelligent tutoring systems’ will free up teachers to focus on supporting learners.^h

Department for Education is harnessing the potential of digital technologies

In 2014, the British Department for Education responded to teacher feedback as to the greatest opportunities to reduce workload.⁵⁶ From nearly 44,000 responses, most frequently cited activities were recording, inputting, monitoring, and analysing data (56%), marking (53%), lesson and weekly planning (38%), administrative and support tasks (37%), attending staff meetings (26%), and reporting on pupil progress (24%).

The Government's response to the workload challenge included creating a central repository for teaching and learning resources, establishing a panel to develop principles for good data management in schools, reviewing existing evidence about monitoring and analysing data, and reviewing how data is shared between schools and from schools to employers or government.⁵⁷

80. Informed decision-making will enable a strategic, system-wide approach to investing in education system performance.

The US Data Quality Campaign is using and sharing data and evidence to improve decision-making

In the United States, the Data Quality Campaign is a non-profit policy and advocacy organisation working to create a sector-wide culture in which high-quality data are

^h An intelligent tutoring system is a computer system that provides “immediate and customized instruction or feedback to students... usually without requiring intervention from a human teacher”: *Intelligent tutoring system*. https://en.wikipedia.org/wiki/Intelligent_tutoring_system referencing J Psotka and SA Mutter, 1988. *Intelligent Tutoring Systems: Lessons Learned*. Lawrence Erlbaum Associates.

collected to improve student achievement.ⁱ Thanks to the campaign's policy roadmaps, all states now have robust longitudinal education data systems providing rich information to help answer critical policy and practice questions.

For example, Hawaii now knows how school graduates fare in postsecondary. Massachusetts and Chicago use early warning indicators to identify and support at-risk students, and Tennessee is analysing the effectiveness of teacher preparation programmes. Georgia helps its teachers view their students' individual progress to enable greater personalisation. Washington's Education Research and Data Centre improves transparency by providing public report cards about the health of the state education system.⁵⁸

Improved agility

81. The constraints of the time, space, place and people of education will be unpicked to increase the flexibility, authenticity and seamlessness of learning opportunities.

NetNZ is a community of secondary and area schools delivering online learning

NetNZ is one of six online learning communities working collaboratively to deliver courses and teaching to 1,500 primary and secondary students unable to access specialist subjects in their own schools.⁵⁹ NetNZ is a community of 60 secondary and area schools across the South Island providing online learning opportunities.

In 2016, NetNZ enrolled about 700 NCEA course placements from schools around the country. Seventy-one different full-year programmes of learning (mainly senior secondary level) were delivered by partner schools for the collective benefit of learners.⁶⁰

ⁱ The Data Quality Campaign is a non-profit policy and advocacy organisation leading the effort to bring every part of the education community together to empower educators, families, and policy makers with quality information to make decisions so students excel: <https://dataqualitycampaign.org>

82. The system will better able to leverage disruptive advances in technology.

Tanz eCampus is using data analytics to enhance the learning experience

Learning analytics enable teachers to understand and address students' individual learning needs and tailor instruction accordingly. When used effectively, learning analytics can generate early signals of learning issues allowing teachers and schools to address the needs of struggling students quickly.

The data analytics and data visualisation integral to the TANZ eCampus⁶¹ online learning initiative are adding significantly to understanding how learning is occurring online and enabling tutors and instructional designers to continually refine course content and assessment to better suit the needs of their students.

This data are also enabling academic tutors to support learners' curriculum and pastoral needs and to intervene early when indicators suggest this is required.⁶²

83. Technologies will support a more timely and nuanced response to changing socio-economic and geographical dynamics.

The Manaikalani programme is making innovative use of educational and community resources

Integrating parental and community support with professional development for teachers and an innovative design, the Manaikalani⁶³ programme is delivering effective digital learning and citizenship to students in the lower socio-economic area of Tamaki in Auckland where 95% of students are of Māori and Pacific heritage.

Independent research demonstrates that students are learning at a base rate of 1.5 times the standard New Zealand learning rate with increased attendance levels and a sharp improvement in on-task behaviour.⁶⁴

At primary level, writing and student engagement have shifted significantly.

At Tamaki College, between 2010 and 2016, the NCEA level 2 pass rate for Māori and Pacific students doubled while the NCEA Level 3 pass rate tripled.⁶⁵ The number of students entering university has increased.

Next Steps

Approach to determining a proposed way forward

84. This paper proposes taking a proactive but measured approach to leveraging digital technologies for system transformation, using the considerable potential for digital to accelerate the right drivers for change (page 13). We have sought an appropriate way forward to unlock the opportunities for system transformation, while at the same time managing associated risks.

85. In considering the two main components – system readiness (having the conditions in place for transformation – page 35) and digital enablement (the scope of this document) – three broad approaches are evident, summarised in Table 1. We could:

- invest in a wide variety of technology initiatives, irrespective of the state of system readiness (approach A – a technology-led approach)
- drive the creation of the conditions alongside targeted investments in technology, recognising the importance of the conditions being achieved but acknowledging that we cannot (and the sector will not) stand still with technology investment. (Approach B – a balanced approach that starts to build system readiness at the same time as making targeted technology investment)
- invest no further in technology while we invest in building the conditions necessary for transformation (approach C – a system readiness-led approach).

Table 1: Approaches to unlock the opportunities and achieve desired outcomes

Focus	Approach A: Technology first	Approach B: System readiness with targeted technology	Approach C: System readiness first
System readiness	Invest ahead of the conditions for system transformation being in place	Start investing in building the conditions for system transformation	Invest first in building the conditions for system transformation
Digital enablement	Invest in technology initiatives	Invest in targeted technology initiatives that are required as enablers and less dependent on system readiness	Invest no further in technology initiatives until the conditions are in place

86. As the next section outlines, the most pragmatic approach is approach B, which would provide enabling technology as we move to achieve a shared vision for education in the digital age.

High-level assessment of the three approaches

Approach B: System readiness with targeted technology – recommended

87. The approach most likely to result in success is approach B. The sector can take immediate steps to enhance current education practices and prepare for the future. This approach recognises that success depends on the right conditions being in place, but also that every constituent of the education sector will likely continue investing in technology initiatives anyway.

88. The technology investment would target initiatives that are less dependent for success on the conditions being in place, and provide the foundation for future technology, for example, robust and safe infrastructure. These ‘no regrets’ initiatives also provide opportunities to trial new ways of working, such as actively engaging and co-designing with the sector so the right solutions address the right problems and building cross-sector governance capabilities and arrangements.

89. Such targeted investments could build on existing work and include:

- improved access to and quality of evidence and information – a business case is under way for Integrated Education Data (iEd)
- integrated digital systems so it is far easier for educators, learners, family and whānau, and communities to collaborate
- streamlined administration activities to free up educators and leaders to increase time spent on teaching and learning
- online assessment, including a project to pilot NCEA exams online, which is under way.
- improvements to the safety, security, speed, and integrity of schools’ IT networks

90. The advantages of approach B are that it:

- delivers capability to support immediate priorities of the system and government
- delivers essential foundational components, such as improved evidence and management information and robust infrastructure
- matches the delivery of digital capability and the creation of the conditions (including leadership and educator capability)
- enable the identified opportunities to be unlocked.

91. The disadvantages of approach B are that it:

- may waste investment if the wrong technology initiatives are progressed
- may stretch the sector’s capacity and capability to support the changes needed
- delays the unlocking of all opportunities, because it runs in parallel with system readiness changes.

Approach A: Technology first

92. Approach A is a **technology-led** approach – making major investments in a variety of digital environments and infrastructure across the system, irrespective of the status of the conditions for system transformation.

93. The advantage of approach A is that it delivers the capability for unlocking all the opportunities. However, this approach runs a high risk of being unsuccessful because it will run ahead of the leadership and education capability required for success. The evidence highlights that technology-led change does not stimulate the conditions for successful reform.

94. This approach:

- has a high level of risk
- would stretch the sector’s capacity and capability to support the changes needed
- risks delivering capabilities and assets that do not address the sector’s needs or for which the sector does not yet have the capability to use effectively
- requires substantial commitment and investment.

95. If technology investment continues without a deliberate, planned approach, future investments are likely to yield disappointing results and a poor return on investment. Because this approach cannot lead to the desired outcomes we do not recommend it as the way forward.

There is no evidence that technology is a particularly good entry point for whole system reform.⁶⁶

Approach C: System readiness first

96. Approach C is a **system-led** approach that involves making no additional investment in technology initiatives until the conditions for system change are in place. This approach acknowledges the evidence about how to successfully deliver whole system change (developing a shared vision, building pedagogical and technological capability throughout the sector, committing to active, collaborative partnerships, and creating flexible resourcing models).

97. This approach recognises that the sector’s continuing investment in ad hoc technology initiatives is unlikely to lift achievement without a shared vision or greater levels of capability to effectively use that technology. However, this approach is unrealistic in a highly devolved and complex education system. No agency or education provider will stop investing in technology initiatives, especially those already under way.

98. The advantages of this approach are that it:

- has the lowest level of technology delivery risk
- limits the investment funding required (at this stage), but enables successful digital investment later once the conditions are in place
- gives the sector time to learn to work differently together.

99. The disadvantages of approach are that:

- it delays the unlocking of opportunities
- it delays the delivery of outcomes
- the sector (learners, educators, family and whānau, education agencies, providers) will continue ad hoc, uncoordinated, and potentially duplicated investments in technologies, with little positive impact.

100. Therefore, we do not recommend approach C as the way forward.

Conclusion

101. The evidence demonstrates that technology, by itself, does not achieve educational improvement.

102. Ideally, we would establish a shared strategy for educational transformation in collaboration with the education sector (agencies, providers, and interest groups) and education stakeholders (learners, parents and whānau, iwi, employers, and other communities) before investing further in digital technologies - approach C.

103. However, the rapid adoption of technologies and the speed of technology change do not afford us the time to stop and reflect before making investment decisions. We need to do these things in parallel, which is why we recommend approach B as the preferred way forward.

Proposed delivery approach

Collaborative, student-centred approach

104. To increase the likelihood of success, we suggest delivery is based on the following core principles:

- **put the student at the centre**, or the educator where appropriate, when considering the development and delivery of services, products, or other arrangements
- **engage openly and proactively to form partnerships** with agencies, education providers, learners, educators, and commercial partners
 - **co-design with partners for relevant solutions** whether engaging, exploring, planning, developing, testing, or delivering – don't assume we can 'build it and they will come'
 - **bring concepts to life, 'testing before investing'** using, for example, proofs of concept, pilots, and trials to build confidence and reduce uncertainty
 - use **feedback loops** to learn continuously about what is and is not working throughout the process to inform refinements
 - identify **what the centre can and should provide** and enable the market to respond to the rest

- **learn from others** who have faced or are facing the same challenges – don't 'reinvent the wheel'
- **break work into manageable chunks** with incremental changes rather than one 'big bang', so continuous learning and review are possible
- **interact with the market early** to seek innovative approaches and procure for outcomes
- **monitor** behaviour, uptake of new services, and satisfaction so design and delivery can be quickly adapted
- **follow the evidence** even when it contradicts common understandings or perceptions and **be prepared to stop** when the evidence so indicates.

Ten-year horizon

105. In the next 10 years, demographic, economic, and societal changes will continue to create strong imperatives to redesign education for rapid change and technological innovation. While it is not possible to plan long term with any precision in times of change, this document sets out the opportunities presented by technology to better educate citizens of all ages for the world they live in now and into the future.

106. Appendix F contains a pictorial representation of a vision for a digitally enabled education system to 2025 and the enabling technology that can help realise the vision. This is supported by the current and future state analysis in Appendix D, which provides more detail on the outcomes we expect to achieve over a 5 -10 year timeframe.

107. Beyond 2025, we can expect technologies such as artificial intelligence, micro-credentials, virtual reality, and simulation to be seamlessly embedded in educational practices, in a system ready and able to adopt new technologies as they emerge.

108. While we can look forward to harnessing technologies for system transformation over a 10-year horizon, this paper recommends that education agencies invest in developing a shared vision with the sector and education stakeholders, and building their own and sector capability, along with initial investments to lay the foundations for transformation.

109. New Zealand is not alone in recognising the challenges and uncertainties inherent in long-term planning for education. The OECD has initiated a project, Future of Education and Skills: Education 2030, to bring OECD education thinkers from around the world to work together on two project strands: to develop a conceptual learning framework relevant for 2030 and to undertake an international curriculum analysis.⁶⁷ New Zealand is participating in this project.

Necessary digital enablers

110. We have started to build a picture of how the future may unfold and the digital enablers we think would be required. A potential and high-level schedule for this system transformation is illustrated in Appendix F.

111. We have divided the enablers into five investment themes. Taken together, these will be the underpinning digital enablers to support system transformation, bearing in mind that,

consistent with Approach B successful transformation will depend on the conditions being put in place, as outlined in para 35.

- a) **Curriculum and Assessment** – design new approaches that leverage technologies to expand what can be learned and assessed and enable assessment to be a seamless part of learning.
- b) **Online learning environments** – enable an integrated, connected online learning environment, accessible to educators and to students and those who support them anytime, anywhere.
- c) **Support for educators and leaders** – provide core digital services and infrastructure to reduce costs, improve efficiency, and free up educators and providers to focus on delivering a quality education.
- d) **Information and data** – enhance decision-making by providing easily accessible high-quality data to educators, stakeholders, and decision-makers, including data on the education workforce.
- e) **Agency channels and systems** – make the communication channels within, between and to the sector agencies, consistent, high quality and unambiguous, also to invest in cost effective, standardised corporate systems for cross agency use.

112. As with any change initiative, an iterative approach of discovery and calibration will be required to ensure objectives and outcomes are achieved. This document suggests that the first next step is to invest in an initial change portfolio.

Initial change portfolio

113. The initial change portfolio will establish core digital foundations onto which further functionality can be built as the capability grows of those who will use and benefit from it. In addition, the change portfolio will expand the work already under way on integrating education data and making NCEA external assessment available online.

114. The portfolio references investment themes a–d from para 111, consistent with Approach B, are proposed as an initial portfolio of work. Taken together, these investments will provide the underpinning digital enablers to support system transformation.

115. We will work collaboratively with the wider education sector to co-design solutions that put the student at the centre and will meet users' needs (as described in para 104).

Proposed investment – enable an integrated, connected online learning environment

116. This proposed investment is for an integrated, connected online learning environment, accessible anytime, from anywhere, to everyone throughout their learning journey. We expect this will comprise quality-assured digital services, tools, and content.

117. Integrating learning environments will connect educators, learners, parents and whānau and other

Unlocking opportunities for education system transformation

- Embed digital in future-oriented teaching, learning, and assessment
- Strengthen connections with families and whānau, communities, and employers

education partners, and be accessible 24/7. The online environment will comprise quality assured digital services and content with significant potential to:

- support personalised learning pathways, with every student eventually able to access their personalised portfolio and record of learning throughout their learning pathway from early childhood through to employment and beyond
- free up time for educators and leaders to focus on teaching and learning
- strengthen educational partnerships, making it easy for learners, educators, parents and whānau, and the wider community to collaborate for learning, including supporting collaboration across Kāhui Ako
- enable flexible education delivery models, including making it easy for teachers to share their expertise widely, and help address teacher shortages in specialist subjects
- be standards based to support system interoperability
- improve administrative efficiency by streamlining administration processes used by educators, leaders and administrators
- expand choice for students and educators, (such as enabling students to study with more than one education provider)
- help enable innovation and the sharing and adapting of new practices
- make it possible for the market to deliver new technologies into the learning environment quickly and to scale.

Proposed investment – design new approaches to curriculum and assessment

118. This proposed investment is to design new approaches to learning and assessment, including progressing NCEA assessment online, that have the potential to:

- integrate assessment seamlessly into day-to-day learning so students are assessed as they learn
- personalise learning using learning analytics to respond more precisely to a student's progress and help identify next learning steps
- expand what can be learned and assessed to include a broader scope of knowledge and competencies
- leverage digital technologies to design new methods of assessment and new measures of progress and achievement
- leverage the potential of gamification and other interactive technologies to take the stress out of assessment
- Provide a stimulus for changes in teaching and learning practices where these have been constrained by once a year, paper-based assessment.

Unlocking opportunities for system transformation

- Embed digital technologies into future-orientated teaching, learning and assessment

Proposed investment – make high-quality data easily accessible to educators and decision-makers

119. This proposed investment is to make high-quality data easily accessible to educators and decision-makers

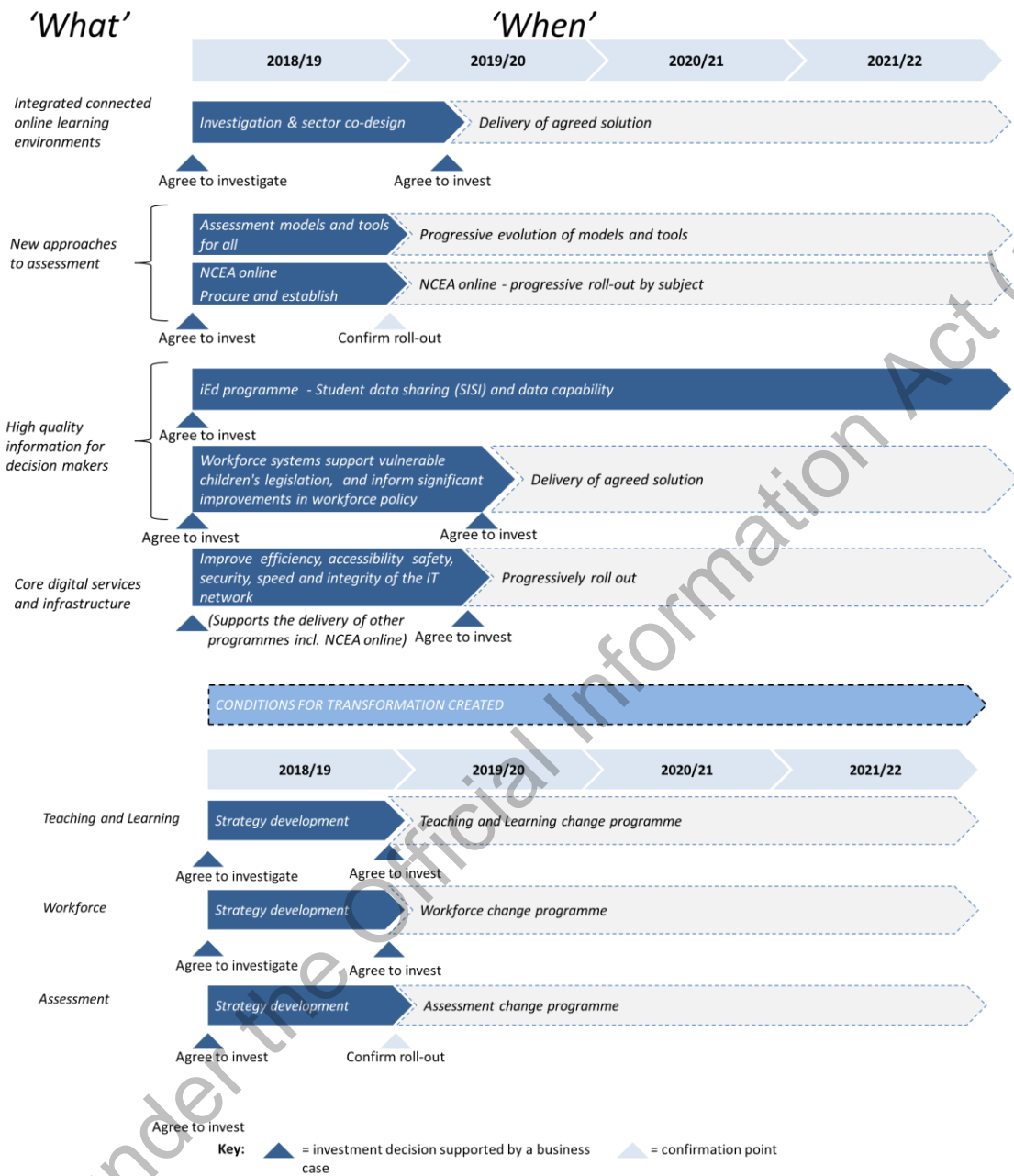
- Initial work is underway under the umbrella of Integrated Education Data (iEd). There are business cases in draft to establish a Student Information Sharing Initiative (SISI) and a Data Transformation project.
- SISI will improve the quality and accessibility of student data and enable data to be easily transferred as students move from one education setting to the next.
- The Data Transformation project will integrate data currently held in many disparate systems so that it can be used to guide more effective decision-making at every level of the education system.

