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Research Article

Expected Learning Outcomes: A Confirmatory Factor Analysis of Higher Education in Interior Architecture and Interior Design for the Thailand Development

Pornthep Jewpairojkit

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Abstract

Nowadays, the standard of professional education, interior architecture and interior design at higher education in Thailand must meet the certification criteria from the Professional Council. However, the expected learning outcomes results in the past studies has not studied the components of expected learning outcomes that are explicit and consistent with the 20-Year National Strategy. The researchers therefore aim to study such components to lead to the development of a standard measurement model to further expected learning outcomes. The researchers synthesized the initial components through the document to create and develop a questionnaire to evaluate the level of performance by estimating 5 levels and collect data with the senior students in the curriculum that has been approved by the Professional Council. Divided into 362 samples in the analysis of survey elements and 364 samples in Confirmatory Factor Analysis by Cluster Random Sampling from state and private universities. The survey component analysis resulted in 6 components along with confirmatory factor analysis of empirical component. The results of the sequence analysis of weight components from descending order as follows: Cognitive for profession skill (CP)=.96 Interpersonal relationship and responsibility skill (IR)=.89 In numerical communication and information technology skill(NC)=.87 Profession future of Thailand skill (PF)=.85 Knowledge for Professional practice skill (KPP)=.73 Moral and ethical skill (ME) =.67.

Keyword: Confirmatory Factor Analysis, Expected Learning Outcomes, Higher Education, Interior Architecture, Interior Design

1. The Core

In Thailand, professional courses in interior architecture and interior design has set the standard of the curriculum through the professional council with certification (Architect Council of Thailand,2002) and must comply with the expected learning standards with Thai Qualifications Framework for Higher Education or TQF: HEd) (Office of the Higher Education Commission, 2009). Meanwhile, imposing the country policy for example, setting up Thailand 20-Year National Strategy 2561-2580 B.E. according to the Government Gazette, announced on the date of 8th October 2561 B.E. (Government Gazette, 2018) resulted in interior architecture and interior design professions since they are classified as Creative & Culture - High Value Services in developing the target industry (Research and Educational Quality Assurance Division, 2016). In term of learning curriculum, which is needed to be developed in accordance with the social context (Saylor, 1981).

As mentioned above, the study of expected learning outcomes such is necessary to lead to the development of a standardized measurement model for professional learning results. Moreover,

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the component analysis is a consistent study approach to conducting research. (Awang, 2012) Therefore conducting this research is a study of confirmatory factor analysis, expected learning outcomes, higher education, professional architecture, interior architecture and interior design for Thailand development.

2. The Objective

The research objective was to analyze the confirmatory factor of higher education in interior architecture and interior design for the Thailand development.

3. The Theoretical Framework

3.1 Framework for Higher Education Qualifications for Thailand Development

Thai education in higher education has set standards and quality assurance for education which is called the National Higher Education Qualifications Framework, used as a guideline for curriculum development in teaching and learning as well as improving the quality of educational management to be able to produce quality graduates. One main point is focusing on standard of graduates' Learning Outcomes consisting of 5+1 skills 1) Ethics and Moral 2) Knowledge 3) Cognitive Skills 4) Interpersonal Skills and Responsibility 5) Numerical Analysis, Communication and Information Technology Skills (Picture 1 in Section A) and allow opportunities for certain disciplines that require high physical skills can increase learning of 6) Domain of Psychomotor Skill. (Office of the Higher Education Commission, 2009) In the meantime, Thailand has announced Government Gazette regarding The National Strategy (2561-2580 B.E.) (Government Gazette,2018) which is mentioned in the practice of interior architecture and interior design in a professional group supporting the industry of the future Creative & Culture - High Value Services as well as complying with national development. Regarding the details of The National Strategy action plan, aimed professional personnel around 10,000-120,000 within 5-20 years with skills of 1) Public mind 2) Design Skills for Future Thailand) 3) Entrepreneur) 4) Built Environmental design (Research and Educational Quality Assurance Division, 2016) which resulted in the graduates' standard of professional learning outcomes. 6) Professional skills for the future of Thailand.

