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Can online learning be scaled using a frugal approach?

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Abstract

Online learning need not be costly for learners and institutions. This reflective paper analyses four case studies from the Commonwealth of Learning to show the low cost of online learning, adopting a frugal approach and following the basic foundations of distance learning in developing courses as learner-centered, especially in the context of professional development at scale. The cost and platform data analysis for the case studies reveals that the courses adopting asynchronous learning and only learner-content interaction produce the lowest cost per enrollment and completion, with a high completion rate (66.7%). The frugal approach to course development, using available open educational resources and very low overhead costs, also contributes to the cost structures. While the content development cost differs across the four examples, the asynchronous course with a high completion rate also had the highest investments with 63.65% cost. Asynchronous online learning also resulted in a 350% return on investment. The paper presents important lessons for capacity building at scale at national and institutional levels, including for the works of international agencies promoting online learning.

Keywords

cost analysis; distance learning; online learning; learning platforms; teacher professional development; Commonwealth of Learning

1 Introduction

Providing access to quality educational opportunities at scale has been a longstanding problem for governments around the world, especially in the low and middle-income countries of the Commonwealth. Recognizing this problem, the Commonwealth Heads of Governments established the Commonwealth of Learning (COL) to promote distance education, which has been popular largely due to its "economies of scale" (Rumble, 2003). Economies of scale imply that the cost of reaching additional learners reduces as more learners are enrolled in a programme of study. Of course, the average cost of reaching more learners stabilizes after a certain enrollment level, and economies of scale cannot be expected to be significant (Pillai & Naidu, 1991). Sir John Daniel (2005) emphasized that distance and online learning could break the nexus of high cost, quality, and low access – the "iron triangle" of education by providing equally high-quality education with wider access at low cost. Research also shows "no significant difference" in the learning outcomes of distance learning courses compared to face-to-face education (Russell, 1999). More recent meta-analyses show positive outcomes for online learning, indicating that students in online learning conditions perform better (Borokhovski et al., 2022; Means et al., 2013). Borokhovski et al. (2022) also highlighted that the costs of setting up an effective online learning environment could be significant. Therefore, spending on online learning must be considered a long-term investment to achieve economies of scale.

Research on the costing of distance and online learning is generally limited. First, collecting cost data is challenging; and second, institutions are reluctant to share cost information due to a competitive business environment. However, cost information is essential to advocate for distance and online learning. In this context, this reflective paper focuses on the cost analysis of various online platforms and courses offered by COL to support advocacy and policy development with reference to online learning.

2 Literature review

One of the earliest cost analysis studies on distance education at the Indira Gandhi National Open University (IGNOU) indicated that the average cost per learner reduced with the increase in enrollment up to a certain point (Pillai & Naidu, 1991). A follow-up study indicated that IGNOU's cost per student is 57% less than its conventional counterparts (Pillai & Naidu,1997). A comparative cost analysis of open schooling in India and Namibia (Rumble & Kaul, 2007) revealed that the cost of educating a child at the National Institute of Open Schooling was less than 10% of the cost of educating a child in conventional school. Similarly, the Namibian College of Open Learning's cost was less than 25% compared to conventional schools. Jung and Leem (2000) reported that the completion rate of students in online education was 93.1% as compared to 55.2% in traditional television and textbook courses (cited in Jung, 2003). The cost per enrolled student in online learning is approximately 43% of the face-to-face training, and the cost per completed student is approximately 56% of the face-to-face training (Jung, 2005). Rumble (2014) emphasized that while open and distance learning offers cost-efficiency in terms of cost per learner enrolled, the same level of cost advantages is not available for cost per graduate.

A Russian study on online learning in science, technology, engineering, and mathematics (STEM) education found that compared to instructor compensation, online instruction lowers the cost by around 80% (Chirikov et al., 2020), leading to the scaling of STEM education. A cost analysis of web-based learning at the Bell Online Institute revealed that web-based training has higher fixed

costs than classroom training. However, the higher course development costs are offset by lower variable costs in course delivery (Whalen & Wright, 1999).

