Continuous Professional Development in Civil Engineering: Closing the Knowledge Gap

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Abstract- **This paper presents the enablers and the key success factors in the civil engineering profession in which the continuous professional development (CPD) is the impetus in closing the knowledge gap related to current advances in technology as well as global development. Many industrialized nations are making it essential for the professional engineers to maintain their practices by advocating the necessity for professionals to continually upgrade their skills through either voluntary or mandatory professional accreditation systems. Currently, the renewal of professional accreditation for civil engineers includes attending learning programs such as seminars, conferences, technical workshops, short courses, and even trainings which have been pre-approved by the local professional accreditation body. CPD points are typically recommended in areas which deepens skills and knowledge in the engineers' area of expertise but also include the broadening of skills to other related areas. A holistic approach should be encouraged among the practicing professionals. In view of this, the academic institution is poised to provide the knowledge needed in transforming the practicing professional into a knowledge based and technically sound practitioner. The current scenario predicates that the academic institution is limited in fulfilling this role but transforming and engaging the academic institution with the practicing professional is seen as a viable and most economical approach in providing CPD. It is noticeable with the creation of Malaysia as the hub for education, the quality of education in Malaysia is comparable to other advanced nations especially in the quality of engineering education. With this as the future momentum, cross learning should be mapped in propagating and enhancing the engineering educator on the practicing aspect of civil engineering. This will be the impetus in fulfilling the road map which will be discussed herein to the future development of CPD for civil engineers.**

Keywords – Continuous professional development, Virtual Learning Environment, distance learning, holistic learning, best practices

I. INTRODUCTION

Continuous Professional Development (CPD) in an engineering context was introduced with the particular aim in ensuring the systematic maintenance, improvement and broadening of knowledge, skill and development of personal qualities for execution of professional and technical duties throughout an engineer's working life [1]. In essence, it tries to achieve two things in particular, a) improvement of existing knowledge and skills to keep abreast of the fast evolving technologies especially in the engineering industry and, b) broadening of competencies to other areas of relevance and interest in which could serve as an impetus for career expansion. The CPD system has become particularly important in today's industrial environment whereby the rapid evolution of technologies demand that competencies in the relevant engineering fields should stay abreast via rapid and intensive learning modules which cannot be achieved through conventional learning modules which are time consuming. Such demanding environments require professional workers to engage in the learning process concurrently with their professional practices in order to stay relevant in their business and area of core competency. Professional accreditation bodies in the United Kingdom have also acknowledged the weightage of the matter by highlighting the huge gaps in skill levels which have resulted in loss of global competitiveness that can only be addressed through maintaining the relevancy of core competencies and skills [2]. CPD activities offered by these professional bodies include a multitude of learning channels to offer flexibility to busy working schedules while at the same time attempting to ensure the knowledge transfer mechanism adopted is effective and profound in practical applications. They include, a) formal trainings and courses, b) informal learning modules (i.e. on-the-job training), c) attending accredited conferences and symposiums, d) submission and presentation of technical papers and, e) services which include contribution to the development of CPD of others.

From an industrial standpoint, CPD also serves as a platform to extract the vast repositories of tacit knowledge which are existent in the industry where it is conventionally reliant on on-the-job training (especially for SMEs). Experienced practitioners have often quoted that their ability to deliver on the outcome as a result of the many years of tacit knowledge that has been procured while being on the job. As such, they find it hard to pass-on and share such knowledge without having a structured platform to do so.

CPD frameworks as such serves as a platform to convert vital tacit skills and competencies which they might otherwise spend years groping in the dark about or procuring it unconsciously through repetitive trial-and-error processes into explicit knowledge. Having a framework to reach out such knowledge can be vital in ensuring the survival of SMEs whereby financial constrictions requires the limited human capital to engage in intensive and continuous CPD. This is further compounded by the shortage of sufficiently technically equipped cohorts into the civil engineering market (indicated by the growing need for Fundamental Engineering Exams for fresh graduates to ensure knowledge quality) which makes it even more imperative that SMEs invest in retaining their best employees that have been engaging in competency building efforts. On the other hand, larger companies that possess a multitude of business arms also find it essential to engage in CPD courses as they can provide a standardized platform for employees to access the best and relevant practices and knowledge of the industry. BT Global has successfully implemented a threaded discussion system called "Gift" which enables its various international business arms to connect and share knowledge [3].