Proposed investment – provide core digital services and infrastructure

120. This proposed investment is to provide core digital services to improve efficiency and accessibility for all users across the system, including improving the security of schools' ICT networks and creating a single digital identity to make it easy for students and educators to access a variety of online services.

Unlocking opportunities for system transformation by providing underpinning infrastructure to support the full range of investments proposed

Figure 2: Initial change portfolio



121. Business cases are being or will be developed to support investment decisions for each programme or project within the portfolio. The business cases will follow the appropriate Treasury Better Business Case guidance and:

- will demonstrate how the proposal contributes to the outcomes and benefits described in the strategic case for change
- provide options and recommend a way forward.

Indicative funding requirements

122. Investment decisions will be taken at individual programme or project level through the detailed business case process.

Governance

123. Delivery of this portfolio of work will be a complex, cross-sector endeavour and will require a lift in our capability to manage and govern its delivery.

Governance is a significant and growing concern, in part because the increasing trend towards large complex multi-agency and all-of-government projects requires a lift in capability. There are significant concerns that expectations are exceeding capability in this area ...

... this view is supported by findings identified by other corporate centre processes including the Investor Confidence Rating and major projects monitoring.⁶⁸

124. Current governance arrangements are inadequate to support cross-agency delivery, with each agency having its own governance structure and its own digital programmes under way. The success of the portfolio of work signalled in this paper will depend on joint decision-making, both strategically and operationally. For example, an integrated online learning environment will succeed only if all parties agree on the common ICT standards that will enable systems to be interoperable.

125. Work is under way to develop a new operating model for the education system, including new governance arrangements. Elements from the current structures could be strengthened to support cross-sector decision-making in both investment choices and delivery, but new structures and processes will also be needed.

126. A set of proposed governance principles has been developed that could help inform the design of the governance structure (see further Appendix E). These principles are:

- **partnership** – agree strategy, priorities, and accountabilities from the onset
- **open and transparent** – define and broadly communicate decision-making processes and outcomes
- **delegation with “no surprises”** – delegate with a no surprises ethos across governance bodies, minimising governance and unnecessary arrangements and delegating to the lead agency and senior responsible owner
- **inclusive** – ensure governance and ongoing delivery are inclusive and include the voice of the “customer”

- **straightforward** – make the governance framework and decision-making processes as simple and ‘flat’ as possible to maintain responsiveness and pace
- **innovation** – foster new ideas, promote effective practices, and collaborate with technology professionals about how we govern to explore new uses of technology to enhance the way education agencies and educators work together to support learnings.

Benefits and change management

127. A common approach to robust benefits creation and sophisticated change management will be taken across the portfolio.

Released under the Official Information Act (1982)

Appendices

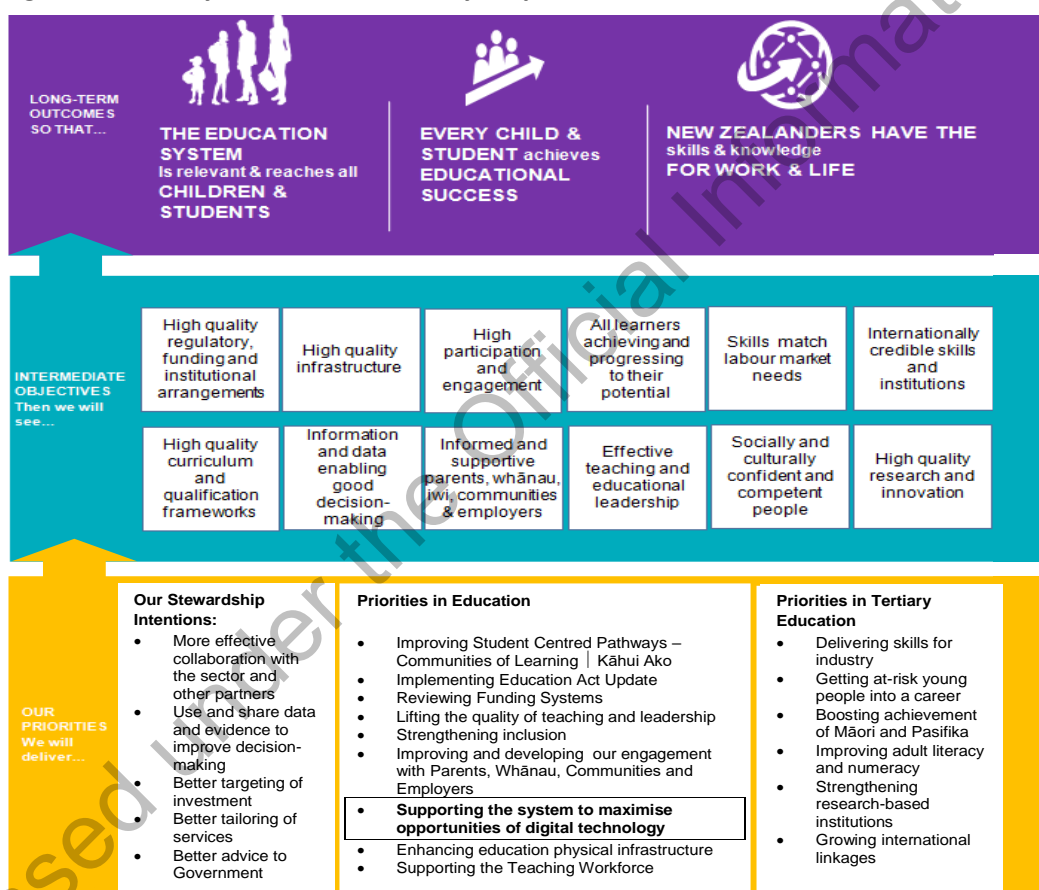
Appendix A: Alignment to education priorities

This appendix outlines how the case for change and proposed next steps align with education priorities set out in the Ministry of Education’s four-year plan (draft as at September 2017), of which a key priority proposed is to support the system to maximise the opportunities of digital technology and the Tertiary Education Strategy 2014–2019.

This appendix also shows how the main document aligns with broader government aims to position New Zealand as a leading digital nation, leveraging New Zealand’s knowledge economy, and improving internet access, safety, and security.

The four-year plan is a consolidated plan across the early childhood education, schooling, and tertiary sectors, and covers Vote Education and Vote Tertiary Education. The plan has three long-term outcomes and a series of intermediate objectives (see Figure 3).

Figure 3: Ministry of Education’s four-year plan 2017–2021



Source: Ministry of Education. 2017. *Ministry of Education Four Year Plan 2017/2021* (draft).

Further to these objectives, the Ministry is also committed to the Māori education strategy Ka Hikitia and the Pacific Education Plan.

The Ministry is implementing significant system initiatives to achieve these aims. Taken together they represent the biggest changes to the education system since 1989. A particular priority for Vote Education is “supporting the system to maximise opportunities of digital technology”.

By the end of 2018, we expect:

- almost every school and many early childhood services will be part of a **Community of Learning | Kāhui Ako**
- the **Education (Update) Amendment Act 2017** will sharpen our focus on lifting achievement and enable new forms of education delivery
- **changes to early childhood education and school funding** will better target the needs of our least advantaged learners.

From 1 July 2017, **Careers New Zealand** was replaced with a refocused careers service within the Tertiary Education Commission to make pathways into further study and work clearer and strengthen connections between education and employers.

From 2020, **Digital Technologies | Hangarau Matihiko** will be mandated as part of the national curricula in Years 1–13.

Following Pilots and Trials, the New Zealand Qualifications Authority intends to progressively implement **NCEA assessment online** for all learning areas for which online assessment is appropriate.

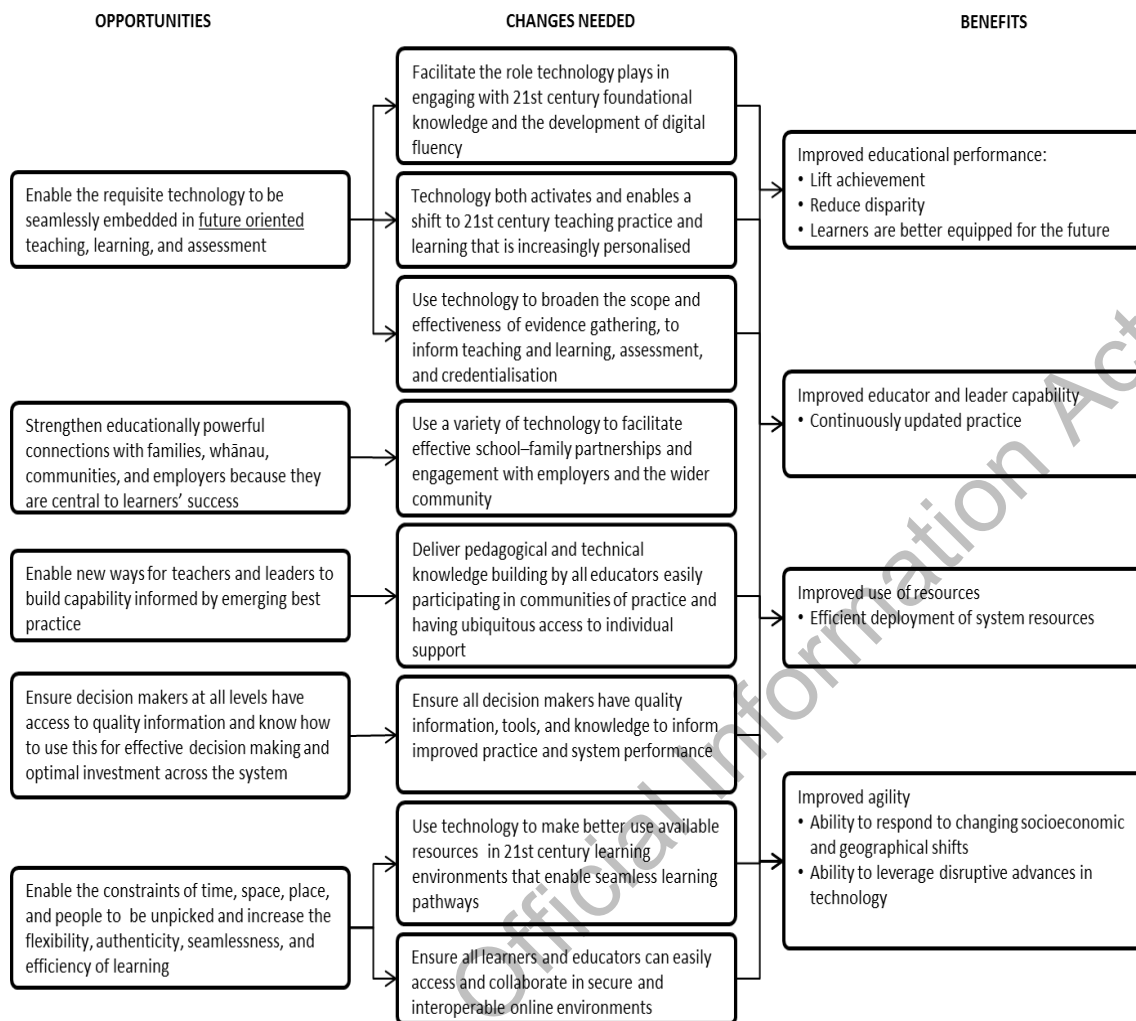
Central to these initiatives is personalising learning pathways, which requires a shift in practice from an adult-centred, supply-driven system, to one that responds in real time to the individual needs of students as they progress from early childhood to lifelong learning.

The success of these initiatives will depend in large part on modern, robust, secure digital services that are common across the system and easy to use.

New Zealand Cyber Security Strategy

Education providers are at risk of cyber-attacks, and several incidents have already created significant issues for the institutions targeted. Any business case will need to outline possible approaches to ensuring the effective management of provider networks to mitigate the risks, which will be informed by the national cyber security strategy.

Appendix B: Intervention logic map



Appendix C: Literature review – executive summary

Note: *This appendix contains the executive summary for Towards Digital Enablement, a literature review undertaken for the project by Charles Newton.*

Introduction

Given its ubiquity, the connections it affords, and the agency it provides students and teachers,⁶⁹ digital technology has a pivotal role to play in education. It is a driver of fundamental changes in how our world works and what education must deliver. At the same time, it is a powerful enabler in how we respond to pressing challenges.

The pervasive digital environment is redefining what it is students need to know and the competencies they must develop. At the same time, rapid advances in the science of learning underscore “the importance of rethinking what is taught, how it is taught and how learning is assessed”.⁷⁰

Impact to date

Strong evidence exists that information and communications technology (ICT) can have a positive impact on student motivation and engagement, but evidence is weaker for an impact on lifting achievement. While we can find examples of technology interventions raising achievement, these are the exceptions as any “specific initiative” gains in achievement do not reflect the system-wide reality.

“Learning centred approaches to technology-enabled learning can empower students and leverage good learning experiences that would not otherwise be possible.”⁷¹ Digital technology offers valuable tools for other building blocks in effective learning environments, including individualised instruction, cooperative learning, managing formative assessment, and many enquiry-based methods.⁷²

Deployed smartly digital technology can reduce geographic, socio-economic, and cultural barriers to accessing quality education.⁷³ Internationally and in New Zealand, online learning is on the rise. Technology is seen as critical to the preservation of te reo Māori. Technology supports powerful connections and collaboration and has the potential to increase equality of educational opportunity.

Data-informed decision-making is increasing the accuracy and precision of decision-making at all levels and across relevant agencies. Access to high-quality, timely information about learning enables a comprehensive long-range view of education.⁷⁴ Increasingly, powerful learning analytics and artificial intelligence (AI) technologies are aiding the support of students’ learning and well-being and freeing up teachers to provide targeted, in-depth teaching and mentoring to students.

Technology is also laying the foundations for new forms of ‘just-in-time’ summative assessment and enhanced AI-enabled formative assessment. This is enabling a rethink of the format, content, location, and timing of summative assessment. We are seeing examinations sat, marked, and moderated online. New models of credentialisation (including micro-credentialisation) may better provide what our fast-changing economic and social systems require.⁷⁵

Technology has enormous potential to reshape the different components, relationships, partnerships, and principles integral to learning environments.⁷⁶ Technology broadens the scope of educators supporting students and allows specialist resources to be shared widely.⁷⁷ When aligned with emerging pedagogical drivers, the powerful suite of emerging technologies will be significant disruptors, supporting greater flexibility and choice to meet learners' aspirations.

Technology is supporting powerful connections and collaboration, enabling significantly increased coordination and cohesion within and between institutions. Teachers are growing their professional practice by leveraging technology to facilitate collaborative inquiry informed by richer student achievement data. This sharing of pedagogical knowledge and emerging best practice is critical to building professional capacity, as schools learn from each other in what Michael Fullan calls "lateral capacity building".⁷⁸

The globalisation of education is growing the capacity and tendency for school systems to learn from each other at every level. The new pedagogies emerging in our innovative classrooms reflect the commitment of our teachers and leaders to leverage digital communications, discussion platforms, and personal learning networks, both locally and internationally, to engage in rich pedagogical discussion.

The pervasive use of technology is raising a slew of increasingly challenging ethical issues that require "fine-tuned ethical and moral modes of thought and action".⁷⁹ Used responsibly, big data, analytics, and machine learning offer significant opportunities to improve learning, but we must ensure data protection while promoting innovation.⁸⁰ Key to this will be raising the digital fluency of all stakeholders.

Establishing the right conditions

The OECD and others suggest that, for a variety of reasons, the real contributions technology can make to teaching and learning have yet to be fully realised and exploited.⁸¹ Despite concluding that research findings on digital technology's impact on student outcomes are disappointing, Michael Barber believes we cannot abandon our ambition to use technology in classrooms because it will underpin the new pedagogy we now need.⁸²

However, much is to be done if technology is to support the significant education system transformation many believe essential. Fullan and Langworthy argue that only when system change knowledge, pedagogy, and technology are thought about in an integrated way can technology make a more dramatic difference to outcomes.⁸³ This has significant implications for curriculum, assessment, teaching, and learning and for future strategy and organisation at school and system levels.⁸⁴

While research has identified success factors underpinning the effective deployment of digital interventions, the greater challenge will be initiating and sustaining those broader transformational shifts required if technology is to help truly modernise our education system.

System stewardship must ensure an informed, cohesive, and inspiring response to the emerging 21st century imperatives. This stewardship must be based on a sound understanding of the forces at play, leveraging the drivers of good performance, and nurturing successful innovation.⁸⁵ “New change leadership” merges top-down, bottom-up, and sideways energies to generate change that is faster and easier than past efforts at reform.⁸⁶ New Zealand education needs to be seeking wider alliances and partnerships with community, iwi, business, and the wider public sector to advance digital learning.