With the use of the Internet in teaching and learning, Hülsmann (2016) proposed considering three different models of ICT use in distance education while analyzing costs: (i) Type-i applications, where teaching and learning are done only through digital resources covering student-content interaction, and there is no additional cost associated with delivery other than the digital content; (ii) Type-c applications where along with digital resources, technology also supports the communication bridge between student and teachers; and (iii) Type i/c applications that combine both. A meta-analysis by Bernard et al. (2009) found that student-content interaction provides a better achievement advantage over student-teacher interaction, indicating a preference for type-i applications. Moore and Thompson (1997) found that cost-effectiveness depends more on rapid technological change and their evolving costs. Rumble (2003) also emphasized that the technology used in distance education delivery and the practice of using the technology has the biggest impact on the costs. Jung (2003, p.721) summarized the factors affecting the cost of online education:

- Number of students in a course
- Number of courses offered
- Amount of multimedia components in online courses
- Amount of instructor-led interaction
- Type of online education platforms
- Choice of synchronous versus asynchronous online interaction
- Completion rate

Inglis (2003) highlighted that cost comparisons are challenging, as the cost of operation varies significantly in different countries. The cost of technologies varies, too, along with exchange rate fluctuations. Further, cost varies due to different delivery methods used in a particular context.

There are also hidden costs, which are sometimes difficult to record and account for while costing online education (Inglis, 2003). Bacsich et al. (1999) categorized such hidden costs into three groups: institutional costs, costs to staff, and costs to students (Cited in Inglis, 2003). For example, the cost of communication and access to online learning via the Internet and the associated costs are now considered costs to students and not usually considered in cost analysis. A study on the online learning costs in the USA reported that colleges are charging lower prices for online coursework, and the advances in online learning could "bend the cost curve" (Deming et al., 2015). Also, determining the cost of online learning is essential to determine if it is appropriate for a particular organization (Bartley & Golek, 2004).

3 A frugal approach to online learning: Four cases from COL

As a pioneer in open and distance learning, COL is an institutional capacity builder. It supports educational institutions throughout the Commonwealth in systematically adopting distance and online learning. While policy development and capacity building at the institutional level are important activities, COL has also been offering online courses for the professional development of teachers in partner institutions. These courses provide an example of what it preaches to other institutions. COL also serves as the testbed for new ideas before an innovation can be scaled at many educational institutions. It may be noted that COL is funded through voluntary contributions of the member governments. Thus, the courses offered by COL are available free of cost to anyone. There is no revenue earned by COL from the courses and activities offered. All

COL courses are non-credit and offered for professional development of teachers in the Commonwealth countries.

The data presented in this paper are carefully collected from the records maintained by COL over some time as part of its ongoing monitoring and evaluation of activities. Four specific online learning applications from COL are presented as frugal examples of different models of online learning with different cost implications. We also use the data collected from online platforms to analyze the findings. All data were captured in early February 2025. The cases presented are:

- *COLcommons* (https://colcommons.org/): It is a short, just-in-time online learning platform with over 42,000 registered users and 13 short courses of 2-5 hours duration. The courses are delivered in the "tell and test" model (Lockwood, 1998) with only learner-content interaction (Moore, 1989). By February 2025, 23,832 unique learners had completed at least one course, and overall, the course enrollment was at 46,546, with 31,086 certificates issued.
- *Commonwealth Digital Education Leadership Training in Action* (C-DELTA) (https://cdelta.col.org/): C-DELTA is a self-learning platform for teachers and students in secondary schools, and beyond. There are seven modules, of which students take only three, and teachers take all to receive a certificate. Upon registration on the platform, the users go through a pre-test to ascertain their current level of understanding about digital education leadership. Based on the scores on the platform, they are guided to the modules as per their user category. The content is interactive with video and quizzes and has been prepared to promote self-learning. For each module, the participants receive badges for completion. By early February 2025, there were over 39,000 users (28,399 students and 11,195 teachers). Of these 13, 294 students and 5,548 teachers had completed C-DELTA. The C-DELTA platform has been used to support teachers' capacities to integrate information and communication technologies (ICT) in teaching and preparing 21st-century learners. As such, COL also works with governments and educational institutions to promote the use of the platform, as per requirements, and to support COL's work on ICT in education at the national level. In institutions where COL works directly to implement C-DELTA, trained master trainers provide additional support to learners where needed.
- *Massive Open Online Course* (MOOC) on Social Media Marketing (https://www.mooc4dev.org/ISMM3): COL has been offering MOOCs on various topics in collaboration with educational institutions and experts. One such MOOC was on social media marketing, which was offered three times between 2021 and 2023. COL hosted a MOOC management software developed at the Indian Institute of Technology, Kanpur (named MooKIT), using Amazon Web Service to offer the course. There were 7,843 enrollments in the three instances, and 832 participants successfully completed the 25-hour course. The pedagogical approach adopted was a typical x-MOOC, where the lessons are offered weekly with video, quizzes, and discussion forums. However, interactive Zoom sessions were also provided in the second and third instance of the MOOC. Teaching assistants provided moderation in the discussion forums and also evaluated the final assignment in the course.
- *Moodle courses*: Moodle learning management system is used at COL to offer online and blended learning experiences. In this paper, two Moodle courses offered on COL virtual learning environment (https://tell.colvee.org/) are used for analysis. One developed during the COVID-19 pandemic using an openly licensed book available on BCcampus. The original author also created 12 videos free of cost for the course recorded via Zoom during the Pandemic. This open course is available for self-enrollment, and by February

