A Development of the Composite Indicators of Quality Evaluation of Higher Education Institutions: Uncertainty and Sensitivity Analyses

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Abstract: The three objectives of research are 1) to evaluate the higher education institutions' external quality reports. (meta-evaluation). 2) to synthesize the meta-evaluation results. (results from objective 1). 3) to develop two composite indicator sets: composite indicator sets of higher education institutions' quality and composite indicator sets of the quality of higher education institutions' external quality reports. Source of study is 200 external quality reports on external quality evaluation of higher education institutions which were assessed in the first round and were approved by The Office of the National Education Standards and Quality Assessment. The study will be conducted in two phases. The first phase is the meta-evaluation of external quality reports by evaluating the accordance between external quality evaluation and four main evaluation standards of The Joint Committee on Standards for Educational Evaluation; utility, feasibility, propriety and accuracy. The second phase is uncertainty and sensitivity analysis to develop two composite indicator sets; using The Simlab 2.2 to study the sources of composite indicator variance in each step of the composite indicator development. Now, it is in phase 1 process. The initial findings are that most reports are standardized according to four main evaluation standards. The quality of reports are significant different throughout higher education institution type. The expected results in phase 2 are that two composite indicator sets obtaining from uncertainty and sensitivity analysis are robustness and accepted by all stakeholders. Equations for building institutions' quality composite indicators are different according to higher education institution type. But, equations for building external quality reports' quality composite indicators are the same in all higher education institution type.
Keywords: quality assurance, higher education, meta-evaluation, composite indicator, uncertainty and sensitivity analysis

Background

Thai educational quality assurance system comprises of internal quality assurance and external quality assurance. The former is the process to develop, monitor and evaluate higher education institutions' quality by each institution or its governing agency. The latter is process to develop, monitor and evaluate higher education institutions' quality by external organizations. In general, the external quality assurance is the external evaluation of higher education institutions' quality by comparing the institution operation to the standard or criteria.

In Thailand, the organization responsible for external quality evaluation is The Office for National Education Standards and Quality Assessment (ONESQA). The external evaluation has been named as "amicable assessment". A team of external evaluators, which consists of experts and academicians in the related areas and disciplines, will present external quality reports to reveal the findings and give recommendations on how to improve the quality of each institution. The institutions use external quality reports as the guidelines on institution improvement. (Office for National Education Standards and Quality Assessment, 2004)

Accordingly, the external quality reports should be highly qualified to be implemented effectively in the educational quality assurance system. So, they should be evaluated. This research, meta-evaluation is to be used to evaluate the external quality reports as it is systematic, validity and reliable. Furthermore, it informs the guidelines on the development of an evaluation quality. (Scriven, 2003; Stufflebeam, 2001; Bustelo, 2003)

Besides evaluating external quality reports, there should be the development of composite indicator, because presenting the evaluation results according to many sub-indicators (profile attribute) is difficult to interpret. Smith, P. (2003); Nardo, M., Saisana, M., Saltelli, A., and Tarantola, S. (2005) summarized that composite indicators are increasingly recognized as a useful tool for policy making and public communications in conveying information. They are much easier to interpret than trying to find a common trend in many separate indicators. The pros of composite indicator are as follows: summarize complex or multi-dimensional issues, easier to interpret than trying to find a trend in many separated indicators, facilitate the task of ranking on complex issues, assess progress over time on complex issues, reduce the size of a set of indicators or include more information within the existing size limit, place issues of performance and progress at the centre of the policy arena and facilitate communication with ordinary citizens and promote accountability.

So, this research will develop two composite indicator sets; composite indicator sets of higher education institutions' quality and composite indicator sets of the quality of higher education institutions' external quality reports. The composite indicator sets of higher education institutions' quality, which indicate higher education institutions' quality, are useful in comparing, rating and ranking the institutions. The composite indicator sets of the quality of higher education institutions' external quality reports, which indicate the quality of higher education institutions' external quality reports, are useful in comparing, rating and ranking the reports' and the evaluators' quality.

There are eight stages in developing composite indicator; 1) theoretical framework identification, 2) selection of sub-indicators, 3) imputation of missing data, 4) normalization sub-indicators, 5) weighting sub-indicators, 6) aggregating sub-indicators, 7) gauging the robustness of the composite indicator by using uncertainty and sensitivity analysis because developing composite indicator involves stages where judgments have to be made, and 8) composite indicator presentation. (Nardo, Saisana, Saltelli, and Tarantola, 2005)

Therefore, the researcher would like to meta-evaluate external quality reports and develop the composite indicator sets by using uncertainty and sensitivity analysis.