Decision-makers need to understand that technology is a tool, an enabler, and, at best, a catalyst, so technical intervention alone will not solve a learning problem.⁸⁷ The complexities of teaching and learning require a tripartite collaboration that leverages learning sciences, pedagogical understanding, and technological innovation.⁸⁸

“Teachers’ pedagogic actions are key to the successful integration of technology,⁸⁹ with student-centred, facilitative approaches at the heart.”⁹⁰ Excitement surrounds the moves to personalise students’ learning experience, to broaden the scope of educators supporting their learning⁹¹ and ensure learning occurs in increasingly authentic contexts. A coherent set of themes is underpinning significant structural changes in innovative schools, driven and sustained primarily by teachers and students and supported by leaders who foster collaborative, risk-sharing cultures.⁹²

“Students need to be engaged in complex and authentic tasks”⁹³ and be able to achieve ‘cognitive acceleration’.⁹⁴ So, it is of concern that, for the last decade, the level of cognitive demand in the use of digital technology across New Zealand schooling has been low.⁹⁵ We need to ensure technology is used to enhance highly effective pedagogical interventions that make teaching and learning ‘visible’ and support ‘teachers as activators’.⁹⁶

Institutions’ curricula need to reflect the importance of “new knowledge”⁹⁷ and that digital literacy is now essential foundational knowledge for all 21st century learners.⁹⁸

Foundational knowledge remains vitally important, but new skills and knowledge are necessary to collaborate digitally and across disciplines as technology changes the methods and techniques of acquiring, representing, and manipulating knowledge.⁹⁹ Connectedness¹⁰⁰ is impacting on all spheres of human activity.¹⁰¹ While literacy and numeracy remain vital, less well-defined outcomes such as problem-solving, collaboration, creativity, and building effective relationships now need significant attention.¹⁰²

Both teachers and students need increasingly sophisticated tools to help them constantly know where learning is at so they can adjust their teaching and learning appropriately.¹⁰³

While research confirms that collaborative inquiry informed by evidence is one of the most powerful determinants in lifting student achievement and closing gaps,¹⁰⁴ not all educators have access to the information and tools needed, sufficient data fluency, or the pedagogical capacity to change their teaching practices in response to the information they receive.

Extensive data has been available to schools and the wider system for many years, but this has not translated into ‘information richness’.¹⁰⁵ Technology’s promise to power data-informed decision-making requires raising the sector’s data literacy capability and providing the comprehensive technical infrastructure and user-friendly tools and systems that allow busy educators easy access to multiple sources of valid data and appropriate options for analysing and organising this to inform their practice.¹⁰⁶

New Zealand must address significant problems of inequality and uneven performance, particularly reflected in outcomes for Māori and Pacific.¹⁰⁷ The digital divide is defined by the ability to use new media to carry out the expert thinking and complex communication at the heart of the new economy.¹⁰⁸ “When resourced equitably, speedy internet connections and one-to-one computer access coupled with high teacher expectations can help address these disparities – especially where these are compounded by the lack of access to technology in students’ homes”.¹⁰⁹ The OECD recommends every child attains a baseline proficiency in reading and mathematics to enable effective use of ICT tools for learning.¹¹⁰

Technological affordances are already supporting collaborative endeavour, which has been identified as a key driver of school and system improvement.¹¹¹ The need to facilitate greater collaborative endeavour across our system is critical as Robinson, McNaughton, and Timperley concluded that there is insufficient teaching and leadership capacity available in a self-managing school to lift the equity and excellence of student outcomes.¹¹²

It is critical that the system invests in the continuous capability building of our teachers and other educators as the quality of teaching is still the greatest determinant of student achievement.¹¹³ Embracing a culture of continuous learning for teachers and educational change leaders is required.¹¹⁴ Andreas Schleicher encourages education policy-makers to provide better support for teachers as they learn and practice new pedagogies.¹¹⁵ A capable workforce also helps sustain the innovation needed to drive the transformational changes now needed to modernise the system.¹¹⁶

New models of professional development will be required if teachers are to develop and sustain the increasing pedagogical and technical competence now expected. Feedback from teachers suggests it is proving increasingly difficult to manage within the existing models of teacher development.¹¹⁷ New Zealand’s leading teachers display commendable commitment in constantly refreshing and improving their knowledge and practices. In line with the experience of the world’s top-performing education systems, they are embracing a “teachers as researchers” mindset.¹¹⁸

We need teachers to become active agents for change, not just in implementing technological innovations, but in designing and evaluating these too.¹¹⁹ The challenge is to expand pockets of educational innovation into broad, holistic change across our system.¹²⁰ Despite leading teachers’ commitment to exploring innovative practices, current policy settings limit their deep engagement with innovation processes¹²¹ hindering the uptake of digital technologies.

The student assessment, teacher evaluation, and school accountability regimes that currently define success for education systems are barriers to innovation. New ways to define and measure success are urgently needed to give students, teachers, and leaders a clear picture of what now needs to be achieved and the strategic actions that can be taken individually and together.¹²²

Providing the enabling digital infrastructure

Technology has a key role to play in helping us address many of these educational challenges, but the research identifies priorities a sector-wide enabling digital infrastructure must first address.

New Zealand's devolved education system means each early childhood education service, school, and tertiary provider is responsible for its own teaching and learning resources, assets, and infrastructure. Integration between administration systems is difficult, the duplication is time-consuming and costly, and not all education providers have the ICT expertise to ensure they have a reliable internal network.

There is a cost to teachers and students when systems lack coherence and interoperability. Critical information does not easily follow students as they move. For example, learners' progress is hindered as they transition from one education setting to another, risking disrupted progress and vulnerable students' falling through the cracks'. Educators waste valuable teaching and learning time, re-testing of students already at risk.

Education needs a cohesive digital eco-system enabling an increasingly seamless and collaborative learning environment. Building ICT infrastructure and capability is a priority for all OECD countries.¹²³ New Zealand is viewed as an international leader in building the physical infrastructure. However, moving to a more cohesive digital ecosystem "so all students and educators will have access to a robust and comprehensive infrastructure when and where they need it for learning"¹²⁴ is a challenge.

This infrastructure must serve the sector's pedagogical and stewardship needs. Wylie reported that most teachers saw real benefits for student learning from the use of ICT, but that both principals and teachers identified adequacy of ICT equipment and internet access as issues that needed addressing.¹²⁵ While there is now adequate and reliable internet access in most schools, it is concerning that 46% of teachers report that students do not have access to digital technology when they need it.¹²⁶

Interventions are needed to help individual institutions provide an infrastructure able to meet the increasingly sophisticated requirements of educational users. The PPTA's ICT Advisory Group confirmed that many of the technology issues that impact teacher workload are due to infrastructure and technical support issues such as accessibility, speed and reliability of networks (particularly wireless), and the accessibility and reliability of hardware and software. Schools report managing a bring your own device (BYOD) policy is time consuming,¹²⁷ and teachers worry that the expectation that they be available 24/7 is "unsafe, unfair and unrealistic".¹²⁸

The integration of digital technologies must reduce rather than exacerbate educators' workload issues. While teachers and leaders see advantages in the digitisation and sharing of high-quality resources, the "absence of planning, resourcing and support means that, for many teachers, the use of digital technologies in schools becomes a frustrating addition to their day to day work".¹²⁹ This suggests that digital technologies are considered a contributor to, rather than a solution for, educator workload issues.

The solutions need to be sufficiently robust, so the sector can take advantage of the increasingly powerful suite of emerging digital technologies already impacting on other sectors. Technologies are already having a significant impact on educational practices.¹³⁰ But as education embraces the potential of networks, mobility, augmented reality and virtual reality environments, gamification, biometrics, social scanning, data analysis, AI, and interoperable digital ecosystems, technology's impact may well extend far beyond the current focus on devices in classrooms.

New Zealand education needs teachers and system leaders who have the knowledge, competencies, and confidence to capitalise on the undoubted potential of digital technologies.

That said, leadership at all levels needs to be both informed and discerning and hold realistic expectations when investing in technology. Working in partnership with all stakeholders to build capacity across all facets of the system will be vital.

Then, in accepting John Hattie's challenge to **"know thy impact"**,¹³¹ we must continuously evaluate our progress in implementing key digital interventions.

Appendix D: Current and future states

Where are we now?

Where will we be?

1. Aspirational stewardship

There is no system-wide consensus on 21st century teaching and learning, which impedes the development of a vision and goals to leverage the benefits of digital technologies*

The contributions digital technology can make to teaching and learning are not being realised as we are yet to build the required capacity across the system.

Technical interventions are often viewed as the solution to learning problems, rather than integrating learning sciences, pedagogical understanding, and technological innovation.

Research findings on the impact of digital technology on student outcomes are disappointing.

The impact of technology on learning has tended to focus on devices in classrooms, rather than the practices associated with their effective use. Emerging technologies, when combined with recent legislative changes, have the potential to be significant disruptors.

The student assessment, teacher evaluation, and school accountability regimes that currently define success for education systems can be barriers to innovation.

Despite our leading teachers' commitment to exploring innovative practices, current policy settings can limit the role of teachers, their collective agency, and their deep engagement with innovation.

Interventions, including digital interventions, are not monitored and evaluated, and investment decisions are not always informed by a valid research base.

Funding, information, and resources are developed and deployed based on traditional education models.

The intensity and rate of change is resulting in some sector resistance. Interventions such as PaCT (Progress and Consistency Tool) have met political and pedagogical resistance because of the lack of buy-in to the benefits to teaching and learning.

** Digital technologies are electronic tools, systems, devices and resources that generate, store or process data. These include social media, online games and applications, multimedia, productivity applications, cloud computing, interoperable systems and mobile devices. Digital learning is any type of learning that is facilitated by technology or by instructional practice that makes effective use of technology. Digital learning occurs across all learning areas and domains.*

The Education System Digital Strategy is ambitious for learners, and results in improved educational outcomes, including a lift in achievement, reduced disparities, and students who are prepared for future success

Educators understand that technology is a catalyst for change and an enabler of the processes that drive powerful teaching and learning.

System change knowledge, pedagogy, and technology are thought about in an integrated way. Furthermore, this 'new change leadership' merges top-down, bottom-up and sideways energies to generate change that is faster and more divergent than past efforts at reform.

Teacher researchers work in partnership with education technology innovators to develop technologies that serve effective pedagogies.

The potentials of mobile technologies, Augmented Reality (AR) and Virtual Reality (VR) environments, gamification, biometrics, social scanning, data analysis, AI and interoperable digital ecosystems are realised in the context of effective practices.

System settings capitalise on teachers' initiative and growing professional confidence to adopt innovative approaches to teaching – and actively support successful innovation to scale. Students are not just consumers of technologies, but makers, problem finders and solvers; and entitled invested players in their own right.

System stewardship deliberately fosters and incentivises sector-generated, informed digital innovation for learning. Wider alliances and partnerships (community, iwi, business and public sector) are supported to advance digital learning across the systems and 'unbundle' education.

An increasingly capable workforce is involved in designing, implementing and evaluating technological innovation.

A cohesive strategy, based on sound pedagogy is co-constructed with sector partners, leveraging professional knowledge and the innovative capability of teachers, educators and learners.

2. Enhanced learning, teaching, and assessment

New Zealand education ranks highly in OECD comparisons, but there is too much variation and inequality in student achievement

There is strong evidence that ICT can have a positive impact on student motivation and engagement, but the evidence is weaker for an impact on lifting achievement.

Most students use digital technologies in some form for learning. However, a low level of cognitive demand is associated with this use in New Zealand schools. Technology is generally used to practise subject-specific skills, research, create documents, and undertake limited collaboration.

The deployment of learning management systems and student portfolios in schooling is less consistent than in the tertiary sector. These could assist teachers and educators to lift achievement and personalise learning.

Focus is shifting from the siloed delivery of discrete content knowledge to an acknowledgement of the increasing importance of “new knowledge” and the need for greater integration and “horizontal connectedness” across learning. There is a growing acceptance of the importance of the key competencies, especially digital fluency, and the transversal skills that are essential for 21st century learning.

Technology is raising challenging ethical issues around privacy, intellectual property and scientific and social engineering. Individuals and organisations are raising ethical issues around the use of big data and analytics in education.

Not all teachers and educators have access to the information and tools needed, sufficient data fluency or the pedagogical capacity to change their teaching practices in response to the information they receive.

NCEA external assessment is largely paper-based and does not allow for more sophisticated forms of assessment.

Technology supports improved educational outcomes including a lift in achievement, reduced disparity, and students better equipped for the future

Technology amplifies effective pedagogies that make teaching and learning ‘visible’ and supports ‘teachers as activators’. Digital learning helps strengthen learners’ 21st century competencies.

Teachers and educators use digital technologies to cognitively extend students and engage them in complex and authentic tasks. Technologies such as serious gaming, virtual reality and simulation are integrated seamlessly into teaching and learning where their use enhances learning.

Digital technology supports seamless lifelong learning, personalises learning experiences, broadens the scope of teachers and other educators supporting their learning, and provides empowering learning experiences that would not otherwise be possible.

Foundational knowledge remains essential but new skills and knowledge are necessary to collaborate digitally, and across disciplines as technology changes the methods and techniques of acquiring, representing and manipulating knowledge. Students are actively engaged in generating new knowledge, creating and sharing their own learning resources.

People understand how personal data is collected, shared, and used, and how to protect themselves against online abuse. Students are developing increasingly sophisticated ethical and moral modes of thought and action.

Technology and new operating models are providing a ‘just-in-time’ formal assessment environment, including NCEA Online and micro-credentialing that can tailor the intent, mode, timing and location to suit the student’s needs.

Students have enduring access to their learning space.

3. Engaged families and whānau and community

Educational institutions tend to operate as closed systems, so fail to realise the benefits to be gained from meaningful educational collaboration with parents, whānau, and interested stakeholders

The potential of digital technology to support and inform families and communities has not been fully realised.

Schools and teachers are yet to fully engage families and employers in collaborative planning for learning.

Educational institutions tend to operate as siloed entities, with limited interaction with other community stakeholders.

There is growing concern from parents, learners, teachers and educators about cyber bullying and online harassment. There are secure systems for online collaboration in place but these are underutilised. The security of schools' digital environments, content and personal data is variable across the system.

Families, whānau, communities, and employers are central to learners' success

Technology facilitates school-family partnerships and engagement with employers and the wider community.

Learners, teachers and educators design evidence-based personalised learning pathways in partnership with parents/whānau/learning mentors. Students and those who support their learning can participate actively to plan, review and revise personalised learning plans.

Education providers interact with a range of stakeholders in their broader community's learning ecosystem.

Learning is facilitated within a secure, safe, managed environment – supported by the enhanced digital fluency of all its users.

Career pathway planning follows the learner's interests as they develop.

4. Capable and empowered education professionals

Teachers and educators are exploring the use digital technologies to improve teaching and learning

Advances in the learning sciences and in educational research identify teaching strategies which have the highest impact on learning, yet not all teachers and educators feel confident to apply this knowledge to the way they use digital technologies for learning.

While a portion New Zealand teachers are committed to continually improving their digital technology knowledge and teaching practices, this is not yet the norm.

Many teachers and educators are struggling to integrate a digital dimension into teaching practice, including new competencies in curriculum delivery and student support, and lack pedagogical knowledge to maximise research and evidence to raise achievement.

Teachers rely on their own research about using digital technologies. Learner, teacher and educator access to subject matter experts is not consistent and the innovative use of digital technologies to support teaching and learning remains localised.

While the majority of teachers support their work by downloading resources and collaborating with other teachers within their school, fewer use digital technologies to collaborate and share resources beyond their school. There is inconsistent adoption of good practice.

Collaborative endeavour is becoming accepted as a key driver of school and system improvement.

Kāhui Ako are expanding opportunities for skilled professionals to share their knowledge across education sector boundaries but lack the digital infrastructure to embed this in daily practice.

TKI provides a wide range of quality, curated content, which is valued by teachers and educators, but is hard to navigate.

There is no persistent record of teachers and educators' professional development that can be shared, for example, when a teacher changes school.

Teacher education is based on 20th century models, which views teachers as deliverers of the curriculum, rather than as "activators of learning".

Enable the requisite technology to be seamlessly embedded (and supported) in teaching, learning, and assessment

Based on an enriched understanding of how people learn best, teachers and educators integrate digital technology into highly effective teaching, learning and assessment practices that benefit learning.

Teachers, educational change leaders and policy-makers support the practice of new pedagogies and transformational change.

The globalisation of education means pedagogical knowledge and emerging best practice can be accessed by every educator through actively participating in local and global communities.

The conventional role of educator continues to evolve, with educators working in teams that may include learning designers, internship coordinators, project facilitators, a game-based learning teaching faculty, and blended learning programme directors.

Teachers constantly inquire into their practice and leverage technology to facilitate collaborative inquiry informed by richer student achievement data.

Teacher capability-building strategies recognise the value of building a research based profession, thereby capitalising on increased professional motivation and engagement.

Technology is supporting connections and collaboration, enabling increased coordination and cohesion within and between institutions. so that teachers and educators can access local and global communities of practice to build pedagogical and technical knowledge.

Educators' own learning pathways are facilitated online, making it easy to manage and share with others, such as employers.

Educators are supported to develop the skills and tools to become innovators and researchers, working at the leading edge of practice. This greater autonomy and challenge attracts the 'best and brightest' to a teaching career.

5. Informed decision-making

Each education provider is responsible for its own data systems and cannot easily share student data. Decision-makers at all levels lack access to quality information and tools, and may lack sufficient knowledge to use them for effective decision-making.

There are wide disparities in the amount and sophistication of data use across education. Extensive data is available to schools and the wider system but this does not always translate into an 'information rich' environment because of the way data is stored and accessed. The use of data to inform practice and decision-making remains a low priority in many institutions.

The lack of data gathering tools and capabilities to provide the evidence needed to change practice and target interventions means data gathering and analysis is labour intensive and error prone. The system is ill prepared to capitalise on the powerful opportunities becoming available.

Systems such as student management systems (SMS) are purchased and managed by individual education providers, are not interoperable, and collect data in different ways and at different times, making it hard to share information between providers and agencies.

Data about learners' progress, needs and interests does not follow them when they move; meaning students who move frequently are at higher risk of not achieving.

The student journey within the education sector, from early childhood to schooling to tertiary and careers, lacks coherence.

Technology has broadened the scope and effectiveness of evidence gathering to inform teaching and learning, assessment, and credentialing. All decision-makers have the quality information, tools, and knowledge to improve practice, enable effective decision-making, and ensure optimal investment

Artificial Intelligence (AI) technologies have increased the accuracy and precision of decision-making at all levels and across relevant agencies. Access to high quality timely information enables a comprehensive long-range view of education; for example, information is available to monitor teacher supply and demand enabling better planning and responsiveness. Education is partnering across the social sector to inform, engage, target and tailor integrated interventions.

Greater confidence in the use of data encourages teachers, educators and institutions to be accountable for monitoring and moderating performance. This focus on using data in research-informed inquiry is leading to increased prevalence of effective teaching, and institutions able to better design solutions to problems.

Digital technologies enable educators and to use sophisticated digital tools to collect evidence of learning outcomes. Learning analytics and technology help educators provide real-time support and encouragement to students through more targeted, in-depth teaching and mentoring. Educators intervene early and quickly to support who need help.

High-quality data is collected seamlessly and collected once, and can be shared easily and securely by those who have a right to it. Data analytics support better data analysis across the system. Education leaders and agencies have the skills necessary to interpret and act on data.

Students have access to their data when they move education settings, helping ensure smooth transitions. Support tailored to the specific needs of the student continues seamlessly at transition points, mitigating the impacts of transience and helping create a seamless experience for learners.

