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The returns to jurisdictions  
from their participation in  
The Le@rning Federation initiative  
and from options for future funding

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## Executive summary

This paper reviews the benefits to jurisdictions—the governments of Australia, New Zealand and the eight Australian states and territories—from their participation in the MCEETYA-sponsored schools' curriculum content initiative, The Le@rning Federation (TLF). It also explores the issue of continued funding.

This is the first of two reports commissioned to look at the economic impact of the Initiative. This report concentrates on the economic impact of the resources, the second will focus on the economic impact of other assets of the Initiative such as agreements, infrastructure and collaborative networks.

The Initiative was introduced in 2000 in the context of policies designed to improve educational outcomes in schools by making greater use of digital curriculum resources in teaching and learning and to foster broader cooperation among states and territories in the provision of school education—policies that remain current.

The major task of The Le@rning Federation was to provide accessible curriculum-relevant digital content that was unavailable through other sources. In providing this content, the Initiative has contributed to the creation of considerable social and intellectual capital in the form of common digital protocols and other cooperative arrangements among jurisdictions and in expanding an understanding of the needs of Australian and New Zealand schools among multimedia and related companies and among the many cultural institutions that hold potentially valuable digital content.

The collaborative nature of the Initiative to ensure its products and services meet the needs of each jurisdiction has resulted in robust networks of curriculum and technical officers from all participating governments, curators in cultural and scientific organisations and of educational specialists and subject matter experts from universities and private consultancies. It has increased the level of expertise in the procurement of digital curriculum resources suitable for incorporation in learning programs addressing Australian and New Zealand curriculums.

By making its digital resources available to teacher training institutions, the Initiative has also provided the opportunity for the improvement of skills of teacher educators and future teachers and further facilitated the achievement of educational policies designed to increase the wider adoption of digital technologies in schools.

Jurisdictions have contributed than \$120m over the eight years of the Initiative. (This figure amounts to \$155m in 2009-equivalent dollars) to the Initiative overall. New program and funding arrangements for the base service have been established for the 2009/10 financial year.

## **Benefits to June 2009**

The Le@rning Federation has provided several major benefits to participating jurisdictions:

- **The availability and ready accessibility to teachers of appropriate digital content is a prerequisite to the implementation of digital curriculum initiatives in classrooms.**

Educationalists consider the Australian market for digital educational resources to be too small and disjointed to encourage and support commercial production. The Initiative will have provided at least 8,600 digital curriculum resources for teachers by the end of its third phase in June 2009.

- **Cost effectiveness.**

The cost structure of creating digital curriculum content—high fixed and low marginal costs—makes sharing costs among jurisdictions financially efficient. The table on the next page shows, for instance, that even allowing for some costs of cooperation, New South Wales (highlighted in the first panel) saves about three-quarters of the full cost of the development of digital learning objects through its participation in the Initiative. Savings for smaller jurisdictions are even greater. Lower costs facilitate the greater supply of digital resources and support policy goals.

Note: The cost-effectiveness of the development and maintenance of standards and specifications; of technical infrastructure for managing the procurement of the content, management of digital rights, the distribution to jurisdictions; the collaborative networks; and the provision of access to schools on the request of jurisdictions and to pre-service educators and trainee teachers will be the subject of the second report.

**Costs of a learning object valued at \$8,000 to jurisdictions under various assumptions<sup>1</sup>**

<i>Curriculum relevance . . .</i>	<i>Fully</i>		<i>Two-thirds</i>		<i>One-third</i>		
	<i>Funding</i> %	<i>Cost</i> \$	<i>Savings</i> %	<i>Cost</i> \$	<i>Savings</i> %	<i>Cost</i> %	<i>Savings</i> %
<b><i>All Australian jurisdictions</i></b>							
Australian Govt	50.00						
States & territories	50.00						
NSW	16.50	1,320	83.5	1,980	<b>75.3</b>	3,960	50.5
Vic.	12.42	994	87.6	1,490	81.4	2,981	62.7
Qld	9.83	786	90.2	1,180	85.3	2,359	70.5
SA	3.81	305	96.2	457	94.3	914	88.6
WA	4.93	394	95.1	592	92.6	1,183	85.2
Tas.	1.20	96	98.8	144	98.2	288	96.4
NT	0.49	39	99.5	59	99.3	118	98.5
ACT	0.82	66	99.2	98	98.8	197	97.5
New Zealand Govt	---	---	---	---	---	---	---
<b><i>All Australian jurisdictions except New South Wales</i></b>							
Australian Govt	50.00						
States & territories	50.00						
NSW	---	---	--	---	---	---	---
Vic.	18.54	1,483	81.5	2,224	72.2	4,449	44.4
Qld	14.67	1,174	85.3	1,761	78.0	3,521	56.0
SA	5.69	455	94.3	682	91.5	1,365	82.9
WA	7.36	589	92.6	883	89.0	1,766	77.9
Tas	1.79	143	98.2	215	97.3	430	94.6
NT	0.73	59	99.3	88	98.9	176	97.8
ACT	1.22	98	98.8	147	98.2	294	96.3
New Zealand Govt	---	---	---	---	---	---	---
<b><i>New Zealand and all Australian jurisdictions except New South Wales</i></b>							
Australian Govt	47.38						
States & territories	47.38						
NSW	---	---	---	---	---	---	---
Vic.	17.57	1,405	82.4	2,108	<b>73.6</b>	4,216	47.3
Qld	13.90	1,112	86.1	1,668	79.1	3,337	58.3
SA	5.39	431	94.6	647	91.9	1,293	83.8
WA	6.97	558	93.0	837	89.5	1,674	79.1
Tas	1.70	136	98.3	204	97.5	407	94.9
NT	0.69	55	99.3	83	99.0	166	97.9
ACT	1.16	93	98.8	139	98.3	278	96.5
New Zealand Govt	5.23	418	94.8	628	92.2	1,255	84.3

<sup>1</sup> Funding based on proportions used for recent MCEETYA projects. Funding from the New Zealand Government is two-thirds of funding for Victoria, assuming that NSW participates and including an allowance of only two-thirds relevance of resources at the outset. Curriculum relevance covers three scenarios—all digital resources are fully-curriculum relevant to all jurisdictions (no costs of cooperation); only two-thirds of resources are relevant to any particular jurisdiction (the cost of cooperation is one-third of resources because of curricula differences among jurisdictions); and only one-third of resources is relevant to a particular jurisdiction (the cost of cooperation is two-thirds of resources).

○ **Future economic benefits from improved human capital.**

These benefits flow from three features of the Initiative that contribute to expected higher economic growth in Australia over coming decades:

- The standard finding that increased public investment in education has substantial leverage on economic growth.
- Investment in the quality of teaching is strategically an effective form of investment in education.
- The products of the Initiative can be employed at low marginal cost across many students.

Given reasonably conservative assumptions about, for instance, the effect of the use of digital content on the quality of teaching and the proportion of students whose education is improved, the estimated present value benefits of the Initiative (\$204.2m in June 2009 dollars) exceed the estimated present value costs (\$155.8m). The estimated benefits are after discounting by seven per cent—the rate used by the New South Wales and Queensland treasuries as the minimum expected return justifying public investment (and greater than the six per cent return criterion used by the Victorian treasury). The estimated economic benefits from the Initiative justify its initial and continued funding.

○ **Digital copyright costs.**

Reducing the copyright costs of jurisdictions (currently about \$50m) through the use of national digital curriculum resources where the copyright is paid up-front and attracts no further remuneration costs to collection agencies such as CAL, at least partly offsets current expenditure on the Initiative. In addition lower direct costs to jurisdictions support policy initiatives to expand the implementation of digital content in teaching and learning.

## **2009-2010**

These benefits will continue for jurisdictions participating in 2009/10. There are, however, two major changes in funding arrangements that will affect the level of these benefits:

○ **Sharing costs.**

The benefits to jurisdictions from sharing costs will be reduced because New South Wales has declined to contribute directly to funding in 2009/10.

○ **Activities in 2009/10.**

The activities can be divided into:

- Base service, designed to sustain the currency of the existing supply of national digital curriculum resources and their on-going ready accessibility to teachers and other educators.
- Supplementary investment designed to further grow the supply of national digital curriculum resources and services.

### **Base service**

Sustaining the supply of national digital curriculum resources and their accessibility is more cost-effective than simply allowing them to depreciate in value through changes in subject knowledge, pedagogy, curriculum or technology. Cost sharing among jurisdictions remains a major advantage. Even allowing for some costs of cooperation and without the direct funding contribution of New South Wales, Victoria, for

instance, will save nearly three-quarters of any of the costs of the Initiative (highlighted in the third panel in the table above). Savings for smaller jurisdictions will be even greater.

Maintaining access to the digital curriculum resources already produced by the Initiative and not allowing them to depreciate, continues to deliver real economic returns of over seven per cent—returns that satisfy the criterion used by several state treasuries to justify investment in public infrastructure. The benefits through savings on copyright costs continue.

### **Extra investment**

The major benefits of the earlier phases of the Initiative will also be realised in any future procurement of digital curriculum resources and services through consortia of jurisdictions. Analyses of the greater use of digital curriculum resources from the early phases of the Initiative point to the improvement of teaching and learning that produces substantial economic returns. Sharing the costs among jurisdictions and distributing the benefits across those jurisdictions are the keys to the economic viability and financial feasibility of further joint investment.

## 1. Introduction

This paper reviews the benefits to jurisdictions and, through them, to students, teachers and the nation, of their participation in the schools online curriculum content initiative, The Learning Federation (TLF). Investment in TLF by the Ministerial Council for Employment, Education, Training and Youth Affairs (MCEETYA) has produced valuable infrastructure and resources that align with the Digital Revolution and National Curriculum policies. The paper also explores options for these assets and TLF beyond the end of the current funding phase in June 2009.

This is the first of two reports commissioned to look at economic impact of the Schools Online Curriculum Content Initiative, The Le@rning Federation. This report concentrates on the impact of the resources, the second will focus on the impact of other assets of the Initiative such as agreements, infrastructure and collaborative networks.

The future viability of TLF's digital curriculum resources is a central concern. The Initiative has also built considerable capital in the form of cooperative arrangements among jurisdictions. These arrangements have helped to deliver cost-effective digital content to improve teaching and learning in Australian and New Zealand schools. Any erosion of these arrangements would undermine the longer-term returns from the jurisdictions' investment in the Initiative.

### 1.1 Background

The Ministerial Council of Employment, Education, Training and Youth Affairs (MCEETYA) created The Le@rning Federation as an initiative through which the Australian Government, the state and territory governments and the New Zealand Government could agree on common standards for sharing curriculum-relevant digital content and could create and share that content.

- After consultation with stakeholders and other educational experts, TLF either commissions new digital curriculum content from private multimedia firms or obtains licences to use existing content from cultural institutions, jurisdictions and the private sector. It then makes these resources available free to all schools in Australian and New Zealand. Teachers in government schools can access the resources through their school systems while teachers in non-government schools as well as student teachers and teacher educators can now access the resources after registration on dedicated websites.<sup>2</sup> TLF's licensing arrangements ensure that schools do not incur any copyright liability when their teachers use these resources.
- TLF also plays an important role in creating and maintaining infrastructure for digital content, hosting content, arranging copyright licenses, setting standards and specifications, commissioning research, developing quality assurance processes, improving the capacity of schools to deliver the content and generally supporting jurisdictions and users of digital curriculum content in schools.

The Digital Education Revolution (DER) is part of a set of educational reforms of the Council of Australian Governments (COAG), through its Productivity Agenda

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<sup>2</sup> <http://www.scootle.edu.au>, <http://econtent.thelearningfederation.edu.au>

Working Group (PAWG), to improve national productivity and social inclusion. It is an initiative through which the Australian Government is working with the states and territories and school sectors to encourage the development of information and communications technology (ICT)-enriched learning environments.

The Initiative's activities and funding have been in three phases:

- Phase 1—July 2000 to June 2001
- Phase 2—July 2001 to June 2006
- Phase 3—July 2006 to June 2009

This paper addresses the possibilities for the Initiative beyond June 2009.

