Development of a Decision Support System for Evaluating the Competencies of Educators

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Abstract: Higher education institutions should rely on the success of educators to deliver quality education in an increasingly economic context. The definition of the competencies necessary for an effective educator rest on top higher education management. Institutions of higher learning may also enhance cognitive abilities. The development of cognitive talents can be aided by qualified teaching abilities. Educators should have a thorough understanding of the subjects they are teaching. Educators should also have real-world experience to enhance the attraction of their teachings. The purpose of this study is to evaluate the abilities of educators using self-assessment tests and to identify any training needs by applying a survey to the educators. The Decision Support System was used to assess the testing procedure and establish the proficiency of the higher education instructors. Decisions were made regarding the necessity of more educational training. ECOEDSS tool was developed using HTML, PHP, JavaScript, and a MySQL database. The philosophy of competency, competencies management, and the DSS concept are all covered in this study. Additionally, ECOEDSS may support and foster educator self-development of skills.

Keywords: Assessment, Competencies, Decision Support System (DSS), Educators, Self-assessment,

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Introductıon

Information Technology (IT) has become one of the principal success drivers for any business enterprise. The function of IT was expanded to decision-making and strategy-building purposes. It will improve the company's use of the Management Information System (MIS) and Decision Support System (DSS). As in (Wahba,2010), (Manurung, 2019) notes that DSS will assist executives in extracting vital knowledge from big data as required. (Dulebohn, 2013) as (Wahba,2010) states that organisations need human resources with a different set of values and competencies,which should be productive, creative, responsive and adaptable to the fast-changing business environment. Hence, this paper discusses the DSS tool to evaluate competencies. (Mohd, 2018) state that the proper application of decision-making tools increases productivity, and efficiency and gives many advantages and benefits to the organisation. Competency-based training helps recognise the behaviours, information, skills, and abilities required to enhance the out- put of a successful learning process. Competencies will often support the learning by concentrating on key skills, providing guidelines for evaluating employee efficiency and capacities, providing a mechanism for defining learning options for the fulfilment of employee and organisational needs, encouraging efficient prediction of administrative activities and developing standards to assess how well learning has occurred. Some of the common benchmark competency-based practices are assessments against competencies.

The following scenarios are possible during this assessment: (1) Self-assessment: The norm for measuring the output of the employee is to evaluate each variable using a standardised rating scale based on the behavioural assessments for the skills and ability levels required within the target role. The accuracy and consistency of each person's self-evaluation are ensured by these behavioural examples. As a result of their increased self-awareness, their intrinsic motivation. The findings highlight the strengths and weaknesses of the employees' skills. An personalised learning plan is then encouraged to be carried out using this information. (2) 180-Degree Assessment: A 180-degree assessment expands on this by taking the employee-under-own appraisal's assessment into account. Before the performance review meeting with their upper management, the employee usually completes a self-evaluation form, evaluating themselves and offering input on how they feel about their performance. (3) 360-degree/multi-source: The technique of self-assessment is comparable to multi-source or 360-degree feedback, which includes multiple evaluators. The procedure must, at the very least, include the employee and his or her supervisor, and it may also include other people the employee interacts with on the job (International Atomic Energy Agency, 2016).

In order for educators to take charge and commit themselves to the support of a system of education, a transformation is necessary. It is significant because educators are the agents and implementers of the educational system and because education is fundamentally tied to demographics (Mohemad, 2018). Furthermore, they don't have techniques available, so how can the competency criteria be assessed? To incorporate the relevant knowledge of requirements at businesses into education, educators must have these approaches available and be proficient in them (Hanifatulqolbi, 2019). Even worse, due to a lack of resources,

educators are unaware. Through the use of simulated teaching, observational recording, and checklist completion, the evaluation will ascertain whether the educator is competent (Prasetio, 2019). In order to evaluate educators' talents in higher education, traditional methods are also used (Yew, 2019). The form is still used, and the manual score measurement is still done using the rubric. Without taking into account their needs, the training was provided to meet KPI.