6. Resource efficiencies

Each education provider and sector agency runs its own administration systems, funding is siloed, and use of resources is constrained by traditional models

Student choice is constrained by current student groupings, subject options and timetabling constraints.

New Zealand has significant problems of inequality and uneven performance, particularly reflected in outcomes for Māori and Pacific. The digital divide now resides in differential ability to use new media to carry out expert thinking and complex communication.

Technology is seen as critical to the preservation of Te Reo, but is underutilised.

Internationally and in New Zealand participation in online learning is rising, but resourcing arrangements are not flexible enough to support this adequately.

Not all education providers have the ICT expertise to ensure they have a reliable internal network, particularly in ECE and schools). There is adequate and reliable internet access in most schools, but over half of teachers claim that do not have access to digital technology when they need it.

Internationally and in New Zealand there is more focus on acquiring the technology than on how to use it effectively or efficiently. Teachers and educators, leaders and administrators spend time performing low value tasks which could be automated. Many transactions and processes are manual and paper based.

Integration between administration systems is difficult. Service interactions with government can be time consuming and difficult to navigate, with multiple websites and contact centres organised around providers and agencies rather than to meet the needs of the customer.

Working collaboratively, we will achieve greater impact on learning, increased equity of outcomes, more efficient investment, and better utilisation of resources

Technology broadens the scope of teachers and educators, supporting students and allowing specialist resources to be shared widely. Institutions at all levels leverage technology to reduce constraints of time, space, place and people, increasing the flexibility, authenticity, seamlessness, efficiency and personalisation of learning pathways.

Equitable resourcing, fast internet connections and individual computer access coupled with high teacher expectations help address disparities. Every child attains the baseline proficiency in reading and mathematics critical to their effective use of technology for learning. Technology supports powerful connections and collaboration to increase equality of educational opportunity and achievement for all students- regardless of their backgrounds, location and learning needs.

Digital technologies reduce geographic, socio-economic and cultural barriers to accessing quality education. Diverse online learning resources are available to those seeking either a fully online or a blended learning experience, powered by sophisticated learning analytics. Digital technology is helping sustain Te Reo and increasing access to other languages.

A robust technical infrastructure and coherent digital ecosystem supports the ubiquitous use of digital technologies. All learners, leaders, teachers and educators can easily access and collaborate in secure and interoperable online environments with expanded access to high quality learning resources, smart tools and state-of-the-art communication.

Smart administrative tools help teachers and educators to plan, manage and record effectively. Educators and leaders can access timely expertise and technical support when and where they need it.

Standardised systems and processes across agencies are reducing cost, and making it easier to improve services. There is a simplified, user-friendly, one-point-of-contact interface with government.

Appendix E: Proposed governance principles

Proposed principle	Rationale	Implications
Partnership		
<p>A common and agreed strategy, priorities, and portfolio from the onset</p> <p>Collaboration across the sector prioritised to harness digital technologies and support effective teaching, learning, and administration</p>	<p>To ensure all parties have clarity regarding the strategic goals and objectives of the programme and clarity regarding their role in the delivery of outcomes</p>	<p>Cross-agency portfolio planning and management occurs with clear alignment of initiatives to a set of agreed investment priorities or strategic priorities</p> <p>Input and support for the strategy and business cases from the agencies and wider sector</p> <p>Clear memoranda of understanding or partnership agreements established to set out the requirements for service delivery across portfolio for programme and projects</p>
Open and transparent		
<p>Decision-making processes and outcomes are well defined and broadly communicated</p> <p>Major or high impact decisions are inclusive of key stakeholders and focus on Education for a Digital Age programme-wide requirements</p>	<p>To ensure key stakeholders are involved and support an open working environment underpinned by trust</p>	<p>Strong board accountability and transparency of decisions</p> <p>Decision rights understood across all parties</p> <p>Collaboration on important issues and opportunities to reach mutually agreed resolutions and strategic objectives</p> <p>Open, honest, and respectful dialogue promoted among the board, programme staff, and project staff</p>
Delegation with 'no surprises'		
<p>Delegate with 'no surprises' ethos across governance – minimising governance and unnecessary arrangements and delegating to the lead agency and SRO</p>	<p>To reduce governance interventions and involvement to ensure faster decisions and better delivery across an extensive portfolio of projects</p>	<p>Senior responsible owner (SRO) prepares for, attends, and actively participates in board meetings to a common and agreed standard</p> <p>'No surprises' approach to engagement at the board level with the SRO ensuring any issues that may be discussed in the public arena or may require a ministerial response are fed into the governance process as soon-as-possible</p> <p>SROs are given real accountability and business authority to make decisions and resolve issues outside of the governance framework</p>
Inclusive		
<p>Governance and ongoing delivery is inclusive of those to whom we are delivering the outcomes: our children, teachers, parents, families and whānau</p>	<p>To ensure customers' voices are heard and continue to be heard through the delivery of this work</p>	<p>Involvement of non-education related stakeholders in the programme or board to advise and support where appropriate</p> <p>Customer-centric design promoted across the portfolio of projects under way to ensure a consistent way of engaging with customers, framing the problem, and defining the solution required</p>

Proposed principle	Rationale	Implications
Straight-forward		
Governance framework and decision-making processes will be simple and 'flat' as possible to ensure responsiveness and pace is maintained	To recognise agencies have their own internal project governance, so overall portfolio governance should be as uncomplicated and unobtrusive as possible	<p>A simple and flat governance structure as possible – with only key governance processes and activities prioritised across the portfolio</p> <p>Major stakeholder groups' needs can be met by appropriate management forums and do not necessarily need a presence on the governing body</p> <p>SROs manage their projects and feed into an overall governance framework actively (see under <i>Delegation with 'no surprises'</i>)</p>
Innovation		
Foster new ideas, promote effective practices and collaborate with technology professionals across how we govern to explore new uses of technology to enhance the way education agencies and educators work together to support learnings	To deliver on the expectations of the education sector by better utilising the vast set of skills, experiences, and learnings that sit across both private and public sectors	<p>Requires effective collaboration with technology partners and providers to understand technology solution options which are relevant to the Education for the Digital Age programme</p> <p>Involvement of non-education related stakeholders in the programme or board to advise and support where appropriate</p>

Appendix F: Ten-year horizon

This appendix has three main components.

- A **time-phased view of the main digital enablers** required over the next 10 years to support the achievement of the five future state objectives described in Figure 1, p 19 (see Figure 4). The digital enablers are divided into five investment streams:
 - **Assessment** – design new approaches to assessment that leverage technologies to enable assessment to be a seamless part of learning
 - **Online learning environments** – enable an integrated, connected online learning environment, accessible to educators and to students and those who support them anytime, anywhere
 - **Workforce** – provide core digital services and infrastructure to reduce costs, improve efficiency, and free up educators and providers to focus on delivering a quality education.
 - **Information and data** – make high-quality data easily accessible to educators, stakeholders, and decision-makers, including data on the education workforce, to enhance decision-making
 - **Agency channels and systems** – make the communication channels within, between, and to the sector agencies, consistent, high quality and unambiguous and invest in cost-effective, standardised corporate systems for cross-agency use.
- An **illustrative timeline for the realisation of each objective**, based on the time-phased view of the provision of the required digital enablers:
 - embed digital in future-oriented teaching, learning, and assessment (Figure 5)
 - strengthen connections with families and whānau, communities, and employers (Figure 6)
 - help leaders and educators build their capability(Figure 7)
 - provide better support for decision-makers (Figure 8)
 - make better use of resources across the system (Figure 9)
- The **current estimate of the scale of possible investment required** (Figure 10) to deliver these enablers. Sources of funding have not been explored such as discretionary sector purchase, redeployment of baseline, and new central funds. In addition, as with any 10-year cost profile the cost in out years become increasingly less certain due to market and technology changes.

Figure 4: Time-phased view of the main digital enablers required over the next 10 years to support achievement of the five future state objectives

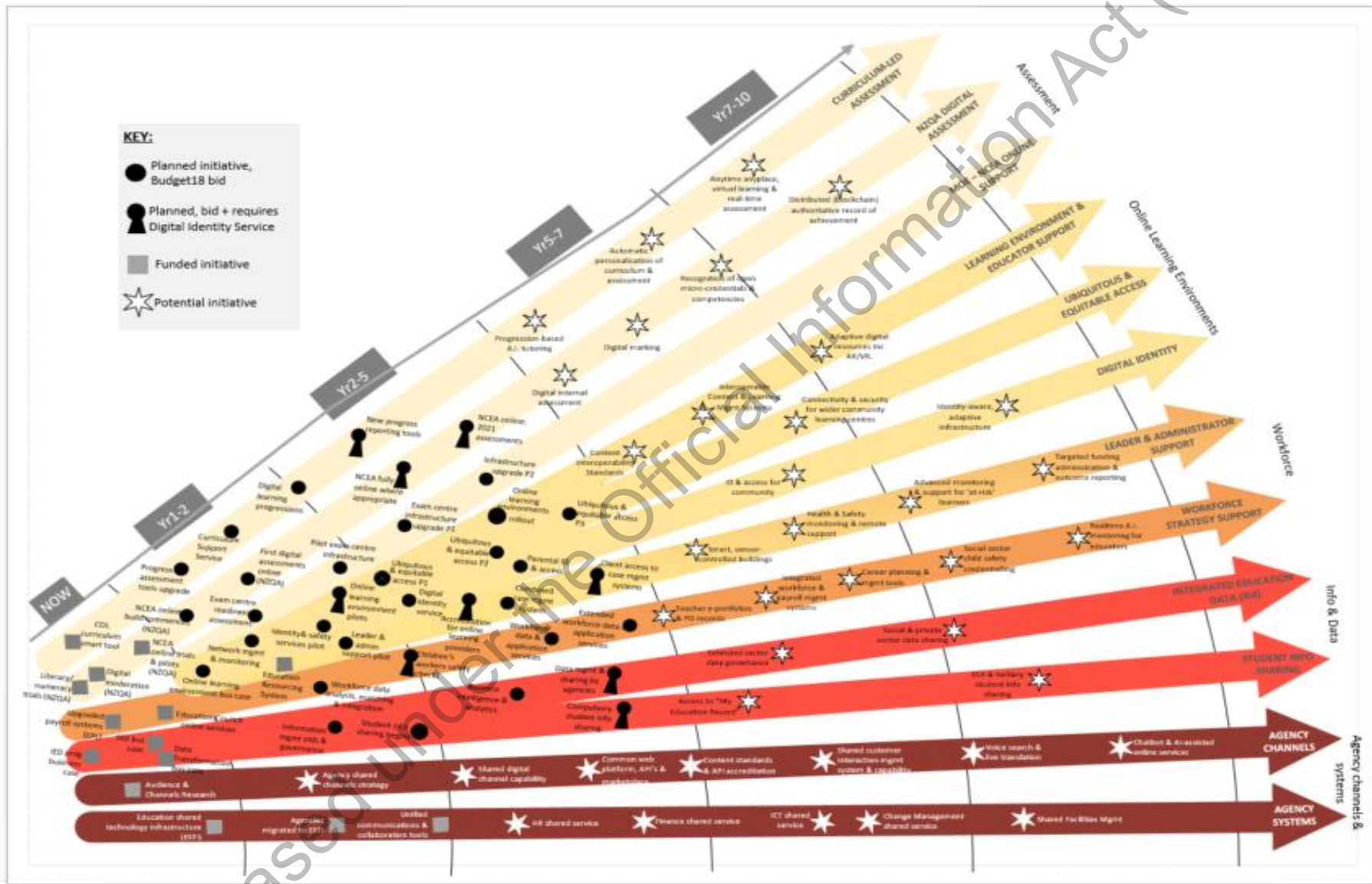
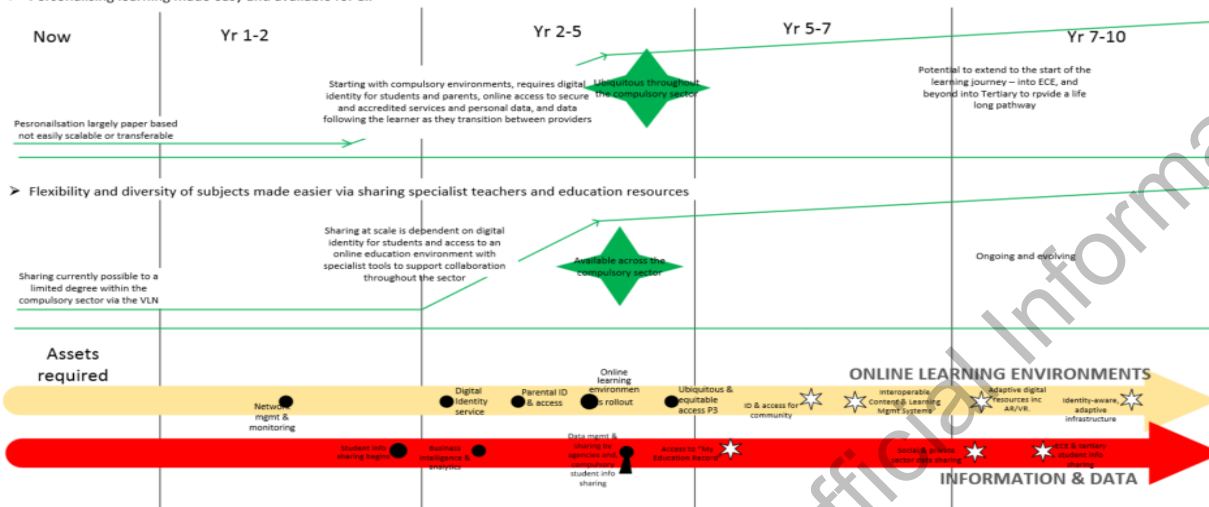


Figure 5: Illustrative timeline for realising the objective 'embed digital in future-oriented teaching, learning, and assessment'

Embed digital in future oriented teaching, learning and assessment

Learners experience a seamless, personalised education from early childhood to adulthood

- > Teaching and learning is supported within a secure, safe, managed online environment our learners are competent digital citizens, able to protect themselves and others
- > Learners have enduring access to their online learning space from early childhood throughout their learning pathway
- > Personalising learning made easy and available for all



Technology enables new forms of assessment:

- > Technologies such as learning analytics, gaming and micro-credentials enable sophisticated assessment in real time, and provide a recognised record of learning
- > Assessment is integrated into day-to-day learning, providing individualised responses and reducing assessment stress
- > New models of assessment enable a broad range of skills and knowledge to be assessed

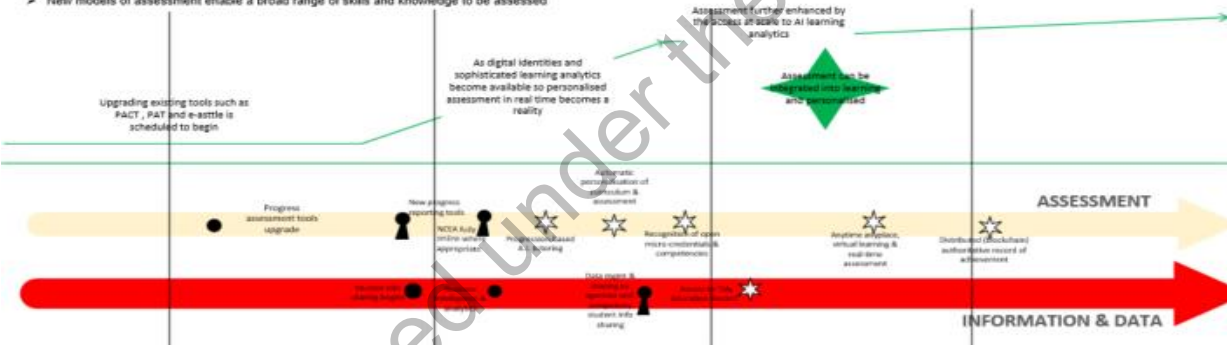


Figure 6: Illustrative timeline for realising the objective ‘strengthen connections with families and whānau, communities, and employers’

Families, whānau, communities, and employers are empowered to support learning:

- Technology enables families and whānau to be partners in their children's learning and receive regular updates on their children's progress and achievement
- Technology helps educators build and sustain learning partnerships with employers and the wider community, educators Can draw on community resources and expertise

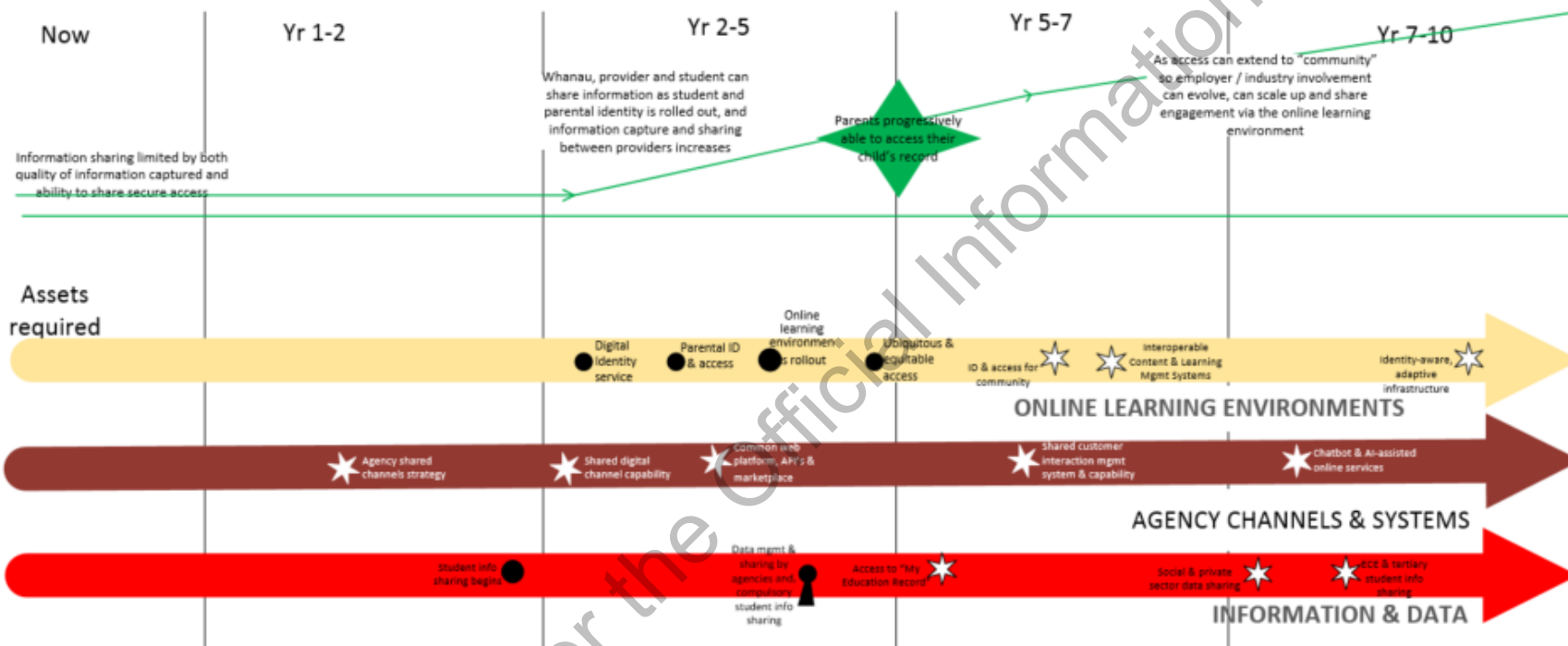


Figure 7: Illustrative timeline for realising the objective 'help educators and leaders build their capability'

