PRIMARY RESEARCH

A study on the design/development time of e-learning projects in New Zealand

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Abstract. This is an exploratory descriptive research study undertaken to explore "What is the time and cost to make one hour of E-learning in New Zealand?" It seeks to investigate the time and cost involved in the development of one hour of E-learning in tertiary and corporate E-learning in NZ. Also, it seeks to establish any changes occurring in training and development and to determine the dynamics influencing the strategies and policies of those responsible for employee development. The study employed a web-survey delivered through e-mail. The survey questionnaire was sent to 200 E-learning development professionals in different industries. The return rate was 32%. The data were analysed using statistical analysis using pivot tables, Cronbach's alpha, correlation and descriptive statistics. The findings imply that E-learning is not just a carrier for cutting costs and diminishing the learning options but, the needs of the learners and the business must take priority and shape our thinking as we consider the investment options for using technology to create a quality learning experience.

INTRODUCTION

Dabner *et al.* (2010), in a Ulearn 2010 conference, emphasized the need for transformation in education to meet the needs of the industrial society, that no longer exists. As today's economy is rapidly changing, it demands employees to adapt quickly, work efficiently and creatively and to think critically in this technology-rich world. New Zealand companies are striving to provide 'anytime, 'anywhere' learning to remain competitive in the global marketplace (Daniel 1996; Katz 1999). However Crump and Andrea (2003) argue that despite the encouraging trend in E-learning, the digital divide remains in New Zealand (New Zealand Ministry of Economic Development, 2001).

Learning 'using' technologies has become a global phenomenon (Gulati, 2008). E-learning offers many advantages and hence, there is more inclination of companies and educational institutes towards adopting E-learning. The increased investment in the E-learning has brought the need to demonstrate the cost-efficiency of the investments with respect to time taken to develop the training. Bates (2000, 8) writes that the pressure to change training in higher education will occur because of three factors: "the need to do more with less, the changing needs of society, and the impact of new technologies on teaching, learning, and research".

Overview of Issues

An executive summary by Higgins and Prebble (2008) mentions the need for chief executives of companies to ask the question "How much will it cost to resource E-learning within the organization?" Also, an E-learning developer consultant Tucker (2014) on a word press on E-learning development blog mentions, "One skill I'm constantly trying to improve is estimating how long it will take to complete a project." Further continuing she mentions, "If I don't, I either bid low and lose money or bid high and lose a project." Hence, there exists a dire necessity in E-learning development industry to quantify the time and costs involved in E-learning development. Siegel (2013) from icon logic blog writes, "One of the more common questions that I get from new E-learning developers is how much time it will take to produce published content."

Purpose of Study

The main aim of this study was to assess the average E-learning product development time and costs in a New Zealand context. The data from this study will be a useful source of reference for those who are planning to embark on E-learning projects, be they for in-house consumption or servicing external vendors/clients. Strategic decisions around E-learning are likely to be affected by unpredictable factors such as learning and development, department size, budget and learner numbers. Therefore, this study will statistically account for the impact of these random factors in evaluating E-learning development time and cost. Estimating the cost of online learning is an essential component in the decision whether moving training to an online format is appropriate for a particular training situation (Bartley and Jennifer, 2004; Tarmuchi *et al.,* 2015; Si and Priyanwada, 2016; Nuchso *et al.,* 2016). This study will try to address that issue by surveying commercial E-learning practitioners regarding current and typical online learning development time. The aim is to assist L & D practitioners to estimate a budget for undertaking E-learning projects or compare their current expenditure against industry norms. This study will be significant as it is the first of its kind conducted within a New Zealand context and the findings of this study will be of valuable help to L & D and E-learning leaders and practitioners in the corporate industries.

RESEARCH METHODOLOGY
Survey Instrument

The survey (Appendix A) was made available through a web link: (goo.gl/HbuVZe). The questions were developed from the adaption of the items in Chapman (2010) 6 questionnaire with additional questions based on similar studies (Garg, 2010). Additions, modification, and deletions were made through collaboration with subject matter experts.

