MULTICRITERIA ANALYSIS FOR THEEVALUATION AND BENCHMARKING OF ENGLISH LANGUAGE MOBILE APPS FOR YOUNG LEARNERS

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UNIVERSITI PENDIDIKAN SULTAN IDRIS
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MULTICRITERIA ANALYSIS FOR THE EVALUATION AND BENCHMARKING OF
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NU'AS KAWTHER IBRAHIM ALGLWOM

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ABSTRACT

This study aimed to construct an evaluation and benchmarking Decision Matrix (DM) based on multi-criteria analysis for English mobile applications (E-apps) for young learners in terms of Listening, Speaking, Reading, and Writing (LSRW) skills. The DM was constructed based on the intersection between evaluation criteria in terms of LSRW and E-apps for young learners. The criteria were adopted from a preschool education curriculum known as the National Preschool Standard Curriculum 2016 standard. The data presented as the DM include six E-apps as alternatives and 17 skills as criteria. Thereafter, the six E-apps were evaluated by distributing a checklist form amongst three English learning lecturers in early childhood learning department from local university in Perak. These apps were then benchmarked by utilising two experimental MCDM methods, namely, best–worst method (BWM) and Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS). BWM is used for weighting the evaluation criteria, whereas TOPSIS is used to benchmark the apps and rank them from best to worst. TOPSIS was utilized in two decision-making contexts, namely individual and group contexts. In group decision making, internal and external group aggregations are applied. For validating the proposed DM, objective and subjective methods were used. The results showed that (1) the integration of BWM and TOPSIS was effective for solving benchmarking and ranking problems of E-apps. (2) The ranks of E-apps obtained from internal and external TOPSIS group decision making were the same, with the first index app being 'Montessori' and the last index app being 'FunWithFlupe'. (3) For objective validation, remarkable differences were observed between the group scores, and they indicated that the internal and external ranking results are identical.(4) For subjective validation, the ranking of experts was exactly similar to the proposed benchmarking DM ranking results. As conclusion, the proposed DM can be used for evaluation and benchmarking different E-apps. The implications of this study will benefit (1) English language teachers/designers for understanding how English course content should be presented; (2) parents for screening and choosing suitable and reliable English learning apps that will help their children; and (3) kindergarten teachers for choosing an appropriate English app.

ANALISIS PELBAGAI KRITERIA UNTUK PENILAIAN DAN PENANDAARASAN APLIKASI MUDAH ALIH BAHASA INGGERIS UNTUK PENUNTUT MUDA

ABSTRAK

Kajian ini bertujuan untuk membuat penilaiandan penanda aras Matrix (DM) berdasarkan pelbagai kriteria analisis untuk aplikasi mudah alih Inggeris (E-Apps) bagi penuntut muda dari segi kemahiran mendengar, bertutur, membaca, dan menulis (LSRW). DM telah dibina berdasarkan kepada perkaitan antara kriteria penilaian dari segi kemahiran LSRWdan E-Apps untuk penuntut muda. Kriteria ini merupakan adaptasi daripada kurikulum standard pendidikan prasekolah yang dikenali sebagai Kurikulum Pendidikan Prasekolah Kebangsaan 2016. Data yang dibentangkan sebagai DM termasuklah enam *E-Apps* sebagai alternatif dan 17 kemahiran sebagai kriteria. Selepas itu, enam*E-Apps* dinilai dengan mengedarkan borang senarai semak dalam kalangan tiga pensyarah belajar Bahasa Inggeris di Jabatan Pembelajaran Awal Kanak-kanak dari universiti tempatan di Perak. Aplikasi ini kemudiannya diukur dengan menggunakan dua kaedah percubaan MCDM, iaitu Kaedah Baik Buruk (BWM) dan Teknik Susunan Keutamaan berdasarkan persamaan bagi mendapatkan penyelesaian yang ideal (TOPSIS). BWM digunakan untuk mengatasi kriteria penilaian, manakala TOPSIS digunakan untuk menanda aras aplikasi dan meletakkan mereka dari segi terbaik atau terburuk. TOPSIS digunakan dalam dua konteks membuat keputusan, iaitu individu dan konteks berkumpulan. Dalam membuat keputusan berkumpulan, penglibatan kumpulan dalaman dan luaran digunakan. Untuk mengesahkan cadangan DM, kaedah objektif dan subjektif telah digunakan. Hasil kajian (1) menunjukkan integrasi antara Kaedah Baik Buruk (BWM) dengan TOPSIS berkesan untuk menentukan penanda aras dan menyelesaikan masalah ranking dalam *E-Apps*. (2) Ranking yang diambil dari sumber dalaman dan luaran adalah sama dengan bacaan indeks pertama iaitu "*Montessori*" dan indeks terakhir iaitu "*Fun with Flupe*". (3) Dari segi penilaian objektif, terdapat perbezaan yang tipis antara kumpulan dalaman dan luaran. (4) Dari segi penilaian subjektif, ranking yang diberi pakar menyamai keputusan penanda aras DM. Kesimpulannya, DM terbukti sesuai digunakan sebagai penanda aras ranking. Implikasi kajian ini akan memberi manfaat (1) guru/pereka Bahasa Inggeris untuk memahami bagaimana kandungan kursus Bahasa Inggeris perlu dikemukakan; (2) ibu bapa boleh menyaring dan memilih aplikasi pembelajaran Bahasa Inggeris yang sesuai dan boleh dipercayai untuk membantu anak mereka; dan (3) guru tadika untuk memilih aplikasi Bahasa Inggeris yang sesuai.