## **1.2 On-going benefits**

This paper identifies several major continuing benefits from an on-going role for TLF:

- *Economic benefits from investment in the education of the future workforce.* In the case of the digital curriculum content initiative, the benefits follow first from the standard finding that increased public investment in education has substantial leverage on economic growth. The second feature is that investment in the quality of teaching is strategically an effective form of investment in education. And thirdly, the products of the Initiative can be employed at low marginal costs across any number of students. Estimates of the benefits suggest that given often conservative assumptions about the impact of TLF resources on teaching, the Initiative exceeds the returns used by government treasuries as the criterion for investment in public infrastructure. The anticipated economic returns justify continued educational expenditure on the Initiative.
- *Lower unit costs from cooperation among the participating jurisdictions benefit all participants.* This aspect of the Initiative was one of the bases for creating the Initiative and continues to be a compelling argument for:
  - Maintaining the currency of the current pool of digital curriculum resources through Curriculum Corporation.
  - Creating any further digital curriculum resources through Curriculum Corporation.
  - The continuing need to encourage common standards for digital curriculum content across jurisdictions.
- *Digital curriculum initiatives require appropriate curriculum content.* Curriculum documents of participating jurisdictions emphasise the role of ICT across all learning areas. This strategy relies on the availability of appropriate digital curriculum resources for teachers to use in their classrooms. A motivation for the Initiative was the perceived lack of appropriate digital curriculum resources or potential suppliers of that content. These concerns have implications for the Initiative going forward.
  - Although local suppliers of digital curriculum content have emerged in response to the Initiative, their continuing viability as content suppliers is uncertain in its absence.
  - Customising products of global curriculum content suppliers to meet local needs may be more efficiently addressed centrally.

- Other non-commercial digital content needs to be assessed for its relevance to curriculum and indexed in a way that makes it accessible to teachers.
- *Addressing future digital copyright costs.* Copyright payments by the school sector have been increasing rapidly over the last decade and are now about \$50m per year. There is currently no agreement on the level of copyright payments for digital content and future payments may be substantial. Under plausible assumptions, TLF digital content will allow participating state and territory jurisdictions to avoid much, and possibly all, of these payments. These savings will offset much of the past and future investment in the Initiative by state and territory jurisdictions.

**Table 1.1 Budget for Phase 2 and Phase 3 of the Initiative**

Phase	Two						Three			
	2001-02	2002-03	2003-04	2004-05	2005-06	Sub-total	2006-07	2007-08	2008-09	Sub-total
Nominal \$m	9.0	15.6	16.0	16.2	16.7	73.1	18.4	18.4	18.4	55.4
June 2009 \$m	12.3	20.7	20.7	20.2	20.0	94.0	21.3	20.3	19.4	61.0

**Sources**

AESOC, 2005. *The Le@rning Federation Phase Two Plan 2005–2006*, p.53, and AESOC, 2005. *The Le@rning Federation Phase Three Plan 2006–2008*, p.31, [www.thelearningfederation.edu.au](http://www.thelearningfederation.edu.au)

### 1.3 Costs

The direct costs of the Initiative are the amounts paid by jurisdictions under the MCEETYA agreements for funding Phases 2 and 3. Table 1.1 shows these values. The real value of nominal dollars can change substantially over eight years. Table 1.1 contains values adjusted using the GDP non-farm deflator, which converts the nominal dollar values into a standard dollar value as at June 2009. The GDP deflator is discussed in Appendix A to this report.

### 1.4 A future for TLF

Much of the report identifies the benefits of the Initiative for participating jurisdictions so far. It also explores the costs and benefits of alternative future scenarios and in this context proposes some options for funding TLF for the base service year in 2009/10.

## 2. Cost sharing

The major advantage of TLF arrangements for the production of digital curriculum resources is cost sharing among the states and territories—and the savings are substantial for all participating jurisdictions. The cost sharing of content is supported by shared standards and protocols about that content. Table 2.1 explores these efficiencies for several scenarios for the funding of a learning object valued at \$8,000.

The values in Table 2.1 are presented in several panels that correspond to different funding scenarios. All are informed by past arrangements for TLF funding:

- The first panel assumes that all Australian jurisdictions participate, that the Australian Government matches the contribution of the states and territories and that the states and territories fund the Initiative is similar to that of recent MCEETYA projects (which reflects the population of the jurisdictions).
- The second panel assumes that all Australian jurisdictions except New South Wales participate in the Initiative, but that otherwise the funding arrangements are unchanged.
- The third panel assumes that New Zealand as well as all Australian jurisdictions apart from New South Wales participate. New Zealand's contribution is set at two thirds of the contribution of Victoria's had New South Wales participated, discounted by two-thirds to allow for lower levels of curriculum relevance—an assumption consistent with previous arrangements. Funding from the Australian Government still matches the funding of the participating states and territories and the funding among the participating states and territories reflects funding arrangements for recent MCEETYA projects.

*Curriculum relevance* covers three scenarios—all digital resources are fully-curriculum relevant to all jurisdictions (no costs of cooperation); only two-thirds of resources are relevant to any particular jurisdiction (the cost of cooperation is one-third of resources because of curricula differences among jurisdictions); and only one-third of resources is relevant to a particular jurisdiction (the cost of cooperation is two-thirds of resources).

The second panel is most relevant to the future funding of TLF. New South Wales has decided not to participate in funding the base service in 2009/10. The participation of New Zealand is yet to be finalised.

Although cost sharing was one of the motivations for establishing TLF and the benefits of cooperative federalism in this context may seem too obvious to require re-statement, the benefits to participating jurisdictions are still current and remain one of the major advantages TLF delivers. The values in Table 2.1 show several features about the benefits of cost sharing:

- *There are substantial cost savings for jurisdictions from cost sharing.* For instance, for Victoria, access to a digital curriculum resource valued at \$8,000 can be obtained through cooperative arrangements for \$1,483—a cost saving of 81.5%.

- *Cost sharing can be less efficient if cooperation results in a product that is not appropriate for the curriculum of a particular jurisdiction. Table 2.1 shows the costs to jurisdiction when resources are fully relevant to the curriculum, when two-thirds of products are relevant and when only one third are relevant. Relevancy applies less to an individual resource than to a bank of resources, hence the values in Table 2.1 should be interpreted as averages across a bank of digital curriculum resources.*

**Table 2.1 Costs of a digital curriculum resource valued at \$8,000 to jurisdictions under various assumptions**

<i>Curriculum relevance . . .</i>	<i>Fully</i>		<i>Two-thirds</i>		<i>One-third</i>		
	<i>Funding</i> %	<i>Cost</i> \$	<i>Savings</i> %	<i>Cost</i> \$	<i>Savings</i> %	<i>Cost</i> %	<i>Savings</i> %
<b><i>All Australian jurisdictions</i></b>							
Australian Govt	50.00						
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WA	7.36	589	92.6	883	89.0	1,766	77.9
Tas	1.79	143	98.2	215	97.3	430	94.6
NT	0.73	59	99.3	88	98.9	176	97.8
ACT	1.22	98	98.8	147	98.2	294	96.3
New Zealand Govt	---	---	---	---	---	---	---
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Vic.	17.57	1,405	82.4	2,108	73.6	4,216	47.3
Qld	13.90	1,112	86.1	1,668	79.1	3,337	58.3
SA	5.39	431	94.6	647	91.9	1,293	83.8
WA	6.97	558	93.0	837	89.5	1,674	79.1
Tas	1.70	136	98.3	204	97.5	407	94.9
NT	0.69	55	99.3	83	99.0	166	97.9
ACT	1.16	93	98.8	139	98.3	278	96.5
New Zealand Govt	5.23	418	94.8	628	92.2	1,255	84.3

If, because of cooperation among jurisdictions, only two thirds of the content is relevant, the cost of the digital curriculum resource to a jurisdiction increases by 50%. For example, the cost of an \$8,000 learning object for Queensland increases from \$1,174 to \$1,761. If only a third of content is curriculum relevant, the cost triples to \$3,521.

The effectiveness of TLF in creating efficiencies through cost sharing depends both on the extent to which the resources are curriculum relevant overall and the extent to which the curricula of the jurisdictions overlap. If TLF is successful in producing curriculum-relevant resources and the jurisdictions have a common curriculum, then the full benefits of cost sharing could be realised.

- *The efficiencies of cooperating in producing digital content are substantial even when average levels of curriculum relevance are low.* Table 2.1 shows that even if only a third of the digital curriculum resources are curriculum relevant, Victoria, for instance, by cooperating with other jurisdictions would still save nearly half (44.4%) the cost of producing digital content.
- *The advantages of cost sharing are greater for jurisdictions with smaller enrolments.* For instance, the cost of a learning object valued at \$8,000 for Tasmania is \$215 and for Victoria \$2,224 (assuming two-thirds curriculum-relevance), which reflects the proportionality of funding to population and the very low marginal cost of distributing digital resources. The funding formula seems to be based on the argument either that the benefits of jurisdictional cooperation are proportional to the number of students in the jurisdiction (which is true educationally, if not financially) or on an ability-to-pay argument. The differential advantages of cooperation among jurisdictions create a basis for differential commitment to cooperation. The matching Australian Government funding ensures that the advantages of cooperation are substantial even for the least advantaged jurisdiction.
- *Overheads associated with cooperative arrangements would have to be very high in order to offset the financial benefits from cooperation among the states and territories.* Cooperation entails real costs. Jurisdictions need to invest in the administrative effort to agree on common standards and protocols and digital curriculum resources need to be indexed against the curricula of all participating jurisdictions. These costs, however, would need to be very high to offset the financial efficiencies that are generated through cooperation.

Table 2.1 does not directly address the position of the government and non-government school systems. In Table 2.1 students attending non-government schools are assumed implicitly to be funded through their respective state or territory government. It could be argued that the state and territory jurisdictions fund students attending government schools and that part of the funding provided by the Australian Government nominally funds students attending non-government schools. Provided the funding formula is still constrained so that the Australian Government matches the funding provided by state and territory jurisdictions and the New Zealand Government funding is unchanged, the pattern and level of cost sharing changes only slightly if state and territory jurisdictions are assumed to fund only students in their respective government school systems.

The implicit comparison in Table 2.1 is between arrangements based on cooperative federalism and a situation in which each educational jurisdiction produces its own digital curriculum resources or purchases them from commercial suppliers.

The scenario of a jurisdiction producing its own digital curriculum resources is financially defensible if the jurisdiction can:

- on-sell the product to third parties at prices sufficient to offset the advantages of cost sharing. This strategy would carry substantial risks, particularly if part of the motivation was to more closely match product to unique curriculum needs. Sales would need to be substantial to offset the advantages of cooperation and Commonwealth matching funding and might be limited by tailored content. Sales of digital curriculum resources would also need to be underpinned by shared technical protocols.
- produce or purchase digital curriculum resources substantially more cheaply than can be delivered by cooperative arrangements. If cooperative arrangements also have access to commercially available digital content, it seems unlikely that any individual jurisdiction would benefit from this approach given that the costs of both commercial and cooperative approaches are likely to be proportional to the number of students and that cooperative arrangements have access to greater scale. An individual jurisdiction would need to achieve technical or personnel efficiencies substantially greater than currently prevail in the private sector in order for this approach to be financially optimal.

The example presented in Table 2.1 considers only the marginal cost of producing a learning object and not fixed costs or overheads. Without cooperation, fixed or partially fixed (those that increase less than proportionately as the number of objects increases) overheads in the production of learning objects would need to be reproduced within each participating jurisdiction. The savings on these costs (both in terms of replication and scales of production) through cooperation could be of several percentage points of the costs to jurisdiction and are additional to any shown in Table 2.1—although these savings would be at least partially offset by administrative costs associated with cooperation.

### **3. The economic value of digital content**

Expanding the availability of suitable digital content is part of a broader enterprise to improve the quality of teaching in Australian and New Zealand schools through greater use of ICT in classroom teaching. Although better teaching in schools has a range of positive outcomes for students, teachers, parents and the broader community, there is also a compelling economic argument for investments that improve teaching.