Educators have the skills to integrate technology into effective teaching and learning practices

- Educators use technologies to enhance those pedagogies known to have the greatest positive impact on learning
- Technology enables educators to connect and collaborate, building their own and others capability
- Educators learning pathways are maintained online

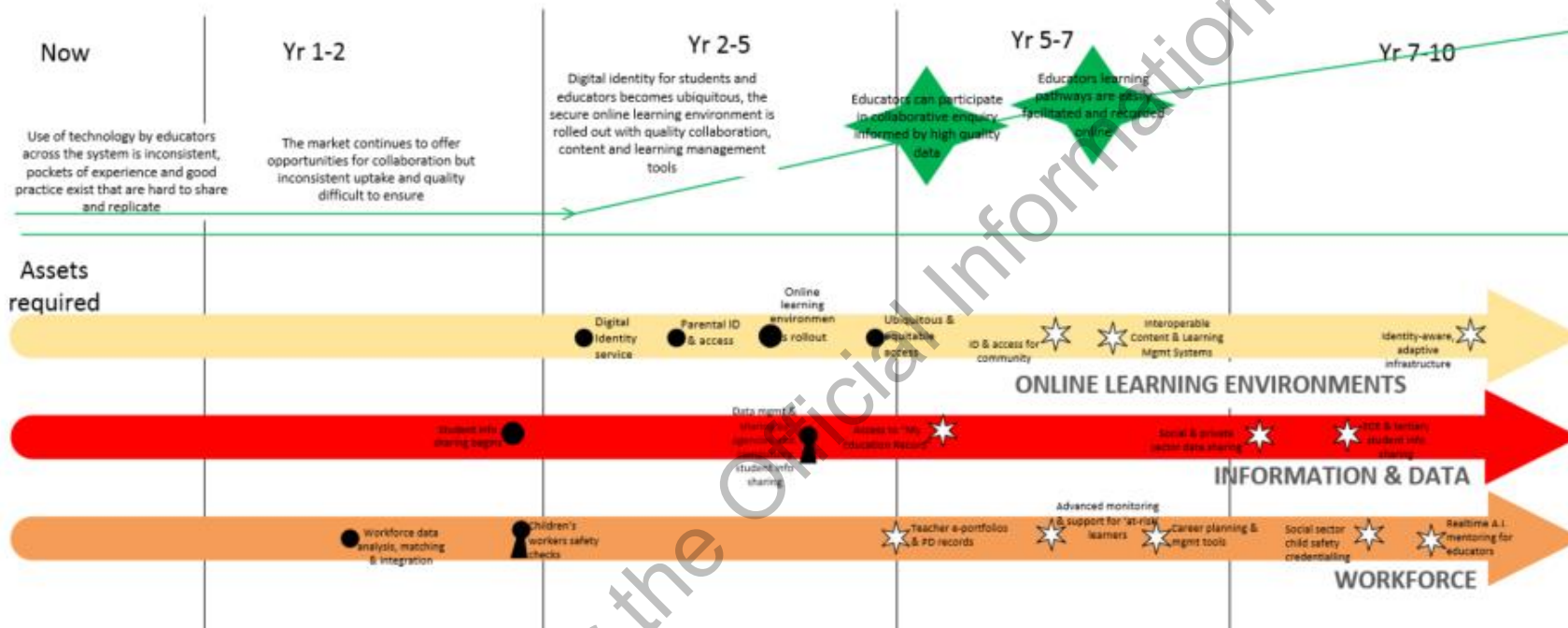
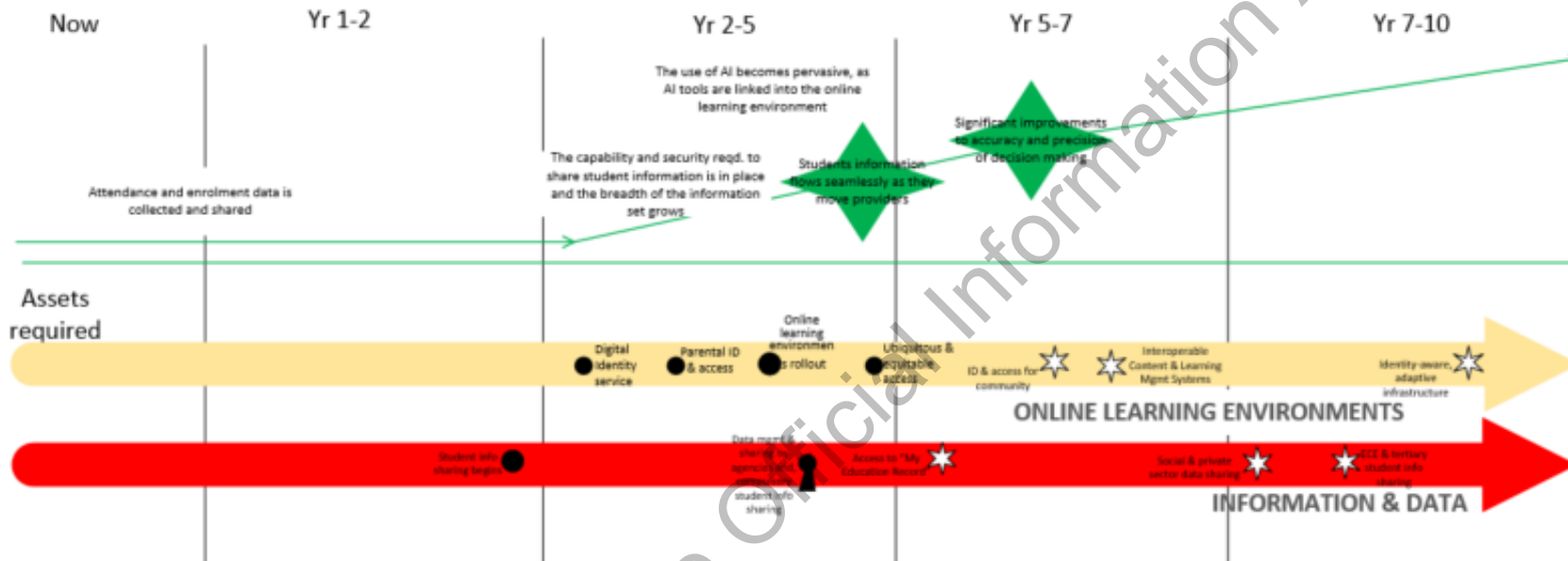


Figure 8: Illustrative timeline for realising the objective 'provide better support for decision-makers'

Decision makers have the quality information, tools, and knowledge they need to enable effective decision making and improve their practices

➤ Access to high quality timely information enables policy makers to identify and respond to education trends, issues and opportunities



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Figure 9: Illustrative timeline for realising the objective ‘make better use of resources across the system’

New delivery models give learners access to high quality learning opportunities, no longer constrained by location, time, or availability of subject specialists and resources

- Technology enables specialist expertise (such as subject expertise) to be shared widely, independent of location
- Powerful connections and collaboration increase equality of educational opportunity and achievement
- Online learning supports fully online and blended learning experiences powered by sophisticated learning analytics

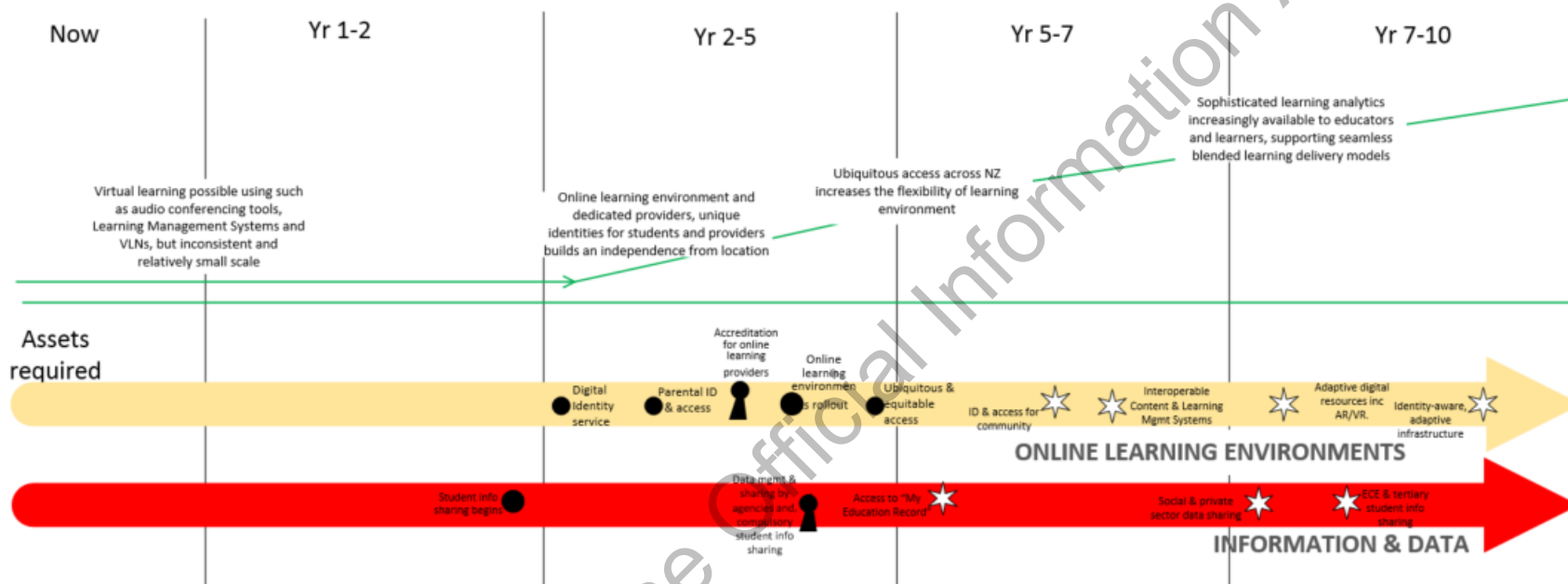
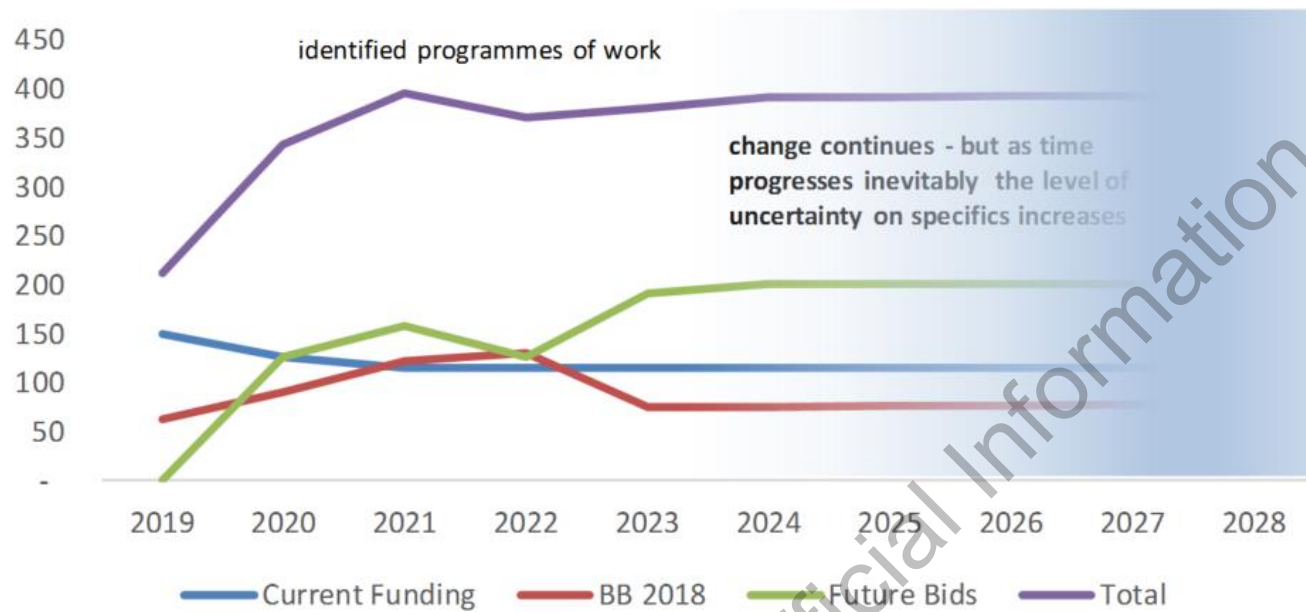


Figure 10: Estimate of the scale of possible investment required



Note: BB 2018 = Budget Bid 2018.

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Appendix D: Executive summary from the literature review

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CONNECTING
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Transforming Education for the Digital Age

2015-2020



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Foreword from the Secretary for Education

Digital technologies and the internet are profoundly affecting the lives and work of all New Zealanders.

We can expect the impacts of technology to be even greater in the future, as technology innovation grows exponentially and the world becomes increasingly connected.

We can no longer view digital technologies as simply the means to make what we already do cheaper and faster; instead we must harness its potential to transform how our system operates.

An integrated, fully digitally-enabled education system is critical if we are to achieve our aim to equip our young people with the skills they need for success in a digital world.

I welcome and whole-heartedly support this education system digital strategy: Transforming education for the digital age.

This will take a collective commitment from all of us in the education system – educators, leaders, administrators and agencies – combined with strong governance across the education system agencies and our sector partners. The success of this strategy will depend on new ways of working, in which we collaborate to achieve a fully integrated system designed to serve the needs and aspirations of all learners.

The changes envisaged here are ambitious but achievable.

We will know we are successful when every student from early childhood through to employment experiences rich and culturally appropriate learning opportunities with high-quality digital resources and interactions; when assessment is woven seamlessly into the process of learning; and when transitions between education settings are smooth, efficient and effective.

We will know we are successful when educators and leaders feel well supported throughout their careers and have the opportunity to work to

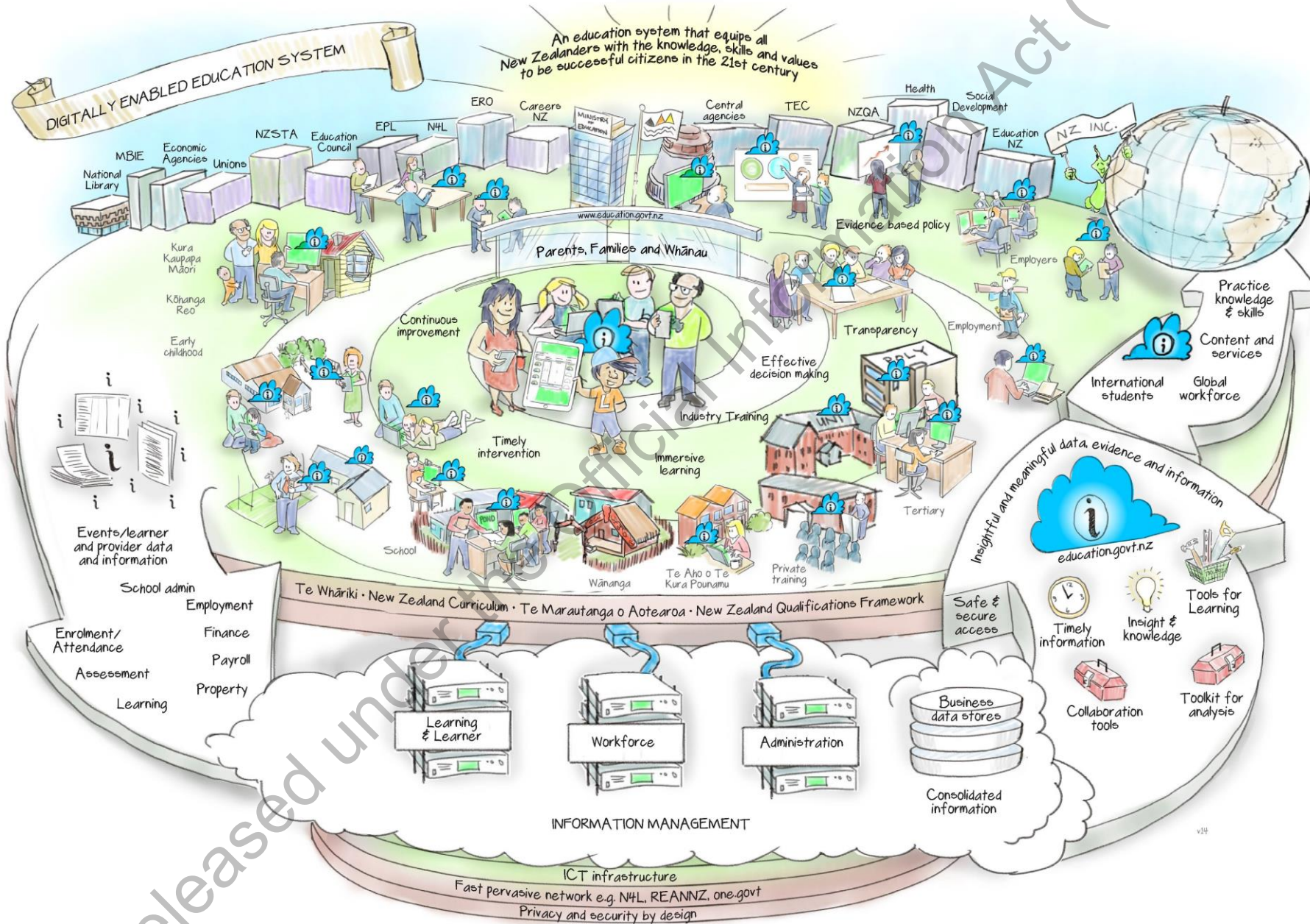
their strengths; and when all those who administer the system have the tools, information and data they need when they need it.

I commend the work done to create this strategy. I am confident it will prove a reliable guide on the exciting journey ahead. I have no doubt that by working together we will be successful in our common goal to be a world-leading education system.

Peter Hughes
Secretary for Education



Vision: A digitally-enabled education system for New Zealand



A1 – A vision for a digitally-enabled education system

The New Zealand education system aims to prepare young people for a digital world of rapid change and significant challenges. New Zealand's future depends on everyone being a competent and confident life-long learner, able to adapt quickly to change and apply their learning to create and innovate throughout their lives.