According to Dillman (2000) the survey items must be written to be respondent-friendly and to extract the desired information. He emphasizes that the survey must be simple, use a simple wording, consist of short questions, and aim for short responses. Dillman *et al.* (1999) also suggest that questions should draw the respondent in and motivate him or her to respond to the survey. Open-ended questions early in the survey draw the respondent in and encourage buy-in. Dillman *et al.* (1999) state that questions should be specific and be written with the assumption that the respondents know less about the subject than they actually may know.

Strengths of online surveys were that they are inexpensive, have a rapid turnaround for data collection, and the data entry is easy, if not automatic a few of the weaknesses were also taken into consideration such as need valid e-mail address and respondent needs access to a computer, respondent needs to be computer literate and frequently overused

questions. Questions were designed so specific that the respondents did not have to make unnecessary calculations. The questions were developed to avoid any double standards or bias. In the survey, both open-ended and closed-ended questions were selected depending on the response expected. If standard yes or no type answers were expected, closed-ended questions were asked. For example question 10 asked, "Are the E-learning products you create, used internally by your organization's employees or external customers/clients?" For open-ended questions ordered questions and unordered questions with hybrid questions were also asked which led the survey respondent to write comments to clarify the question in detail. The survey developed for this study consisted of 17 major questions. The closed questions were designed to elicit specific answers. The open-ended questions allowed the respondents to answer a broad question about the clarification of roles or type of interactivity used in the E-learning. Some of the questions asked the respondent to select one response. Some questions provided respondents with a list of responses and requested they check all that apply. The closed questions were the demographic questions, which asked for information about the no. of hours worked, the size of the industry, the type of the industry, the institution's budget (and the proportion of the budget from state sources), the percentage out of the annual budget allocated to E-learning development, etc.

Pretesting

Litwin (1995) suggests that pretesting can help eliminate many errors, and makes the survey more reliable. Hence, before the survey was conscripted, pretesting was carried out by E-learning knowledgeable professionals to confirm that respondents produce valid responses for the survey. Pretesting by subject experts included reading the questions as intended, to highlight poorly worded questions, ensure clear instructions and the determined amount of time needed. It confirmed the following: right type of questions is asked, i.e. Open-ended vs. close-ended, number of questions asked and response options were professional. Fowler's standards for questions development were considered; they include consistent understanding and consistent administration format, to ensure that respondents knew what answer formats are acceptable and expected, answerable question so that everyone is willing to answer each question for the necessary applicability, or it can be unknown (Fowler, 2002).

Data Collection

The researchers chose to collect data electronically for reasons found in the literature on using e-mail to distribute a survey. Compared to mailed surveys, research indicates respondents are more apt to respond, respond more openly, and provide longer answers to open-ended questions when using an Internet survey (Dillman, 1998; Grover, 2003; Mehta and Eugene, 1995; Shafer and Don, 1998; Bachmann *et al.,* 1996).

RESULTS

This section will present the key results question-wise for the survey items. They are described in the following table:

Categories of E-learning development according to learning objective, Course Type and Level of multimedia used in E-learning projects.

Of the 200 contacts for participation in the survey, 64 companies responded to the survey from all over New Zealand.

TABLE 1 . Learning objectives explained

Learning Objective	1- Recall of facts and information	2 - Application of learned skills (cognitive, process or procedural)	3 - Analysis and Synthesis of skills and information	0 – Other Blended Level 1, 2 and 3
	(e.g. Presentation of company policies, job descriptions and objectives, details of protocols, strategies or processes)	(e.g. How to use a software application, repair a car engine, apply an outlined process, find and use information to solve a problem scenario)	(e.g. How to change tact in a business meeting, how to be a better manager, how to solve a complex problem, diagnose a patient)	

TABLE 2 . Course type explained

Course Type	1 - Presentation	2 - Interactive Scenarios	3 - Games/Simulations	0 – Other
	(Built using PowerPoint, SlideShark etc.)	(Built using software such as Lectora, Captivate, ToolBook, TrainerSoft, Articulate, etc.)	(Built using coding languages such as C++, Java, HMTL5, etc.; possible use of avatar characters, custom interactions, etc.)	Blended Level 1, 2 and 3