This section is structured around the following (extended) syllogism:

- Digital content is part of ICT, which contributes to better teaching in schools.
- Better teaching improves the educational attainment and achievement of students;
- Improved educational achievement and attainment of students contributes to higher economic growth;
- Therefore digital teaching contributes to economic growth.

This section quantifies this argument using a series of often quite modest assumptions about the nature of these relationships. The resulting estimates suggest that returns from investments in TLF exceed the criterion for investment in public infrastructure used by several state treasuries.

The financial strength of the Initiative derives from:

- the often quite strong leverage on economic growth from additional strategic expenditure on improving education; and
- the ability to roll-out digital curriculum resources at nearly constant cost for a variable number of students.

#### **3.1. Teaching with digital content**

Many research studies point to the positive effect on student outcomes of the inclusion of appropriate ICT in good teaching practices. The effect, however, is mediated by access to well-designed digital curriculum resources and appropriate teacher training.

A UK study, ImpaCT2, found that students' improvement in the core subjects of English, mathematics and science was positively related to their ICT use (Pittard, 2003: 6). The Institute of Education at the University of London has conducted meta-analyses of peer reviewed studies of improvements in literacy, science and mathematics learning associated with the use of ICT. One review of 33 studies found gains in students' understanding of algebraic ideas through their use of ICT in learning (Goulding & Kyriacou, 2008). Another review of 37 studies reported that the use of ICT for simulations in science teaching significantly improved students' understanding of science ideas (Hogarth *et al.*, 2006: 3).

Another study reported strong links between the use of ICT in the classroom and students' mathematics scores on the US National Assessment of Educational Progress (NAEP) for fourth and eighth graders (Wenglinsky, 1998). The study found that the use of computer-based programs for higher-order-thinking skills (such as applying concepts or developing simulations to demonstrate them) was positively related to academic achievement in mathematics (Wenglinsky, 1998, p. 21).

Freebody and Muspratt (2007) evaluated the efficacy of the learning objects component of The Le@rning Federation initiative. Their field experiment evaluated outcomes for upper primary students in science (27 classes) and lower secondary students in mathematics (28 classes). Three groups were compared: classrooms using Learning Federation learning objects within a learning management system (Moodle); classrooms using Learning Federation learning objects without a learning management system; and classrooms in which no change was made (digital materials could be used, but not TLF digital curriculum resources). They found that for science overall, post-test scores increased significantly more for the learning objects group than for either the Moodle or control groups and there was no difference in growth between the Moodle and control groups. For mathematics overall, however, there was no difference among the three groups in the increase in the post-test scores.

The research literature emphasises the importance of contextual factors in the effect of ICT on improving student outcomes. For instance, simply transferring traditional classroom tasks onto computers (Loveless, 2001; Protheroe, 2005) or using computers for drill or practice exercises (Wenglinsky, 1998; Archer, 2000) elicits little improvement in student outcomes. Availability of appropriate software, professional development of teachers (including support for teachers in their use of ICT) is important if the potential of ICT to contribute to improved student learning outcomes is to be fulfilled (Jonassen 2004; Locke & Andrews, 2004; Pittard, 2003; Protheroe, 2005; Wiley *et al.*, 2004).

### **3.2. The value of effective teaching**

‘Years of schooling’ is the metric that links the quality of teaching with productivity and economic growth. Better quality teaching improves students’ academic performance, which can be translated into equivalent years of progress through school. Differences in student performance associated with the quality of teaching can be equivalent to about a years’ schooling for a given academic year—and this effect is cumulative across years.

The direct effect of the quality of teaching on academic performance and ‘equivalent years of schooling’ is increased by an indirect effect. Higher achieving students are more likely to stay at school longer and to continue study after leaving school.

The academic performance of students of the same age or year level can differ by the equivalent of several years of schooling (OECD, 2005b). These differences are influenced by both students’ backgrounds and aspects of their schooling. The latter are often more responsive to policy interventions.

The research literature suggests that the quality of the teaching students receive is the most important policy-sensitive variable influencing student performance (Hill & Rowe, 1996; OECD, 2005b citing reviews by Santiago, 2002; Schacter & Thum, 2004; and Eide *et al.*, 2004). Further improving the quality of teaching may also be the most economically efficient approach to improving student performance (Hanushek, 2004).

Teaching can have a substantial effect on school achievement. Hanushek (2003), for example, suggests that the academic performance of students taught by the best teachers improves by the equivalent of 1.5 grade levels for a single academic year

while that of students of the worst teachers improves by only about 0.5 grade levels. Leigh (2007), analysing Queensland state testing results, reports that a teacher at the 90th percentile of performance can achieve in half a year what a teacher at the 10th percentile can achieve in a full year. Teacher effects are not only large but cumulative over time (Sanders & Rivers, 1996).

Better quality teaching not only affects the ‘equivalent years of schooling’ in terms of improved student performance, but increases the actual years of schooling by improving retention and participation in post-school education. A series of reports based on the LSAY (*Longitudinal Surveys of Australian Youth*) program documents the connection between the literacy and numeracy achievement levels of Year 9 students and their completion of Year 12 and participation in post-school education.

Fullarton *et al.* (2003), for instance, report that ‘student achievement in school is probably the strongest correlate of Year 12 participation’ (p. 19). Marks *et al.* (2001), analysing an earlier LSAY panel, also note that ‘student achievement is strongly related to participation in higher education.’ (p. 16). The relationship between school achievement and participation in various forms of VET is more complex (Ainley & Corrigan, 2005; McMillan *et al.*, 2005).

Separately and collectively these results point to quite strong effects of the quality of teaching on the equivalent and actual years of education of students. The effects go beyond nominal changes in years of schooling to actual changes in the quality of learning.

### **3.3. Education and economic growth**

The knowledge and skills of a nation’s population contribute substantially to its well-being. This human capital is an important driver of economic growth. Expenditure on education is an investment in human capital—and this investment can produce considerable economic returns over time.

An extensive research literature discusses and documents the links between education, labour productivity and sustained higher levels of economic growth. These links fall into three broad categories:

1. *Increases in GDP as a result of higher labour productivity.* Based on results from Mankiw *et al.*, (1992), an additional year of schooling will increase GDP by 0.2% per year for the next 40 years as older workers are replaced by better educated younger workers.
2. *Increases in GDP growth through self-sustaining growth in knowledge.* Skills, techniques, knowledge and innovation are supported by education and can lead to on-going technological change that reinforces higher rates of GDP growth (Romer, 1986 and subsequent papers outlining the ‘new growth theory’).
3. *Increase in GDP through indirect effects.* Improvements in the quantity and quality of education have other less direct economic effects including lower welfare expenditure (Burke *et al.*, 2003) improvements in health and lower health expenditure (OECD, 2001b; Wolfe & Haveman, 2001), lower levels of crime and incarceration (Green & Preston 2001), among others.

A recent review of Australian studies concluded that the effect of an additional year's education for the workforce on GDP growth was an increase in:

1. the level of GDP per person by 6% or 0.15% per year over 40 years; and
2. the rate of growth of GDP per person by 0.3% per year,

which conservatively is about 0.45% in GDP growth per person per year (Dowrick, 2003). An annual growth rate of 0.45% on 2007 GDP per person of \$47,954 (ABS 5204.0, Table 1) translates into a present value of about \$40,000 for an individual over 40 years using a real discount rate of 7%.<sup>3</sup> For any reasonable costing of a year of full-time education, an additional year's schooling provides a very satisfactory return on the investment.

### **3.4. Investment in digital content and economic returns**

The economic value to Australia of the schools online curriculum content initiative can be estimated for two scenarios:

- a) TLF is extended for the three years 2009-10 to 2011-12 and beyond with TLF providing on-going hosting and access to existing digital content only.
- b) TLF is extended to 2009-10 with TLF providing a base service of on-going hosting and access to existing digital content and maintenance of the existing digital content pool only.

The first scenario provides an indication of the economic value of the overall Initiative through its effect on per person productivity. The second provides an indication of the value of maintaining the current pool of items.

Valuing the Initiative depends on comparing its costs with the possible economic benefits. The benefits are examined first, followed by the costs and then a comparison.

#### **Benefits**

The size of the wider economic benefits of investments in the digital content Initiative depends on:

- The size of the effect of digital curriculum resources on the quality of teaching for each teacher.
- The number of students who receive the improved teaching.
- The translation of the quality of teaching into equivalent years of education.
- The size of the effect of an additional year of schooling on GDP growth.
- The level of GDP per person.
- When and for how long the benefits can be realised.
- The discount rate used to equate future benefits to present day benefits.
- The rate at which learning objects lose their value for teaching and learning.

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<sup>3</sup> The NSW Treasury Department recommends a real discount rate of 7%, while the Victorian Treasury recommends 6%. Both are substantially higher than the Australian Government bond coupon. Costs used in standard rates of return calculations are not an issue here because the comparison is between GDP with the additional year's education and GDP without.

Some of these values are unknown, but what can be shown is that on the basis of often quite conservative assumptions, returns from investments in TLF satisfy standard investment criteria. The benefits are calculated for Years 1 to 10 (the major target grades for the content produced by the Initiative) for Australian students for 10 years of use and for students across 40 years of post-school productivity effects.

The assumptions are:

- ▶ TLF's pool of digital curriculum resources improves the quality of teaching on average at every Year level by the equivalent of five percentiles on the distribution of teaching quality. That is, teaching that was at the 20th percentile of the quality distribution improves to that of teaching at the 25th percentile of the distribution. Given the size of some reports of the effect of digital learning on student performance, this may be a conservative assumption.
- ▶ The number of students in grades over coming years is assumed initially to be the number of full-time students by Year level in 2007 (ABS, *Schools Australia* 2007, 4221.0). These numbers are adjusted for expected growth using ABS population projections for relevant age groups, for example growth of six year-olds for Year 1 (ABS, *Population projections, Australia—Series B*, 3222.0). The inclusion of New Zealand students would further increase the benefits. No allowance is made for the expected further positive effect of higher quality teaching on school retention (and through it, on average years of education) in Year 10. A scenario that excludes students in New South Wales government schools is discussed.
- ▶ One in two students is influenced by the introduction of teaching based on digital learning objects. With the emphasis in the curricula of participating jurisdictions on the use of ICT and the distribution of TLF materials through jurisdiction, this may also be a conservative assumption.
- ▶ An increase in the quality of teaching from the 25th to the 30th percentile is assumed to correspond to an improvement in student performance equivalent to 0.025 years of schooling (based on an interpretation of Leigh's (2007) analyses of Queensland standardised literacy and numeracy tests for students in Years 3, 5 and 7, the results of which are broadly consistent with overseas research). Further positive effects through increased school retention and participation in post-school education are ignored. Additional positive effects on teacher quality may result from effects through improvements in teacher education and teacher professional development.
- ▶ Following the research literature discussed above, the effect of an additional year's schooling on GDP growth through improved labour productivity is 6%, which is distributed over a standard working life of 40 years as new cohorts of students enter the workforce—that is 0.015% per annum. No allowance is made for emigration or mortality over this period. Additional effects through self-sustaining economic growth are ignored.
- ▶ The average level of GDP per person is \$47,954 in June 2007 (ABS 5204.0, Table 1). This value reflects the population structure and the current level of economic activity. To the extent that these change (and non-education productivity effects have been positive over time), the level of GDP per person may be higher and the benefits from higher levels of education commensurately greater. GDP per person is projected to grow at 2% per annum over the period of

the analyses (the average for 1989 to 2008, ABS, *Australian system of national accounts*, 5204.0, Table 1).

The analyses consider the GDP per person for the 40 years after students leave school. GDP per person during these years is likely to be substantially above the average because these are typically an individual's prime working years.

