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TRAINING AND DEVELOPMENT STRATEGIES TO ENHANCE THE USE OF MODERN SOFTWARE IN QUANTITY SURVEYING PRACTICE IN SRI LANKA

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ABSTRACT

Information technology (IT) has been developing day by day making a great impact on the construction industry including the Quantity Surveying (QS) profession. To perform the duties of the quantity surveyor in an innovative manner, software packages such as WinQS, Vector, Cost X, QSCAD, QSPlus, Masterbill, CATA, Planswift, Cubi cost, Revit, Excel and Autodesk Quantity take off, are introduced. The software is compatible with the task specialisation, speed up the performance and enhance the accuracy. Training programmes, seminars, workshops, software tutorials, higher education about software and Continuing Professional Development (CPD) are identified as approaches to integrate IT usage among the QS practices. This research aimed explore the gap between the awareness and practice of modern software in QS practices in Sri Lanka to propose suitable training and development strategies to achieve technological advancement. A mixed method approach was adopted to carry out this research using a survey as the main research strategy. Questionnaires were collected from 65 practising quantity surveyors in Sri Lanka to explore the gap between the level of awareness and practice of modern software. Five expert interviews were conducted with senior Quantity Surveyors who have been extensively using modern software in their practice. Gap analysis and manual content analysis were used to analyse primary data collected through questionnaires and interviews respectively. Development of the national construction guideline, professional training programmes, government concessionaries, professional degree programmes addressing modern software knowledge, and implementation of a marketing approach were the strategies recommended to address the training needs to achieve technological advancement in the QS practice in Sri Lanka.

Keywords: *Modern Software; Quantity Surveying Practice; Sri Lanka; Training and Development.*

1. INTRODUCTION

The world today is dynamic and characterised by constant technological advancement (Jaiswal et al., 2021). In this developing world, competitive advantages are being achieved with the aid of rapid technological improvement and innovative practices

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(Kulasekara et al., 2013). All the business and industries are transforming their methods of practices with fundamental changes according to the advancement of IT system (Li et al., 2000). Global recognition and widespread adoption of Information Communication Technology (ICT) have encouraged competition not only among organisations yet among various professions worldwide (Oyediran & Odusami, 2005).

Quantity surveyors provide important and essential services to their clients which are unique from other consultants and contractors (Agyekum et al., 2015). Due to factors such as client's requirements, development and application of information and communication technology, research and developments of the profession, graduate capabilities and the size of practice, the role of the surveyors is expected to be developed in future (Thayaparan et al., 2011). Therefore, the construction industry certainly needs to improve its information flow and project delivery mechanism (Ibironke et al., 2011).

The lack of knowledge and skills concerning the practice of sophisticated software and techniques can usually be overcome through solutions such as training programmes, seminars, workshops and tutorials on the use of software (Raphael & Priyanka, 2014). As per the authors, staff will need training not only regarding the use of new software yet about changes in accountabilities and changes within the company itself. However, the limited usage of modern software in practice can affect badly to the productivity, efficiency, standards and development in Sri Lankan construction industry (Hewage et al., 2024). Even though measures have been taken to integrate ICT usage among QS practitioners, research exploring the efficiency of such modern software in QS practices in the Sri Lanka is limited. There is a dearth of research on effective training and development strategies to enhance the use of modern technology in QS practices. In addressing this research gap the aim of this study was to propose suitable training and development strategies to improve the use of modern software in QS practices in Sri Lanka. The research first explored the gap between awareness and practice of modern software used by QS in Sri Lanka, then the factors contributing to such gap were investigated to develop suitable training and development strategies to reduce the gap between awareness and practice.

2. LITERATURE REVIEW

The QS profession has experienced developmental changes from a measurement-oriented background to the current position where a quantity surveyor is accepted as a financial specialist and adviser in the construction industry of the countries where his expertise is recognised (Seidu et al., 2020). Salleh et al. (2020) stated important roles and responsibilities of a quantity surveyor such as providing approximate cost estimates, advice on procurement, cost planning, measuring items on-site, preparing bills of quantities, preparing schedules of works, preparing financial statements, controlling costs throughout project, and assessing and negotiating tender. The constant demands for greater precision of costs from the QS profession is a considerable challenge because of the increasing complexity of construction projects (Agyekum et al., 2015). During the pre-1960s, the roles of QS were limited to a scope including approximate estimating, bills of quantities, and final accounts, whereas they were widened during the last two decades to include e-procurement, Building Information Modelling (BIM), low-Carbon building technologies, private finance, public-private partnership and modern procurement, risk management, suitability etc. (Ashworth & Perera, 2015; Cartlidge, 2018).