This document is a study from related policies and documents within Thailand by considering the composition of picture 1 (Section B). The professional council in Thailand have set up various skills details (Architect Council of Thailand, 2015) including law (Building Control Act, 2015) and professional ethics (Architect Council of Thailand, 2015) as well as procedures that are consistent with the expected learning standards in various fields used for conceptual framework for studying documents for determining the basic components by considering in picture 1 (Section C)

3.2 Professional learning outcomes in foreign countries

In foreign countries, professional standards in interior architecture and interior design require the expected Learning Outcomes by professional organization such as Council for interior design Accreditation of United States of America: CIDA, 2018 and document by Shirley Lesch (2017). At present, details specified in the documents, including various skills, as well as professional responsibility and ethics are used to determine learning outcomes or learning standards that are expected in professions abroad.

(CIDA Professional Standards, 2018). When studying through the curriculum documentation that applied the expected learning outcomes of CIDA including interior design course for example, Sheridan College (2018) California College of the Arts (2018) and interior architecture course such as University of Nevada (2018) New School of Architecture and Design (2018) Chatham University (2018). In higher education institutions, details of various components are found and also studied meaning and compositions of creativity from the concept of Torrance, E.P. and R.E. Myers (1962) and related documents Amos Rapoport (1990) Denise L. Lawrence and Setha M. Low (1990).

By considering in the part of picture 1 (Section D) leaded to the synthesis of all 6 components which are 1) Moral and Ethics consisted of 3 variables 2) Knowledge for Professional practice consisted of 8 variables 3) Cognitive Skills) consisted of 3 variables 4) Interpersonal Skills and

Responsibility consisted of 3 variables 5) Numerical Analysis, Communication and Information Technology Skills consisted of 3 variables 6) Professional skills for future of Thailand consisted of 4 variables by considering picture 1 (Section E).

4. Research Process

4.1 Research tools

The tool used in this research is a questionnaire divided into 2 parts. The 1st part: basic information which is types of courses of respondents and the 2nd part: standard framework for learning in 6 aspects which are 1) Moral and Ethics 2) Knowledge 3) Cognitive Skills) 4) Interpersonal Skills and Responsibility 5) Numerical Analysis, Communication and Information Technology Skills and 6) Professional skills for future of Thailand.

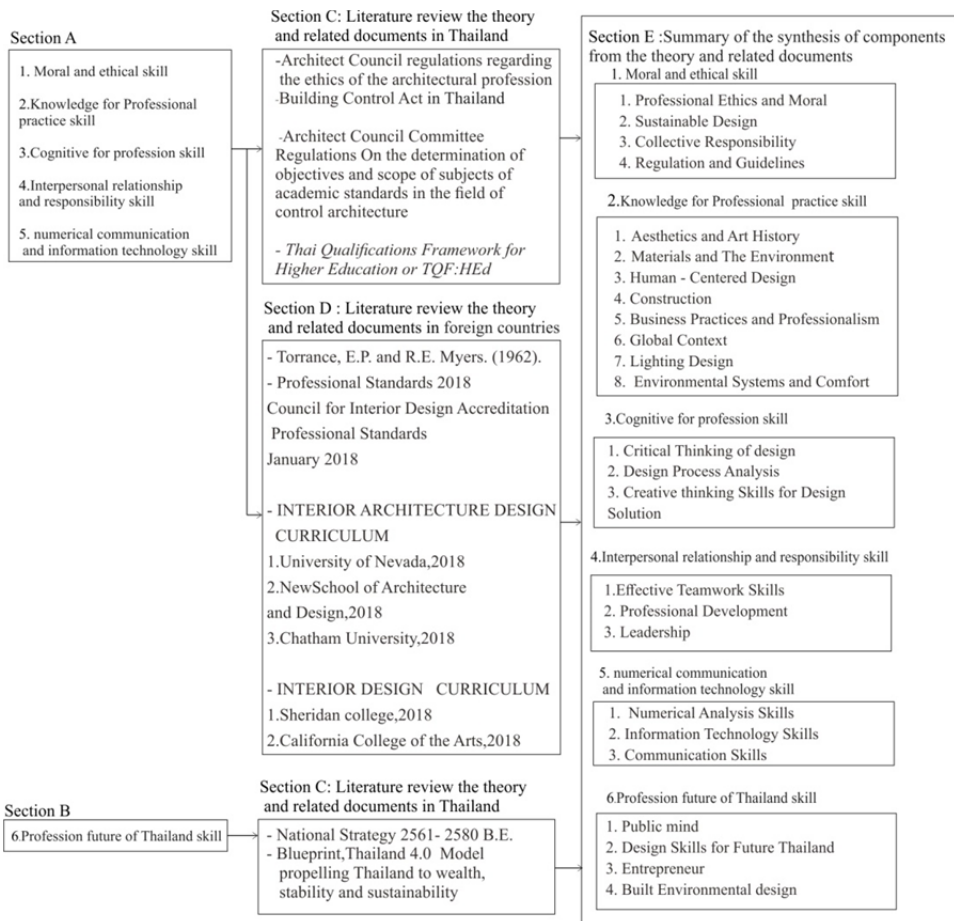With a 5 level rating scale questionnaire
5= take action the most
4 = take action most
3 = take action moderate
2 = take action less
1= take action the less