- ▶ School students on average enter the labour market immediately after the year in which they would normally have completed Year 12. There are further economic benefits for students who complete post-school qualifications, although further study postpones the time when any economic benefits are realised.
- ▶ The real discount rate is 7%. The New South Wales and Queensland Treasuries use this as the rate to equate future to present benefits and as a base from which to evaluate the economic feasibility of investments. If a lower discount rate were used, say the 6% rate of the Victorian Treasury, estimated benefits from the Initiative would be higher. This discount rate is substantially higher than real returns from government bonds, the more traditional standard risk-free criterion used by public authorities.
- ▶ Unless they are actively maintained, digital curriculum resources lose their value over time for a variety of reasons discussed elsewhere in this report. The first scenario examined here assumes that the digital curriculum resources are not actively maintained, while the second scenario assumes that they are maintained (and hence there is no depreciation). In the following estimates, the effectiveness of the digital curriculum resources is assumed to devalue at 4% compounding per annum over the first 10 years and to be valueless thereafter unless the digital curriculum resources are actively maintained. Estimates of the benefits from the Initiative and from future expenditure are sensitive to the choice of a depreciation rate—the higher the depreciation rate, the lower the benefits.

The choice of an appropriate depreciation rate is not self-evident. A 4% compounding depreciation rate means that after 10 years, the equivalent of two-thirds of the resource pool is still fully functional, which may be high given the rate of change in the digital and broader learning environments. On the other hand, budgets for maintenance of TLF digital curriculum resources have been somewhat lower and assuming no value after 10 years removes any long tail of residual benefit from the object pool, which is equivalent to assuming a higher depreciation rate.

Given these assumptions, the economic benefits of the Initiative from the subsequent improved productivity of students from their higher levels of education in the workforce are \$204.2m (June 2009 dollars). The corresponding benefits if the digital objects are maintained during the first year of the analyses (say in 2009), that is depreciation is set to zero for the first year, is \$211.4m (June 2009 dollars). The benefit from keeping the digital pool fully functional and current for one year is therefore \$7.2m.

## **Costs**

The benefits of the Initiative can only be interpreted in the context of its costs. Some assumptions about costs make comparison with benefits more straightforward. We assume that at the start of the comparison, all TLF products are fully up-to-date and current so that depreciation can be calculated for the whole pool of digital products.

The costs are incurred over 8 years and are converted to a common currency unit—2009 dollars. Phase 2 and phase 3 of the Initiative involved nominal costs of \$120.2m over eight years, which is about \$143.6m in June 2009 dollars. The first scenario, however, without maintaining the currency of the online digital material and allowing depreciation to compound at 4% per annum, entails additional costs.

For students to gain the educational benefits of the resource pool, teachers need to have continuing access to the resources. In the final section of this report, on-going access is costed at \$2.9m per year. Over the ten years considered by the analyses, and with appropriate discounting, the cost of access is \$21.4m.

The expenditure of TLF over phases 2 and 3 over-estimates the real cost of this digital product because it includes an allowance for expenditure on maintenance of already-produced digital resources. Other expenditure on hosting digital material, infrastructure, administration, user support and so on, although not directly related to the production of content, is nevertheless a cost incurred in delivering digital content to the classroom. Total costs also include income from the New Zealand Government, while benefits are only recorded for Australian students.

The additional cost of maintaining future access cannot simply be added to the preceding investment because of the double-counting. The initial investment of \$143.6m already includes some funding for access, although at a lower rate because the item pool increased over time (and access was presumably less expensive to provide) and some features of access (such as the Scootle website) were added later. Allowance also has to be made for the fact that the Initiative covers only eight years rather than the ten considered in the analyses.

It is difficult to quantify the necessary expenditure precisely, but assuming that expenditure on access in the eight years of the Initiative is about a third of the required expenditure for the next 10 years, then the net additional expenditure required to maintain access is about \$14.2m. The total cost of scenario 1 is therefore about \$155.8m (in June 2009 dollars).

The second scenario requires that the digital curriculum resources be maintained for an additional year rather than being allowed to immediately depreciate. The additional cost of maintaining the item pool is expressed as a percentage (4%) of the value of the item pool. Only a proportion of the budget of the Initiative was spent on producing content—TLF engaged in a range of activities.

The value of the item pool itself is not easy to estimate on the basis of budget or other figures. Expenditure cannot always be identified as content-related, especially because some ‘overhead’ or organisational costs need to be allocated to the production of content. The estimates provided in the *Cost effective options* paper, together with

actual expenditure values, suggest that expenditure on content during Phase 3 was about 88% of total expenditure if overheads are distributed pro-rata to production of content.

Projecting the corresponding per item costs for Phase 3 across the entire item pool, suggests a value for the \$94.8m (in June 2009 dollars). For comparison with estimates in other documents and elsewhere in this report, it is important to note that this is not the cost of the production of the content itself, but includes an allowance for broader costs of implementing the Initiative because these costs would be expected to be incurred in maintaining the content. The estimates are also based on Phase 3 costs and extrapolated to the full pool of digital content to more closely reflect recent costs of the Initiative.

If the content depreciates at 4% per annum (that is, it requires the equivalent of 4% of its value to be kept fully current for teaching and access purposes), then the cost would be \$3.8m per year.

### **The returns from The Le@rning Federation**

The major result of these analyses is that, given reasonably conservative assumptions, the present value benefits of the Initiative (\$204.2m) exceed the present value costs (\$155.8m). Since the estimates allowed for a real discount rate of 7%, these results suggest that as an investment, TLF exceeds the criterion commonly used by state treasuries as the threshold for public investment.

The second set of analyses examines the benefits of maintaining the currency of TLF content for an additional year. They compare a scenario in which access to TLF digital content was funded but the content itself was not with a scenario in which on-going access was funded and the content was maintained for one year only. The benefit from the second scenario was \$211.4m, an increase of \$7.2m compared. The benefit from increased productivity of improvements in the quality of teaching associated with maintaining the digital content pool is therefore \$7.2m. The cost of maintaining the digital content for one year was estimated at \$3.8m. Again, the benefits exceed the costs under reasonably conservative assumptions. Under the criterion commonly used by state treasuries, future expenditure on maintaining TLF content is financially justifiable.

The analyses of the returns to expenditure on maintaining TLF digital content pool are for one year only. The results, however, can be extended indefinitely for subsequent years. At the end of that one year, the content pool is fully maintained and the results from the analyses are the same for the next year (varying only slightly due to changes in population and population growth).

The analyses of the returns to expenditure on maintaining TLF digital content pool are based on an assumption that the value of the pool depreciated at 4% per annum. While the estimates of both costs and benefits are sensitive to the assumed level of depreciation, they are sensitive in the same direction—if depreciation is higher, both

benefits and costs increase more or less proportionately.<sup>4</sup> The result is therefore not sensitive to the choice of depreciation rate.

### **Differences among the states and territories**

These estimates are for Australia as a whole but apply to each of the participating jurisdictions. The returns might be expected to be proportionately greater for jurisdictions in which GDP per person was higher, that is Western Australia, the Northern Territory and the ACT (ABS, *Australian National Accounts: State Accounts*. 5220.0) and in states with projected higher rates of population growth, that is, Western Australia and Queensland.

Most of any differences among jurisdictions will be reduced by inter-state migration, as students move between states while attending, or after leaving, school and through redistribution of benefits through direct or indirect federal funding and trade between the jurisdictions.

### **New South Wales and returns to the Initiative**

The continued participation of the New South Wales Government in the Initiative is uncertain. It appears that New South Wales will not be a full participant in the Initiative but may participate partially under terms yet to be finalised. If New South Wales does not participate, costs will be almost unchanged (some allowance might be made for lower coordination and support costs), but benefits will decline substantially because benefits are (almost) directly proportional to the number of students whose productivity is improved by experiencing higher quality teaching.

If the analyses in this section are repeated excluding students enrolled in New South Wales government schools, then the benefits fall to \$157.6m, which is only marginally higher than the present value cost of the Initiative, \$155.8m. Even with New South Wales government schools excluded, the Initiative as a whole still satisfies the standard investment criterion used by some state treasuries.

A distinction needs to be drawn between the first scenario and what actually happened in the Initiative. New South Wales fully participated in the second and third phases of the Initiative and the analyses for the first scenario suggest that the returns to the Initiative during this time were positive—although the analyses model a different scenario that considers the situation going forward from the end of the third phase.

The more important results are for the benefits from maintaining TLF's digital content pool with New South Wales government students excluded, because these correspond to real costs in the next phase of the Initiative. Maintenance for one year increases the benefits to \$163.1m, which is a difference of \$5.1m. Although substantially less than the \$7.2m benefit if New South Wales participates, it is still above the estimated cost of \$3.8m. Expenditure on maintaining TLF's digital content pool still more than satisfies the minimum financial criteria commonly used for investment in public infrastructure.

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<sup>4</sup> Although the absolute level of benefits declines, the benefit from maintaining the digital content pool is the difference between the benefits in Scenario 1 and Scenario 2, which increases as the depreciation rate increases.

## 4. Achieving strategic educational goals

New technology is a key driver of economic change and development in general and is no less so in education. Information and communication technologies (ICT) both contribute to the teaching of other subjects and have become a subject in their own right. The curricula of school education authorities in all jurisdictions recognise these twin roles of ICT. These aspects of curriculum would have been more difficult to implement without the digital content supplied through TLF.

The need to develop students' 'skills of information processing and computing' was included in the 1989 *Hobart Declaration* by the Australian State, Territory and Commonwealth Ministers of Education meeting as the Australian Education Council. MCEETYA's 1999 *Adelaide Declaration* shifted the terrain towards a broader use of ICT across the curriculum with the goal that students should 'be confident, creative and productive users of new technologies, particularly information and communication technologies, and understand the impact of those technologies on society'. (Goal 1.6).

Ken Boston, the then NSW Director-General of Education and Training and Managing Director of TAFE, NSW, in a related address in 1999, expanded on the theme of the role of ICT in the broader curriculum—a development he termed 'The Digital Challenge'. While noting the potential provided by ICT, he regretted the scarcity of content suitable for Australian schools—a problem he linked to the small Australian market. The pathway forward lay with cooperation among the states and territories to settle on a common approach to ICT to achieve the economies inherent in larger scale production. He concluded that Australia needed 'a strategy for sharing curriculum materials and delivery by means of a national grid, based on a partnership between the Commonwealth, States and Territories to provide a national and globally competitive digital curriculum platform for all Australian schools'.

The paucity of digital content suitable for Australian schools was noted more widely and was a significant consideration in the decision to pursue the schools online curriculum content Initiative—'commercially available curriculum materials are focused in narrow areas of the curriculum, are variable in quality and limited in local relevance'. At the time TLF was first mooted, it was believed that the economics of producing sufficient appropriate content suitable for Australian schools meant that the market acting by itself would be unlikely to produce sufficient content. The Initiative, by pooling the financial resources of its participants and creating common standards, has allowed a niche industry to develop.

The September 2008 draft of the *National Declaration on Educational Goals for Young Australians* maintains and strengthens the emphasis on the role of digital technologies in school education. It notes that 'in this digital age, young people . . . increasingly expect to be able to use such technologies in their learning' and that we need to make a quantum leap in the effectiveness of their use in the coming decade (p. 3). The document strengthens the emphasis on the role of ICT in both underpinning other learning areas and requiring specific knowledge and skills in its own right.

This new declaration recognises fundamental changes in how students learn – driven by technology and drawing on better information about how learners learn. It

acknowledges that the skills of critical, cross disciplinary thinking are vital in all 21st century occupations and are already occurring beyond the school gate in the way young people are networked into online communities. It acknowledges that these sophisticated skills are built upon the achievement of basic literacy, numeracy, social and digital media skills. (p. 4).

The education departments of the states and territories and New Zealand have moved towards embedding digital content across their curricula:

*New South Wales.* ‘Connected Learning’ is one of six priority areas in the Department of Education and Training’s (DET) *Office of Schools Plan 2009-2011*. It emphasises the need to integrate ICT and digital educational resources across the curriculum (NSW DET, 2008).

*Victoria.* The *Victorian Essential Learning Standards (VELS)* outlines the curriculum for Years P to 10. ICT plays a prominent interdisciplinary role (DEECD, 2008).

*Queensland.* *Smart Classrooms* focuses on innovation, teacher professional development and digital learning. It is founded on the *Information and Knowledge Strategic Plan 2007-2011*, which ‘focuses on interdependencies and integration to engage the digital generation, improve individual learning opportunities and get the best from our ICT investment (DETA, 2008a).