Literature review

Meta-evaluation

Meta-evaluation is defined as the process of judging an evaluation or an evaluator based on criteria and standard sets, to improve quality of the evaluation or evaluator. The Evaluation Standards being widespread used among evaluators were developed by the Joint Committee on Standards for Educational Evaluation, consist of four main standards; utility, feasibility, propriety, and accuracy. (Scriven, 2003; Stufflebeam, 2001; Bustelo, 2002)

Composite indicator

Composite indicator is the mathematical combination of individual indicators that represent different dimensions of a concept whose description is the objective of the analysis.

(Saisana, Saltelli, and Tarantola, 2005). There are eight stages in developing composite indicator; 1) theoretical framework identification, 2) selection of sub-indicators, 3) imputation of missing data, 4) normalization sub-indicators, 5) weighting sub-indicators, 6) aggregating sub-indicators, 7) gauging the robustness of the composite indicator by using uncertainty and sensitivity analysis because developing composite indicator involves stages where judgments have to be made, and 8) composite indicator presentation. (Nardo, Saisana, Saltelli, and Tarantola, 2005)

Uncertainty and Sensitivity Analysis

Uncertainty Analysis is the technique used to analyze the changing of composite indicator values. The purpose of uncertainty analysis is to study an uncertainty of composite indicator value which is the result of the combination of sub-indicators using different techniques in the developing composite indicator stages. So, it focuses on how uncertainty in the composite indicator development techniques propagates through the structure of the composite indicator and affects the composite indicator values. The sources of such uncertainty are from the difference techniques used in each step of the development of composite indicator.

Sensitivity Analysis is the technique used to analyze the effect of the uncertainty sources influencing the composite indicator variance, result from the combination of sub-indicators using different techniques in the developing composite indicator stages. Sensitivity analysis aims to study how much each individual source of uncertainty contributes to the composite indicator variance. The source of uncertainty which is considered important must describe composite indicator variance as or over 1/n, when n is the number of all sources of uncertainty. (Nardo, Saisana, Saltelli, and Tarantola, 2005)

Conceptual framework

Researcher shows the conceptual framework in figure 1. Figure 1 reveals that the external quality evaluation results are the external quality reports presenting guidelines on institution improvement. The external quality reports should be highly qualified so they should be evaluated by using meta-evaluation.

According, there are two types of evaluation results: institutional evaluation results and meta-evaluation results. Both types of result are presented in profile attribute according to standards and indicators. The composite indicator development process by using uncertainty and sensitivity analysis will build two composite indicator sets. Composite indicator sets of higher education institutions' quality and composite indicator sets of the quality of higher education institutions' external quality reports. The former are built from 3 sub-indicator sets used to evaluate institution (input, process and output sub-indicators). The latter are built from 4 sub-indicator sets used to evaluate external quality report (utility, feasibility, propriety and accuracy sub-indicators).