Built environment professionals embraced IT into their practice with the prime intention of levelling up with other industries (Ibim, 2024). According to Smith (2011), IT shall be introduced into the QS practice in three main phases i.e. (i) Automation: to automate technical and specialist tasks using IT, (ii) Value addition: to improve the information management systems of QS firms by linking electronically with other partners of the construction supply chain, and (iii) Business process re-engineering: to operate the firms with the use of IT in order to transform the core business. In general, modern IT applications improve the quality of QS services in terms of shortened time, reduced cost, enhanced efficiency and effectiveness (Newman et al., 2020), less repetitive work, and improved communication modes (Haupt & Naidoo, 2016).

Although there have been potential benefits through ICT in the construction industry, the level of application used in the construction industry is limited (Gambo, 2017) due to challenges such as inadequate training and education in the use of IT tools, higher cost of investing and learning new technology, inadequate IT content in construction education, resistance to organisational change, lack of industry standards, additional cost of engaging computer staff, lack of management desire and appreciation of IT, breakdown problems, and fear of IT making professionals redundant (Agyekum et al., 2015). The less usage of IT in QS practices causes operational inhibitors, educational problems, poor return on investments, and high costs of software among others (Oyediran & Odusami, 2005). The lack of knowledge and skills related to the use of sophisticated software, resistance to organisational changes, and software becoming outdated and requiring frequent upgrading are the key reasons why IT is less used in QS practices (Raphael & Priyanka, 2014). However, limited usage of IT can badly affect the productivity, efficiency, standards and development of the Sri Lankan construction industry (Kulasekara et al., 2013).

When selecting software packages there are several factors considered by the QS organisations such as user-friendliness, flexibility, compatibility, initial cost, running cost, experience, security, and training (Jacky et al., 2007). As per the manufacture details, QS Plus, CATO, QSCAD, Quikest and Cost X software shall be used for the taking-off purpose, Win QS, QS Plus, CATO, QSCAD and Vector are used in BOQ preparation, and software such as CostX, Vector, Wessex, QSCAD, Estimate, QS Plus, Win QS and Master Bill are used as the tendering and estimating tools. Further, Quantity Surveyors are the one of most potential characters who utilise modern ICT applications during the project life cycle (Newman et al., 2020). When considering one main function done by QS professionals, quantity take-off, IT provides automated quantity take-offs that shall enable reduced errors and allow quicker take-offs (Adesi et al., 2018). This indicates that the QS profession does have the potential to improve its practice with the use of modern technology. By considering the demand for training on software usage for QS professionals, training shall be implemented by the current practitioners in the QS industry via Senior practitioners' advice and guidance, structured Continuous Professional Development (CPD), regular help from assigned tutors on the subject, in house seminars from the organisations, time allocation for self-training and self-studying, and update on the latest developments (Ying & Kamal, 2021). However, before deciding on the most suitable training and development programme, the existing level of knowledge and awareness that the quantity surveyors have of modern software and the level of actual practice using such software needs to be explored. The next section explains the research methodology adopted for this research.

3. METHODOLOGY

A mixed-method approach was selected to carry out the research integrating quantitative and qualitative approaches (Hands, 2022). A quantitative approach was used explore the gap between awareness and the practices of modern software and a qualitative approach to investigate the factors contributing to the gap, and to develop training and development strategies to reduce such gaps. The research problem "what is the gap between awareness and practice of modern software in the quantity surveying practice?" has placed the research in a fact-finding approach with the question starting with "what", hence a quantitative approach was more appropriate to establish the gap. Besides, the research intends to cover a larger sample to explore the level of awareness and usage of different technologies used in QS practices. Hence, a survey was considered as the most suitable research strategy. Proposing training and development strategies to achieve technological advancement in QS practices would become a function of the researcher's insights and impressions along with an assessment concerned with attitudes, opinions and behaviour of different industry professionals. This was achieved through a qualitative approach (Sutton & Austin, 2015).