Picture 1: Summary of the synthesis of components from the theory and related documents

The development of tools has been conducted from 5 persons to examine content validity by using Index of Item − Objective Congruence: IOC from 5 experts.The results of content validity checked by experts is between $0.60 − 1.00$ and then bring the questionnaire to analyze the reliability by using Alpha Coefficient From the experiment with 30 representative samples. By analyzing alpha coefficients of all questions, the number is 0.982. The components arranged from components 1-6 in the following order: $0.895, 0.962, 0.948, 0.911, 0.887$ and 0.938

4.2 Population and examples

From the concept of curriculum development to study from being an analytical study from bottom to top (Taba, 1962) used as a guideline for curriculum development (Saylor, 1981) Moreover, it also shows the participation in the presentation of requests from learners (Gloria Brown Wright, 2011) whom aimed to achieve participation in curriculum development.

In this research, targeted at the population of senior undergraduate students in the course of interior architecture and interior design from both public and private universities certified by the Thai Architect Council and the Office of the Higher Education Commission at the amount of 1,765. (The data as of 30th June 2560 B.E.)

In this research, 726 people used sampling methods by Cluster Random Sampling by dividing into public and private universities. We believe in the quality of the curriculum of all courses equally, due to educational standards through educational quality assurance system as well as systematically curriculum checked.

Number of sample groups using conceptual framework of Comrey and Lee (1992) and Hair et al., (2010) as shown in Table 1.

5. Data Analysis

5.1 Exploratory Factor Analysis: EFA

Bring information from the study of documents to extract the basic components and rotate the axis of the perpendicular component to identify the components of professional learning standards and consider the selected suitable components.

The components needed to be more than 1 variance, the observed variable has a weight value of 0.30 or more and each component has three or more observations. (Details as shown in Table 2).

Considering the correlation coefficient between the observed variables used as data to analyze the confirmed component model by considering from Bartlett's test of sphericity and KMO (Kaiser-Meyer-Olkin) (Details as shown in Table 2)

Table 1: Sample research characteristics

General Information	EFA		CFA		Total	
	Amount	Percentage	Amount	Percentage	Amount	Percentage
1. Public/Private universities						
1.1. Public universities	260	71.82	261	71.70	521	71.76
1.2. Private universities	102	28.18	103	28.30	205	28.24
Total	**362**	**100.00**	**364**	**100.00**	**726**	**100.00**
2.Duration of study						
2.1 5 years courses(overall)	**215**	**100**	**217**	**100**	**432**	**100**
2.1.1. Public universities	199	92.56	200	92.17	399	92.36
2.1.1. Private universities	16	7.44	17	7.83	33	7.64
2.2. 4 years courses(overall)	**147**	**100**	**147**	**100**	**294**	**100**
2.2.1. Public universities	61	41.50	61	41.50	122	41.50
2.2.1. Private universities	86	58.50	86	58.50	172	58.50

*Sampling from student population from statistical data, information published, higher education information (The data as of 30th June 2560 B.E.)

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Table 2: Summary of the exploratory factor analysis of the expected learning outcomes of higher level in interior architecture and interior design for the Thailand Development