*South Australia.* The *Strategic Plan for Learning and Business Technologies 2006-2010*, states, ‘A significant (and increasing) percentage of all work and life activities today requires a degree of competency in information and communication technologies (ICT) and, regardless of the role of the school in the future, the increasing use of technology in everyday life means that the education systems need to reflect this’ (DECS, 2006).

*Western Australia.* Technology and Enterprise is one of eight learning areas identified in the *Outcomes and Standards Framework*, but skills in ICT are recognised as integral to achievements in the other learning areas (DET, WA: 2005).

*Tasmania.* ICT is incorporated in all seven curriculum areas through the structure of enquiring, creating and communicating using ICT and having the skills to operate ICT (DoE, 2008).

*Northern Territory.* Learning Technology is one of the five structural components identified in the *Curriculum Framework*. It is specifically stated as cross-curricular—operating technology components, problem-solving, decision making through research, and communicating using ICT are needed to enhance education in all key learning areas (DET, NT, 2008)

*ACT.* The *Curriculum Framework* has Technology as one of its eight key learning areas as well as one of the essential learning achievements that form the principles underpinning the Framework (DET, ACT, 2008).

*New Zealand.* The *National Digital Strategy*, coordinated from the Ministry of Economic Development, incorporates the business, government, community, health and education sectors. The goal for the Education Ministry is to have digital curriculum resources available to all teachers, students and administrators across all levels of education and to have ‘repositories of relevant, high-quality digital content resources’ to support a rich learning and teaching environment (NZ Ministry of Education, 2008).

The National Curriculum initiative also highlights the increasingly important role of digital curriculum resources in teaching substantive areas of the curriculum. The Initial Advice Papers on the four areas of current focus for the Initiative—Science, Mathematics, English and History—include strong recognition of the role of digital curriculum resources in the future development of teaching in schools:

In English, for instance:

Digital technologies have had significant effects on the ways in which many people, groups and communities work, meet and stay in touch, share, build and store knowledge, entertain themselves, and access material for pleasure and learning. This in turn has implications for the ways in which young people learn in school and how individual and classroom work can be organised. An obvious implication is that there are now new opportunities for teaching with digital and online materials. (NCB, 2008a, p. 10).

And in mathematics:

. . . digital technologies are not optional extras: they offer new approaches to explaining and presenting mathematics. The continuing evolution of digital technologies has progressively changed both school mathematics and the work of mathematicians . . . Digital technologies can make previously inaccessible mathematics accessible, and enhances the potential for teachers to make mathematics interesting to more students . . . (NCB, 2008b, p. 7).

MCEETYA and the Ministerial Council for Vocational and Technical Education endorsed a joint ministerial statement on ICT in education in June 2008. The ministerial statement commits to ‘national, cross jurisdictional and cross sectoral approaches through the Australian ICT in Education Committee to address the ICT enablers of technology-rich learning environments’, which includes the access to online learning resources (MCEETYA, 2008). MCEETYA’s decision highlights the importance of the work being done by The Le@rning Federation in keeping Australian education standards and achievement at a global level. The success of many of these policy initiatives will depend on digital content supplied by TLF.

## 5. Savings on digital copyright

This chapter canvasses the extent to which TLF digital content can offset the digital copyright costs paid by the school sector. It reviews digital copyright costs for schools and the extent to which these costs may increase. Likely scenarios suggest that digital copyright costs may be substantial and could offset perhaps half the initial investment in the Initiative by participating state and territory jurisdictions.

The implications of copyright savings for investment in sustaining access to TLF resources beyond June 2009 are positive. The investment in TLF content has already been made. The investment required to maintain access to that content is modest by comparison with the initial investment and very modest by comparison with the potential copyright savings, even without the participation of New South Wales after June 2009.

Savings on copyright fees may partly offset expenditure in maintaining the currency of the Initiative's current pool of digital content and in providing new content.

### 5.1. Copyright costs for schools

TLF, which supplies copyright free digital content to schools, has a strategic role to play as part of the school sector's response to increasing copyright payments. In 2007, copyright payments by the school sector were \$50.1m—or about \$14.56 per student (Table 5.1). Payments have increased from \$9.6m in 1999—a compound annual rate of increase of 22.9% per year over eight years. Converting to real currency values reduces the rate of increase only slightly—the compound annual increase has been 18.6% per year. The change between 2006 and 2007 was the least of the period—from \$45.9m to \$50.1, which is a nominal increase of 9.2% or a real increase of 4.2%. Across this period, the number of students enrolled in Australian schools has increased by less 1% per year.

The digital component of copyright fees has so far been relatively small. Payments for copyright for electronic use were 6.4% of total payments in 2006 and 6.0% in 2007. The change in the amount paid for digital copyright between 2006 and 2007 was only 2.9% nominally or a decline in real terms of 1.8%.

**Table 5.1 Copyright payments by the school sector by medium, 2006 and 2007**

Year	Hardcopy	Electronic Use Scheme	Total
2006	\$43.0m	\$2.9m	\$45.9
2007	\$47.1m	\$3.0m	\$50.1

AICTEC 2007. Copyright Forum: Where are we and where do we need to go from here? Adelaide.

Copyright payments for electronic use by the school sector are not covered by an agreement between schools and the Copyright Agency Limited (CAL)—the copyright collection agency that covers the school sector. The schools sector has volunteered payment for digital use of about \$0.87 per full time equivalent student. A decision by the Copyright Tribunal is pending.

**Table 5.2 Total copies recovered in education institution by destination 2004-05 to 2006-07**

Source	2004-05		2005-06		2006-07	
	Pages copied	%	Pages copied	%	Pages copied	%
Paper	6.6m	46.8	8.3m	49.2	7.0m	53.1
Digital	7.5m	53.2	8.6m	50.8	6.2m	46.9
Total	14.2m	100.0	16.9m	100.0	13.2m	100.0

Copyright Agency Limited, 2007. *Annual Report, 2006-07*.

The potential for increased payments by the school sector for digital copyright is substantial. In 2006, for instance, payments for digital copyright were about 30% of the TAFE sector’s total copyright payments—the sector paid about \$4 million for photocopying and just over \$3 million for electronic use. If this ratio had been translated to the school sector, copyright payments would have increased to about \$75.2m in 2006, payments of an additional \$29.3m. Estimates derived from CAL’s 2006-07 Annual Report suggest that payments for digital copying by educational institutions other than schools are about 25% of total copyright costs, which corresponds to an additional \$11.8m.

Policy emphasis on the role of ICT in schooling can only increase the use of digital content and increase the potential for higher copyright payments by the school sector. The Copyright Agency Limited’s (CAL’s) 2006-07 Annual Report, for instance, outlines its strategies to increase copyright returns for its members from what it describes as ‘the steady growth in digital use’. In 2006-07 digital pages copied were about 47% of all copying in the education sector—although overall digital copying declined between 2005-06 and 2006-07 (Table 5.2). This apparent decline may be linked to the shift of some digital copying in education to ‘commercial’.

Increasing copyright costs for the school sector have prompted policy initiatives to reduce current costs and further increases. Some copyright costs paid by the school sector are within-sector or near-sector transfers. Schools access and download materials where the copyright holder is another school or more frequently an education department or other government department. From June 2006 the *National Education Access Licence for Schools* (NEALS) initiative (a royalty-free licence between the education departments of the various states and territories) removed some material from copyright that would attract copyright payments from schools. Similarly, and more extensively, a recommendation from the 2008 *Review of the National Innovation System* that materials released for public information by Australian governments should be released under a creative commons licence, would also reduce copyright costs for the school sector.

A second response is to encourage teachers’ use of digital materials that do not attract copyright fees. A substantial amount of such material is available. Teachers could be encouraged to use it if it was collected in a single repository where materials were properly catalogued against curriculum requirements, easily accessed and teachers knew that they did not have to worry about copyright issues. Ease of access and certainty of conditions of use would facilitate the use of digital material in school.

TLF materials are a variant of this second response—created to fill absences in digital materials available to address the curriculum needs of Australian and New Zealand schools, mainly by commissioning new materials, but also by arranging access to existing materials that would not otherwise be available to teachers, indexing the resources against curriculum needs and clearing copyright restrictions for schools.

## **5.2. Savings on copyright costs from TLF resources**

Estimating potential savings on digital copyright payments from TLF resources is difficult because of the uncertainty surrounding the level of future digital copyright costs for the school sector and the extent to which TLF material offsets the use of other copyrighted digital materials (rather than simply extending the use of digital materials by schools). The best that can be done is to explore the implications of plausible assumptions.

Table 5.3 shows the present value in 2009 dollars from digital copyright savings associated with the use of TLF resources. The key variables are the level of expected digital copyright costs for the school sector in 2009 and the extent to which TLF materials reduce the use of other costs:

- Past experience and policy settings suggest that copyright costs will continue to increase. The increase will be driven in part by an increase in the number of students, an increase in the volume of copyrighted material accessed per student, an increase in the real cost of material accessed and an increase in the scope of the material assessed for copyright. We take the relatively modest real increase (in historical terms) of 4.2% between 2006 and 2007 as an indication of future increases. (The changes in digital payments alone are outside any agreement with CAL and therefore not a good guide.). These real increases are projected from 2007 values (in 2009 dollars) across 2009 to 2018.

The cost of copyright for the use of digital materials in schools can be expressed as a ratio of digital to print. Based on the discussion above, current ratios of about 15 (print) to 1 (digital) are unlikely to persist, even given efforts to ameliorate growth in digital costs. The recent ratio for non-school education seems to be about 4 to 1 and the recent TAFE ratio about 1.3 to 1. The projected expansion of the provision of digital education in schools and the possibility of replacing some hard copying with digital copying suggests that eventually a 1 to 1 ratio may not be impossible.

- The extent to which TLF digital products are able to substitute for products for which copyright is paid is the second unknown. The absence of comprehensive information on the extent to which TLF materials are used is a major problem for any evaluation of the Initiative.

**Table 5.3 Estimated present value of digital copyright payment offsets from TLF resources by assumed ratio of hardcopy to digital copying and assumed percent of substitution of digital copyright costs (\$m in 2009 dollars)**

Print to digital	15 to 1	10 to 1	5 to 1	2.5 to 1	1 to 1
<b>TLF substitution</b>					
10%	\$2.5m	\$3.7m	\$7.5m	\$15.0m	\$37.4
15%	\$3.7m	\$5.6m	\$11.2m	\$22.5m	\$56.1m
20%	\$5.0m	\$7.5m	\$15.0m	\$29.9m	\$74.9m
25%	\$6.2m	\$9.4m	\$18.7m	\$37.4	\$93.6m
<b>1. Proportion of total TLF budget (%)</b>					
10%	1.6	2.3	4.8	9.5	23.7
15%	2.3	3.6	7.1	14.3	35.6
20%	3.2	4.8	9.5	19.0	47.5
25%	3.9	6.0	11.8	23.7	59.3
<b>2. Proportion of value of digital content (%)</b>					
10%	2.3	3.4	6.9	13.8	34.3
15%	3.4	5.1	10.3	20.6	51.5
20%	4.6	6.9	13.8	27.4	68.7
25%	5.7	8.6	17.2	34.3	85.9
<b>3. Proportion of savings from maintenance in 2009/10 (%)</b>					
10%	1.5	2.3	4.6	9.2	22.9
15%	2.3	3.4	6.9	13.8	34.3
20%	3.1	4.6	9.2	18.3	45.8
25%	3.8	5.7	11.4	22.9	57.2

See text for interpretation. Shaded cells are considered more likely outcomes.

Nevertheless, we know that TLF materials are numerous, span the curriculum, are systematically incorporated in digital content management systems by jurisdictions, are curriculum relevant and have been actively downloaded since some teachers were able to directly access them on the Scootle website from April 2008.

On the other hand, not all copyrighted digital material copied by schools will be for immediate teaching purposes. Some will be for administration and some for broader staff development and other purposes. These forms of copying set an upper limit on the extent to which TLF materials can substitute for all digital copyright materials.

The estimates explore the fairly narrow bound of replacement effects of 10%, 15%, 20% and 25%.