2025, there were 565 enrollments and 279 completions. The adapted course from BCcampus has video and quizzes as activity. Learners have to compete and mark each of the pages/tasks to receive a final set of quiz questions. Achieving 80% in this test allows the learner to download the certificate of completion. The second course was developed at the request of a Commonwealth country and offered to teachers in that country. The course duration was five weeks, and each week there was one Zoom session for the participants to interact with the facilitators/instructors. The course includes videos and quizzes, apart from reading materials. Participants had to complete one end-of-course assessment to be reviewed by the instructors to finally receive a certificate of completion. This course can be further offered to other countries or converted into a self-enrolled course.

There are limitations related to this reflection that should be borne in mind. COL is not a traditional course provider like academic institutions. Hence, it primarily outsources the activities related to course development and platform maintenance while keeping the task of instructional design and quality assurance internally under the direct control and supervision of one professional staff with multiple responsibilities. Therefore, for costing, the overhead has been calculated at a notional level of 10% of the total cost for all activities related to the case. The cost analysis also does not follow the total cost calculation based on a combination of fixed and variable costs divided by the number of students. Instead, all the cost heads are considered fixed costs due to the nature of the courses and the organizational context. The models of online learning used are different in different institutions. In this context of the paper, online learning refers to the involvement of an online network which a learner needs in order to access the learning materials and assessment activities.

4 Cost structures of the four cases

The four cases are presented below to demonstrate the cost structures.

4.1 Case 1: COLcommons

The COL Commons platform has 13 short courses with 46,546 enrollments, and 31,086 completion certificates have been issued. This indicates a completion rate of 66.7%. Based on the total cost of the platform, and number of courses available, the average cost of developing a course is CAD 21,720, and the course development cost is 63.65% of the total cost. As indicated in Table 1, cost structure includes three components: (i) cost associated with platform development and maintenance, (ii) course development, and (iii) administration cost. The cost for content development includes payments for the experts, the conversion of the content into HTML5 interactive version, and accessibility testing. Development of the interactive HTML5 courses covers 36% of the costs (Table 1). Considering that the platform offers self-learning courses with no teacher-student or student-student interaction, all the cost heads can be treated as fixed costs. Accordingly, the cost per enrollment is CAD 9.53, and the cost per certificate of completion is CAD 14.27.

Table 1: ***Cost structure of COLcommons***

Cost heads	Cost in CAD	Percentage
Content preparation (Expert)	98,110	22.12
Online course development	159,033	35.85
Accessibility	25,212	5.68
Platform Development	50,530	11.39
Maintenance (including evaluation)	57,125	12.88
Administration (10% of Content, platform and maintenance cost)	40,325	9.09
Total	443,575	100
Cost per enrollment (46,546)	9.53	
Cost per completion (31,086)	14.27	
Average cost per course	21,720	