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LIST OF ABBREVIATIONS

AHP   Analytic Hierarchy Process

ANP   Analytic Network Process

App   Application

AR   Augmented Reality

BWM   Best worst method

CR   Consistency Ratio

KSPK   Kurikulum Standard Prasekolah Kebangsaan

LSRW   listening, speaking, reading, and writing

MCDM   Multiple-criteria decision-making

MEW   Multiplicative Exponential Weighting

SD   ScienceDirect

TOPSIS   Technique for Order of Preference by Similarity to Ideal Solution

UPSI   Universiti Pendidikan Sultan Idris

WoS   Web of Science

WPM   Weighted Product Model

WSM   Weighted Sum Model

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter describes the research background, problem, questions and research objectives. It also includes the significance of constructing a decision matrix for the evaluation and benchmarking of English learning mobile applications (apps) for young learners. Moreover, the scope and the organisation of research are included to describe the scope and structure of the entire sections of each chapter in this study. Section 1.2 presents a brief background of the research components. Section 1.3 identifies and introduces the research problem, which is the basis of the research direction. Section 1.4

presents the research questions. Section 1.5 describes the research objectives. Sections 1.6 and 1.7 present the significance and scope of this study, respectively. Section 1.8 outlines the main structure of our study. Finally, Section 1.9 abstracts and summarises this chapter.

1.2 Research Background

At present, the world is considered a global village where individuals communicate with one another through a well-known and common language in the international community, that is, English (Yang & Chan, 2008). According to Robson (2013), English is utilised at a useful level by approximately 1.75 billion people worldwide (one out of four people). By 2020, two billion people are forecasted to use or learn to use English.

Furthermore, early childhood stage is considered the most rapid development period in human life and is important to the complete and healthy cognitive, emotional and physical growth of children (Walter & Wrester, 2009). Early childhood English education can lead young children to learn the language effectively and support their formal English learning in primary school. Thus, inspiring the learning interest of children is important and represent the key for improving teaching quality (Yanyan Chen, Zhou, Wang & Yu, 2017).