Data collection was carried out using a questionnaire survey among Sri Lankan Quantity Surveyors to explore the gap between awareness and practice of modern software used in QS practice. Random sampling coupled with snowball technique was used to recruit the respondents for the questionnaire. Several databases maintained at the professional institutes of quantity surveyors and alumni associations were used to gather the contact details of quantity surveyors working in Sri Lanka, and email invitations were sent to all. In addition, the researchers asked the quantity surveyors to forward the survey invitation to other quantity surveyors, who are not included in the database. Hence the total population of Sri Lankan Quantity Surveyors who received the invitation was not known. 65 completed questionnaires were received which were used for the gap analysis. When analysing the features of this study, it shall be emphasised that 65 is an appropriate sample size for this study (Lakens, 2022). Additionally, expert interviews with five QS professionals who had at least ten years of experience and extensive knowledge and practical experience in using modern software were carried out to identify the reasons behind the gap between awareness and practice, and to propose suitable training and development strategies to achieve technological advancement in QS practices. Table 1 demonstrates the demographic factors of the experts interviewed.

Table 1: Demographic factors of the expert interviewees

	E1	**E2**	**E3**	**E4**	**E5**
Profession	Director/ Lecturer	General Manager	Senior quantity surveyor	Deputy general manager contracts	Senior Lecturer
Type of organisation	Consulting	Contracting	Contracting	Contracting	Academic institutes
Knowledge and experience with modern software	Yes	Yes	Yes	Yes	Yes
Industry experience	15 years	13 years	12 years	14 years	20+ years

The collected data from the questionnaire were analysed using gap analysis with the aid of a radar chart (Zhang & Chu, 2010), and the data gathered from the expert interviews were analysed using manual content analysis (Hsieh & Shannon, 2005).

4. RESEARCH FINDINGS

4.1 GAP ANALYSIS BETWEEN AWARENESS AND PRACTICE OF MODERN SOFTWARE

The questionnaire survey was conducted to explore the awareness (knowledge) and the actual usage (practice) of modern software in QS practices. The results of the questionnaire helped to establish the gap between the awareness and practice of the software. The study considered the software that is popularly used by QS professionals, such as MS Excel, MS Word, CostX, Planshift, Blue beam, Cubi cost, QSCAD, Win QS, QS PLUS, CATO, Vector, Estimate and Master Bill. Awareness of the QS professionals on the modern software was ranked based on the response rate obtained through the questionnaire survey. Accordingly, MS Excel had a response rate of 0.95 where it marked the highest awareness rate. MS Excel was used for BOQ preparation. MS Word, Cost X, PlanSwift, Blue Beam, QSCAD, and Cubi Cost reported considerably high rates of awareness which marked the response rates as 0.83, 0.74, 0.58, 0.65, 0.37, and 0.40 respectively. The lowest rate of awareness was reported for Win QS and Master Bill where the response rates were respectively 0.23 and 0.14. Cost X, Planswift, Bluebeam, QS CAD, and Cubi cost are mostly used for taking-off quantities and Win QS and Master Bill software are used for estimation. Further, MS Word is solely used for the purpose of report writing and documentation. Moreover, it was reported that none of the respondents were aware of software such as QS PLUS, CATO, Vector, and Estimate and they claimed that have never used such software in practice.

When it comes to practice, the survey revealed that MS Excel was highly used, showing a rate of 0.95, followed by MS Word with a 0.80 response rate. Apart from that, software such as Planswift, Blue Beam, Cost X, QS CAD, and Cubi cost had very low actual usage whereas Win QS had the least actual usage among the quantity surveyors.

Based on the questionnaire survey, even though the industry representatives are aware of the existence of most of the software the actual usage of such software in practice is lower than the awareness. Figure 1 illustrates the gap analysis done between awareness and practice against nine software that was used by Sri Lankan quantity surveyors.