Table 2 indicates the value users assign to courses on the COLcommons platform. Course participants receive a survey on the completion of a course. The data collected on the platform from 2,412 users indicate that 43.53% would like to value the course at CAD 50, followed by 20.27% at CAD 100 and 14.68% at CAD 75. Only 4.6% preferred not to assign a dollar value to the courses they took. The average value of the courses on COLcommons based on the data presented in Table 2 is CAD 80. A previous evaluation of a free online course offered by COL revealed that participants are willing to pay an average of USD 85 for the course (Panda, 2019). Extrapolating the average value assigned by the users to the total completed learners comes to benefits of CAD 2,486,880, and if we use the modal value of CAD50, the total benefit of the platform comes to CAD 1,554,300. Considering the latter as a conservative estimate, the return on investment (ROI) is about 350%, which is also similar to the findings of Panda (2019) at an ROI of 354%.

Table 2: ***Value of COLcommons courses***

Value in CAD	Frequency	Percentage
0	111	4.60
50	1050	43.53
75	354	14.68
100	489	20.27
125	118	4.89
150	143	5.93
175	41	1.70
200	106	4.39
	2412	100

4.2 Case 2: C-DELTA

The development of C-DELTA content and platform started with extensive consultation and research. Also, it has an implementation model where COL offers training of trainers' (TOT) workshops (either online or face-to-face) in collaboration with institutions or the Ministry of Education in Commonwealth countries. As such, 43.53% of the cost has been invested in such TOTs, probably contributing to the 47.5% completion rate. The cost per enrollment on C-DELTA is CAD17.25, while the cost per completion is CAD 36.25 (Table 3). The students on the platform

take three modules compared to the teachers, who take seven modules to complete and receive a certificate. Therefore, cost-per-module analysis shows better efficiency with just CAD 4.18 per module enrolled and CAD 8.68 per module completed. Considering that there are seven modules on the platform, the average cost of developing a module was CAD20,026, which includes the C-DELTA design consultation cost, payments to experts for content development, and online course development. The country-level engagements for TOTs were held largely face-to-face with some online training, covering 1,714 teachers. This leads to CAD 173.43 as the cost per teacher trained in-country.

Table 3: ***Cost structure of C-DELTA***

Cost head	Cost in CAD	Percentage
Content development (Expert)	105,500	15.45
C-DELTA design consultation (Cape Town)	15,726	2.30
Online course development	18,959	2.78
Platform development	71,422	10.46
Platform TOT workshop (Delhi)	45,794	6.71
Maintenance (including pilot testing and evaluation)	93,218	13.65
Administration (10% of Content, platform and maintenance cost)	35,062	5.13
Total platform related costs	385,681	56.47
Country level engagements (TOTs)	297,261	43.53
Grand total	682,942	100
Cost per enrollment (39,594)	17.25	
Cost per completion (18,842)	36.25	
Average cost per module	20,026	
Cost per module enrolled (163,562)	4.18	
Cost per module completed (78,718)	8.68	
Cost per teacher trained in TOTs (1,714)	173.43	

4.3 Case 3: MOOC

The introduction to social media marketing was offered with the support of an expert and several teaching assistants in three cohorts with a total enrollment of 7,843. In the course, we also used the concept of "active learners" articulated by Ostashewski and Cleveland-Innes (2022), defined as those who have signed into the course space at least once. Thus, the completion in the MOOC calculated based on active learners is 18%, the cost per active enrollment is CAD 7.83 (in contrast to the cost per enrollment at CAD 4.63), and the cost per completion is CAD 43.63. The cost of developing the course (including the reading materials and videos) was 49.45% of the total cost at CAD 17,950, while the delivery cost was 41.46% (Table 4). This delivery cost is a variable cost and would change based on engaging more teaching assistants. However, this was considered a fixed cost in our analysis, as we have not changed the number of teaching assistants based on the number of participants in the MOOC.