TABLE 5 . Results of data by course type; Question 14

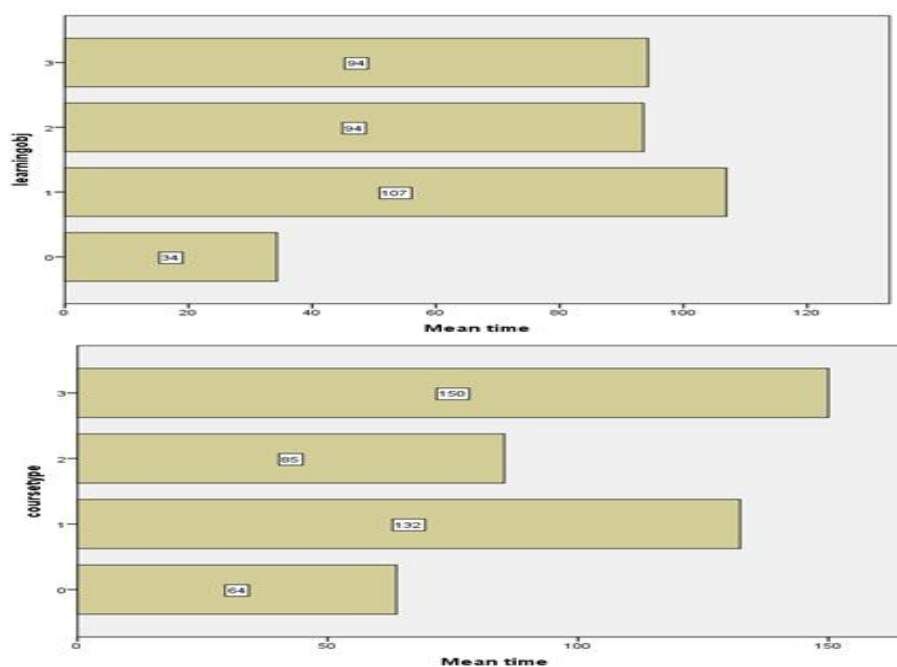| Row Labels	participants	Sum of 3 How many employees work for your entire organization- Nationally	Average of 16) Considering a typical E- learning project of your organization, estimate the total number of development hours it takes to create one finished hour of E-learning:	Average of 17) Considering a typical E-learning project of your organization, estimate (if known) the average cost of developing one finished hour of E-learning, in NZD:
0	12	45386	64	5,980.00
1	11	31419	132	8,407.38
2	40	57698	85	5,322.99
3	1	15	150	18,750.00
Grand Total	64	134518	90	6,386.62

Question 16:

FIGURE 2 . Average development time vs. course type

TABLE 3 *.* Level of multimedia explained

Multimedia used	1 - Level 1 (Basic)	2 - Level 2 (Intermediate)	Level 3 (Advanced)	0 – Other Blended Level 1, 2 and 3
	Any or all of the following: text, images, graphics, audio and video.	Any of Level 1, plus animations such as click and reveal, hotspots, drag & drop, multiple choice.	Complex animations and simulations, virtual environments, multi-user/player environments, high fidelity graphics, complex multi-level, multi-variable interactions.	
	Mostly reliant on templates for layout and pages development	If characters are used, they are mostly static with speech boxes. Use of templates is low or nil.	If characters are used, then animated characters are with live movements (lip synching, head and body movements, expressions). Graphics may be created in 3D	