Meanwhile, technological development through mobile devices and adaption of apps has translated into considerable opportunities for children to learn English (Gangaiamaran, 2017). Mobile devices can promote children motivation (Oakley &Imtinan, 2018), make the process of language learning fun and enjoyable and help learners develop language skills positively (Gangaiamaran, 2017; Jeong, 2017). Mobile devices also provide a unique learning environment and a great opportunity for young learners of the English language to practice and learn (Kim & Smith, 2015). Numerous research findings show an entire development towards utilising mobile devices to promote the efficiency and eminence of learning via mobile learning for young learners. Therefore, mobile devices are becoming increasingly popular as a new and effective learning tool (Gomathi, 2014; Kamaruzaman & Zainol, 2012). Mobile learning refers to utilising smart phones and their apps in the teaching and learning processes within different learning environments (Voutilainen, Saaranen & Sormunen, 2017). At present, mobile apps are constantly increasing and considered a communal tool for learning (Pham, Nguyen, Hwang & Chen, 2016). They are the latest technological developments to help in English learning (Yadegaridehkordi & Alaa, 2017) and considered one of the preferred environments for children to learn and practice a language. Mobile apps are also becoming increasingly popular and play an essential role in English language learning for children (Sadiq, Cavus & Ibrahim, 2019). Although numerous apps are available, only a few are successful (Pham et al., 2016). Many available English learning apps are provided for children (Oakley & Imtinan, 2018); however, determining whether these apps are designed with a theoretical approach (Pilar, Jorge, & Cristina, 2013) in addition to the absence of quality control on the content of these apps (Kalz et al., 2014)

have resulted in difficulty for users to choose the right app (Başaran & Aduradola, 2018). Therefore, evaluating these apps is important to select the best on.

1.3 Research Problem

Early childhood is the best period for language learning (Yanyan Chen et al., 2017) because children in this stage are generally considered capable of learning a new language fast and with minimal effort (Çakici, 2016).

Moreover, along with the advancement of mobile devices and the increase in the number of English speakers worldwide, numerous English learning apps for children and adults have been developed and are widely available in the App Store, Play Store and other repositories (Ma, 2016; Oakley & Imtinan, 2018; Robson, 2013; Son, 2016). However, whether these apps are designed with a theoretical approach to teaching (Pilar et al., 2013) cannot be concluded, and quality control on their contents are unavailable (Kalz et al., 2014). Thus, selecting the right app is difficult for users (Başaran & Aduradola, 2018; Gangaiamaran, 2017). Therefore, finding tools and mechanisms that may help instructors and learners in selecting apps that can represent a real added value to their teaching/learning efforts, is important (Arús-Hita, Calle-Martínez & Rodríguez-Arancón, 2014).

The evaluation process is generally one of the key components of education. Evaluation in this context is a process that critically examines apps by collecting and analysing information regarding app activities, characteristics and outcomes. Evaluation is conducted to make judgements regarding apps (Fomichov & Fomichova, 2017). Analyses in the literature indicate that the current evaluation criteria for English learning apps are insufficiently specific due to a lack of concentration on the content evaluation with respect to the listening, speaking, reading and writing (LSRW) skills as an integrated platform. Researchers (Al-Otaibi et al., 2016; Chuang, 2017; Kamaruzaman & Zainol, 2012; Pilar et al., 2013; Segaran, Ali, & Hoe, 2014) have evaluated apps on the basis of ease of use, functionality, design/layout, usability, usefulness and content. The content evaluation focuses on content definition, visible description, presentation and value and determines whether apps are engaging, cultivating and motivating. Pronunciation skill, which is a part of speaking (Silfiani & Rezeki, 2017), is also used to evaluate the content. However, no evaluation is mentioned for the other three skills. All the aforementioned studies focus on adult learners instead of early childhood, and only one study is related to early childhood. Lee et al. (2017) concentrated on vocabulary rather than the four main LSRW language skills. Thus, no study has been conducted for evaluating early childhood apps for English learning as a second language with respect to LSRW skills as an integrated platform to benchmark those apps and choose the best one.

Benchmarking refers to a standard or a group of standards utilised as a point of reference for evaluating and comparing the performance or level of quality against others (Leonid et al., 2013; Yas, Zaidan, Zaidan, Rahmatullah & Abdul Karim, 2018).