Components	Variable	Question	Weight value	Checked statistics
1.Moral and Ethics=ME	1. Professional Ethics and Moral=ME_PE 2. Sustainable Design = ME_SD 3. Collective Responsibility = ME_CR 4. Regulation and Guidelines=ME_RG	8 5 3 4	.660-.868 .539-.783 .545-.806 .468-.702	KMO =.895 Chi-Square=4168.168 df = 190 Sig. =.000
2. Knowledge for Professional practice=KPP	1. Aesthetics and Art History=KPP_AA 2.Materials and The Environment= KPP_ME 3.Human - Centered Design = KPP_HC 4. Construction= KPP_C 5.Business Practices and Professionalism=KPP_BP 6. Global Context=KPP_GB 7.Lighting Design= KPP_L 8. Environmental Systems and Comfort =KPP_EC	11 8 5 5 4 5 3 3	.410-.793 .458-.774 .558-.757 .663-.766 .493-.769 .438-.709 .423-.471 .478-.707	KMO =.908 Chi-Square = 9374.786 df = 946 Sig. =.000
3.Cognitive for Professional Skills=CP	1. Critical Thinking of design= CP_CD 2. Design Process Analysis=CP_DA 3. Creative thinking Skills for Design Solution=CP_CS	8 5 5	.462 -.692 .555-.701- .584-.701	KMO =.949 Chi-Square = 3536.843 df = 153 Sig. =.000
4) Interpersonal Skills and Responsibility=IR	1.Effective Teamwork Skills=IR_ET 2.Professional Development=IR_PD 3.Leadership = IR_L	7 6 3	.536-.750 .511-.730 .555-.789	KMO =.930 Chi-Square = 3134.073 df = 120 Sig. =.000
5. Numerical Analysis, Communication and Information Technology Skills=NC	1. Numerical Analysis Skills=NC_NA 2. Information Technology Skills = NC_IT 3. Communication Skills = NC_CS	4 5 5	.615-.907 .607-.817 .553-.767	KMO =..897 Chi-Square = 3398.623 df = 105 Sig. =.000
6.Professional skills for Future of Thailand=PF	1. Public mind=PF_PM 2.Design Skills for Future Thailand=PF_DF 3.Entrepreneur= PF_E 4.Built Environmental design= PF_BE	12 8 5 5	.528-.759 .494-.747 .756-.802 .580-.728	KMO =..930 Chi-Square = 3134.073 df = 120 Sig. =.000

5.2 Confirmation Factor Analysis:CFA

Confirmatory factor analysis with a computer program and checking the model parameter estimation by using Maximum Likelihood: ML.

Examined by considering the consistency of the measurement model and empirical data using statistics, Goodness of Fit Index: GFI, Adjusted Goodness of Fit Index: AGFI,Comparative Fit Index, (Root Mean Residual: RMR) (Schumacker, 2010).

6. Summary

6.1 Section 1; Summary of Exploratory Factor Analysis: EFA

The number of variable values in each component is slightly different from the original conceptual framework studied through document synthesis. The survey analysis results and names of compositions as shown in Table 2.

Survey component analysis of variables standard framework for expected learning outcomes, interior architecture and higher level Interior design for Thailand development consisted of 6 components which are 1) Moral and Ethics consisted of 4 variables 2) Knowledge for Professional practice consisted of 8 variables 3) Cognitive Skills consisted of 3 variables 4) Interpersonal Skills and Responsibility consisted of 3 variables 5) Numerical Analysis, Communication and Information Technology Skills consisted of 3 variables and 6) Professional skills for future of Thailand consisted of 4 variables.

6.2 Section 2; Summary of Confirmatory factor analysis

The results of the confirmed component analysis after composition adjustment can be found the

number of df=186 CMIN/df=1.296 GFI=0.951 RMSEA=0.029 in examining the structural validity of the components which meet the criteria (Schumacker, 2010)represents the model with harmony between the theoretical model developed with empirical data when considering the weight factor loading.

A group of 6 elements, sorting the weight of the components descending from most to least as follows (details from picture 2).

- Cognitive for Professional Skills (CP) = 0.96, factor weight values of variables in the analysis of Critical Thinking of design (CP_CD) =0.88 Creative thinking Skills for Design Solution (CP_CS) =0.83 Design Process Analysis (CP_DA) = 0.78
- Interpersonal Skills and Responsibility (IR)= 0.89 factor weight values of variables in the analysis of Leadership (IR_L) = 0.84 Effective Teamwork Skills (IR_ET) = 0.81 Professional Development (IR_PD) = 0.741
- Numerical Analysis, Communication and Information Technology Skills (NC) = 0.87 factor weight values of variables in the analysis of Communication Skills (NC_CS)= 0.89 Information Technology Skills (NC_IT)=0.60 Numerical Analysis Skills (NC_NA) =0.50
- Professional skills for Future of Thailand (PF) = 0.85 factor weight values of variables in the analysis of Built Environmental design (PF_BD) =0.80 Public mind (PF_PM) = 0.73 Design Skills for Future Thailand (PF_DF) =0.73 Entrepreneur (PF_E) = 0.71
- Knowledge for Professional practice (KPP) =.73 factor weight values of variables in the analysis of Materials and The Environment (KP_ME)=.86 Construction (KP_C)=.73 Lighting Design (KP_L)=.68 Business Practices and Professionalism (KP_BP)=.67 Global Context KP_GB=.63 Environmental Systems and Comfort (KP_EC)=.58 Human - Centered Design (KP_HC)=.56 Aesthetics and Art History (KP_AA)=.54
- Moral and Ethics (ME) =.67 factor weight values of variables in the analysis of Collective Responsibility (ME_CR) =.75 Sustainable Design (ME_SD) =.65 Regulation and Guidelines (ME_RG)=.60 Professional Ethics and Moral (ME_PE)=.55