TABLE 4 *.* Results by learning objective type; Question 13

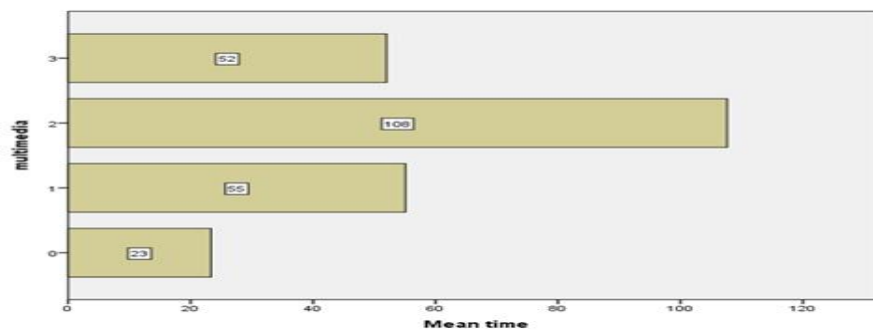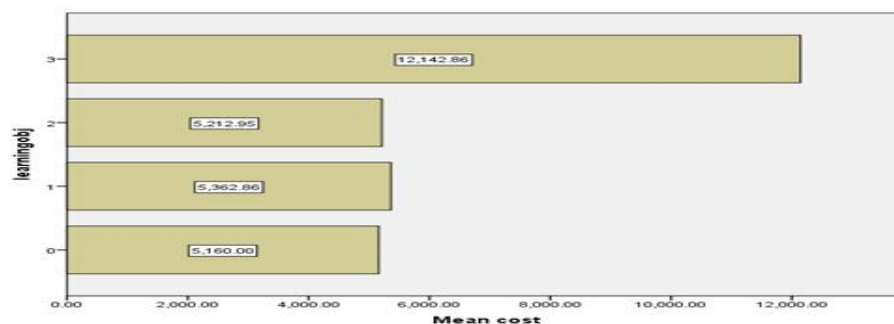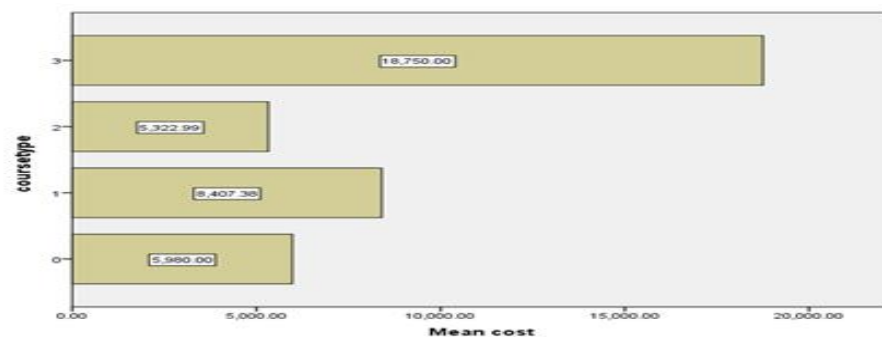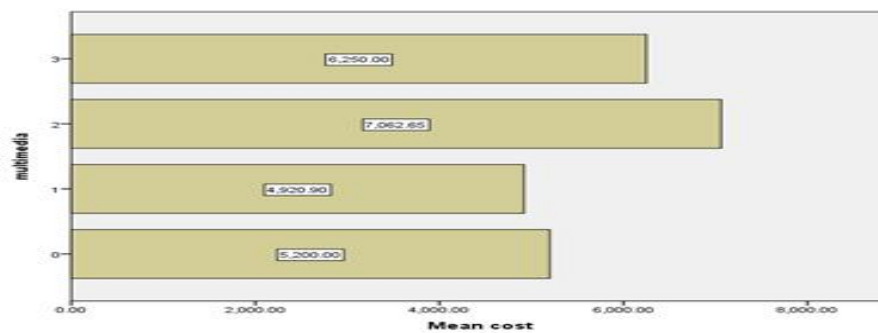| Row Labels	Participants	Sum of 3) How many employees work for your entire organization- Nationally	Average of 16) Considering a typical E- learning project of your organization, estimate the total number of development hours it takes to create one finished hour of E-learning:	Average of 17) Considering a typical E- learning project of your organization, estimate (if known) the average cost of developing one finished hour of E-learning, in $NZ:
0	7	12264	34	5,160.00
1	14	46997	107	5,362.86
2	36	55745	94	5,212.95
3	7	19512	94	12,142.86
Grand Total	64	134518	90	6,386.62

FIGURE 3 *.* Average development time vs. levels of multimedia

Question 17:

FIGURE 4 *.* Development cost vs. learning objective

TABLE 6 *.* Results of data by level of multimedia used; Question 15

Row Labels	Participants	Sum of 3) How many employees work for your entire organization- Nationally	Average of 16) Considering a typical E-learning project of your organization, estimate the total number of development hours it takes to create one finished hour of E- learning:	Average of 17) Considering a typical E- learning project of your organization, estimate (if known) the average cost of developing one finished hour of E-learning, in $NZ:
0	3	684	23	5,200.00
1	12	25187	55	4,920.90
2	44	102622	108	7,062.65
3	5	6025	52	6,250.00
Grand Total	64	134518	90	6,386.62