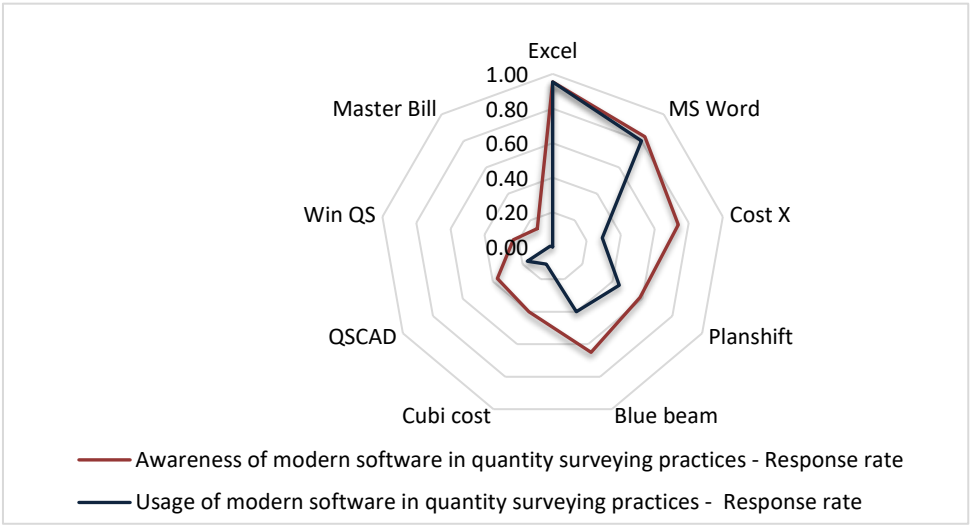

Figure 1: Gap identification of awareness and usage of modern software

As per Figure 1, it is visible that there is a considerable gap between the awareness and actual usage of most software except for MS Excel and MS Word, which had the highest level of awareness and usage. MS Excel is used for several QS tasks including, taking-off measurements, BOQ production, feasibility, estimation, cost planning, cost modelling, tender analysis, valuation, cost control, financial account reviewing, and report writing. It was evident that the respondents were aware of the use of Excel to perform the aforementioned tasks.

Cost X software has the highest gap between awareness and actual usage demanding critical attention for its improvement. This software enables to perform taking-off measurements and BOQ production more efficiently, however, the respondents seem comfortable with using MS Excel to perform such tasks.

The next highest gap is seen with Cubi Cost, which is used for quantity take-offs and estimations. Both the level of awareness and actual usage of Cubi Cost is comparatively lower than that than that of Cost X. Another considerable gap could be seen in Blue Beam, QSCAD and Planswift. The application of this software extends to several tasks such as quantity take-off, BOQ production, estimation, cost planning, tender analysis, and valuation. However, the respondents' awareness of the task performed by this software was limited to quantity take-off. The least awareness was on Master Bill and Win QS, where respondents have never practised. Hence it might consume more time and cost to implement strategies to introduce such software for QS practices.

The gap analysis helps to establish the customised training needs to minimise the gap between awareness and practice.

4.2 Analysis of the Factors Contributing to the Gap Between Knowledge and Practice

The gap analysis presented in Section 4.1 reveals the gap between the level of awareness and knowledge of several modern software and the level of actual usage of such software in QS practices. The factors that contributed to the gap between knowledge and practice were investigated through expert interviews.

E1 and E2 highlighted that the lack of practice is affected by the ***unavailability of software irrespective of its benefits and usage***. Further, most of the respondents confirmed the lack of usage shall also be due to the ***higher licensing cost and the maintenance cost of the software*** and is creating a gap between the knowledge and practice of the software. Moreover, ***personal computers which do not support high-functioning graphic software*** are a practical concern confronted by QS professionals in the office environment when practising modern software. However, E4 rejected the argument stating, "*software licenses are approaching as cloud license and it can share the licenses for view purposes*". Furthermore, as per E1 ***security issues, cyber-attacks, and risk of data redundancy*** are contributing to the gap between the knowledge and practice in the Sri Lankan context. E2 commented ***lack of time available for industry professionals due to tight schedules*** is demotivating the knowledge improvement of the professionals on modern software. As per E5, even though the professionals engage in developing the knowledge, the respective ***companies shall depict a lack of motivation towards the practice of the modern software,*** which shall waste the knowledge obtained by the professionals regarding the modern software. Demotivation towards modern software may arise due to several ambiguities such as the effect made on the traditional processes of the entity, working methods of employees, poor return on investment, less compatibility for the working environment, high initial cost or periodical payments for updates, and lack of experience on operating the software.

Furthermore, E1, E4, and E5 highlighted ***insufficient marketing on the software*** as another concern for the lack of awareness of modern software in Sri Lankan QS practice. Even though, higher education provides a structured education on MS Excel and MS Word, ***less concern was given to the modern software in university education***. This creates a knowledge gap in the QS industry. E3 pinpointed employees who know the software such as Cubi Cost cannot practically apply them to their daily tasks since it requires practice and structural guidance on the software irrespective of the knowledge. Furthermore, E5 highlighted that the ***lack of user-friendliness*** of advanced software such as 'Cubi Cost' and 'CostX' is demotivating the practice of the software. Nevertheless, E4 commented that it is not a reason for the increase of knowledge and practice of modern software since they are updating frequently.