Decision Support System in Different Areas

DSS is implemented in a variety of fields, including forensics (Noor, 2019), agriculture (Rupnik, 2009), aquaculture (Doucette, 2009), medical (Rajoo, 2009), education (Mohemad, 2020), (Mohd, 2019), and sustainable development (González, 2013). For instance, AgroDSS (Rupnik, 2009) has been used in the agricultural industry. Data analysis was done using data mining to identify trends, distributions, and patterns that are hard to spot with the human eye (Mohd, 2019). Users may be able to comprehend the specifics, observe time shifts, and make future behaviour predictions with this tool. The main production usage of the AgroDSS will yield results based on the data provided without needless user intervention. Although AgroDSS employs data mining algorithms, these are approachable algorithms. Example data include phenomenon prediction, goal variable prediction, shift identification, seasonal analysis, and more. These data make it simple for farmers to conduct and comprehend the study (Rupnik, 2009). First Aid Decision Support System (FADSS) has been created in the medical industry to enable users to locate information about first aid instances that are available as an application tool. The FADSS uses data extraction, mathematical models, decision trees, and real-time knowledge measurement to produce a decision-making process. The major objective of the tools is to give individuals and junior staff members in First Aid Centers a useful tool for locating the information resources that are available (Ahmed, 2020).

The DSS for Environment Assessment of Marine Finfish Aquaculture was introduced in aquaculture. The goal of the Marine Finfish Aquaculture Decision Support System (MFADSS) is to enhance uniformity in the evaluation of environmental data included in marine finfish lease applications and to offer Habitat Managers systematic scientific guidance to assist them in making decisions. A lease application comes with most of the necessary information. The user enters the data into the MFADSS, which then returns results (Doucette, 2009). A DSS for Sustainable Tourism: Three municipalities close to Lake Garda have a plan for sustainable tourism that was developed using the SFIDA Project as a tool in the tourism industry. The DSS can be used to generate data and encourage involvement, making the decision visible, repeatable, and participative.

Several stages of the planning process are supported by the DSS's components, including the management of decision-maker disagreement, the definition of the plan method, the impact representation, the evaluation and comparison of the alternatives, and the management of the environmental and socioeconomic analyses (Laniado, 2004). There is a DSS for Construction Prequalification in the construction industry (Alias, 2011), (Noor, 2010). An expert/decision support system for contractor prequalification called CP-DSS is described in the study as a

prototype. The approach starts by assessing contractors' competence in accordance with parameters particular to the project. The risk that might be brought on by contractors is then determined. Finally, contractors are evaluated based on their expected performance, managerial skills, available resources, forward movement, competitiveness, and activity. For prequalifying contractors, a three-level decision support has been developed (Ng, 1994).

Educators' Competency Dss Tools

To determine a teacher's proficiency, some DSS tools are employed. For instance, the DSS for best instructor performance utilising the Multi-Objective Optimisation approach based on Ratio Analysis (MOORA) method (Manurung, 2019). (Hanifatulqolbi, 2019). This research resulted in a web-based DSS that was used to assist decision-makers in choosing the best instructor performance. Since the results of the assessment serve as a benchmark for determining the incentive level and warning letter for instructors, it strives to promote and enhance the quality of their performance. A DSS is required to assist in choosing the best instructor performance in order to prevent making the incorrect choice. This programme used MOORA. It facilitates the swift and impartial selection of the top performing instructor for Islamic boarding schools (Prasetio, 2019). The abilities of their staff, choose the best applicants, and create efficient succession plans and employee development plans (Wahba,2010).

One of the examples of a method used to assess academicians' competencies is a Competency Mapping for Educational Institutions: Expert System Approach. The development of the expert system is intended to support competence management in the educational environment. An extensive assessment of the literature on competency management practises and interviews with competent deans and managers served as the basis for the knowledge acquisition for this expert system. Analysis of the competency management process is intended to diagnose it. The goal of the research is to develop an expert system for a competence-based management procedure that attempts to solve the majority of the issues with competency management and performance management (Joshi, 2020).

Key Performance Indicators Monitoring Tool (KPI-MT) was developed using Macromedia Dreamweaver. In contrast, PHP Hypertext Pre-processor (PHP) is used as a scripting language and MySQL as the database management system. DSS in the KPIMT system used a weighted sum method (WSM) to calculate the overall score of teachers and to determine whether the performance of teachers in a particular year was very good, good, fair, poor, or weak. With the KPI-MT system, 56 school principals can monitor teachers' performance from the first year of their service at schools (Samuri, 2016). With additional features on the KPI-MT prototype, such as the display of graphs and the ability to monitor the performance of teachers every year, it is seen that the prototype has the potential to replace the KPI system existing at the school to assist the school management, especially the principals, in assessing and monitoring teacher's performance efficiently (Noor, 2019).