Table 4: ***Cost structure of MOOC***

Cost head	Cost in CAD	Percentage
Content development (Experts)	8,950	24.66
Video development	9,000	24.79
Subject expert (course delivery)	10,050	27.69
Teaching assistants	5,000	13.77
Overhead cost (10% of above costs)	3,300	9.09
Total Cost	36,300	100
Cost per enrollment (7,843)	4.63	
Cost per active enrollment (4,613)	7.87	
Cost per completion (832)	43.63	

4.4 Case 4: Moodle courses

The development and delivery of the two Moodle courses presented in Table 5 followed two different paths. Course 1 was developed on the basis of an already available open educational resource (OER), and the content expert offered free services to record the videos during the Pandemic. This course is available for self-enrollment at any time, while Course 2 was developed for a small group of participants with the possibility of reusing the course again. The Moodle platform currently has 60 courses; therefore, the platform maintenance cost was calculated as the average of the total platform maintenance cost over the years. The data in Table 5 shows some interesting results. The cost per enrollment in Course 1 is CAD 18.26, and the cost per completion is CAD 36.98, with a completion rate of 49.3%. The cost per enrollment and completion of Course 2 are high at CAD 325.04 and CAD 1,075.12, respectively. It may be noted that, as of now, Course 2 has only one cohort and the cost structure may change based on future cohorts, their enrollments and completion.

Table 5: ***Cost structure of COL Moodle courses***

Cost head	Cost in CAD	Percentage
Course 1		
Content development (OER)	0	0
Online course development	8,974	86.97
Moodle platform cost (Average)	406	3.93
Overhead cost (10% of above costs)	938	9.09
Total	10,318	100
Cost per enrollment (565)	18.26	
Cost per completion (279)	36.98	
Course 2		
Content development	5,740	41.07
Online delivery	6,560	46.94
Moodle platform cost (Average)	406	2.90
Overhead cost (10% of above costs)	1,270.6	9.09
Total	13,976.6	100
Cost per enrollment (43)	325.04	
Cost per completion (13)	1,075.12	

5 Discussion

The characteristics of the course contribute to the cost structure. The cost of course development also varies due to the nature of the course and the expected seat time for the course. For example, the COLcommons courses are around 2-5 hours, while the other courses require around 25 hours' seat time to complete. Also, the interactive nature of the course and the use of OER have contributed to the low cost of course development in the examples discussed in the paper. The cost of course development (Table 6) provides an indicative cost for developing new courses. It may help institutions plan full graduate-level courses for online delivery using the costs in the paper as a useful benchmark. The interaction model also plays a critical role in the cost structure. Table 6 also indicates that the cost per learner enrolled is low in all cases (except the Moodle Course 2) due to the open nature of the course and large enrollment. These courses are also free for the learners/users to register. Considering that many register for free courses and then never invest the time required to complete the course, the cost per completion provides a better indicator of the value of the course and cost-efficiency. Also, the cost per learner is low for open courses, where the learners can enroll anytime and complete the course according to his/her convenience. The asynchronous nature of the course also helps with higher completion. This is in line with the findings of Bernard et al. (2009) that student-content interaction provides a better achievement advantage. For the Moodle Course 2, which is instructor-led, it shows a relatively low completion rate (30%), and thus a higher cost per completion. While the course is free of cost and the participants have self-nominated themselves to enroll, the completion rate is low due to the lack of submission of the final assignment for assessment on time. This is usually a problem for cohort-based courses with fixed schedules, and completion rate could also be influenced by intention to complete (Celik & Cagiltay, 2024).

Table 6: ***Comparison of costs (in CAD)***

	COLcommons	**C-DELTA**	**MOOC**	**Moodle (Course 1)**	**Moodle (Course 2)**
Average cost per Course/Module	21,720	20,026	17,950	10,974	5,740
Cost per enrollment	9.53	17.25	7.87	18.26	325.04
Cost per completion	14.27	36.25	43.63	36.98	1,075.12
Completion rate	66.7%	47.5%	18%	49.3%	30%

These four cases of COL provide lessons on how to scale online learning. Cost is a significant factor in government and educational institutions' adoption of digital learning. The right online learning model could provide greater awareness and capacity building of teachers at scale and at low cost worldwide. Therefore, while considering capacity building at scale, a self-learning model (often also adopted by the MOOC providers) may be the best approach. The quality of learner-content interaction and the quality of the content are also critical factors for the completion of the courses (Xiao, 2017). Short courses have better chances of completion by those who are often busy in work and family environments. The open enrollment also supports the "long-tail" theory on the Internet (Anderson, 2004). If a platform has many products and is available for a longer time, the cumulative use of the products in low demand could be more than the product with the most demand over time. When open courses are available for registration at any time, they will have more enrollment and completion, reducing the cost per enrollment or

completion. This also has significance for paid courses, not just free courses like the ones provided by COL. Educational institutions can leverage the use of asynchronous online courses to generate revenue over a period of time.