4.3 STRATEGIES TO REDUCE THE GAP

The gap between awareness and the practice of modern software shall be addressed through implementing various strategies. Table 2 illustrates the strategies proposed by experts in reduce the identified gap.

Table 2: Strategies to reduce the gap between knowledge and practice in modern software

Strategies	E1	E2	E3	E4	E5
Introducing software in higher education	✓		✓		
Promoting the usage	✓	✓			
Reducing licensing fees	✓	✓	✓	✓	✓
Conducting practical workshops	✓	✓		✓	✓
Encourage employees to familiarise modern software		✓			
Reduce the fee for the software-related courses			✓	✓	
Increase the use of modern software in government organisations		✓	✓	✓	

Strategies	E1	E2	E3	E4	E5
Create standards and policies	✓		✓	✓	
Organising CPD sessions	✓		✓		✓

According to Table 2, "*reducing licence fees*" and "*organising practical workshops*" are the most accepted strategies to minimise the gap between knowledge and practice. Respondents emphasised on "*increasing promotional activities on the modern software to increase awareness*" and "*introducing practical and theoretical learning packages at higher education*". However, "*organising CPD sessions*", "*creating national standards and policies*", "*increase the use of modern software*", and "*encourage the use of modern software at professional practice*" are several other strategies proposed. However, E4 disagreed with conducting CPDs stating that "*CPD sessions on modern software practices will not provide the expected outcome since a technical skill is impossible to obtain within a few hours of training*".

The experts further added the following factors as the barriers to effective implementation of the strategies proposed by them. According to the respondents, ***lack of financial capabilities*** of the companies, as well as the ***high consumption of time*** is affecting the acquisition of the knowledge and practice of the modern software. It was further highlighted that ***privacy issues, malfunctions, and vulnerability of hackers*** as the challenging factors for the adaptation of modern software for QS aspects. Furthermore, ***lack of interest of the students and the professionals to familiarise modern technology*** is a challenge arising from personal perspectives. Along with the lack of interest, ***higher resistance to change*** appear as a demotivating factor. In the academic perspective, there prevails a ***shortage of lecturers in the academic institutions***, and in the industry perspective, there is a ***lack of trainers***, which challenges the implementation of strategies. The experts emphasised that ***unavailability of marketing approaches for familiarity with modern software*** has become a challenge in the modern industry to increase awareness. Further, ***unavailability of a common platform and resources for the project stakeholders to proceed*** has become a challenge that affects the increase of the gap of knowledge and practice in the QS profession. Additionally, ***complexity of the modern software*** when compared to traditional software such as MS Excel and MS Word, irrespective of the user's capabilities, is a key challenge that degrades the implantation of strategies to reduce the gap between knowledge and practice.

4.4 TRAINING AND DEVELOPMENT FRAMEWORK TO IMPROVE THE USE OF MODERN SOFTWARE IN QUANTITY SURVEYING PRACTICE

Technological advancement for QS practices shall be attained via several modes, especially through training and development. Training and development of software are achievable through the building up both knowledge and the practice of the modern software used to perform QS related tasks. Figure 2 illustrates the training and development strategies proposed by the experts to achieve technological advancement in QS practices. The specific initiatives discussed by the experts under each strategy are presented in Figure 2. If the initiatives can be undertaken by the identified stakeholders, such as the government, professional bodies, and the professionals, that would help to implement the strategies, which in turn will help to reduce the gap between the awareness and practice of modern software in QS practice. However, the effective implementation

of such strategies can be hindered by the barriers identified by the experts that are discussed in Section 4.4.