Methodology

DSS help users who rely on knowledge to solve problems. DSS is designed to support not replace a decision-maker [33]. The decision support and expert systems have shifted from solely analytical tools for assessing the best decision options (Larsson, 2014). The typical DSS consists of three subsystems which are data management, model management and user interface. DSS is configured with four subsystems as Dialog Generation and Management System (DGMS), Database Management System (DBMS), Model Base Management System (MBMS) and Knowledge Base Management System (KBMS). A significant component of the DSS is the decision-maker, user and task. Thus,it can be concluded that such composition of the DSS is the most rational as shown in Figure 1.

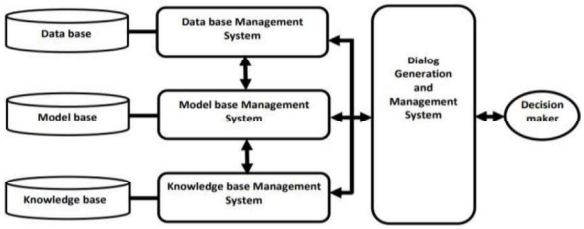


Figure 1. Standard DSS structure [(Noor, 2017), (Larsson, 2014)]

Figure 2 shows the model of the DSS for Evaluating Competencies of Educators in Higher Education (ECOEDSS). It involves four steps which are to determine the educators' competencies, competency testing, usability testing and training need analysis.

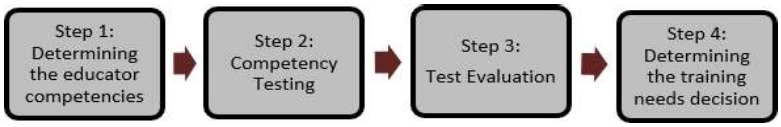


Figure 2. System Model

Step 1 : Determining the educator competencies. The competencies will focus on three components which are personal and social,pedagogy and teaching, and technical skills.

Step 2 : Employing the Likert Scale on CoA self-assessment test and the essential elements was used to implement competency testing.

Step 3 : Testing evaluation utilising the ECOEDSS user interface. The score and competency level will be displayed.

Step 4 : Deciding on the training requirements for educators. The ECOEDSS will activate the proper rules to create recommendations or solutions

The procedure starts when the educator engages with the user interface (UI). The educator is required to fill out information about his skills and activities during the service period based on three factors: personality and social, academic, and technical capabilities. The ECOEDSS User Interface (UI) will determine a ranking, show the competency level, and activate the appropriate standards for categorizing competency solutions or suggestions. The procedure is considered to be complete after the educator has acquired the required ratings, abilities, and recommendations, regardless of whether additional training is required.

Implementation

ECOEDSS interfaces have been developed using the Notepad++ platform, and many aspects need to be highlighted, including the selection of suitable colours and the use of user-friendly icons. The Hypertext Markup Language (HTML), JavaScript (.js), and PHP Hypertext Pre-processor (PHP) languages were used to create this framework. Additionally, the Cascading Style Sheet (CSS) was utilised to increase the interactivity of this tool. The primary interface for ECOEDSS is shown in Figure 4. Only if the data has previously been entered into the database are users able to log in. Users must input their username and password to access the next graphical user interface, which is a self-assessment form. In the event that an unauthorised user tries to log in, a warning box will appear. Only one ID may submit a response to this self-evaluation. A once-per-semester self-evaluation is conducted.

By selecting View Reporting as seen in Figure 3 and Figure 4, both the instructor and the supervisor can see the report. The report will display the Table and Overview (Score). The outcomes of the assessments can also be visualised graphically using Nine-Box and a number of charts. The overall assessments will be displayed in red, the supervisor assessment score in purple, and the educator assessment score in blue. On the y-axis, each assessment is displayed as a percentage. By referring to the competency measured on the x-axis, educators can view their top rating scores in line and bar charts on lines and bars. Educators can view their competency score patterns based on competency ratings in the radar chart. The pattern will let educators assess their degree of competency.

