Chapter 81

An Adaptive Neural Network for the Cost Estimation of E–Learning Projects in the United Kingdom

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ABSTRACT

This research aims to address the problems of estimating e-Learning development costs particularly within the United Kingdom. Hundreds of managers with no prior experience of managing e-Learning development often find themselves needing to produce cost estimations for e-Learning development. The lack of prior experience in e-Learning development means that these managers will not be able to apply structured expert judgement to their cost estimations and the risk of inaccurate estimations will be high, with all the subsequent problems this will bring with it. Although an e-learning project cost model that serves this purpose has been developed in the past by the author, the previous e-learning model was based on multi regression analysis that has the great limitation of losing its relevancy as the industry changes, the new proposed model uses an adaptive neural network model that copes with changes as it can be trained easily with new data and this allows the management to keep more accurate cost estimates that reflect market changes.

1. INTRODUCTION

According to Tavangarian et al. (2004), e-learning is electronic learning, and typically this means using a computer to deliver part, or all of course whether it is in a school where it is part of a mandatory business training or a full distance learning course. E-learning has grown at an exponential rate in the UK (Condon & Valverde 2012; 2014), this has created the need to develop project management techniques for e-learning project management in particular cost estimation as this is very challenging due to the constant change of technologies and skills required to implement this type of projects. Historically cost

estimation for e-Learning development has been carried out on a 'rule of thumb' basis, meaning it is a heuristic approach based on judgement borne out of experience. This has meant that those carrying out the estimation need to have considerable knowledge of e-Learning development along with knowledge of the actual costs on previous projects in order for the estimations to have any degree of accuracy. In recent years, the use of rapid e-Learning development tools such as Lectora (lectora.com) has been gaining pace. Furthermore, the recession has forced companies to look at ways of reducing their overheads. These two factors have prompted a move away from the previous norm of outsourcing to expert e-Learning development companies, with businesses choosing instead to develop their e-Learning in-house.

This creates a specific problem in terms of cost estimation. Those in charge of estimating the costs for an e-learning project in many cases do not have the specialist knowledge needed to make reasonably accurate estimates. Often those carrying out the development work are subject matter experts rather than e-Learning developers, so there is no pool of knowledge for managers to refer to when making cost estimations for e-Learning projects. The subject matter experts that do have some e-Learning authoring experience do not have e-Learning design experience, therefore any help they can offer managers in terms of e-Learning knowledge is limited and does not reflect the 'whole picture'.

A solution is needed to this problem, so that the managers who will be responsible for overseeing e-Learning development can create cost estimates that are as accurate as those developed by managers with expert experience.

Although an e-learning project cost model that serves this purpose has been developed in the past by the Valverde & Moseley (2014), the previous e-learning model was based on multi regression analysis that has the great limitation of losing its relevancy as the industry changes, the new proposed model uses an adaptive neural network model that copes with changes as it can be trained easily with new data and this allows the management to keep more accurate cost estimates that reflect market changes.

The purpose of this research study is to develop an adaptive neural network cost model for e-learning projects in the United Kingdom, based on data extracted from previous e-Learning projects located in the United Kingdom which can be used to predict the cost of future e-Learning projects.

2. NEURAL NETWORKS

Winston (2010), gives a simple layman, yet effective and elegant definition describing that Artificial Intelligence, machine learning (Simon, 2013) and cognitive science (Miller, 2003) paradigms encompassing Artificial Neural Networks (ANN) could loosely be defined as "representations that support the making of models, that facilitate understanding targeted at thinking, perception and action." Similarly, ANN first envisioned and conceptualized by McCulloch and Pitts (1943), could be described as a set of mathematical rules, able to respectively mimic both complex and rudimentary neural structures found in biological organisms, modelled as representations of synapses fired during thought and reflex processes.

However, Reid (2014), argues that while ANN may be modelled after biological neural systems and synaptic activities, graphically represented as interconnected nodes, able to exchange and pass values between them. Such models are arguably loosely bound to biological systems in a similar manner as the "Olympic stadium in Beijing was inspired by a bird's nest" (Reid, 2014), only through inspiration, basic representation and abstract design, making the two fundamentally different. Reid (2014), adds that ANN can be seen as much less complex in design and logic, consisting of perhaps several dozen neurons arranged through logically designed interconnected layers, when compared to even the most simplistic

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