7. Discussions

This research reveals the component details of expected learning outcomes of higher education in Architecture and Interior Design for Thailand development. There are 6 educational elements synthesized through documents and the element weights that the learning outcomes place the importance on are Cognitive for Professional Skills (CP) = 0.96, factor weight values of variables in the analysis of Critical Thinking of design (CP_CD) =0.88 Creative thinking Skills for Design Solution (CP_CS) =0.83 Design Process Analysis (CP_DA) = 0.78. In consideration of Picture 2, it appears the weight as Interpersonal Skills and Responsibility (IR)= 0.89 Numerical Analysis, Communication and Information Technology Skills (NC) = 0.87 Professional skills for Future of Thailand (PF) = 0.85 The details of expected learning outcomes has to be in consideration in order to encourage learning process which should be consistent with Thailand development policy according to the 20-Year National Strategy (2561-2580 B.E.). In the past, there were no such education covers the 20-Year National Strategy. Therefore, this research results can be used for further development in higher education in Architecture and Interior Design in the future.

8. Suggestions

In the study of the composition, standards, learning results, higher education, professional architecture, interior and Interior design leads to find the most weighted components and the least of the expected learning outcomes to be compared to the mean and standard deviation in order to know the level of practice of the learner, therefore using in accelerating the development or promotion of teaching and learning in components of design knowledge analysis.

Regarding data of the standard learning outcomes in this research, which can lead to future study of professional expected learning outcomes standards to determine guidelines for future

development of professional courses in interior architecture and Interior design.

9. Acknowledgement
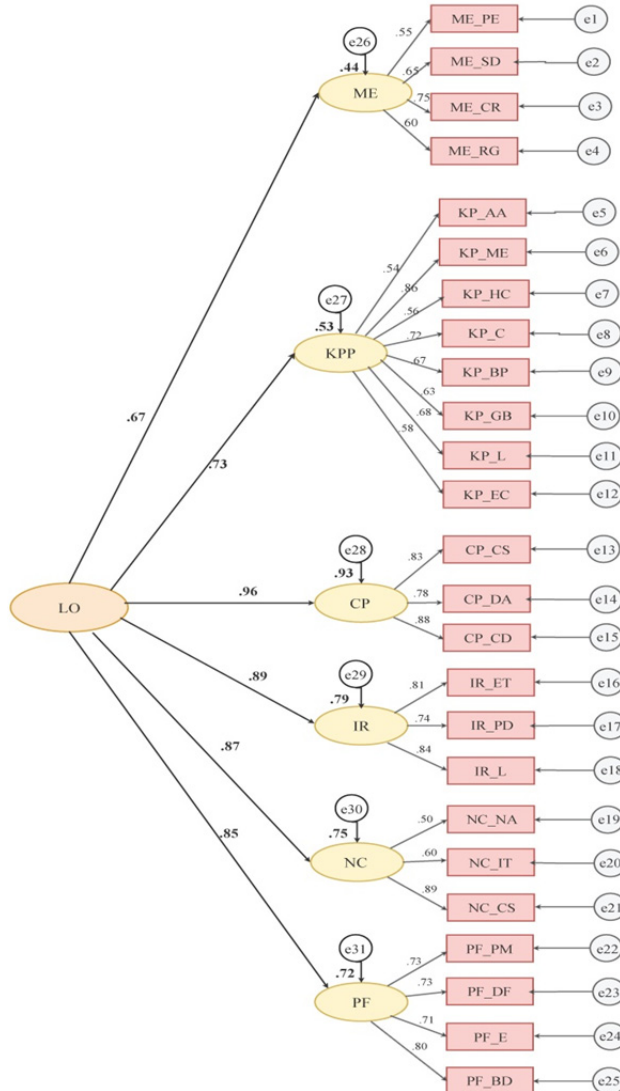
Chi-square = 240.974 , df= 186, CMIN/DF = 1.296, GFI=.951, RMSEA= .029

Picture 2: Show the second confirmed component analysis value (S-CFA) after customizing the model

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