II. IMPLEMENTATION OF CPD PROGRAMS & THE ROLE OF UNIVERSITIES

The advent of the capitalist movement in the 1980s pushed universities, consultancies and even promoted the setup of new training companies to engage actively in structuring CPD programs to address the increasingly competitive global market. The boom in CPD programs soon took upon a different take as commercialization of these programs became more apparent. Much emphasis was pushed towards topping up of knowledge rather than addressing the holistic development of personnel [4]. Such quick-fix approaches were seen as detrimental as the objectives of CPD began shifting from a developmental-based to one that is more tangible and measureable. As a result, the CPD programs offered had less relevancy between each other and contributed less to the holistic development of a professional .This led to professionals finding a lack of cohesion between the fragmented programs and their personal development which ultimately led to it being more convenient to attend CPD courses to fill up the mandatory credit hours rather than focusing on their personal learning needs. The constriction of the CPD program development by the capitalist outlook made it difficult for universities to compete at par with companies that specialized in CPD. This made it convenient for universities to limit competition by establishing monopoly with professional associations to maintain their market share in CPD development [3]. This outlook however began to change in the 1990s as universities were urged to play a more prominent and contributing role in CPD [5]. This breakaway however signified a new challenge to universities in changing the already fragmented & over-emphasized measureable outcomes of CPD structures. Universities were posed with criticism from the industry that doubted their ability to deliver CPD programs along practical lines as universities were too fundamental in approach. Universities found it hard to come to a compromise on the industry's "bottom-line" approach which made it difficult to encourage the learning culture. As such, even until the present day, the level of participation of universities in the structuring of CPD programs is relatively low. SMEs still tend to participate in formal learning courses organized by professional associations while larger firms will have either an in-house or third party company providing CPD solutions to their personnel. This trend has led to outcomes that are too "bottom-line" focused as well as having a feeling of the course being a mandatory part of retaining professional status by fulfilling CPD points. As such, universities have been provided an opportunity in injecting much needed learning and creative culture which in hopes will create a more holistic approach in CPD as well as engaging personnel in frontier and pioneering technology which is one of the founding objectives of CPD. The following section discusses the framework to facilitate this implementation.

III. UNIVERSITY CPD STRUCTURING FRAMEWORK

In order to achieve the successful inception of universities as a key figure in providing a holistic and creative approach to CPD implementation we need to revisit the objectives that the universities are expected to achieve. It has to, a) achieve target competency that complies with the requirements and needs of the industry, b) produce deliverables with the end-user in mind, c) achieving a holistic learning outcome of the professional which will serve as a basis for expansion of skills beyond the core competencies, d) comply to standards of design and quality management, e) ensure the deliverables of the CPD is able to uphold the professionals position in the competitive global arena and, f) ensure that the concept of lifelong learning and a continuous learning culture is embedded within the professional fraternity. To facilitate these objectives, a framework is proposed with a delivery strategy in mind as well as the operational tools required to aid the motion of the strategy.

A. DELIVERY STRATEGY

University-Industry Needs Assessment – Foundation works to this strategy must go back to the drawing board using analysis tools to identify the key players involved in the implementation as well as having an open dialogue session in which all parties are able to share their needs, requirements and fundamental values. With universities acting as the central and neutral party in the exchange session, other players that need to be included are the professional associations, individual professionals and corporate bodies that engage in CPD. The dialogue needs to confer the different perspectives of various parties and should be done so with compromise in what would otherwise result in development of programs with vested interests (which would ultimately fail to achieve the aforementioned

objectives). However it must be noted that the end result of the dialogue must have the best interests of the professionals at mind in which they should have the biggest influence in determining the method of delivery of CPD courses that is in line with the objectives. Even with the conclusion of the initial dialogue, all parties still need to engage in continuous needs analysis to constantly gauge the dynamically evolving needs of the fast-paced industry. The conclusion of the dialogue should be upheld at all times by parties that have come into agreement to ensure the integrity and objectives are achieved with minimal dispute.