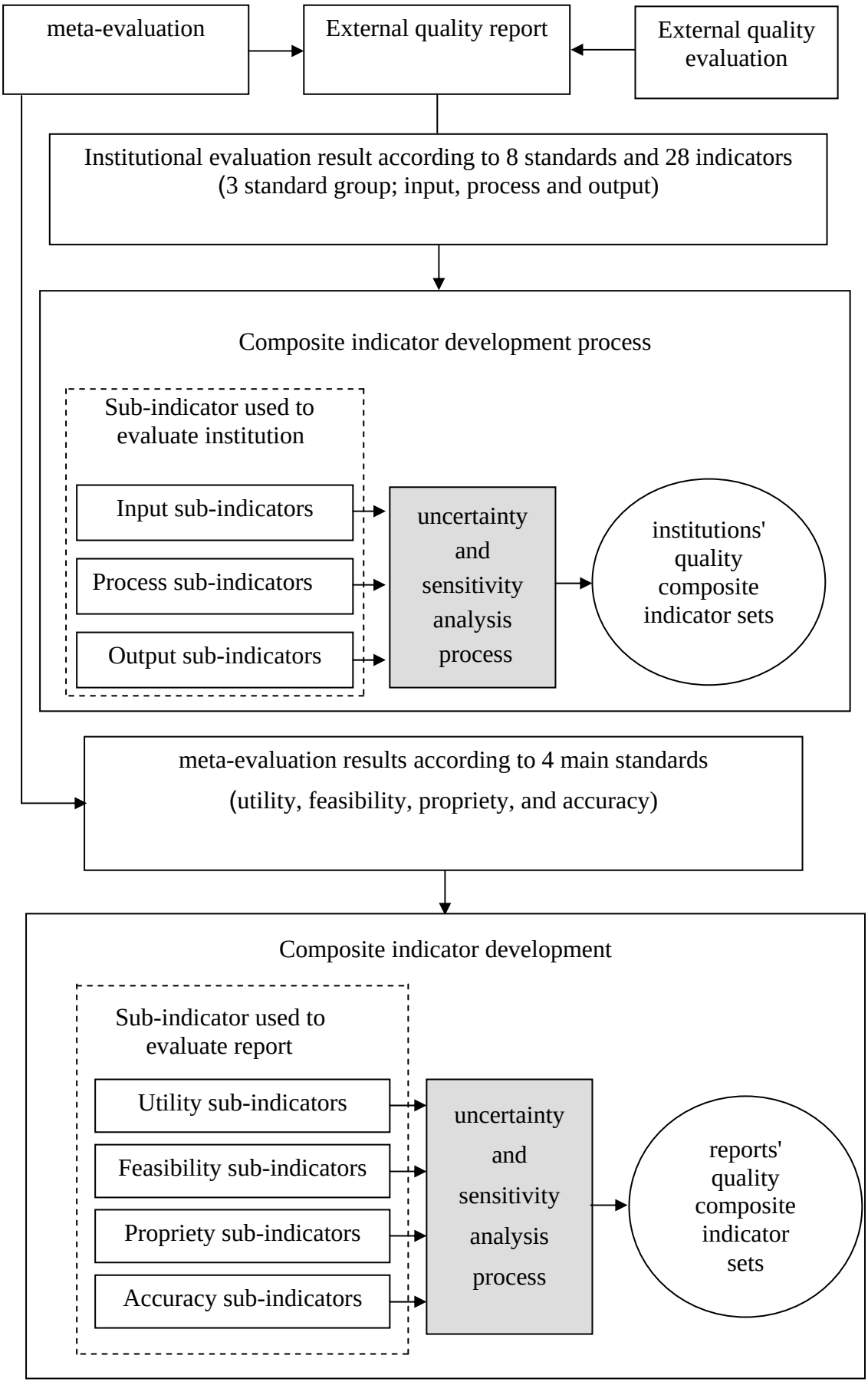

Figure 1: *Conceptual framework*

Objectives of the Study

The three objectives of research are 1) to evaluate the higher education institutions' external quality reports. (meta-evaluation). 2) to synthesize the meta-evaluation results. (results from objective 1). 3) to develop two composite indicator sets: composite indicator sets of higher education institutions' quality and composite indicator sets of the quality of higher education institutions' external quality reports.

Scope of the Study

This study will analyze four sources of uncertainty; imputation of missing data in sub-indicators, normalization sub-indicators, weighting sub-indicators and aggregating sub-indicators.

Research Methodology

Source of the Study

200 reports on external quality evaluation of higher education institutions which were assessed in the first round and were approved by The Office of the National Education Standards and Quality Assessment, obtaining by stratified random sampling relevant to the ratio of institutions in each institution type from a total of 260 reports. (There are six types of higher education institution; government institution, private institution, rachapat institution, rachamongkol institution, specific institution, and community college)

Data for the study; two kinds of data comprise of

1) The data illustrating quality of reports on external quality evaluation of higher education, obtained from a checklist for meta-evaluation of reports' quality (objective 1). This data will be used for synthesizing the meta-evaluation results (objective 2). Moreover, it will be used for developing composite indicator sets of the quality of higher education institutions' external quality reports (objective 3).

2) The data revealing qualification and essence of evaluation reports and the results of higher education institution evaluation, obtained from recording form which researcher records according to the information accessible in the external quality reports. It will be used for describing qualification and essence of evaluation reports and for developing composite indicator sets of higher education institutions' quality (objective 3).