Benchmarking English learning apps is a challenging task because the content of each English learning app must be evaluated through many aspects, and each aspect has a set of criteria that should be considered. Therefore, benchmarking and ranking of English learning apps has been facing issues in several significant aspects, as illustrated in Fig. 1.1.
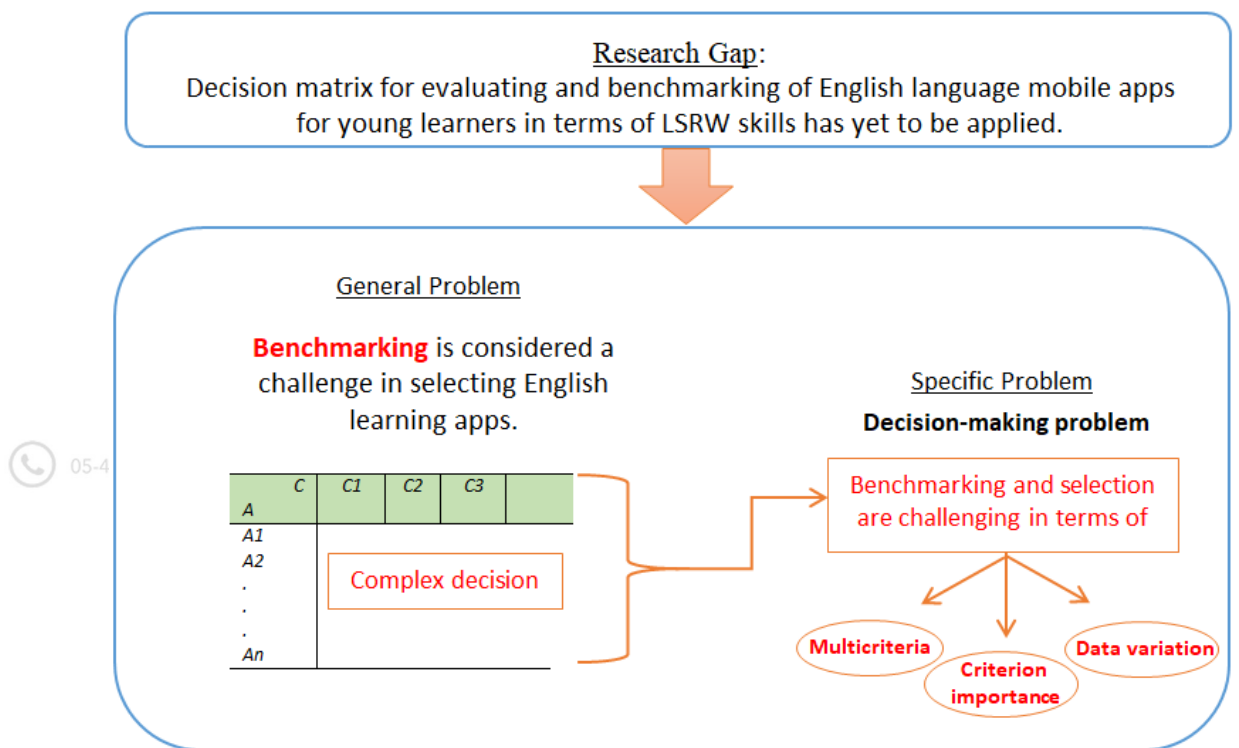
Figure 1.1 Research Problem and Gap

From Fig. 1.1, benchmarking faces three issues, namely, multicriteria, criterion importance and data variation. Firstly, multicriteria issue indicates that many criteria affect the benchmarking process of English learning apps. This study involves three main criteria with 17 subcriteria, which are all considered simultaneously (A. R. Karimi;, N. Mehrdadi;, & S. J. Hashemian; G. R. Nabi Bidhendi; R. Tavakkoli Moghaddam, 2011).

Secondly, criterion importance refers to the preference of one criterion more than the others (N. I. Jaini, 2017). In other words, the criteria of LSRW skills and their subcriteria are at different levels of importance (Z. Chen & Yang, 2011). Thirdly, data variation implies various alternatives that are represented as a set of various data during benchmarking. In other words, each single English learning app is assigned with a single value for each criterion(Liu, Liu, Liu, Zhou & Zhang, 2015; Roozbahani, Zahraie & Tabesh, 2012). The data variation amongst criteria causes a problem wherein decision makers cannot compare apps against others (Deng, Vroman, Zeng & Laouisset, 2010; Podvezko, 2011). This appointed area of evaluation and benchmarking is considered a multicriteria problem.

1.4 Research Qustiones

1. What are the existing criteria for the evaluation and benchmarking of English learning mobile apps for young learners?