Within the next decade it is likely we'll see radical changes in education driven by digital technologies. Right now we have the chance to be ambitious in building on the technologies available today by leveraging the investment in infrastructure and the enthusiasm of students, educators and leaders to embrace the tremendous advantages technologies have to offer.

The ubiquity of digital technologies in modern societies has for the first time opened up the opportunity to adopt learner-centric pedagogies at scale, underpinned by smart tools, rich data and powerful analytics.

This strategy signals a fundamental shift from a system with organisations at the centre to a system with the learner at the centre. New technologies provide the means to adapt the education system to fit the learner's needs, collapsing traditional boundaries to create an integrated, seamless system characterised by:

- personalised, self-directed, authentic learning available to all, with students' data and records of learning travelling with them
- the means for all students to develop higher-order competencies, including digital fluency, complex problem-solving, collaboration and team-work
- strong, active learning relationships between learning providers, students, educators, parents, whānau, communities and business
- common tools and platforms providing access to secure, accurate, up-to-date information that is easy for users to find

- effective stewardship of the system led in collaboration with sector representative groups and central agencies
- targeted investments to upgrade system infrastructure as new advances in technologies provide opportunities for innovation and improvement.

The strategy and supporting work programme are designed to achieve the target state in four areas:

Innovative learning environments

The education system will be characterised by a strong culture of innovation and the use of new technologies to expand learning opportunities for all students. Traditional boundaries will collapse, enabling students to access learning from a range of providers at any time.

Efficient administration of the education system

Common tools and systems, and the integrated collection and sharing of data, will provide access to rich, timely information to those who need it, and reduce administrative time and overheads.

Engaged and productive education workforce

The education workforce will be supported by common services for registration, recruitment, remuneration, and professional development and learning. Integrated data and information systems will enable efficient workforce management.

Effective corporate and common services

A common infrastructure and shared services will be underpinned by standards-based systems for security, privacy, and identity and access management.

A2 – What achieving the vision will mean

To students and learners

- I am in the driving seat of my learning. I make choices with expert guidance from educators who work with my family and me to plan and support my learning.
- I learn alongside others in my community. Learning is collaborative. I teach as well as learn.
- I am confident using digital technologies and I can apply computational thinking to solve problems.
- I own my own record of learning. It is immediately accessible wherever I am and I can go on adding to it throughout my life.
- I can choose from a number of locations, providers and online resources to learn about topics that interest me. I am gaining skills and knowledge that will help me achieve my dreams for the future.
- My progress is assessed as I go and I can use a range of ways to demonstrate what I've learned. Using smart technologies means skills like communication, teamwork and problem solving are assessed along with my subject knowledge.
- I get high-quality information about career opportunities and my future prospects, so I'm confident I can choose the right mix of things to study.
- I trust the system to protect my information and privacy.

To parents, caregivers, family members and whānau

- I am an active partner in my children's education and I can follow their progress through the education system.
- I get all the information I need when I need it to help me support my children's learning.

To teachers and educators

- Using digital technologies has transformed my teaching practice. I see my role as an activator of learning, providing expert advice and mentoring to support students to direct their own learning.
- Digital technologies are integrated seamlessly into everything I do. Smart tools enable me to plan, manage and record effectively, freeing me up to focus on supporting students with their learning.
- I have accurate, timely information at my fingertips wherever and whenever I need it.

To schools and education providers

- Smart technologies enable me to operate within an interdependent community of learning, supporting students and staff who can learn from a range of providers. Students and staff move seamlessly between physical and virtual learning settings.
- I have access to quality assured, comprehensive information on which to base decisions. I can trust the integrity and security of the data I use. I input data once and can use it many times.

To education sector agencies and Government

- Smart tools and common IT systems make delivering service improvements and implementing policy changes simpler and less expensive than they used to be, freeing up investment to improve outcomes for students and educators.

A3 – Context for change

The digital world

Digital technologies are an integral part of modern societies and have transformed almost every aspect of life. Mobile technologies and the internet are ubiquitous and have changed how we think about knowledge and learning.

The digital economy

The nature of work is changing rapidly as new technologies replace unskilled and many skilled jobs. Today's employers seek young people who can demonstrate higher-order skills along with subject knowledge, such as digital fluency, entrepreneurship, advanced communication skills and the ability to collaborate to solve complex problems.

Government investment in modernised ICT infrastructure

New Zealand education is at a tipping point. While digital technologies have been around for a long time, the Government's investment in a national fibre network and upgraded infrastructure is giving every New Zealand student and educator access to the benefits of new technologies and high-speed broadband.

Modernised infrastructure is making administration easier and more efficient, and enabling education providers to collect, analyse and share large amounts of data easily.

Transparent government

Modern democracies increasingly demand accurate, timely information as digital technologies give everyone the means to access it. Education providers and agencies generate vast amounts of information, which they currently hold in their own systems. This is resulting in duplication of effort, and making data difficult to collate, analyse and use to improve services.

Rapid technological change

The rapid uptake of technologies is creating new opportunities and challenges, for example:

- *Mobile computing* is opening up new opportunities for personalised learning and seamless access to internet tools and resources. Mobile devices are giving students opportunities to learn anywhere, anytime from a range of providers
- *Apps for teaching and learning* are growing exponentially, getting less expensive to implement at scale, and presenting highly interactive, engaging ways to learn
- *Globalisation of education* is creating new opportunities to deliver online education, including export education, but poses a risk that we lose market share if we fail to exploit the opportunities
- *Open content* is making online content easy to use, share and re-purpose through schemes such as Creative Commons
- *Learning analytics* are enabling learning programmes to be precisely tailored to meet the needs of individual learners and targeted groups
- *Cloud computing* is increasing flexibility, improving the speed of deployment and reducing the IT management burden on individual organisations
- *Social networking and gamification* are creating new levels of interaction and engagement with learning and other education management systems as well as contributing to learning analytics
- *Privacy and security concerns* are growing as educators and students use the web to create, use and store data.

A4 - Contribution to Government priorities

We expect the digital strategy to make an important contribution to achieving the Government's aims for education. Integrated systems based on common standards for data collection, security, privacy, and identity and access management are necessary enablers for collaboration across agencies and between providers.

Government economic and social priorities

The Government has four key priority areas to which the education system contributes:

1. *Delivering better public services (BPS) targets*, of which three are in education:
 - increase participation in early childhood education
 - increase the proportion of 18 year-olds with NCEA Level 2 or equivalent
 - increase the proportion of 25-34 year-olds with advanced trade qualifications, diplomas and degrees at Level 4 or above.
2. *Business Growth Agenda (BGA)*, to which education agencies contribute in three work-streams: Skilled and Safe Workplaces, Innovation, and Export Markets.
3. *Rebuilding Canterbury*, which offers a unique opportunity to build a state-of-the-art education network in New Zealand.
4. *Responsibly managing the Government's finances*.

Education system strategic intentions

We aim for the education system to achieve the three key outcomes set out below. Achieving these are pre-requisites to delivering the longer- term social, cultural and economic outcomes we seek for New Zealand.

1. *The education system is relevant and reaches all children and students*. Education is accessible, seamless and flexible enough to accommodate different aspects of learners' lives and varying needs throughout their lives.
2. *Every child and student achieves educational success*. We aim for a system that is tailored to the needs of students from early childhood to tertiary and into employment. Every student, no matter their background or needs, is supported to meet their potential. The success of our future society and economy rests in large part on getting better educational achievement with less disparity.
3. *New Zealanders have the skills and knowledge for work and life*. An effective education system provides qualifications that open doors to future opportunities and the skills needed in a modern society and modern workplaces.

New Zealand needs an education system that provides its people with the skills and knowledge they need to be successful in life and in an increasingly global economy. Demand for future-focused learning is increasing. This Strategy and the Government's objective to strengthen 21st Century practice in teaching and learning will help ensure that we have the right focus for this outcome.

Government ICT Strategy

The intended outcomes of the digital strategy are also consistent with the Government's ICT Strategy and Action Plan, which aims to ensure:

- Customers experience seamless, integrated and trusted public services
- Information-driven insights are reshaping services and policies, and adding public and private value
- Adoption of information and technology innovations is accelerated and value is being created
- Investment in innovative digital services is being prioritised and benefits are being realised
- Complex problems are being solved and innovative solutions are being adopted

Education system stewardship

The Education System Stewardship Forum is providing unified and collaborative leadership in the areas of strategic direction, sector governance, delivery of government priorities, resource sharing and co-operation in education system delivery.

The Forum's objectives are:

- A focus on the performance of the education system and its key outcomes
- Effective stewardship of the education system through joined-up work programmes in key strategy and policy areas
- Environmental scanning and strategic thinking on the future of the system
- Alignment of education system-wide strategy, policy and associated Budget processes
- Delivery of the system's Better Public Services Action Plan and targets
- Coherent cross-agency reporting to Ministers on education system performance, pressures, and priorities.

The Forum is the sponsor of this strategy. The Forum has established the Education System Digital Strategy Board (Digital Strategy Board) to take responsibility for the delivery of the strategy and associated work programme.

This Board will play a critical role in the success of the digital strategy. Effective governance should ensure that investment decisions are made through collaboration between agencies and are consistent with the intent of the strategy.

A5 – Describing the target states

Innovative learning environments

The Digital Strategy aims to create the conditions in which innovation flourishes and state-of-art technologies are used as a matter of course to enhance learning outcomes and streamline administration.

We will know the Digital Strategy is successful when the system is centred around the needs of students; when students have autonomy and choice in what and how they learn, and are supported by expert guidance from skilled educators.

Smart tools and resources will amplify the variety and capability of educators and students. A strong and growing evidence base will help students, leaders, educators and education agencies make effective decisions about new practices in teaching, learning, assessment and administration. The target state is illustrated in the graphic overleaf, and from the perspectives of key participants in the *Supporting Modern Learning Practices* posters in Appendix 1.

We will know we are successful when:

- All leaders and educators use learning practices that make the most of innovative learning environments
- All students are engaged and achieving, including being able to demonstrate 21st century skills
- All students have equitable access to digital learning opportunities
- Core services are provided nationally using a common platform, with most services based in the cloud
- Rich information about students and their record of learning and achievement transfer easily across institutional boundaries and enable students to learn from a range of sources
- Students have adaptive, individualised learning pathways enhanced by the use of sophisticated forms of assessment,

including new ways to demonstrate achievement and gain qualifications

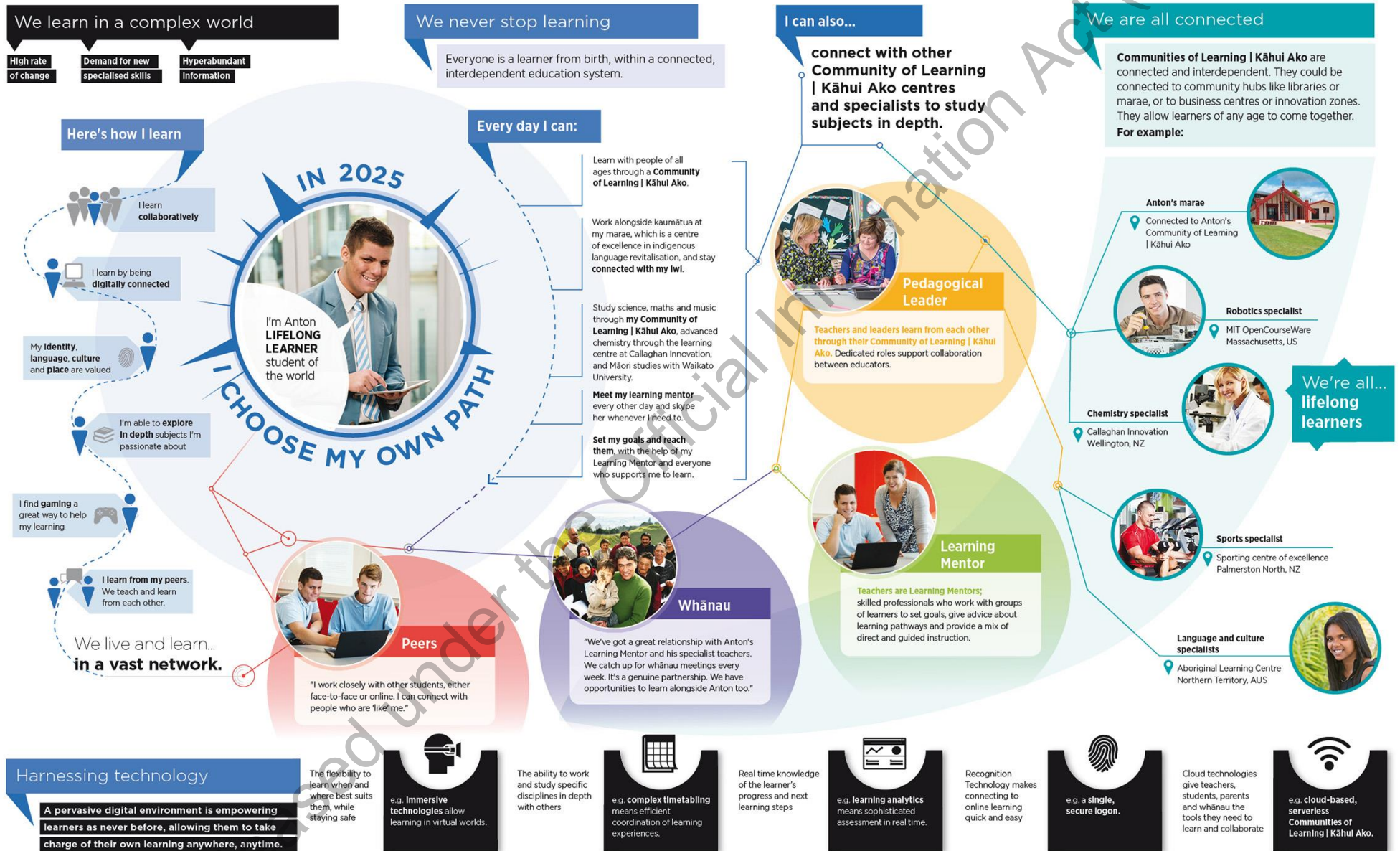
- Effective privacy and security practices ensure data and information are secure and the public can trust the systems used to hold students' records of learning
- IT infrastructure is maintained and upgraded over time so educators and students can keep up with new technologies as they emerge
- Funding and performance measurement models for institutions accommodate the greater flexibility needed for students to learn from a range of sources and educators to share their expertise with others
- Education institutions are interdependent, networked with other sites of learning such as libraries, marae, and workplaces.

cloud-based services
interoperable systems
anywhere, anytime learning
equitable access
data follows the student
interdependent system
thriving communities & networks
responsive IT infrastructure

Ngā Kāwai Hono - The Web of Relationships

NEW ZEALAND EDUCATION IN 2025: LIFELONG LEARNERS IN A CONNECTED WORLD

A highly connected, interdependent education system that equips students with skills for the future, fosters students' identity, language and culture, and prepares students to participate as successful citizens in the 21st century.



Efficient administration of the education system

Technology presents significant opportunities to simplify and reduce the administrative workload faced by education providers and other participants in the education system. This includes smarter shared services options, and streamlined collection and appropriate sharing of data and information.

We will know we are successful when:

- Information flows seamlessly from education provider systems, improving timeliness and reducing data management and administrative burden for providers and agencies
- Student record transfer is routine, so that an individual's complete journey through the education system is available to them
- There is strong support and advice on good practice use of ICT in the education system for all participants
- Providers have improved access to the data and information they need to support them in their decision-making. This is underpinned by a series of high quality data analytics and reporting tools, and an education system business intelligence capability
- There is mature governance and successful delivery of high quality shared services, whether they are delivered by the private sector or by education sector agencies
- Strategic versus operational ownership of data is clear, with roles and responsibilities for managing data agreed, including who can access what kind of data and when.

information management

lower compliance costs

event-based data collection

process improvement

shared services

common infrastructure

learner systems improved

communities of learning

Engaged and productive education workforce

Smart systems and new technologies give us the tools to support system transformation, but it is an engaged, committed workforce that makes it happen.

An important objective of this strategy is to ensure education employers and employees are well supported by common, secure services for registration, recruitment, remuneration, and professional development and learning.

In the highly flexible, adaptive education system we envisage for the future we expect educators and leaders to take collective responsibility for the success of all the students in their communities. They will need tools that make it easy to work together, share information and share effective practices. This strategy includes providing tools to enable educators to collaborate online as well as face-to-face.

We will know we are successful when:

- Educators and leaders are well supported throughout their careers in education and are motivated to do their best work
- Employees in the education sector have access to their own employment related information and can interact directly with the systems used to store and manage it
- Information systems supporting routine workflows for registration, recruitment, remuneration and professional learning and development are standardised, reducing compliance costs and streamlining processes
- Effective tools to support online and face-to-face collaboration among educators enable modern learning practices to be quickly identified and shared
- There is increased confidence in employment practices, supported by high-quality tools and solutions

- Education sector agencies have access to high-quality, timely information to inform reporting, forecasting and education system interventions.

free to focus on what matters most
tools for collaboration
access to my employment history
professional development
information management
streamlined recruitment
protecting vulnerable children
process improvement
shared services

Effective corporate and common services

There will be a common infrastructure and a range of shared services to support education providers and sector agencies. This environment will be underpinned by a standards-based approach to security, privacy, and identity and access management.

We will know we are successful when:

- Education sector agencies consume services and solutions rather than maintain their own separate corporate information systems
- Workflow and process improvement are enabled by the availability of high-quality information systems to support education sector agencies
- National frameworks and policies for security, privacy, and identity and access management, are in place to support the education system
- Common infrastructure reduces the cost and resource burden of maintaining and managing these environments across the education system.

streamlined workflow

joined-up government

self-service

information management

collaboration

consume services & infrastructure

value for money

process improvement

mobility

sharing by default

client focussed channels

Governance

Governance arrangements, as set out on page 16 below, are being established to ensure the effective, collaborative implementation of the strategy.

The organisations represented on the Digital Strategy Board are:

- Careers New Zealand
- Education New Zealand
- Education Payroll Limited (EPL)
- Education Review Office (ERO)
- Ministry of Education
- Network for Learning Limited (N4L)
- New Zealand Qualifications Authority (NZQA)
- Education Council of Aotearoa New Zealand
- REANNZ
- Te Aho o Te Kura Pounamu (Te Kura)
- Tertiary Education Commission (TEC)

Types of education providers include:

- privately and community-owned early learning education services
- state and state-integrated schools and kura, partnership schools and private schools
- publicly and privately owned tertiary education providers.

The Ministry of Education acts as the steward of the education system and the government's lead advisor on the education system. In those capacities the Ministry is leading this strategy on behalf of the education sector agencies and the broader education system.