Research Instrument; two kinds of research instrument comprise of

1) Meta-evaluation checklist developed by Stufflebeam in 1999, organized according to the evaluation standards of The Joint Committee on Standards for Educational Evaluation. The checklist consists of four main standards; utility, feasibility, propriety and accuracy. The four main standards are comprised of 7, 3, 8 and 12 sub-standards, respectively. Total are 30 sub-standards. There are 6 checkpoints drawn from the substance of each sub-standard. So, there are total 180 checkpoints. The reports' quality evaluation is an evaluation of how each report reveals operation according to 180 checkpoints. The total of checkpoints is the report's quality score.

2) Recording form for recording the qualification and essence of each evaluation report and the results of each higher education institution evaluation based on 8 standards and 28 indicators which accessible in the report, used to record information about external quality report attributes, external evaluation process, higher education institution context, evaluator attributes and values in evaluation indicators of each higher education institution.

Research Method

The study will be conducted in two phases. The first phase is the meta-evaluation of external quality reports by evaluating the accordance between external quality evaluation and evaluation standards of The Joint Committee on Standards for Educational Evaluation, including a synthesis of the result from meta-evaluation. The second phase is uncertainty and sensitivity analysis to develop two composite indicator sets: composite indicator sets of higher education institutions' quality and composite indicator sets of the quality of higher education institutions' external quality reports.

Data Analysis; data analysis consists of

1) Primary data analysis to describe external quality reports' attributes and evaluation indicator values.

1.1) The analysis to describe external quality reports' attributes; frequency distribution and percentage will be used to analyze categorical attributes, such as, executive summary, institution's philosophy, vision and mission. Mean, standard deviation, skewness and kurtosis will be used to analyze continuous attributes, such as, the number of pages.

1.2) The analysis to describe higher education institution evaluation indicators' values; mean, standard deviation, skewness and kurtosis will be used to analyze the indicators' values which is a continuous quantitative variable.

2) Data analysis to answer the research questions consists of

2.1) Meta-evaluation of external quality reports to meet objective 1; researcher will present the meta-evaluation results of each institution according to the four main meta-evaluation standards, including an interpretation of meta-evaluation results comparing to the criteria of evaluation standards.

2.2) Synthesis of meta-evaluation results to meet objective 2, consists of:

2.2.1) Synthesis of meta-evaluation results of each institution. It is the process of analyzing the median of 30 sub-standards from meta-evaluation results and the summary of meta-evaluation results in sub-standards to be the institution's four main evaluation standards scores.

2.2.2) Synthesis of meta-evaluation results of each institution type. It is the process of analyzing the median of 30 sub-standards from meta-evaluation results of each institution type and the summary of meta-evaluation results in sub-standards to be the institution type's four main evaluation standards scores.

2.2.3) Strength and weakness of external quality reports. It is an analysis of higher education institutions' external quality reports to detect the strength and weakness. Strength of the reports is the evaluation sub-standard being rated as very good and excellent. Weakness of the reports is the evaluation sub-standard being rated as fair and poor. Researcher will summarize those strength and weakness of each institution and each institution type and give suggestions on how to improve fair and poor evaluation sub-standard.

2.3) Development of two composite indicator sets to meet objective 3, consists of: 1) composite indicator sets of higher education institutions' quality; in eight evaluation standards and the overall. 2) composite indicator sets of the quality of higher education

institutions' external quality reports in four main evaluation standards and the overall. The Simlab 2.2 is used to analyze uncertainty and sensitivity to study the sources of composite indicator variance in each step of the composite indicator development, to develop the robustness composite indicator sets.

Research result

Now, it is in phase 1 process (meta-evaluation). The initial findings are that most reports are standardized according to four main evaluation standards; they are rated as very good and excellent in utility standard, as fair in feasibility standard, as good in propriety standard and as fair in accuracy standard. The quality of reports are significant different throughout higher education institution type; government institution reports' quality are better than other types but community college reports' quality are worse than other types.

The expected results in phase 2 (composite indicators development) are that two composite indicator sets obtaining from uncertainty and sensitivity analysis: composite indicator sets of higher education institutions' quality and composite indicator sets of the quality of higher education institutions' external quality reports, are robustness and accepted by all stakeholders. Equations for building institutions' quality composite indicators are different according to higher education institution type because each institution type has specific attributes and emphasis which different from others. But, equations for building external quality reports' quality composite indicators are the same in all higher education institution type.

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