2. What are the current problems and issues facing benchmarking English learning mobile apps for young learners?

3. What are the main requirements needed to identify a decision matrix for the evaluation and benchmarking of English learning mobile apps for young learners?

4. What is the suitable technique for benchmarking English learning mobile apps for young learners?

5. Is the result of the proposed benchmarking decision matrix for English learning mobile apps for young learners valid?

1.5 Research Objectives

The overall objectives of this study are as follows:

1. To investigate existing criteria of evaluation and benchmarking English learning mobile apps for young learners and highlight the weaknesses.

2. To propose a new decision matrix on the basis of the intersection between amongst multicriteria evaluation in terms of LSRW using the National Preschool Standard Curriculum (KSPK) standard and English learning mobile apps for young learners.

3. To benchmark the English learning mobile apps for young learners on the basis of the proposed decision matrix using multicriteria decision making (MCDM) techniques.

4. To validate the benchmarking results for the proposed decision matrix objectively and subjectively.

Table 1.1

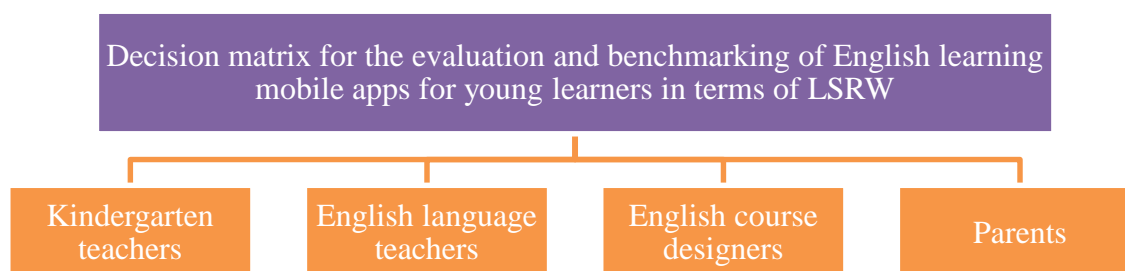*Link Between Research Questions and Objectives*

Research Questions	Research Objectives
1. - What are the existing criteria for the evaluation and benchmarking of English learning mobile apps for young learners? - What are the current problems and issues facing benchmarking English learning mobile apps for young learners?	- To investigate existing criteria of evaluation and benchmarking of English learning mobile apps for young learners and highlight the weaknesses.
2. - What are the main requirements needed to identify a decision matrix for the evaluation and benchmarking of English learning mobile apps for young learners?	- To propose a new decision matrix on the basis of the intersection amongst multicriteria evaluation in terms of LSRW using KSPK standard and English learning mobile apps for young learners.
3. - What is the suitable technique for benchmarking English learning mobile apps for young learners?	- To benchmark English learning mobile apps for young learners on the basis of the proposed decision matrix using MCDM techniques.
4. - Is the result of the proposed benchmarking decision matrix for English learning mobile apps for young learners valid?	- To validate the benchmarking results for the proposed decision matrix objectively and subjectively.

1.6 Significance of the Study

Education using mobile devices would likely be beneficial to English learning for children because using mobile devices provides children with a good environment for English study. This extensive usage of mobile devices has realised numerous mobile apps in English learning (Lee, Shon & Kim, 2015). Numerous apps are available for language learners to download through easy access on the Internet; however, the success of these apps cannot be guaranteed (Pham et al., 2016). Consequently, developing a strategy to evaluate and benchmark these apps is demanded to guide users in choosing suitable and reliable English learning apps

.

The proposed decision matrix will provide considerable benefit to kindergarten teachers, English language teachers/designers and parents. Firstly, the proposed decision matrix can help kindergarten teachers to choose an appropriate English app. Secondly, it will help English language teachers to understand how their English courses content should be presented. Thirdly, it will assist English course designers to understand the effective approach for designing apps for English courses. Lastly, the proposed decision matrix can guide parents in screening and choosing suitable and reliable mobile apps to help their children increase their English ability (Fig. 1.2).

