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Requirement Examination: Users' Involvement in IS Model Development

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Abstract:
The active involvement of the users (also known as curriculum designers in this study) in designing curriculum in Institution of Higher Learning (IHL)is important. Earlier study conducted shown that curriculum designers face challenges such as mapping course learning outcomes to programme learning outcomes and calculating student learning time manually requires much effort. The curriculum design process also faced problems such as error-prone and consume a lot of time. This paper presents the results of gathering and analyzing user requirements during the development of a proposed model, named as Information System Curriculum Design (ISCD) model. The requirement analysis consists of literature reviewon the existing systems and a survey conducted among 90 curriculum designers from 20 IHL. The respondents who have at least one year experience in curriculum design have verified thecomponents and subcomponentof ISCD model by indicating their perception of the importance of these components. The overall results show that all components and subcomponents are perceived important by curriculum designers in IHL and the relationships are positively related to each other.

Keywords: *user involvement, curriculum design and information system.*

1. INTRODUCTION

User involvement in system or model development is very important. It is the key concept and widely acceptable principle in developing a usable system (Kujala, 2003; Kujola et al., 2005). According to Sun (2013), system requirements and specifications are incomplete if lack of users' involvement. In this study, users (known as curriculum designers)who are actively involved in curriculum design have faced difficulties during curriculum design process. In the preliminary study conducted earlier, the difficulties or challengesidentified during curriculum design process for Institution of Higher Learning (IHL)such as the mapping of course learning outcomes (CLO) to programme learning outcomes (PLO) and calculating student learning time (SLT) based on programme standard guidelines given by the qualification accreditation body (Thong et al., 2011). Aproposed model, named as Information System Curriculum Design (ISCD) model provides guidance to overcome the challenges(Thong et al., 2018). In this paper, the process of gathering and analyzing user requirements for the development of ISCD modelin curriculum design domain is presented. Each component and subcomponent of the model are identified through literature study and

verified by curriculum designers in IHL. The following section presents the literature review which are relevant to this study.

2. LITERATURE REVIEW

Based on literature review, IS is used in curriculum design throughout all these years. Some of the key functionalities of IS used are design and maintain curriculum in Navy (Wallace et al.,1993); provide comprehensive summaries of curricula content(Friedman and Nowacek, 1995); support curriculum development activities such as planning, implementation and assessement(Wikes et al., 2002);provide access to outcome-based curriculum database(Kousky, 2006); manage medical curriculum (Joshua et al., 2009); designcurriculum in real time, perform curriculum coherence verification and generate statisticsto be used for academic and accreditation purpose (Hamam and Loucif, 2009); redesign IS-related programmes(Slack, 2011); facilitate alignment and communication between university and learners(Dafaulas and Zheng, 2012); anddesign and manage all types of curricula (Piccioli,2014).

Table 1 presents the summary evaluation of selected IS for curriculum design including their strengths and limitations. The identified strengths serve as key reference for developing overall structure of the model whereasthe limitations are used as key reference for proposing components and subcomponents for the model.In summary, every feature of these IS is developed to address issues or specific academic disciplines in IHL. One of the common features is report generation. However, the common limitationin most systems is there do not target specific intended-user group.

Table1. Summary Evaluation of Selected IS for Curriculum Design

IS for Curriculum Design	Strength	Limitation
Curriculum Design Tool (Dafaulas and Zheng, 2012)	Provide standardized approach in expressing curriculum components using terminologies and vocabulary	Does not notify users when there are new terminologies and vocabulary added to the database
Curriculum Design System (Slack, 2011)	Able to generate comprehensive curriculum documentation or report	Does not generate/provide statistical report and statistical analysis in the curriculum redesign process
Web-based Curriculum Support Engine (Hamam and Locif, 2009)	Enable curriculum designers to set and verify accreditation criteria as well as provide support during the accreditation process	Does not provide automated notification services for frequently change criteria, this may results in non-coherence and non-compliance
Online Outcome Database (Kousky, 2006)	Able to assist curriculum designers to manage an outcome-focused curriculum plan	Does not provide step-by-step guidance to curriculum designers in curriculum redesign process
Curriculum Management System (Wikes et al., 2002)	Cover the whole curriculum design process	Does not cover curriculum design activities in-depth such as course design process

The entire structure ofISCD modeladapted basic structure of existing MIS model (Raymond, 1998). The components of the model are: Input which consists of internal input and external input; process which consists of curriculum database, curriculum designmodule (subscribe to notification agent) and curriculum design process (step-by-step guided process); and output.The output includes curriculum alignment matrix and reports. Table 2 shown the components and subcomponents of ISCD model.