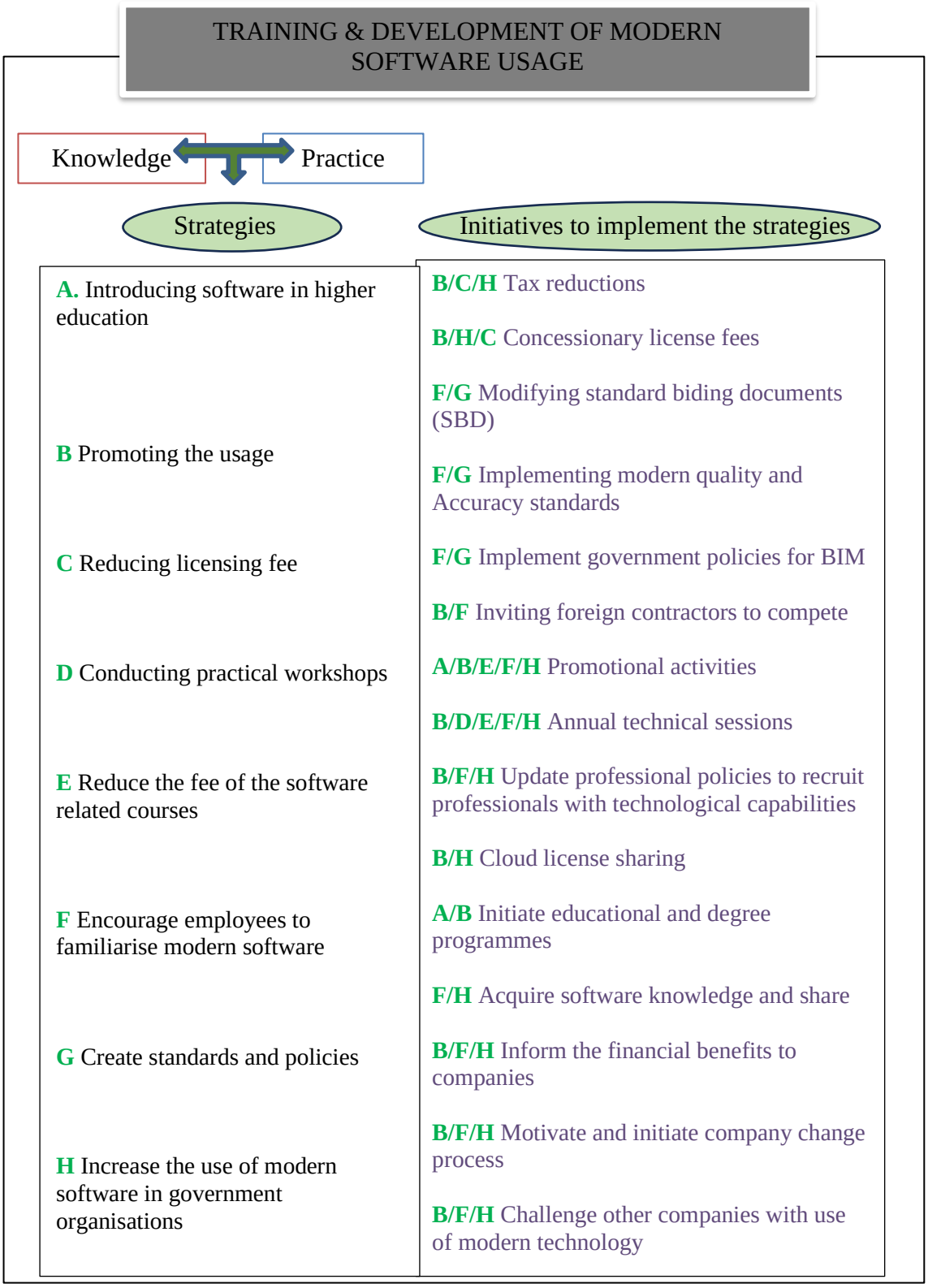

Figure 2: Training and development approaches in achieving modern technological advancements in the QS practice

5. CONCLUSIONS

This study has explored the gap between awareness (knowledge) and practice (actual usage) of modern software in QS practice. The factors, contributing to such a gap were identified to propose suitable training and development strategies to address the existing gap. Additionally, specific initiatives along with the responsible stakeholders were identified under the strategies. The research further discussed the barriers to the effective implementation of the strategies.

The evolutionary nature of the roles played by the quantity surveyors shall be made more efficient and effective with the use of modern software. Much software is available, and each software shall be used to perform general and specific tasks of quantity surveyors. This research proposed the training and development strategies for quantity surveyors to reduce the gap between awareness and practice of modern software. To efficiently utilise such training and development strategies, support is necessary from the government and professional bodies. Accordingly, the framework developed has identified the necessary strategies, along with the initiatives to be undertaken by the government, professional bodies, higher education institutes and QS professionals to improve the application of modern software in QS practice in Sri Lanka. The findings of this study shall be used by higher education institutions and industry professionals in leveraging the software usage to streamline the QS-related job roles. The findings shall be utilised to implement strategies in providing training and development for QS professionals on modern software usage.

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