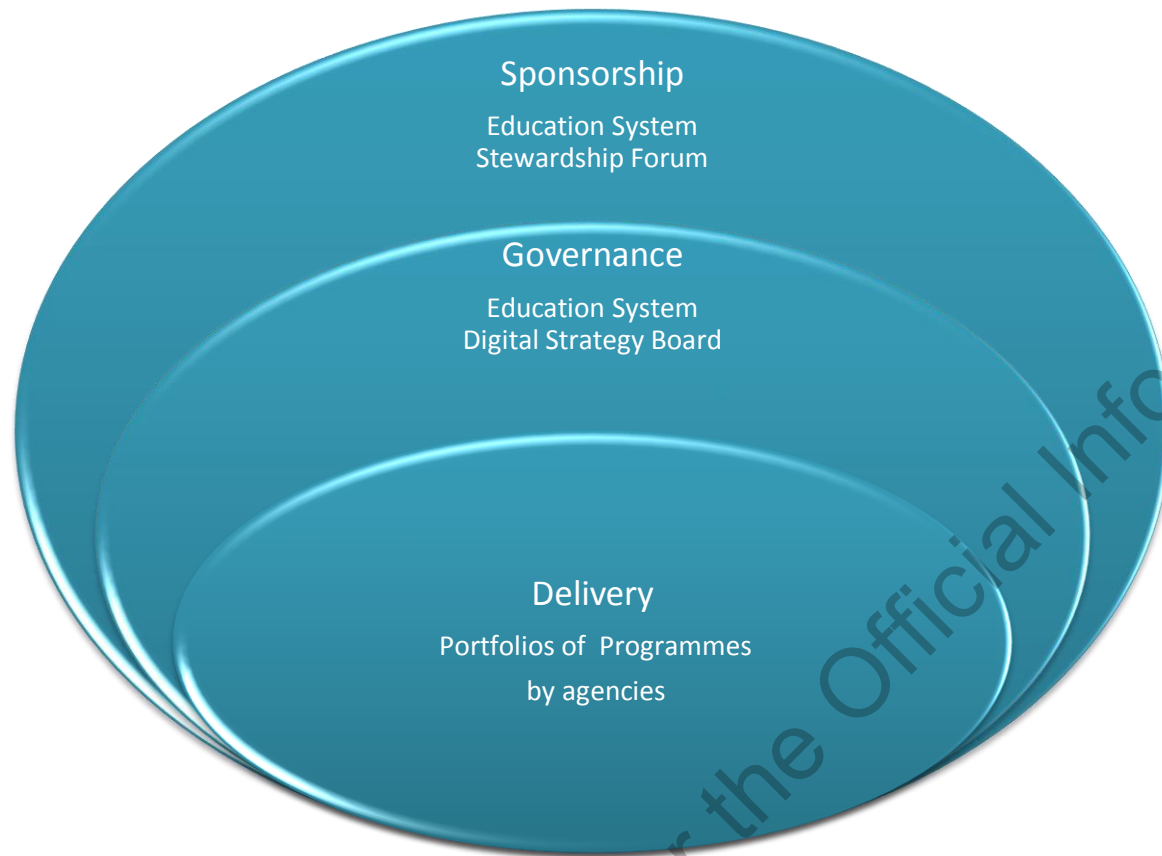
Governance of digital investment

To achieve this strategy's successful implementation, we need effective governance across the education system supported by active leadership at all levels. Over the next 18 months appropriate governance and management systems will be established that address:

- system-wide governance for the strategy and associated work programme
- inter-agency systems where an initiative has an impact on or involves more than one part of the education system
- agency-specific mechanisms for individual projects and programmes.

These governance and management systems will be based on all-of-Government guidelines and good practice with a strong emphasis on:

- ensuring robust approaches to risk, assurance and change management are in place and working effectively
- building an environment with better engagement and agreement on how we will work together
- co-design and leadership of projects and activities with end-users and the 'business owners' (wherever they may be based in the education system)
- building strong integration with broader agency and system governance structures and mechanisms
- separating investment decision-making from delivery governance, establishing programmes of work, and separating management structures from project and programme governance.



Collaborative delivery

- The Digital Strategy Board will be accountable to the Education System Stewardship Forum for delivery against the strategy and associated work programme.
- The Digital Strategy Board will be chaired by the the Ministry's Chief Information Officer, with advisory services and secretariat support provided by the Ministry's IT Group.
- A shared governance model will be adopted for ICT systems and their funding across education sector agencies and the education system.
- A model will be developed for end-user and business ownership and leadership for ICT-enabled change initiatives. This will include the championing of their adoption across the education system.
- Engagement will be facilitated with education leaders for discussion and debate around future use of ICT to support learning, teaching and administration.
- Robust project and programme management mechanisms will be adopted.
- Operational systems will be maintained and supported appropriately for their full life-span.

Supported by:

Programme and Project Management, Enterprise Architecture and Standards

The strategy in depth

The diagram on page 18 below illustrates a conceptual framework to underpin the strategy, target states and work programme. The framework follows the enterprise architecture convention of using layers and segments as a means to separate domains and reduce complexity.

The 'business' components of the strategy are represented towards the top of the diagram while the 'technical' components are positioned at the base. Sandwiched between the two is the 'data and information' layer. This format is broadly consistent with the Government Enterprise Architecture for NZ (GEA-NZ) framework and will facilitate the use of GEA-NZ to map out a whole-of-sector architecture.

The segments and layers of the framework are described briefly below. The elements within each of these segments and layers are illustrative only and not intended to be an exhaustive representation.

Audiences

These are the main stakeholders in the education system. Their perspectives and future needs, around which the strategy is constructed, are described in the vignettes that accompany the strategy document.

Channels

Channels are the means by which the education system communicates and interacts with the audiences. Most involve some technology to mediate the channel. As the world becomes increasingly digital, new channels emerge and become more effective than some more traditional ones. The strategy reflects this shift.

Business capabilities

This layer describes business capabilities and the business applications directly related to them. Almost all business capabilities use digital technologies in some way or will do so in the target state.

Data and information management

This layer represents both the collection and management of data in sector registers and the use of a consistent set of information across the sector for reporting and analytics. The Information Commons represents the systems (data stores) outlined in the strategy to achieve this.

Platform and integration

These elements represent essential technical services that support the effective delivery and integration of business applications as well as data and information management.

Infrastructure

The hardware, system software and network infrastructure, and end-user devices required to support the digitally-enabled education system.

Foundations

The rest of the architecture is guided by strategies and policies, and associated performance measures at a government, sector and agency level. Privacy and security regulations, directives, policies and standards ensure that information and systems are protected appropriately. Standards ensure effective design and implementation, and enable interoperability.

Audiences

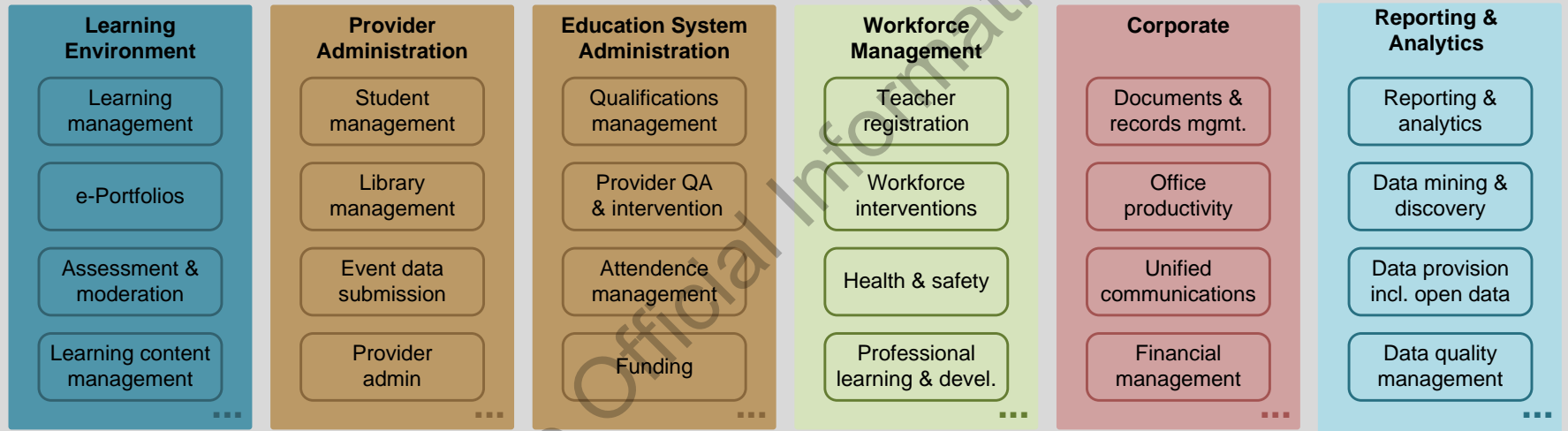


Learners Parents & whānau Educators Education leaders Administrators Agency staff Public Immigrants Employers

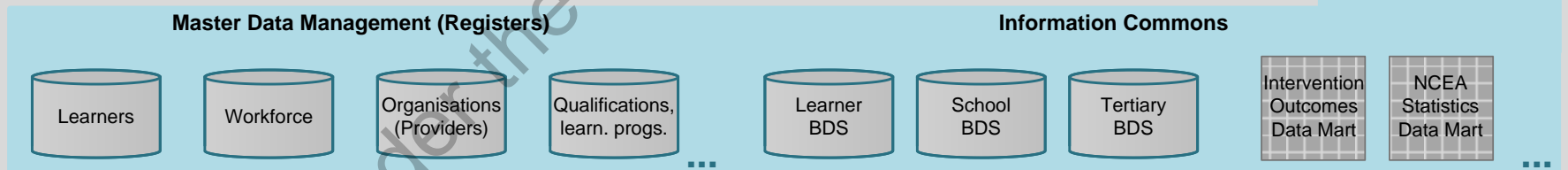
Channels



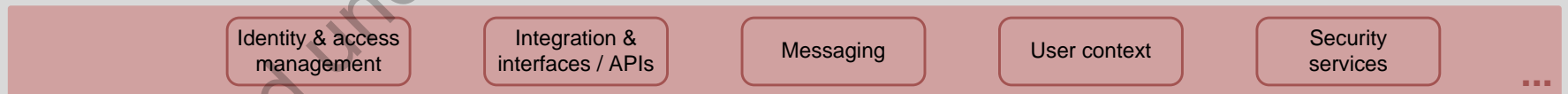
Business Capabilities



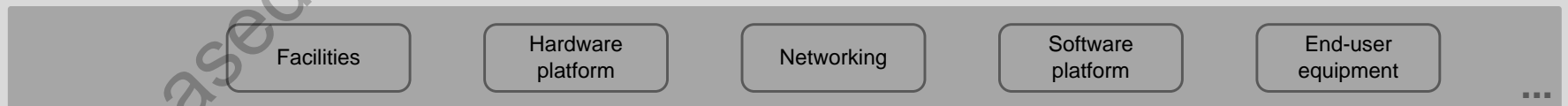
Information Management



Platforms & Integration



Infrastructure



Foundations

Strategy & Policy Performance Security & Privacy Standards

Channels

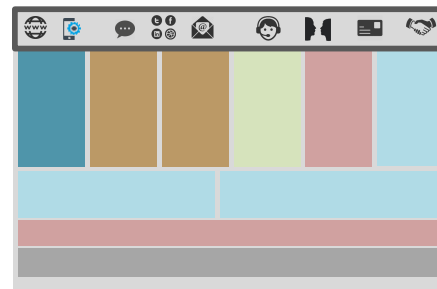
Channels are the means, both digital and traditional, through which the education system delivers its services and interacts with its customers and participants.

Current state

- Too many websites, with agency-centric design, poor accessibility, and duplicated, inconsistent information
- Multiple call centres, with resourcing challenges and variable ability resolve calls at first point of contact
- No single view of the learner/client and limited ability to switch channels during an interaction
- Customers often have to provide the same information to multiple agencies to complete a business process
- Data collection often requires manual handling, which is resource intensive and prone to error
- Many transactions are still completed on paper or not captured and systematically managed (e.g. calls direct to specific staff).

Strategy

- Establish **shared governance** of channels organised around consumer needs
- **Consolidate** channel delivery focussing initially on service discovery information
- **Eliminate unnecessary** transactions and manual handling (e.g. via system integration)
- Move paper transactions to **digital channels**, and provide traditional alternatives via partners where required



- Move low complexity and low value transactions to **self-service** channels to reduce unit cost; re-focus call centre and face-to-face on high value interactions
- Establish a shared **service design capability** to ensure delivery is customer focused and integrated across agencies
- Extend and strengthen **client relationship management** practices and support with appropriate technology
- Leverage **collaboration technology** for face-to-face interaction to reduce travel and regional support costs
- Design websites to be **responsive, accessible** and **multi-lingual**, and support with native mobile applications only where there are sufficient benefits
- Provide **open data** and **APIs** to enable innovative delivery by partners and intermediaries, and use these to support our own digital channels.

Target state

- Service delivery is primarily via self-service, digital channels with seamless assistance available when required
- Shared channels are structured around the needs of the service consumer not agency structures. Information and services are easy to find and use
- Clients are able to use digital channels that suit their needs and move between channels without losing context
- Service delivery is integrated so that customers can complete an interaction efficiently
- There is no unnecessary duplication of information and channels
- There is clear ownership and active management of channels and content.

Learning environment

This segment covers all education system capabilities that directly interface with the learner, educator and family. Collectively these capabilities and systems are part of the learning environment.

The learning environment encompasses:

- management of learning
- learning content and teaching materials
- lesson planning and learning activity development
- diagnostic, formative and summative assessment
- learning collaboration and communication
- recording student work and achievement
- management of student information
- career information, advice and guidance
- interactions between education leaders / practitioners and parents / family / whānau.

Current state

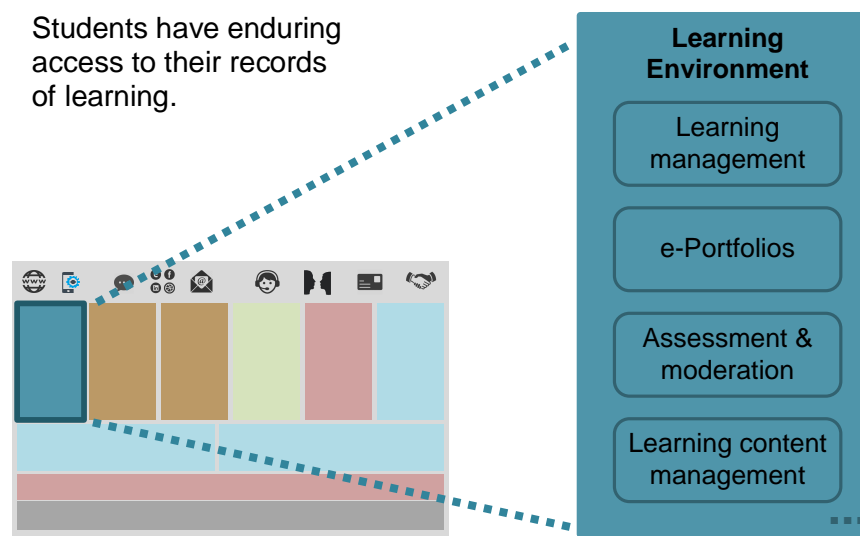
- Digital enablement of the learning environment is highly variable across the system and solutions are often poorly integrated
- Assessment data is not always available when and where it is needed to influence student learning
- Student records and portfolios do not persist across education establishment boundaries
- Much of the system is organisation-centric rather than learner-centric
- Managing learning technology is a significant overhead for providers.

Strategy

- Invest in a truly **learner-centred** education system in which digital technologies amplify the variety of learning experiences available to students
- Implement a truly **universal Record of Achievement**, and **standardise core e-Portfolio** functionality
- Provide **platform and integration services** to support diversity and personalisation
- Support the effective **governance** of digital learning environments and work collaboratively with sector-led forums
- Adopt a joint approach to **digital assessment**
- **Maximise digital inclusion.**

Target state

- Digitally-enabled and integrated learning environments allow anytime, anywhere learning and assessment
- Equitable access to digital learning opportunities and resources narrows the digital divide
- Students have enduring access to their records of learning.



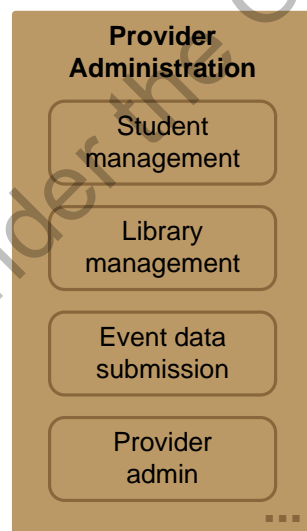
Provider administration

This segment covers all aspects of education sector provider administration functions and activities. Provider Administration includes:

- student management, including provider and programme enrolment, attendance and timetabling
- recording of assessment and achievement
- examination centre management
- pastoral care
- behaviour management
- back office functions and facilities management.

Current state

- There are multiple and in some cases aging or incomplete student management systems and back office systems
- There are few agreed interoperability standards for administrative system integration and student data transfer
- Business processes vary significantly across providers
- Agency data collection is duplicated, inconsistent and time-consuming
- Systems are not cloud based
- System support for collaboration within Communities of Learning is limited.

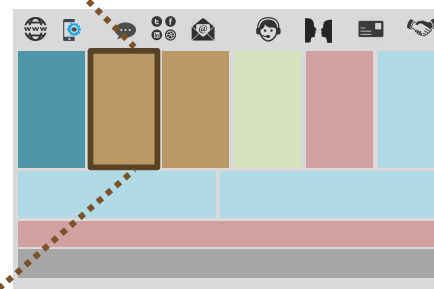


Strategy

- Use **digital** technologies and best-practices to **simplify and streamline** administration functions and agency data collection
- Actively support and enable **safe adoption of cloud** services
- **Standardise core SMS** functionality and data with open APIs to value-add services and back-office applications
- Implement **event-based data collection** to improve timeliness and reduce workload
- Create a **transparent funding model** for schools ICT via the operations grants.

Target state

- Providers are easily able to adopt integrated cloud-based services to meet administration needs
- Education interoperability standards allow transfer of learner and assessment information
- Business processes for administration are well-defined and consistent
 - Systems support effective collaboration within Communities of Learning
- Data flows automatically to agencies
- Core student data is managed centrally on behalf of the education system.



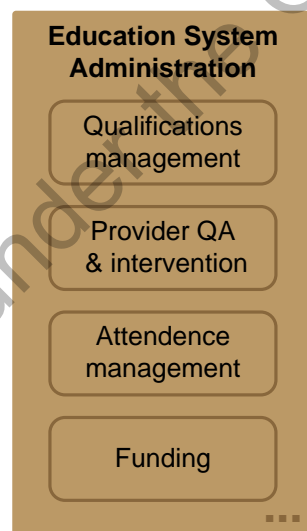
Education system administration

This segment covers those business capabilities that are unique to particular agencies. Education system administration capabilities include:

- qualifications, learning programme and standards management
- provider quality assurance and interventions
- student interventions
- system level enrolment, attendance and truancy management
- provider performance planning, monitoring and reporting
- early childhood, compulsory, tertiary and research funding
- property management and schools transport
- administration of examinations.