Table 5.3 presents a matrix of estimates of the digital copyright savings from the use of TLF resources under a range of assumptions about the ratio of print to digital costs and the proportion of digital costs offset by TLF materials. These estimates are

present value benefits in 2009 dollars of the benefits between 2009 and 2018. The estimates are calculated on the basis of a number of assumptions:

- That all TLF digital curriculum resources are current as at the start of 2009.
- That copyright costs for print material are \$56.9m in 2009—the \$47.1m copyright print costs in 2007 converted to 2009 dollars and allowing for real growth of 4.6% compounded across two years.
- That benefits beyond 2009 are discounted at 7% (consistent with the approach of several state treasuries), are subject to depreciation at 4% per annum compound (no further expenditure is used to update the digital resources), reflect real growth in underlying copyright fees of 4.6% per annum and cease after 2018.

The estimates in Table 5.3 are sensitive to changes in any of these assumptions. No allowance is made for on-going expenditure for hosting the resources and providing user support. These are discussed with the cost-side of the equation. Given that the assumptions are used to project values some ten years into the future in the rapidly changing context of digital education and intellectual property rights, the uncertainty is substantial.

The values in Table 5.3 are ‘present value’ estimates. That is, they sum expected future benefits that have been appropriately discounted and express them in constant (June 2009) dollars. These are, in effect, the total expected copyright benefits of TLF materials given the assumptions underlying their calculation.

The values in Table 5.3 can be interpreted in the context of the total expenditure on the Initiative, which were about \$143.6m in 2009 dollars (excluding the contribution by the New Zealand Government). An additional \$14.2m can be added as the cost of on-going access to the digital content pool over the decade for which the estimates are made.

Most of the total expenditure on the Initiative can be attributed to the tasks of the production of copyright-free digital curriculum resources and making them accessible to users. The relevant cost base is therefore less than \$143.6m. The value of the item pool can be estimated in various ways. Following the approach outlined in an earlier section, it is about \$94.8m if the Phase 3 costs are extrapolated to the entire item pool and administrative costs are allocated pro-rata, which, with the \$14.2m for on-going access, sums to \$109.0m.

A value of say \$22.5m in Table 5.3 (ratio of 2.5 to 1 and substitution of 15%) indicates that about 14% of the total cost of the Initiative is likely to be recovered through savings in payments for copyright on digital curriculum resources and about 21% of the value of the digital content. Higher values therefore correspond to better outcomes for the Initiative.

The range of the values in Table 5.3 is considerable—from \$2.5m to \$93.6m. The shaded cells indicate the more likely scenarios. The experience of other educational sectors to date suggests that the ratio of print to digital is likely to be initially close to 2.5 to 1 and, if the digital revolution is successful, moving to 1 to 1 or beyond. A strongest case scenario suggests that the savings in copyright would offset more than half the costs of the Initiative.

### **5.3. Copyright costs and the future**

Copyright savings have different implications for the future funding of different aspects of TLF activities. There are five areas of potential expenditure in the future:

- Maintaining the protocols and understanding to facilitate sharing of digital content by jurisdictions.
- Providing on-going access for jurisdictions, teachers and others to the digital content created during Phases 2 and 3 of the Initiative.
- Investing in the current pool of digital curriculum resources to maintain their currency in terms of knowledge, curriculum and pedagogy.
- Adding to the pool of digital content.
- Other activities.

The analyses presented in Table 5.3 provide an assessment of the copyright value of the overall Initiative—and it is reasonably positive. These analyses can be used to argue for the continuation of TLF in its present form and the value of adding to the pool of digital content.

The copyright value of TLF digital content, however, is an even more compelling argument for funding on-going access to the content. The investment in the content has already been made. All that is required now is the marginal cost of providing access to that material, which is estimated in the next section as \$1.6m for one year or \$12.1m in present value terms for the 10 years discounted at 7% per annum, which corresponds to the analyses in Table 5.3. \$12.1m is less than all but the most conservative of the estimates in Table 5.3. On average, jurisdictions would fully recover through copyright savings all of their investment in on-going access to present TLF resources.

Future investment in maintaining the currency of TLF's digital content pool is similarly offset by potential copyright savings. If depreciation is assumed to be 4% per year and equates to \$3.8m (June 2009 dollars), the corresponding copyright savings are proportionate. The results in Panel 2 in Table 5.3 also hold for the percent of costs offset through copyright savings from maintenance of the pool for any one year.

### **5.4. Copyright costs and the jurisdictions**

The benefits from savings in copyright fees are not equally shared among the jurisdictions participating in the Initiative. With the Australian Government matching state and territory contributions, the costs for other Australian jurisdictions are halved and the contribution of the New Zealand Government further lowers the costs to the states and jurisdictions. The Australian Government, however, receives none of the benefits from savings in digital copyright because it does not make any direct payments for school copyright. The savings are distributed among the states and territories, approximately proportional to enrolments in schools which in turn approximate the funding share (and the New Zealand Government also benefits from the digital copyright savings, but their costs have not been included in the estimates of digital copyright costs). It is therefore possible, subject to future trends in digital

usage, digital copy right costs and usage of TLF digital resources, that jurisdictions may recover their full expenditure on the Initiative through reduced copyright costs.

State and territory education departments, however, will only benefit from savings on copyright for students attending government schools. Since about two-thirds (66.4%) of students are enrolled in government schools, on average jurisdictions may recover about two-thirds of the cost of TLF content through savings on copyright. Jurisdictions with lower proportions of students in non-government schools will benefit more. Non-government schools in Australia make no direct contribution to TLF resources but may gain through savings on digital copyright costs.

Combining these two effects—the matching grants from the Australian Government and the recovery of copyright costs only from use in government schools—means that the costs of the Initiative from the perspective of state and territory jurisdictions are halved while their benefits are reduced by only one-third. The values in Table 5.3 are therefore lower bound estimates of the extent to which state and territory jurisdiction can recover their investment in TLF through savings on copyright costs.

After taking into account these two partially countervailing effects, the percentage values in Table 5.3 can be increased by a third. For instance, Table 5.3 shows that if the ratio of print to digital copyright costs is 2.5 to 1 and TLF material substitutes for 25% of total digital copyright costs, then copyright savings from TLF digital content are 23.7% of TLF's budget. This saving is from the perspective of the Initiative overall. From the perspective of the states and territories, the savings are not 23.7%, but a third higher, that is 31.6%.

## **5.5 Future funding and jurisdictions**

The estimates in this chapter assume the funding formula used in Phase 3 of the Initiative. They therefore provide a retrospective view of the costs and benefits to state and territory jurisdictions from the second and third phases of the Initiative.

If the New South Wales Government does not participate in the next phase of the Initiative and the Commonwealth maintains matching funding with the states and territories, each state and territory jurisdiction is paying about 50% more for all elements of the Initiative. Their potential savings through reduced digital copyright fees, however, are unchanged.

The changes in the cost base of the participating states and territories affects the proportion of expenditure on Phase 1 that they can expect to recoup through savings on copyright fees. The values in the final panel in Table 5.3 bring together all the considerations relating to the costs and benefits to states and jurisdictions in the future—the reduced costs through matching Commonwealth funding, the reduced benefits after allowing for non-government schools and the increased costs if the New South Wales Government does not participate. The combined effect of these adjustments is to reduce the initial savings as a proportion of expenditure by a third.

The values in the final panel show potential savings on copyright fees for participating state and territory jurisdictions as a proportion of any expenditure on new content or in maintaining existing content. The values for the more likely expected outcomes for digital costs and savings vary from modest to substantial. The copyright fee offsets

through maintaining access to existing digital content during 2009/10 are still substantial, even if New South Wales does not participate.

## 6. Options for the future

The third phase of the digital content Initiative ends in June 2009. This section discusses options for the future. The activities of the various options differ in scope, cost and benefits. The options examined vary from a minimalist approach that seeks to preserve the assets of TLF to options that seek to build on the digital content of the Initiative and provide flexibility in funding for the participating jurisdictions.

The costings and approach used in this section are drawn from the papers *Cost-effective options for online curriculum content beyond June 2006* (a paper prepared for Phase 3 of the Initiative. The *Cost effective options* paper was based on experience from Phase 2 of the Initiative as well as on judgements about the resources required to undertake certain activities, discussions with TLF secretariat and staff, discussions at AESOC and TLF Steering Group. Further costing and related information are drawn from *Sustainable national digital curriculum resource supply for schools*—a paper that also explored options for the fourth TLF phase and was submitted to the AESOC meeting of 30 October 2008.

### 6.1 The justification for future funding

The discussion addresses MCEETYA's concerns that the assets developed during the Initiative be sustained, but that the financial commitment required of participants be constrained. The costings are modular and can be combined in different ways. The recommendations for continued funding of the Initiative are underpinned by the following observations:

- ▶ The cooperative Federalist model is cost effective for any initiative such as TLF where the fixed and partially fixed costs are high and the marginal costs are low. Cooperation between jurisdictions avoids the waste of duplication of effort and more than offsets the costs of cooperation. The advantages for state and territory jurisdictions are strengthened by the matching funding by the Australian Government and any contribution by the New Zealand Government, but persist without their contribution. Non-participation by any state or territory jurisdiction reduces the advantages, but does not remove them.
- ▶ The schools online curriculum content Initiative supports the focus of all state and territory jurisdictions on the role of ICT in their curricula and the *Digital Education Revolution* and contributes to movement towards *National Curriculum*.
- ▶ Expanding the role of ICT in school curricula is designed to improve the quality of teaching and the relevance of education to an increasingly digitally oriented world. Given often conservative assumptions about the effect of ICT on the quality of teaching and learning, the eventual returns through improved productivity justify investment in:
  - the Initiative to date.
  - on-going cooperation to maintain access to the digital content by participating jurisdictions.
  - on-going maintenance of the existing digital content from TLF.
  - new digital content.

Further investment in the Initiative by jurisdictions satisfies standard state Treasury criteria even without the full participation of the New South Wales in the fourth phase of the Initiative.

- ▶ Savings in digital copyright payments and licensing fees provide a further significant potential return from investment in copyright-cleared digital content provided through TLF. These savings:
  - are potentially a substantial proportion of the investment in the Initiative to date.
  - justify continued funding of cooperation among jurisdictions to maintain access to the digital content by participating jurisdictions.
  - offset some of the costs of the on-going maintenance of the existing digital content from TLF.
  - offset the costs of the production of new digital content.

## **6.2 TLF's assets**

The Ministers wish to preserve TLF's assets. TLF has four broad sets of assets:

- physical assets that include about 8,600 copyright free digital curriculum resources and other digital curriculum resources for teachers. Part of the value of these assets is the licensing agreements that have been negotiated to ensure that the resources are free of copyright. Some of these agreements are in perpetuity and others cease in 2015.
- technical systems, standards and specifications to manage the procurement of digital curriculum resources, manage copyright licences, ensure appropriate metadata is applied and provide access to schools across Australia and New Zealand.
- human capital that is embodied in its staff and its various contractors. Over the decade of the Initiative TLF staff and its contractors have developed expertise in the educational design, production and distribution of quality assured digital curriculum resources and resources.
- organisational capital contained in the relationships TLF has built with stakeholders and various contractors and that underpins coordination among jurisdictions in terms of standards and protocols for learning objects and digital content more generally, copyright and licensing agreements with content providers and the distribution of content to jurisdictions, teachers and others.

The majority of the expenditure of TLF has been on commissioning and licensing content. Hence changes in the level of aggregate TLF expenditure tend to focus on changing the production of new content.

### 6.3 Major activities

The *Cost effective options* paper usefully distinguishes between a number of activities involved in the Initiative:<sup>5</sup>

- Maintaining the foundations for sharing existing and new digital content among school jurisdictions.
- Cost effective procurement of new content.
- Provide systems to support content management and distribution.

These activities can be combined to describe and cost options for the future of the Initiative. The details of the activities included under these headings are shown in Tables 6.1 and 6.2. The numbering in those tables mostly follows the numbering in the *Cost effective options* paper. The number 2 was used for costs associated with the creation of new content and these are treated differently.

The *Sustainable national digital curriculum resource supply for schools* paper identified a number of activities for funding in the future of the Initiative. These fall into the broader categories of the *Cost effective options* paper:

#### ***Activities associated with maintaining the foundations for sharing digital content***

- expanded partnerships with cultural agencies and public organisations (these partnerships are currently delivering an average of 900 ‘green’ digital curriculum resources per year);
- further facilitation of jurisdictions’ sharing of digital resources; and
- a base level of longitudinal research in the effectiveness of digital curriculum resource application.