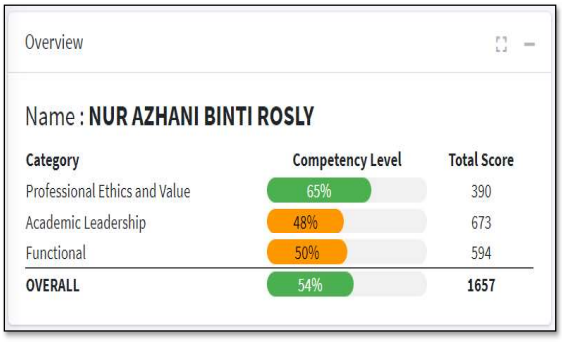


Figure 3. Score Overview

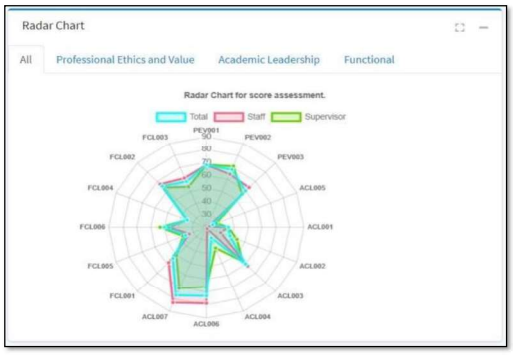
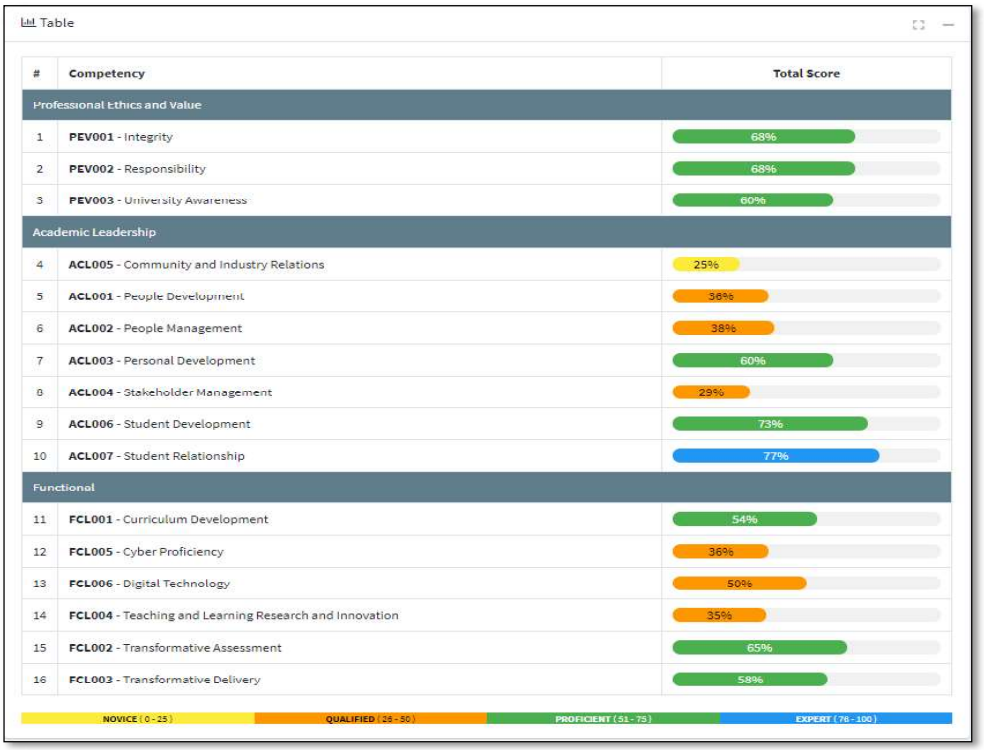


Figure 4. Radar Chart

Figure 5 shows the list of available competencies. The competency has three main categories which are Professional Ethics and Values, Academic Leadership and Functional. Each category, they have its competency. Professional Ethics and Value will measure Integrity (PEV001), Responsibility (PEV002) and University Awareness (PEV003). Academic Leadership will measure seven competencies which are People Development (ACL001), People Management (ACL002), Personal Development (ACL003), Stakeholder Management (ACL004), Community and Industry Relations (ACL005), Student Development (ACL006) and Student Relationship (ACL007). The functional category will measure the competency of Curriculum Development (FCL001), Transformative Assessment (FCL002), Transformative Delivery (FCL003), Teaching and Learning Research and Innovation(FCL004), Cyber Proficiency (FCL005) and Digital Technology (FCL006).