The cost analysis also identified several key elements in calculating costs. For example, the cost of access to the learning platform has become the responsibility of the learners. In an institutional context, this becomes a crucial factor, and therefore, the choice of technology and the platform must consider the nature of access available to the stakeholder and accordingly design the platform and develop the courses. This is important in the context of providing quality education for all using a technology-mediated open platform, where students have challenges due to poor affordability of technology (Xiao, 2023). As access to mobile and smartphones continues to grow worldwide, a mobile-first approach could be useful to increase the use of courses and investments in online learning.

The cost of hosting the platforms, including Moodle or any other platform like COLcommons and C-DELTA, would require additional costs. However, this may be too small to significantly impact the cost structure of online learning. As the platform scales to more learners and with an increase in bandwidth usage, the cost of the back-end hosting may go up, and this is something that needs to be monitored while offering online learning.

In the early cost analysis studies, the common findings indicated that having more courses has implications for increasing costs, especially in institutional contexts (Inglis, 2003; Jung, 2003; Pillai & Naidu, 1997). This may not be the case in an online world, especially when the courses have open-ended enrollment. The availability of online courses for any time enrollment could increase revenue and may also lead to stackable micro-credentials (McGreal & Olcott, 2022; Mishra, 2024).

The ROI data on COLcommons at 350% and more indicates the power of asynchronous online learning. Though the ROI calculated was based on the reported willingness of the users, it provides evidence of scaling online learning at reduced cost and high accrued benefits. A similar approach was reported by Taplin et al. (2013) blended learning in an Australian University, and the authors indicated that 42% of students were willing to pay $50 to download iLectures. They emphasized that educational institutions could use such an approach to calculate the optimum value for a course. In this study, the ROI clearly indicates the platform's value to the stakeholders.

The four COL cases also have implications for multilateral agencies like UNESCO and others that focus on scaling teacher professional development and improving the quality of education. In the Transforming Education Summit, the United Nations (2022) emphasized promoting digital learning platforms for the public good. Such digital learning platforms could leverage the cost advantage of asynchronous online learning to improve teacher competencies and effectiveness.

6 Conclusion

The paper reflects on a frugal approach adopted by COL in delivering online learning during the Pandemic and beyond using custom-built platforms, learning management systems, and MOOCs. While each of these interventions to support educational institutions and the government was designed as purpose-focused, the choice of technology and design of the system adopted a frugal approach to focus on the minimum requirements and financial investments. The results presented in the case studies show that the highest cost-efficiency comes from asynchronous online learning. The cost of developing an online course also depends on the

availability and integration of OER, as well as fewer teacher-learner interactions and more learner-content interactions built into the courses. The investment in such courses is over 60% of the total cost, though the cost is also a function of the length of the learning time. The ROI value of 350% also indicates the cost-benefit accrued due to the COLcommons platform. The study has some limitations related to the assumptions about the nature of the courses and the cost analysis considerations based only on fixed costs. While the lessons in this paper are helpful for asynchronous online learning, organizations and governments planning to adopt online learning may focus on the costs associated with learners' platform access and the bandwidth costs for the institutions to provide learning opportunities at scale. They will also accrue more benefits by considering the courses offered as stackable micro-credentials. Cost analysis of online learning needs more research studies. Online learning providers must undertake action research projects to share data on cost-analysis to help better understand the underlying cost structure. Beyond cost analysis, institutions may also consider research from the perspective of cost-effectiveness and ROI using actual institutional revenue earned. We need more cost studies to understand the economics of online learning.

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Data Availability

The author confirms that the data supporting the reflective analysis are available within the article.

Ethics and Consent

This study does not involve the use of human or animal subjects, and no confidential institutional information has been included.

Competing Interests

The author of this paper works at the Commonwealth of Learning and manages the online learning projects discussed in this paper.

The views expressed are those of the author, and not necessarily those of his employer.