Delivery Structure – The needs analysis will serve as a precursor to the development of tools required to structure the implementation of the CPD programs via multi-faceted delivery points. As universities are constrained geographically in terms of CPD delivery, it is essential to adopt a web-based Just-in-Time method of delivery [6] that will be able to cater to a larger audience that requires extensive flexibility when it comes to engaging the learning process while carrying out professional duties. Although this method will be able to transcend geographical boundaries, it is imperative that a blend of traditional learning environments be maintained to deliver learning interactions at an optimal level.

Web-based delivery will involve the heavy utilization of Virtual Learning Environments (VLE) to achieve the initial stages of delivery. Learning portals and forums are utilized here to allow the, a) networking and connection between various organizations in a thread-based forum which encourages live interaction and feedbacks, b) repository of CPD materials that have successfully demonstrated delivery of tacit knowledge via explicit forms, c) ease of search and organization of materials which will ease the charting of a Personal Development Plan (PDP), d) aggregation and moderation of content to ensure suitability and objectivity of deliverables, e) fast and secure retrieval of information across digital platforms regardless of geographical limitations [7]. Examples of systems already in place that carry out such remote methods of delivery include Schlumberger's NExT software as well as BP's BPConnect website.

Running parallel with this web structure is the ability for subscribers of these CPD programs to be assigned to a mentor via a distance learning infrastructure. This will able to link back the web-based learning process with direct feedback with related professionals in the respective areas. This mentoring system will work as part of the CPD point system that enables fellow technically-related professionals to assess the learner's progress and outcomes via a web-based structure.

As optimal learning via the VLE structure requires, at the end of the day, a certain amount of contribution from face-to-face interactions and social contact to ensure the application of the learning process and optimal transfer of technology and knowledge to the working environment [8]. The formation of quality development improvement clusters as part of the post-program set of assessment tools [9] will be able to induce an open-ended approach to the learning process and effective transfer of knowledge to participants. This assessment tool must be assessed via the immediate supervisory at the organization to ensure the effective application of learning outcomes on the professional deliverables.

Program Material Preparation – This process involves the extraction of materials from selected repositories and sources for development of course materials and will be developed with web-based delivery in mind. This is achieved via university to industry attachments which is to enable the capture of core requirements and particular needs of the professional individual/team while at the same time maintaining the core objectives that it has set out. The materials that are to be delivered must go through the university's internal review process together with input from professional associations and professionals from related industry players.

Assessment & Dissemination – Delivery of courses ultimately must be coupled with feedback from the organizations in which the learners originate from and the learners themselves. This is to conclusively assess whether the course objectives and deliverables are relevant in the sense that they are able to achieve a high level of application in workplace practices on top of enabling learners to understand and embrace the concept in which CPD has always set out to be, a self-initiated lifelong learning process which seeks to establish the broadening of knowledge as well as the enhancement of core competencies. Once this pilot program is able to be successfully implemented, it will thus set a road map as well as provide the necessary tools to conduct future CPD structuring with much improved time delivery as well as competitive economic factor.

IV. CONCLUSION

In summary, universities are well-placed to deliver to the working professionals CPD courses from an impartial point of view while maintaining the relevancy and applicability of the knowledge in working practices. The framework proposed is much needed to usher the role of universities which have been once displaced in the area of enhancing professional development into a competitive edge once again. Ultimately, universities will be able to provide holistic lifelong learning, encourage open-minded approaches to learning among professionals and introduce new core competencies to keep abreast with fast-evolving technology. The professional fraternity will be able to greatly benefit from this unbiased approach to learning and as it will promote a healthy and organic growth of skills and core competencies.

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