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Table 2. Components and Subcomponents of ISCD model

Activity	Component	Subcomponent
Input	Input	Internal Input, External Input
Process	Curriculum Design Module (subscribe to notification agent)	Curriculum Maintenance, Curriculum Assessment Curriculum Analysis
	Curriculum Design Process	CLO Design, CLO Mapping, CLO Alignment, Managing & Monitoring CLO Process
	Curriculum Database	Curriculum Database
Output	Output	Output

3. METHODOLOGY

The methodology used in this study consists ofliterature study and a survey. Literature study is conducted on selected existing IS in curriculum design to indicate its strengths and limitations. Next, the expected outcome of its component and subcomponent of ISCD model are identified. A survey is conducted to verify the components and subcomponents.In survey administration, 40 emails are sent to intial contacts in both public and private IHL inviting them for online survey participation. Data collection technique used is snowball sampling technique. The curriculum designers from public and private IHLare target respondentsinvolve in the survey.

4. RESULTS AND DISCUSSION

This section presents the findings of the survey using descriptive analysis and inferential analysis.

Descriptive Analysis

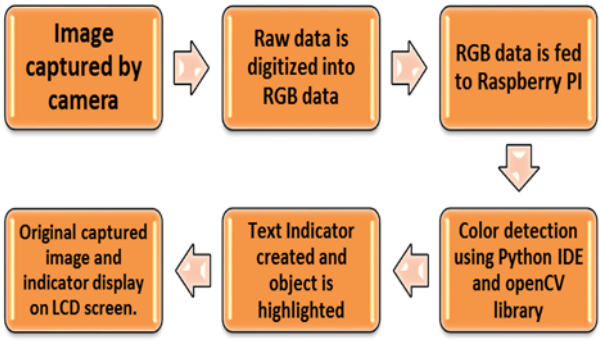
They are 90 respondents from 20 IHLsparticipated in this survey. Targeted sample consistsof curriculum designers from public IHL (50%) and private IHL (50%). The basic demographic of the survey is shown in Appendix.

Measurement of Scales

In designing and administering questionnaires, one of the main concern or extremely important step is reliability and validity of the measurement scales.According to Cavana et al. (2001), a reliable measure shows steadiness and consistency in measuring the concept and also evaluate "goodness" of the measures. This subsection describes the reliability and validity of the measurement scales which implemented in the questionnaire. All the items or variables are testified for reliability and consistency by using Cronbach alpha.Reliability can be manifested in terms of stability, equivalence, and consistency. Consistency check is commonly manifested in the form of Cronbach Coefficient Alpha (Cronbach, 1951), and it is a popular method. Generally, the value of Cronbach alpha which is more than 0.60 is considered good and acceptable. It is inline with notes given by Hair et al. (2006) and Malhotra and Peterson (2006), the coefficient values from 0 to 1 and a value of 0.6 or less indicatethe realiability of internal-consistencyis not satisfactory.In this study, this value is used as an instruction to guarantee the stability and consistency of the instrument (or questionnaire). The results shown Cronbach alpha for all the constructs are acceptable and good as their scores are all exceeded 0.6.This indicates that measurement scales of the construct are stable and consistent.

Hair et al. (2003) definevalidity as "the extent to which a variable measures what it is assumed to measure". There are three approaches to evaluate validity of measurement tool, these approaches are content validity, criterion validity and construct validity. Based on Hair et. al. (2003), "Construct validity assesses what the construct (concept) or scale is, in fact, measuring". In this study, construct validity is taken as validity measurement and factor analysis is utilized as variable validity measurement (Cavana et. al., 2001). The value of Kaiser-Meyer-Olkin (KMO) is 0.783 which resides between 0.5 – 1.0 and it shows factor analysis is suitable.Before further analysis is conducted, the appropriateness of factor model is essential and need to be tested. Barlett's test of sphericity and KMO are two methods used to measure the sample adequacy and the appropriateness of the factor model. Barlett's test of sphericity provides statistical significance that the correlation matrix has significant correlations among some of the variables (Hair et. al., 2006). KMO is used to measure sampling adequacy and assess the adequacy of their correlation matrices for factor analysis (Kaiser, 1970).Eigen Values for all the variables are more than 1.0. In summary, factor loading for all items within a variable are more than 0.50. Therefore, there is no overlapping of the items andsupporting respective variables.