Table

#	Competency	Total Score
Professional Ethics and Value		
1	**PEV001** - Integrity	68%
2	**PEV002** - Responsibility	68%
3	**PEV003** - University Awareness	60%
Academic Leadership		
4	**ACL005** - Community and Industry Relations	25%
5	**ACL001** - People Development	36%
6	**ACL002** - People Management	38%
7	**ACL003** - Personal Development	60%
8	**ACL004** - Stakeholder Management	29%
9	**ACL006** - Student Development	73%
10	**ACL007** - Student Relationship	77%
Functional		
11	**FCL001** - Curriculum Development	54%
12	**FCL005** - Cyber Proficiency	36%
13	**FCL006** - Digital Technology	50%
14	**FCL004** - Teaching and Learning Research and Innovation	35%
15	**FCL002** - Transformative Assessment	65%
16	**FCL003** - Transformative Delivery	58%

NOVICE (0 - 25) QUALIFIED (26 - 50) PROFICIENT (51 - 75) EXPERT (76 - 100)

Figure 5. Total Score Table

The Nine-Box is focused on potential vs performance, and each box has its own scale and indications (Figure 6). The indicators in Nine Box are displayed with a variety of scales on the x-y axis. The scale's range is as follows:

Poor Performance Limited Potential (1-33, 1-34)\
Poor Performance Moderate Potential (1-33, 35-67)
Poor Performance High Potential (1-33, 68 -100)
Good Performance Limited Potential (34-66, 1-34)
Good Performance Moderate Potential (34-66, 35-67)

Good Performance High Potential (34-66, 68 -100)

Outstanding Performance Limited Potential (67-100, 1-34

Outstanding Performance Moderate Potential (67-100, 35-67)

Outstanding Performance High Potential (67- 100, 68-100).

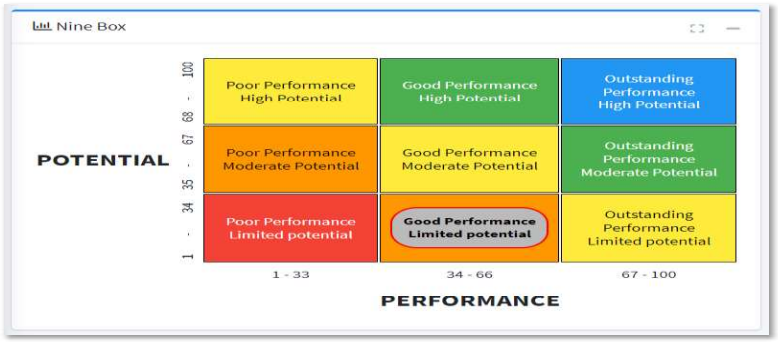


Figure 6. The Nine-Box

As a result, the framework created to gauge the competency level of educators has been successfully implemented. The evaluation of competencies using the CBTM4EDUCATORS can produce various results depending on the conceptual framework used. Based on the competency gap and the results of the system evaluation, management will release training development plans. This enables management to assign educators the proper duties depending on their competencies and training requirements. The first step in establishing the kind of training required is to evaluate an educator's strengths and weaknesses. Competency gaps in competency assessments also give information on development initiatives, which is useful for both businesses and educators.

Conclusion

The discussion led to the development of a framework that satisfies all objectives. The environment of this study is centred on higher-level educators. The section of this study that is mentioned attempts to serve as a blueprint for creating effective educators. The abilities can be applied to hiring staff, creating curriculum for educators' re- and up-skilling programmes, and generating curriculum for educators. To succeed, higher education institutions need hire high-potential individuals. In addition, the framework needs to ensure they undergo training and development needed to identify their potential and suggest improvements. The ECOEDSS was shown to be a more effective method than the conventional one for evaluating the abilities that educators must possess and for developing a training plan to increase those skills.

These abilities will enable educators to adapt and adhere to best practises to suit societal expectations, effectively aiding in the economic development of the nation. It tries to pinpoint the fundamental skills teachers need to possess in order to fully prepare their learners for the transfer to the workplace. Therefore, if effectively implemented, these abilities would guarantee that educators are given the proper training and, as a result, give

their learners a smooth transition from the institution to finding employment. There are some restrictions on meeting the predetermined targets. In this system, only self-assessment techniques were employed, and top management was only able to monitor the reported outcome. There are several suggestions that can be made to enhance the usability of the ECOEDSS features, including the user level.

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