Decision matrix for the evaluation and benchmarking of English learning mobile apps for young learners in terms of LSRW

| Kindergarten teachers | English language teachers | English course designers | Parents |

Figure 1.2 Significance of The Study

1.7 Scope of the Study

This study is a cross domain that involves English learning field and decision making. The study is designed to solve issues related to early childhood (ages 5+) app selection for English learning as a second language in terms of LSRW skills based on the KSPK standard. Checklist form is used for collecting data obtained from three experts to evaluate six English learning apps. An experimental approach is used to benchmark and rank the apps by using MCDM methods. Two outputs are expected from this study. The first output is a new decision matrix that can be used in the evaluation and benchmarking processes of English learning apps. The second output is an entire guideline for the evaluation and benchmarking of English learning apps following the KSPK standard, which can accommodate the development in this area (Fig. 1.3).
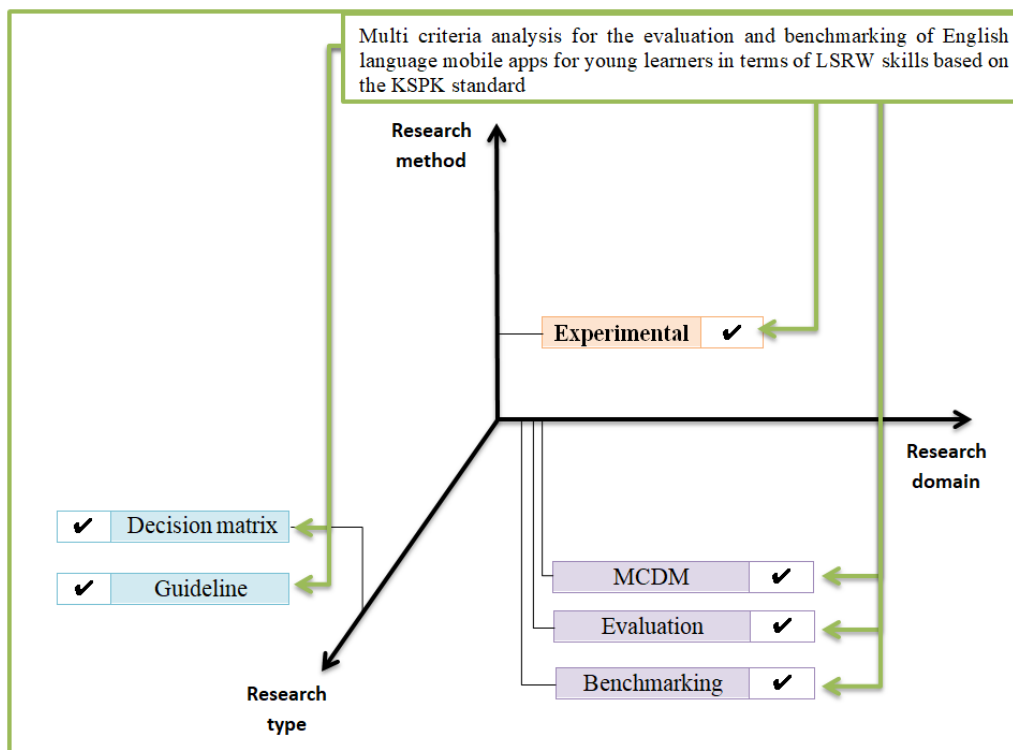
Figure 1.3 Scope of The Study

1.8 Organisation of the Study

The present research is divided into five chapters. Chapter 1 introduces the present study

and contains the background introduction; statement of the problem, questions and

objectives; and the significance of the study. Chapter 2 provides the literature review of

past studies related to English language learning evaluation. Chapter 3 elaborates the

research methodology by providing guidelines on the manner in which the study will be

conducted. Chapter 4 presents the results of the proposed decision matrix for the

evaluation and benchmarking of English learning apps for young learners. Finally,

Chapter 5 summarises the main findings in relation to the research objectives, contributions, limitations and future direction of this study.

1.9   Chapter Summary

This chapter has introduced the study conducted. It has also explained in detail the issues, such as research background, problem, questions and objectives, as well as the significance and scope of the study. Moreover, the organisation of research has been included to describe the structure of the entire sections of each chapter in this research.