#### ***Activities associated with providing systems to support content, management and distribution***

- hosting and managing of systems to store and distribute digital curriculum resources to all States and Territories;
- access to teacher-developed learning sequences;
- continuation of Scootle, a secure national online teaching and learning delivery interface providing access to all Le@rning Federation digital resources;
- licensing commercial resources;
- access to digital curriculum resources for and delivery to pre-service institutions, teacher-educators and pre-service students; and
- Intellectual Property licence maintenance and capacity to negotiate licences to an agreed national standard.

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<sup>5</sup> The *Cost effective options* paper identified several other activities associated with the Initiative, but which did not form part of its brief—the physical (software, hardware, communications and technical support) infrastructure required for the use of digital content and the professional development of teaching and other staff. Costs for systems and services for new digital content were also explicitly excluded.

**Maintaining the currency of the existing digital content**

- updating the existing 8600 digital curriculum resources for changing technologies and standards;
- linking all resources in the national pool to National Curriculum, as it is developed;
- linking of the School Cataloguing Information Service (SCIS) records to the national resource pool to enable teachers to obtain, alongside the national digital curriculum resources, a list of relevant non-digital resources in their own school libraries;

**Table 6.1 Activities and costings associated with maintaining the foundations for sharing digital content—2009-10 (June 2009 dollars)**

The structural elements that underpin cost-effective investment in online content and systems and that help to maximise the benefits of online curriculum content for the education sector. They help to avoid the costs of:

- Duplication of effort.
- Inability to share content across jurisdictions due to inconsistent specifications or restrictive copyright agreements.
- Inequitable distribution of benefits across the sector (all jurisdictions advance together).
- Reduced knowledge and skills development.

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1.1 Convene groups of suitable representatives from each jurisdiction whose task is to agree on curriculum priority areas for which content should be procured in the future

1.2 Convene groups of suitable representatives from each jurisdiction whose task is to agree on a common set of intellectual property arrangements that will enable content to be shared with jurisdictions other than the commissioning jurisdiction.

1.3 Agree on the basis upon which jurisdictions would contribute content to a common pool for sharing.

*Comment:* The costing included intensive initial meetings to establish the framework and thereafter quarterly meetings to monitor progress and respond to changes. The framework is already in place and hence the equivalent of initial meetings is not required.

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1.4 Activities involved in the maintenance and renewal of specifications and standards and the development, communication, implementation and monitoring of quality assurance processes on selected types of content in order to meet those standards.

1.5 Quality assurance processes. Ensure that a proportion of content produced or procured meets agreed quality assurance levels.

*Comment:* Even if (or especially if) TLF no longer commissions or procures new content, a common set of specifications and quality assurance procedures is required to underpin equitable sharing of resources among jurisdictions.

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1.6 *Industry development.* Improve communication within and between the private and public sector components of the educational content industry to stimulate innovation.

1.7 *Research & development.* Research and development products that contribute to advances in understanding of the use and effectiveness of digital curriculum resources in teaching and learning.

*Comment.* These activities will enhance knowledge and skills that will directly benefit the whole school sector and for which there is an on-going need—regardless of who produces the digital content.

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Adapted from TLF, 2004. *Cost-effective options for online curriculum content beyond June 2006.*

**Table 6.2 Activities and costings associated with providing systems to support content, management and distribution—2009-10 (June 2009 dollars)**

*3.1 Management systems & services for TLF content. to support the provision of content to jurisdictions. maintained, stored and distributable to education systems and sectors and assist with the provision of information about its distribution and management.*

3.1.1 Operation and maintenance of the content repository

3.1.2 Hosting of the content repository

3.1.3 Licence renewal on selected items of third party content whose licence duration has expired

3.1.4 Provision of information and advice to technical and systems administrators in the jurisdictions.

*Comments.* The costs in this section are proportional to the amount of digital content available and will increase accordingly. 3.1.3 is directly proportional to the amount of licensed content. Other costs are assumed to increase by a third, even though content has more than doubled.

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Adapted from TLF, 2004. *Cost-effective options for online curriculum content beyond June 2006.*

- continuing and extending the Schools Online Content Thesaurus (SCoT)<sup>6</sup> in response to changing priorities and national curriculum requirements; and
- applying and updating metadata.

#### ***New flexible content***

- sourcing extant resources and commissioning new resources in response to demand;
- piloting, and hopefully extending, the application of Creative Commons licenses for national schools digital resource sharing.<sup>7</sup>; and
- provision for facilitating distribution of new teacher-developed digital curriculum resources including learning sequences.

The core activities are those associated with maintaining the infrastructure for the sharing of digital content among jurisdictions; activities associated with providing systems to support the management and distribution of content; and the maintenance of content.

Tables 6.1 and 6.2 also contain comments on the costings of some activities and potential changes in the activities. The costings are summarised in Table 6.3 and are based on the detailed annual costings contained in the *Cost effective options* paper and focus on calendar year 2009. They are estimated after noting that the original costings were for five calendar years commencing in 2006 with an allowance of 3% per year for cost inflation. One-off program-initiating costs for 2006 are omitted while other start-up (but in-principle recurring) costs for 2006 and any other one-off (but in-principle recurring) costs attributed to a particular year are distributed across the five

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<sup>6</sup> ScOT is an online thesaurus of terms and phrases commonly used in school education. It is a specialist thesaurus specifically to support teachers in an online environment. Its set of terms is agreed across the schooling sector in Australia and New Zealand.

<sup>7</sup> This is to ensure maximum access and to investigate the relevance of current trends internationally to move to this form of licence.

years. The resulting values are for the year 2009-10 and are converted to June 2009 dollars using the GDP deflator (Appendix A).

New digital curriculum resources might be provided by participating jurisdictions contributing digital curriculum resources to the collective pool which is managed by TLF. Any savings on TLF administrative overheads through the reduced scope of the Initiative would be allocated to managing the stronger arrangements needed to oversee the bartering and exchange of digital curriculum resources among jurisdictions. In the absence of a market or ‘efficient-production’ price for some of these resources, these arrangements are likely to be more complex despite the existence of sharing protocols.

## **6.4 Additional activities**

Only three modifications to the costings in the *Cost effective options* paper are suggested:

- Providing access to teacher-developed content and access for student teachers and teacher educators in higher education.
- Allowance for services for maintaining additional content from Phase 3 of the Initiative and any new content procured.
- Maintaining the currency of the existing digital content of the system from Phases 2 and 3 of the Initiative and of new content created in the future.

Potential demand for additional digital content is also discussed.

### **Providing access to teacher-developed content and access for student teachers and teacher educators in higher education**

The *Cost effective options* paper considered teacher-developed content, but not the development of a community of users. Phase 3 of the Initiative funding to support a community of users of TLF resources. The community creates and distributes digital curriculum resources itself that can be characterised as teaching plans that suggest ways in which digital curriculum resources can be utilised. These are clearly both useful in themselves and encourage broader and perhaps more innovative use of other TLF resources.

The Initiative also expanded access to resources through the Scootle website which supports direct access for some teachers as well as for student teachers and teacher educators at universities. These initiatives were not considered in the *Cost effective options paper*.

### **Increasing provision for systems and services for additional and new content**

The number of digital curriculum resources requiring support is substantially greater in 2009 than in 2006. The initial costing of systems to support content management and its distribution was based on the expected 4,000 digital curriculum resources produced during Phase 2 of the Initiative. Support will be required for an expected 8,600 items from Phases 2 and 3 of the Initiative. Additional support will be required for any further digital curriculum resources procured.

The nature of the support has also expanded. The introduction of the *Scoutle* and eContent web sites have brought the Initiative into more direct contact with some teachers, with student teachers and with teacher educators. This expansion was not included in the initial costings.

The costs of the activities listed in Table 4.3 can be expected to increase with the amount of digital content and the use of that content. The cost of Activity 3.1.3, licence renewals, is directly proportional to the number of expected licence renewals and has been calculated on the basis that they will triple. Other costs might be expected to increase less than proportionately to any increase in content, although diminishing cost would be offset by new services, particularly if policies aimed to increase the use of digital material in the classroom succeed. New services through Scoutle would add to the cost. Without any firm basis, other costings for the provision of systems and services for additional and new content has simply been increased by a half. Options that fund further substantial increases in content through TLF increase initial costings by two-thirds.

### **Maintaining the currency of the existing digital content**

The *Cost effective options* paper provides for activities to maintain the systems and services to support the content, but not, seemingly, to fund updating and other revisions for the digital content itself. Digital curriculum resources may lose value for a variety of reasons, including:

- a) *Computer and network specification changes.* Learning objects execute in an environment of computer hardware running particular operating systems and within broader digital education enabling software. As these change, despite efforts to ensure backward comparability, digital curriculum resources may no longer work or may not work as well as they did previously.
- b) *Computer and network potential improves.* The possibilities provided by information technology are constantly increasing. A learning resource that was at the forefront of technological possibilities when it was produced may be superseded by new technology. Although the object itself is unchanged and no less useful, it loses value because better resources are available.
- c) *New digital curriculum resources become available.* New resources such as photographs, film or sound can be discovered or made available through changed licensing or copyright arrangements. Again, although the object is unchanged, its value is less than it might otherwise be.
- d) *The state of knowledge changes.* The knowledge within disciplines such as science, literature, history, economics and geography can change as new theories emerge and disciplines such as law and commerce can change due to changes in the underlying legislative base. A digital curriculum resource that isn't maintained and contains wrong information could be worse than valueless.
- e) *Views about best practice in digital teaching change.* Research might suggest that different approaches to the design and use of learning objects produce better student outcomes. Learning objects designed on earlier principles are less useful than they might otherwise be.
- f) *Curriculum changes.* For TLF, which operates in an environment of nine related curricula, curriculum changes might increase or decrease the relevancy of

learning objects as existing learning objects are re-aligned against new curricula. Changes to curriculum can also render digital curriculum resources obsolete from one year to the next.

Other costs are associated with changes to the content of individual digital curriculum resources that are not directly related to the objects themselves. Indexing or tagging items may be required after updating items so that they can be easily found by teachers.

The extent to which digital curriculum resources lose value is a variant of asset depreciation. Depreciation is likely to be an increasing cost in a project such as the schools on-line curriculum content Initiative as new learning objects are added to the asset base and need to be maintained.

In some cases digital curriculum resources that lose value can continue to be used while in other cases they cannot. Repairing an impaired learning object may be the cheapest approach to providing a replacement impaired learning object—it may not have value for teaching, but it may still retain value as a basis for the production of a replacement learning object.

Accurately estimating the rate of depreciation of TLF learning objects would require a substantial research project beyond the scope of this report. Despite the lack of data, it is important to explore this issue because it is likely that depreciation of the value of learning objects will become an increasing and substantial cost to TLF Initiative—as well as integral to decisions about its future.

The following assumptions are made about the depreciation schedule, the currency of the current learning objects and the rate of depreciation in order to explore the extent of this cost:

- all learning objects are current (that is, at full value) as at 30 June 2009 because of on-going maintenance (which means that any variation in the depreciation schedule can be ignored);
- that the value of TLF's pool of digital content is \$94.8m (in July 2009)<sup>8</sup>;
- that depreciation is 4% per annum;

then the cost of maintaining the learning objects in 2009-10 would be \$3.793m and in each year thereafter (assuming that no new digital content is added to the resource pool).

A depreciation rate of 4% implies a half life for the item pool of 18 years, which given the potentially rapid change in the use of digital content is conservative. On the other hand, as noted above, content that is otherwise inappropriate for use in the classroom may have residual value as a basis from which to construct useful content.

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<sup>8</sup> This is not the amount spent on content. It includes some pro-rating of other expenses, but importantly extrapolates Phase 3 budget expenditure to Phase 2 content. Expenditure is converted to June 2009 equivalent. Phase 3 costs per object are lower than Phase 2 costs and reflect the more recent mix of digital learning resources created and efficiencies in production and procurement.