FIGURE 5 *.* Development cost vs. course type

FIGURE 6 *.* Development cost vs. multimedia

DISCUSSION

A limitless number of variables and factors that come into play when attempting to accurately rate the development cost of your E-learning course, it's no wonder this subject is constantly revisited time and time again. Kapp and Robyn (2009) are true to conclude that designing training is as much of an art as it is a science. While declaring the findings, the researchers have noted an important fact that the respondents only provided numbers as data to the survey items that they have used or applied to them. The researchers have unveiled some interesting results from the survey as mentioned below:

This survey represented approximately 134518 employees all over NZ in various jobs related to E-learning development roles in different industries of NZ. The dominant message from the results indicates four findings. It is significant in NZ E-learning development industry that one employee within the company may be job sharing inter-related roles. Or

in other words as company ID 153 mentions, 'one person wears many hats'. See company reference ID 66, 108 and 112 and 153 of question 7 and its comments section mentions that an employee may be the technical writer and instructional developer simultaneously, or a manager and instructional developer duties both shared by the same person within the company indicating the need for employers to employ experts by job specification for optimum profit.

The statistics indicated in answers to questions two and three that nearly half i.e., 56.25 percent (36 out of 64) respondents in NZ E-learning industry were also a part of a Global company indicating that NZ E-learning industry has a major role to play in the Global learning development world. It is noteworthy that E-learning solutions developed by the 64 New Zealand industries were used by a range of approximately 164000 to 169000 users or learners including employees, partners, external customers, etc. in NZ and abroad as reported by question eight of the survey item and its comments.

The research statistics indicated that a majority of the employees in the E-learning industry in NZ worked full time jobs 40 hour/week as indicated by question two. It is interesting to know that approximately a third (25 of 64) of the respondent companies outsourced their work. The outsourcing may point to the lack of labor within NZ and also less financial liability. It is indicative of a need of more instructional developer roles to be invited in NZ to reduce the need of outsourcing. It is noteworthy from the statistics of question six that 96.88 percent (62 out of 64) of the internal staff employed in the E-learning industry in NZ were directly related to the E-learning design and development specifying the efficiency of the Human resourcing team in NZ E-learning development to employ qualified people for the jobs.

CONCLUSION

The study findings presented in this research estimated that the average time to develop one hour of E-learning in NZ was approximately 90 hours. The cost to develop one hour of E-learning was approximately 6300 NZD. An important finding was that the maximum number of E-learning development companies in NZ developed instruction satisfying application of learned skills as learning objective, interactive scenarios course type and intermediate level multimedia was used. The results of the survey suggest that there are various factors that affect the time and costs of E-learning development as discussed in the literature hence, the cost may not be in direct proportion with the level of E-learning created. The cost and time analysis of any proposed E-learning project will enhance the profits in terms of tangible and intangible benefits for the company. But one must keep in mind that the behavior of costs as output also varies on how output is defined and measured (Morris, 1995). Whilst asserting that the relationship between research and practice is complex, the researchers found that time-tracking and good project management skills along with regular ROI calculations can make a significant contribution to time and cost reduction in development. It is unrealistic to expect that only the answer, 'it depends' suffices for the research question, "What are the E-learning development time and costs in New Zealand organizations?" to apply the findings of research in practice. When it comes to developing E-learning courses, the requirements that are related to budget vary all the time. We agree with Butterfield (2002) in saying that the overall aim is to maximize the benefits for employees and the businesses by making cost-effective decisions for the implementation of E- learning in New Zealand.

LIMITATIONS AND RECOMMENDATIONS

Since, E-learning development industry is booming in NZ, thus this field has lot more potential to be expanded and explored. This study covered a small portion of this domain and call researchers to investigate it further. As per the findings, the areas of development would be to develop much advanced level of E-learning including simulations and games, course type to teach analysis and synthesis of skills using much advanced multimedia. E-learning is not just a carrier for cutting costs and diminishing the learning options but, the needs of the learners and the business must take priority and shape our thinking as we consider the investment options for using technology to create a quality learning experience.

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