Current state

- There are siloed systems, diverse technology platforms, and many aging legacy business applications
- There is no single view of provider and student information
- No real differentiation exists between common interests and unique areas of work
- Data collection is duplicated, inconsistent and time-consuming.

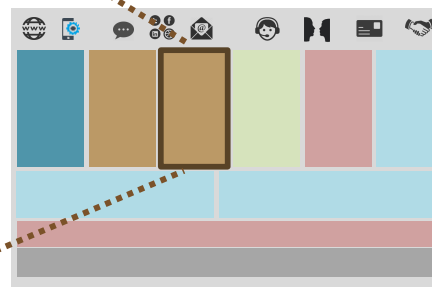


Strategy

- Agree upon **standards** and define interfaces to **support integration**
- **Model business capabilities** across the education agencies and use this to identify opportunities for information sharing, alignment across sectors and system consolidation
- Manage business **applications as a single portfolio** to reduce duplication, improve reuse and co-ordinate investment
- Adopt **shared case management practices** and technology to enable better outcomes for provider review, service and interventions, and student service and interventions.

Target state

- A joined-up approach to information management supports better business outcomes
- Education system data is available on demand
- Integrated agency systems support multiple business needs cost-effectively
- Capability and governance frameworks are in place to ensure alignment.



Workforce management

This segment covers all aspects of the management of the education workforce. *This segment will be reviewed with the Education Council when it is fully established and operational.* Workforce management includes:

- education provider and agency staff and contractors
- teacher registration
- education workforce recruitment and employment
- education payroll
- workforce safety checks to ensure vulnerable children are protected
- workforce interventions
- workforce health and safety
- professional learning and development.

Current state

- There are different processes and requirements for registration, recruitment and employment for teaching and non-teaching staff
- There is no coherent overview of employee information i.e. workforce records are siloed
- There are multiple systems for managing workforce interventions.

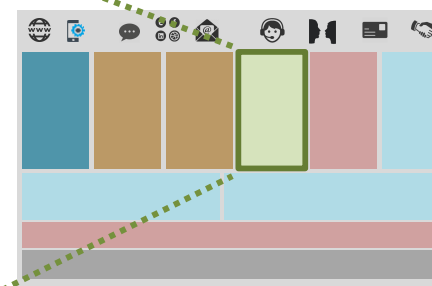


Strategy

- Define **standards** and interfaces to **support integration**
- Implement an education **workforce register**
- Adopt **shared case management practices** and platforms to enable better outcomes for workforce processes and interventions.

Target state

- Information systems support standardised workflows for registration, recruitment, remuneration and professional development
- A joined-up view of education workforce participants is in place
- Staff can access their information online
- With the consent of staff, providers can view and update shared workforce records
- Education agencies and providers have better information for forecasting, budgeting and reporting.



Corporate

This segment covers those business capabilities that are related to administration of the agency itself and are common across all organisations. Corporate business capabilities include:

- financial management, procurement and contracts
- document and records management
- unified communications including telephony
- ICT services
- office productivity and collaboration.

Human resources management is addressed in the Workforce management section on page 23 above.

Current state

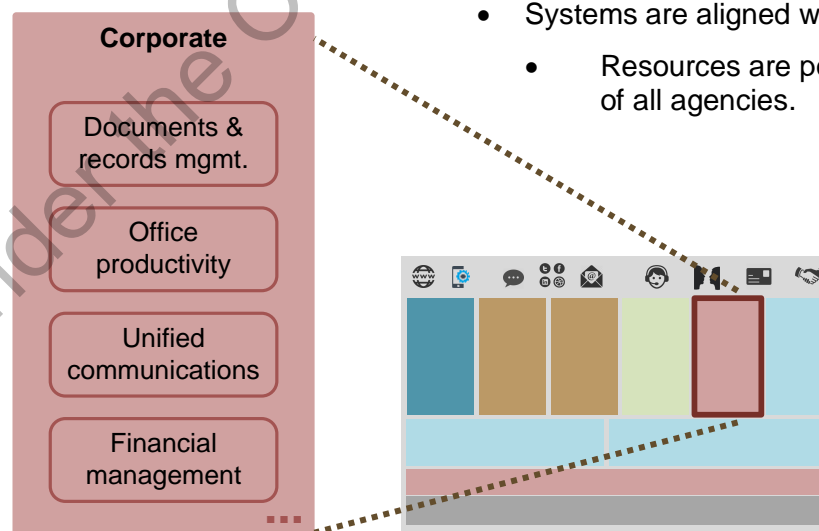
- Systems and processes vary widely across agencies with unnecessary costs and complexity
- There is duplicate, siloed information across agencies
- Few tools support effective inter-agency collaboration
- There is significant reliance on paper, or inefficient electronic versions of paper based processes.

Strategy

- **Aggregate demand** across education agencies to drive down cost of provision
- **Standardise and digitise** back-office processes and **consolidate systems**, ensuring cost profile is acceptable for smaller agencies
- Leverage **common capabilities** (and implement these where required)
- Invest in systems to **support** effective **inter-agency collaboration** (e.g. shared intranet, phone lists, organisation charts, messaging, project and team collaboration tools).

Target state

- Streamlined, efficient processes and consolidated systems are in place for sector agencies including common finance, communications and office productivity systems
- The unit cost for commodity provisioning is significantly lower
- Systems actively support inter-agency collaboration
- Systems are aligned with AoG requirements
 - Resources are pooled and managed on behalf of all agencies.



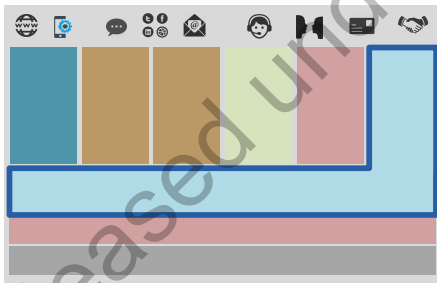
Data and information management

This segment covers data and information management capabilities and concerns, including the Information Commons platform. Data and information management includes:

- common data models and definitions
- master data and data quality management
- reporting data stores and data marts
- reporting and analytics toolsets
- data mining and discovery
- dataset provision (raw data access) and open data.

Current state

- Some registers exist but master data is not adequately managed. There is a proliferation of siloed data stores, and duplicated, inconsistent toolsets
- There is no universally agreed common data model and there are limited common data definitions
- Information is difficult to access for non-technical users
- Minimal structured data is available on learning activity, assessment and the effectiveness of learning content
- There is limited availability of open data in machine readable formats.



Strategy

- **Measure and improve information management maturity** across the system using accepted good practice
- Consolidate **master data management** for shared data
- Implement **centralised reporting data stores** fed by automated data feeds to meet all agency reporting needs
- Implement **common BI tools** and repositories for obtaining high-quality, timely information on all aspects of the education system from the centralised data stores
- Drive the **proactive release** of high value **non-personal data** in open standards based, machine-readable formats, licensed for re-use
- Establish **shared governance** and common operational **management** of shared data and Information Commons
- Establish a shared **competency centre** for all sector **business intelligence** needs
- Assess the opportunities for **learning analytics** to enable a highly adaptive, dynamic system, capable of responding to the needs of learners in real-time.

Target state

- There is effective master data management and active data quality management
- Information Commons enables high quality, consistent reporting and analytics across the education system agencies
- Non-personal data is available in open, machine readable formats licensed for re-use
- The availability of granular learning activity data revolutionises our ability to improve the quality and relevance of digital learning resources
- Resources are pooled and managed on behalf of all agencies.

Platforms and integration

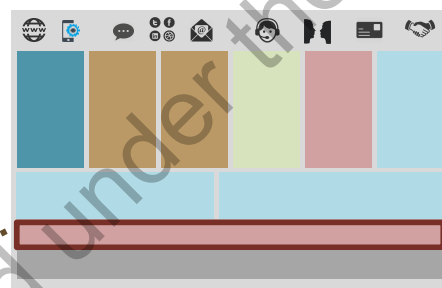
This segment covers common ICT services that support business capabilities and applications in the vertical segments as well as data and information management.

Platform services include:

- identity and access management
- integration and interfaces/APIs
- messaging/data transfer
- user context (e.g. role, location, provider, class)
- consent management
- security services (e.g. encryption, security controls).

Current state

- There is ad-hoc and/or localised implementation of systems for which all agencies have a common need
- Integration is difficult because of a lack of standards and platform services
- Provisioning across multiple services is difficult.



Identity & access management

Integration & interfaces / APIs

Messaging

User context

Security services

...

Strategy

- Implement **common platform services** to support access, interoperability and security for all education participants
- Leverage identity, format and protocol **standards to ensure interoperability** without constraining innovation. Adopt GEA-NZ or internationally accepted open standards where feasible. Work with sector groups to develop local education specific standards where necessary
- Implement **delegated management tools** for providers to manage across multiple services
- Adopt **modern application design** approaches to enable digital business models and cloud based delivery.

Target state

- Well-defined and specified common platform services and interoperability standards are widely adopted
- There is consistent and robust implementation of cross-cutting concerns
- Administration for platform services is appropriately delegated through self-service interfaces
- Platform services and applications provide comprehensive published APIs to support interoperability
- A security competency centre supports effective security across the system
- Resources are pooled and managed on behalf of all agencies.

Infrastructure

This segment covers the physical computing environment that supports all other ICT systems and services.

Infrastructure includes:

- facilities
- hardware platform
- networking
- system software
- end-user devices
- database management software.

Current state

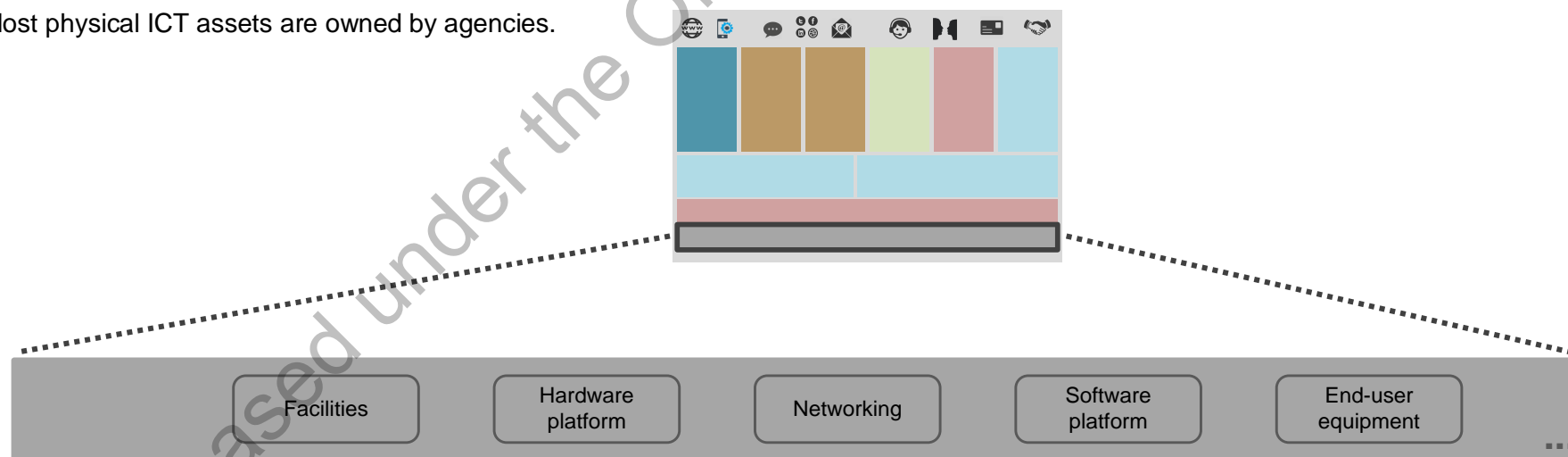
- There are multiple in-house/local environments
- Technology investment is fragmented
- There are many operational and security barriers to sharing services and infrastructure
- Most physical ICT assets are owned by agencies.

Strategy

- **Aggregate demand and consolidate delivery and operations** across agencies
- Implement **enterprise management** toolsets
- Move proactively to **adopt cloud based infrastructure**.

Target state

- Infrastructure and platforms are cloud-based, providing cost effective operation and elastic resourcing
- Agencies don't own physical infrastructure assets
- There is effective enterprise system management and capacity management
- Resources are pooled and managed on behalf of all agencies.



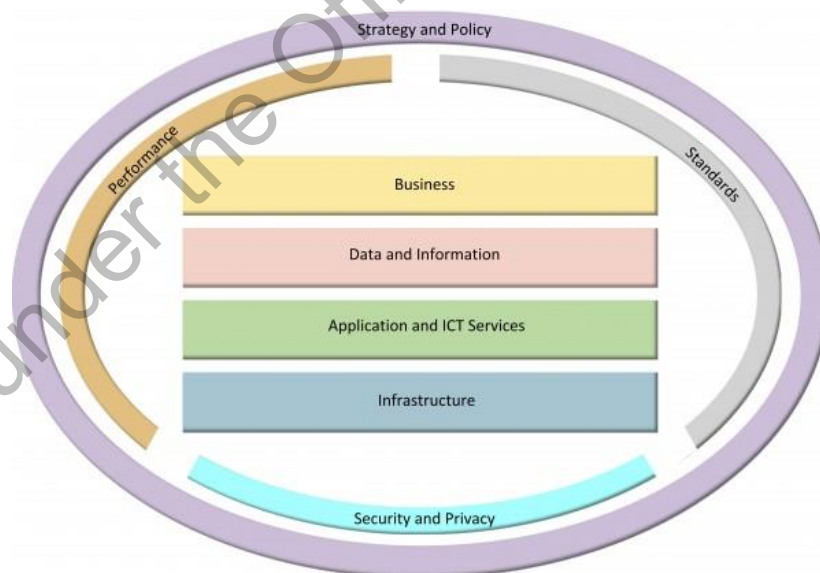
Foundations

This segment addresses aspects that guide or support the strategy. They include the dimensions in the outer ring of GEA-NZ (shown below) as well as other key artifacts and supporting processes:

- Strategy and policy – provides linkage to strategic goals, objectives and policy
- Performance – describes targets and measures that allow monitoring of progress towards goals and outcomes
- Security and privacy – incorporates requirements, processes risk management and controls that ensure information and systems are protected appropriately
- Principles and standards that guide decision making and implementation for the other segments
- Governance model and processes
- Common approach to requirements management
- Current and target state documentation.

Current state

- There is fragmented, ad-hoc documentation across sector
- Architectures are partially aligned with GEA-NZ
- Agency teams generally work in isolation with varied approaches
- Security practices are variable.



Strategy

- Define a **common Enterprise Architecture framework and approach** across the education system which maps to GEA-NZ and supports development and maintenance of common approaches across agencies
- Conduct a high-level **privacy impact assessment** for the strategy
- Establish an **education information security framework** to support system-wide improvement in the management of personally identifiable information
- Establish a **single design authority** for capabilities within the scope of this strategy
- Adopt a **shared governance model** for programmes and projects within the scope of this strategy.

Target state

- There is coherent documentation of the architecture, which is well aligned with GEA-NZ
- Education system enterprise architecture capability provides pooled resourcing across agencies
- Privacy is protected appropriately
- Information security is managed effectively across the system
- Governance models and processes are well aligned to the strategy.

The work programme

To support the achievement of the strategy, the Digital Strategy Board will annually prepare/update a four-year work programme.

This work will commence in May each year and be aligned with individual agency work programmes. By August a collective view will determine what initiatives should be submitted as potential budget bids for the following financial year. All potential budget bids will have supporting analysis, requirements definition and investment options prepared by the nominating and agreed lead agency.

Fiscal environment

Proposed new investments need to have compelling value propositions, demonstrate value for money, and be able to deliver clear return on investment by either lifting educational achievement or making the administration of education more efficient.

There will need to be clear education sector governance around the strategy and associated work programme. New approaches to funding may need to be explored, that better enable the design and prototyping of innovative solutions than current procurement rules allow.

Working together for success

The successful execution of this strategy will require a significant change to the way initiatives are governed and managed. Agencies will have to work together more than ever before, and agree on joint investments where appropriate.

Each initiative will be led by one agency, working closely with identified partner agencies who will commit resource, actively participate in shared governance, and ensure their work programmes are aligned. Other interested agencies will be consulted as required and receive reporting via the Digital Strategy Board.

Identifying and prioritising initiatives

Proposed criteria to identify and prioritise initiatives include:

- a clearly defined problem statement and value proposition for the investment
- clear evidence of how it contributes to government or education system priorities
- relevant education system leadership, managerial support and ownership
- an impact on more than one education sector agency, or importance to the system as a whole
- solutions that are scalable, interoperable where appropriate, and based on agreed standards
- multi-provider, community, or end-user input into the solution design
- a momentum of activity or readiness and capacity within relevant organisations to support implementation
- endorsement by the senior leadership of the sponsoring education sector agency
- secured funding or a commitment to seeking funding.

Once proposed projects/initiatives are assessed against these criteria they can then be prioritised into one of the following categories: Critical (next 2 years); Important (2-5 year horizon); or Emerging (5-10 year horizon). (These timeframes are guides only).

In any given year there should be no more than 10 critical education system priority initiatives, with an emphasis on those that:

- are of high strategic and education system value and deliver improved education outcomes or administrative efficiency
- replace out-of-date or unsupported systems to create a sound foundation for the future

- deliver high value for money invested
- provide an essential platform or enabler for future high-value applications.

Major project delivery

There have been valuable lessons learnt about major project delivery across government. These include the need to strengthen the governance and delivery of projects, and ensuring projects align with priorities across education and the broader government landscape.

Currently each education sector agency has its own ICT governance and funding arrangements. This strategy seeks to establish a more integrated planning and implementation environment across those agencies and organisations.

There is always a risk that projects are run without appropriate and meaningful engagement with the 'end-user' – in the education setting that can be learners, educators or administrators. This lack of collaboration and user input can hamper the utility of projects and services. A stronger emphasis on co-production is important for delivering high-quality, fit-for-purpose services and solutions.

Many schools and education providers already use technology to enhance learning and support management activities, but ICT capability is variable across the sector. While it is important to encourage innovative use of ICT, it is equally important to ensure investment is considered, evidence-based and focused on lifting educational achievement and improving learning outcomes.

Reporting against the work programme

The Digital Strategy Board will receive regular reports on progress with the strategy, covering:

- progress with the initiatives in the joint work programme
- progress towards the target states articulated in the strategy
- expenditure against the agreed investment plan

- performance relative to the GCIO Agency Maturity Framework.

Reports to the board will be:

- balanced, including both favourable and unfavourable results
- comparable, with consistent format and content across the life of the strategy
- accurate, timely, clear, and relevant, including good quality information to guide board decision-making
- reliable and traceable to ensure transparency.

Where possible work programme reports will build on existing reporting requirements, such as what is required by the Government's GCIO. The reporting framework will be in place by end of March 2016.

Performance measures will be developed to ensure the work programme can be tracked as a whole entity. We will also adopt existing measures where relevant, such as the Agency Maturity Framework scale.