## Potential need for additional digital content

The policy focus on the role of digital curriculum resources in schools has, if anything, increased in participating jurisdictions since the third phase of the Initiative began. The *Cost effective options* paper, while acknowledging the speculative nature of the estimate, uses international benchmarks to suggest that at least 16,000 learning objects and other resources are required. The gap between the 8,600 expected resources at the end of Phase 3 and this benchmark is substantial.

While there may be need for a greater depth of digital content in the curriculum areas already identified for the Initiative, there may also be need for greater breadth of content. The Initiative has so far not addressed the need for digital curriculum resources for students in Years 11 and 12, in early childhood development or in VET in schools as well as some other curriculum areas.

## 6.5 Modular costings

Table 6.3 presents costings for modules of major activities for the base service year (2009-10). The costings are adapted from the *Cost-effective options paper* and reflect a bias towards cost containment. The following options draw on this table.

**Table 6.3 Modular costs for 2009-10 (June 2009 dollars)**

Modules	\$'000s
A. Activities associated with maintaining the foundations for sharing digital content	
1.1, 1.2, 1.3 Oversight and agreement on sharing protocols	358.0
1.4, 1.5 Quality assurance (variable with amount of new content)	
assume fixed base of 0.1	134.4
assume proportional to value of content at \$232 per \$1000 of content.	
1.6, 1.7 Research and industry development	271.6
Assume that research and development funded at half the rate	
Assume that industry development funding ceases	
B. Activities associated with providing access to content	726.8
C. Maintaining the currency of the existing digital content (4% of \$94.8m)	3.793
D. New digital content (variable, as required)	

Based mainly on *Cost-effective options for online curriculum content beyond June 2006*.

## 6.6 Option 1—Baseline

The sustainable baseline scenario maintains the existing assets created by the Initiative during Phases 2 and 3. It maintains the functions required for sharing new digital content among jurisdictions (but outside TLF itself, because there is no allowance for new content) and on-going access to TLF content by participating jurisdictions. The bulk of expenditure is for maintaining the currency of existing digital content. The total cost is \$5.3m.

The baseline option does not provide funding for the creation of new content, apart from any associated with replacing existing digital content. As well as failing to extend the resources available to meet major policy initiatives, the restriction on new content also imposes a constraint on funding options for the jurisdictions. If there is no provision for new digital content in the budget, participating jurisdictions cannot contribute their own digital content as full or partial in-kind payment for their on-going participation in the Initiative.

There are several implicit more minimalist alternatives to this option, which provide a basis for assessing the value of continuing the Initiative:

- The first alternative is to return all digital content to participating jurisdictions. It would then become the responsibility of jurisdictions to maintain the currency of those parts of the digital content that they found relevant to their own curricula. To the extent that there is overlap of curriculum and judgements about the relevancy of content, jurisdictions will waste resources through duplication of effort. To the extent that costs are higher for jurisdictions acting alone, fewer digital curriculum resources will meet any cost criteria for their maintenance and the pool of digital content will be diminished.

The return of digital content to individual jurisdictions also means that those jurisdictions become responsible for ensuring access to the resources, again with the attendant duplication of effort and higher costs leading to lower levels of service.

- A second alternative is to provide access to the existing digital content, but not maintain it. In this case, the pool of digital content gradually becomes obsolete or more difficult for teachers to access by aligning content with curriculum. Arguments presented earlier in this report suggest that there are advantages to maintaining the currency of the existing digital content, not least of which is the need to underpin current policy initiatives.
- A third minimalist alternative is to remove all funding from the Initiative which, by undermining common protocols for sharing content, would lead to a digital separatism between jurisdictions, the creation of content that was not easily transferable between jurisdictions, higher production costs for multimedia firms and a retreat from the use of ICT in schools.

<b>Activities and costs for Option 1</b>	<b>\$'000s</b>
A. Activities associated with maintaining the foundations for sharing digital content	
1.1, 1.2, 1.3 Oversight and agreement on sharing protocols	358.0
1.4, 1.5 Quality assurance (variable with amount of new content)	
assume fixed base of 0.1	134.4
assume proportional to value of content at \$232 per \$1000 of content.	
1.6, 1.7 Research and industry development	
Assume that research and development funded at half the rate	271.6
Assume that industry development funding ceases	
B. Activities associated with providing access to content. (3.1 to 3.4)	726.8
C. Maintaining the currency of the existing digital content (4% of \$94.8m)	3,793.3
Total	5,284.1

## 6.7 Option 2—Additional content

The baseline Initiative provides no allowance for additional digital content. There are at least two reasons why additional content may be desirable:

- a) Current policy initiatives are likely to increase demand for digital content both in depth (more content in learning areas for which there is already some content) and in breadth (some content in grades and learning areas for which the Initiative has so far provided little content).
- b) If additional digital content is budgeted for in the future, jurisdictions can, with agreement, use their own digital content as full or partial in-kind payment for their participation in the Initiative.

<b>Activities and costs for Options 2a and 2b</b>	<b>2a</b>	<b>2b</b>
	<b>\$'000s</b>	<b>\$'000s</b>
A. Activities associated with maintaining the foundations for sharing digital content		
1.1, 1.2, 1.3 Oversight and agreement on sharing protocols	358.0	358.0
1.4, 1.5 Quality assurance (variable with amount of new content)		
assume fixed base of 0.1	134.4	134.4
assume proportional to value of content at \$232 per \$1000 of content.	429.4	2,104.4
1.6, 1.7 Research and industry development		
Assume that research and development funded at half the rate	271.6	271.6
Assume that industry development funding ceases		
B. Activities associated with providing access to content. (3.1 to 3.4)	726.8	726.8
C. Maintaining the currency of the existing digital content (4% of \$94.8m)	3,793.3	3,793.3
D. New digital content	1,850.9	9,070.5
Total	7,564.4	16,450.0

**Table 6.4 Jurisdictions’ contributions for 2009/10 by option and funding formula (June 2009 dollars)**

	Funding share %	Option 1 \$'000s	Option 2a \$'000s	Option 2b \$'000s
<b><i>Australian Government funding matches states and territories</i></b>				
Australian Govt	50.00	2,642.1	3,782.2	8,225.0
NSW	---	---	---	---
Vic.	18.54	979.5	1,402.2	3,049.4
Qld	14.67	775.3	1,109.8	2,413.5
SA	5.69	300.5	430.2	935.4
WA	7.36	388.8	556.6	1,210.4
Tas	1.79	94.6	135.5	294.6
NT	0.73	38.6	55.3	120.3
ACT	1.22	64.7	92.6	201.3
States & territories	50.00	2,642.1	3,782.2	8,225.0
New Zealand Govt	---	---	---	---
Total	100.00	5,284.1	7,564.4	16,450.0
<b><i>Funding proportionate to original shares for all jurisdictions</i></b>				
Australian Govt	59.88	3,164.1	4,529.6	9,850.3
NSW	---	---	---	---
Vic.	14.87	786.0	1,125.1	2,446.8
Qld	11.77	622.1	890.5	1,936.6
SA	4.56	241.1	345.2	750.6
WA	5.90	312.0	446.6	971.2
Tas	1.44	75.9	108.7	236.4
NT	0.59	31.0	44.4	96.5
ACT	0.98	51.9	74.3	161.5
States & territories	40.12	2,120.0	3,034.8	6,599.7
New Zealand Govt	---	---	---	---
Total	100.00	5,284.1	7,564.4	16,450.0

There is no single answer to the question of how much additional content is required. It is unlikely that any plausible budget could provide too much content. The practical answers to this question are probably opportunistic. The first consideration is the level of funding already discussed in other papers and the second is the amount that would provide sufficient flexibility for any jurisdiction that wishes to make in-kind contributions to the Initiative.

The paper *Sustainable national digital curriculum resource supply for schools* discusses two overall levels of funding for the Initiative—\$7,564,369 (Option 2a), which is a minimum proposal and followed an earlier paper that proposed a budget of \$16.45m (Option 2b). The corresponding costings are shown below. The additional

costs of quality assurance of new content mean that the value of new content is not simply the gap between these amounts and the budget for option 1.

Both values for new content in Options 2a and 2b are substantially less than the corresponding values in Phases 2 or 3 of the Initiative and the total budgets are correspondingly less. They therefore both satisfy the requirement that overall funding for the Initiative be reduced.

Option 2b provides more flexibility to jurisdictions in terms of payment in-kind than option 2a. Subject to the way in which individual jurisdictions wish to contribute to the Initiative, Option 2a may not allow sufficient flexibility. There are clearly many possibilities between Options 2a and 2b.

## **6.8 The contributions of jurisdictions**

Table 6.4 shows the contributions of the jurisdictions in 2009/10 for the three funding options discussed above and under two funding arrangements. In the first formula, only participating states and territories increase their share of funding for the Initiative to compensate for the absence of New South Wales while in the second formula, all jurisdictions increase their contribution proportionately. The level contribution will be reduced to the extent that the New Zealand Government or the New South Wales Government participates in future funding.

## Appendix 1: Price indices

Prices in this report are in June 2009 dollars. Nominal prices have been converted to June 2009 dollars using the Non-farm GDP deflator (ABS, *Australian System of National Accounts*, 5204.0, Table 26: Selected Analytical Series). Income and expenditure estimates for the Initiative are variously for the years 2001-02 to 2008-09. The real value of nominal dollars has changed substantially over this period and it is important when aggregating or comparing income and expenditure to standardise nominal values to a common real value. Expressing value in June 2009 dollars is convenient since this is the start of the next phase of the Initiative.

GDP is the gross domestic product, that is, the total value of all final goods and services produced within Australia during a specified period. The non-farm GDP deflator is a measure of the change in prices of all new, domestically produced, final goods and services in Australia. Farm production is excluded because of the volatility of agricultural prices.

The non-farm GDP deflator has been used as the price index in this report to be consistent with the Australian Government Treasury, which uses it as the price index in the budget papers. It could be argued that other measures, such as the wage price index and the consumer price index, might be more appropriate, especially given the apparent influence of high non-farm commodity prices on forecasts of the non-farm GDP deflator for 2008-09.

**Table A1 Non-farm GDP deflator and CPI All groups Australia, 2000-2009**

Year	Non-farm GDP deflator		CPI All groups Australia	
	Index	% change	Index	%change
2000	80.1	2.04	126.2	3.19
2001	83.7	4.49	133.8	6.02
2002	85.7	2.39	137.6	2.84
2003	88.3	3.03	141.3	2.69
2004	91.8	3.96	144.8	2.48
2005	95.4	3.92	148.4	2.49
2006	100.0	4.82	154.3	3.98
2007	104.8	4.80	157.5	2.07
2008	109.0	4.00	164.6	4.51
2009	115.8	6.25	170.4	3.50

Source: ABS, *Australian System of National Accounts*, 5204.0, Table 26: Selected Analytical Series and ABS, *Consumer price index, Australia*, 6401.0, Table 1, All groups, Australia. Values for the Non-farm GDP deflator for 2008 and 2009 and CPI for 2009 are estimates and forecasts from the Department of Treasury, *Budget 2008-09 Statement 2: Economic Outlook*, Table 1 Domestic economic forecasts.

Values for the GDP deflator were only available to June 2007 at the time of preparation of the report. The 2008 and 2009 values are taken from Australian Government Treasury estimates and forecasts for the 2008-09 budget. The values for the non-farm GDP deflator and the Consumer Price Index are shown in Table A1. Subsequent economic changes during 2008-09 may result in lower than anticipated growth in inflation and GDP. The overall effect on estimates is likely to be small because it affects only one year in a series. Further, the effect of a lower than estimated growth in GDP in 2008-09 on estimates of returns to the Initiative will be negligible because both costs and benefits will be affected in the same direction.

Where information about income or expenditure is only available for Phase 2 or Phase 3 as a whole, the amounts are indexed to the midpoint of each phase—the average of 2003 and 2004 for Phase 2 and the average of 2007 and 2008 for Phase 3. Standardising prices to a future year rather than a prior year means that the price deflator acts as a price inflator. Phase 2 values are increased by 28.6% while Phase 3 values are increased by 8.3% to convert them to June 2009 dollars.

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