Inferential Analysis



Inferential analysis is used to draw conclusions pertaining to population characteristics based on sample data (Hair, 2006).Inferential statistics include hypothesis testing and the type of inferential analysis used is simple regression analysis in this study. In total, there are 13 hypotheses derived from the main research question i.e. "What are the relationships of the components and subcomponents of ISCD model". Simple regression analysis is used for hypothesis testing and it is used to evaluate relationships between components and subcomponents of ISCD model. The test is used to determine the relationship between components of ISCD model whether they are accepted or rejected. The acceptance status of the test is all the relationship between components and subcomponents are accepted.

Input is the first componentwhich feedscurriculum information to curriculum database.Curriculum database later supplies information to curriculum design module and curriculum design process stimulates various aspects of operation in IHL for curriculum design. Curriculum design module obtains information provided by curriculum database and then followthe systematic curriculum design process. The step-by-step design process has been reviewed by the experts in earlier work,particularly the sequence of curriculum design process (Thong et al.,2016; Thong et al., 2018).Finally, output is generated. Curriculum designers make use of the output to design curriculum.The overall structure and relationships between components in ISCD model are supported by descriptive and influential statistics. The results of hypothesis testing are presented in Appendix.

5. CONCLUSION

The concluding remark made is the components in ISCD model are perceived important by curriculum designers in IHL and all relationship

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are positively related to one another. Although the ranking of importance may varies according to the perception of curriculum designers in IHL, the overall response shown is positive. The model is also perceived to be able to increase work efficiency of curriculum designers in designing curriculum for IHL in terms of reducing time, error and effort during the design process. Model validation is required in future work.

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7. APPENDIX

Basic Demographic of the Survey

Profile	Total	Percentage (%)
Age		
20-29	3	3
30-39	45	50
40-49	27	30
50-59	12	13
60 and above	3	3
Highest Education Level		
Bachelor	0	0
Master	34	38
Doctorate	3	61
Other	1	1
Institution		
Public IHL	10	50
Private IHL	10	50
Year of Experience in Curriculum Design		
Less than 5 years	34	38
5 -10 years	27	30
11-20 years	20	22
21-30 years	7	8
More than 30 years	2	2
Discipline of Curriculum Design Involved		
Computer Science/IT	28	25
Education	8	7
Social Science	6	5
Business	12	11
Management	10	9
Engineering	28	25
Medical/Pharmacy	0	0
Fine Arts	0	0
Others	22	19
Level of Education for the Designed Curriculum		
Diploma or certificate	33	19
Bachelor Degree	86	51
Master Degree	42	25
Doctoral Degree	9	5

Results of Hypothesis Testing

Number	Hypothesis	Unstandardized Beta	p-value (<0.05=sig)	Outcome
1	H1:Internal Input is positively related to curriculum database	1.113	0.000	Accepted
2	H2:External Input is positively related to curriculum database	3.096	0.000	Accepted
3	H3:Curriculum database is positively related to Intelligent Components	1.118	0.000	Accepted
4	H4:Curriculum design process is positively related to Curriculum Database	0.852	0.000	Accepted
5	H5: Curriculum Maintenance is positively related to Curriculum Analysis	0.141	0.000	Accepted
6	H6: Curriculum Maintenance is positively related to Curriculum Assessment	0.797	0.000	Accepted
7	H7: Curriculum Assessment is positively related to Curriculum Analysis	0.080	0.000	Accepted
8	H8: Course learning outcome design is positively related to course learning outcome mapping	0.154	0.03	Accepted
9	H9: Course learning outcome mapping is positively related to course learning outcome alignment	0.176	0.028	Accepted
10	H10: Course learning outcome alignment is positively related to managing and monitoring course learning outcome design	0.272	0.008	Accepted
11	H11: Managing and monitoring course learning outcome design is positively related to Course learning outcome design	0.615	0.031	Accepted
12	H12:The PR affects the output [of IS system]	0.077	0.000	Accepted
13	H13: The output affects input	3.013	0.001	Accepted