
Review Article

A Technique of Modeling in Public Health Research and Development

Phongpisanu Boonda

Department of Dental Public Health, Sirindhorn College of Public Health Phitsanulok, Faculty of Public Health and Allied Health Sciences, Prabormarajchanok Institute of Health Workforce Development, Ministry of Public Health, Wangthong District, Phitsanulok, Thailand

Email address:

phong2470@hotmail.com

To cite this article:

Phongpisanu Boonda. A Technique of Modeling in Public Health Research and Development. *World Journal of Public Health*. Vol. 5, No. 4, 2020, pp. 89-98. doi: 10.11648/j.wjph.20200504.13

Received: June 17, 2020; **Accepted:** August 8, 2020; **Published:** November 27, 2020

Abstract: Before quasi-experimental in public health research and development (R&D) modeling is step 2 of the main steps of doing R&D in public health include Step 1: Studying Situations, Problems, and Needs, Step 2: Creating and Auditing Innovation, Step 3: Experimenting and Studying Results of using Innovation, and Step 4: Assessing and Improving Innovation. Researchers apply to model to create and invent innovation/ product (the machine, program, procedure) for solving in health and objective to present a technique of modeling R&D in public health which the technique of modeling are conductor: 1) create or develop forms (a. study of relevant documents and research, b. study from real context, and c. formatting); 2) verification of model accuracy (a. model testing with assessments under with specified standards assessments, b. pattern testing with assessment by the qualified person, c. format testing by surveying opinions of relevant personnel, and d. format testing by testing the format) which used for modeling a semantic model and a causal model.

Keywords: Modeling, Public Health, Research and Development

1. Introduction

Research and development (R&D) is one of the research characteristics that great benefit to the task development, professional development, or development of the human lifestyle. Currently, many organizations have tried to encourage personnel affiliated with the knowledge and ability in research and development [1]. Before quasi-experiment in public health research and development (R&D) modeling is step 2 of the main steps of doing research and development in public health include Step 1: Studying Situations, Problems, and Needs, Step 2: Creating and Auditing Innovation, Step 3: Experimenting and Studying Results of using Innovation, and Step 4: Assessing and Improving Innovation [2-3].

Step 2: Creating and Auditing Innovation (Machine/ Material, Curriculum/ Program/ Activity, and Process) which maybe use Model/ Intervention instead [2-3]. Model refers to what shows the structure of the relationship between a set of factors or variables or important elements with each other or reasoning to help understand the facts or phenomena in

particular subject scholars who give the meaning of the form in this way include [4-7].

The Longman [8] has given the meaning of the model that the model refers to the small model of buildings, vehicles, machines or other things that can be separated from each other or referring to a person who works in the field of clothing display, hairstyling that is a fashion show or photography including means parts or designs of automotive or mechanical products. It also means examples of explaining phenomena occurring in science by computer calculation and it also means a successful person or something that is a quality product that needs to be imitated.

Good [5] has given the meaning of the model refers to a role model to guide the creation or reproduction, as an example for imitation, is a chart or a three-dimensional figure which represents one thing or principle or concept is a set of factors or variables that are related to each other which together form a factor and a social system symbol.

Willer [7] gave the meaning of the model refers to conceptualizing a set of phenomena based on the principles of a figurative system. The aim is to clarify the definition of

relationships and related propositions in which the precision model will develop into the theory. Haauser [9] has given the format meaning refers to those designed to represent the elements and processes of examining the differences between the theoretical relationship with the real phenomenon.

Likewise, with Nadler, Michael et al., and Stoner & Wankel, [10-12], have given the format meaning refers to the reality of the phenomenon to describe phenomena with relationship elements the process of that phenomenon is simplified as a schematic or a scheme of action which continues with the systematic relationship.

There are many types of formats, which scholars in different categories are divided into different categories.

If talking about the type of model, there are many scholars to say. For example, Steiner [13] can be divided into 2 types: Practical Model and Theoretical Model, Smith and others [14] can be categorized into 2 types which are Physical Model and Symbolic Model, Keeves [15] classifies educational forms into 5 categories Is the analogue model, the semantic model, the mathematical model (Mathematical Model, Causal Model and Schematic Model.

For social sciences formats divided into 4 types which are [16]:

1. An analogue model is a model that uses metaphorical analogy, which is a concrete, to create an understanding of abstract phenomena, such as a model for predicting the number of students going into the school system which deduce the idea from opening water in and releasing water from the tank, the students that are logged in can compare to the water that opens from the tank. Therefore, students who remain in the system are equal to students who have logged in, minus students who have logged out, etc.

2. A semantic model is a form of language that is used to describe or describe phenomena studied in language, chart, or picture to see the structure, ideas, elements, and relationships of the elements of that phenomenon, such as the teaching style of [17], etc.

3. A mathematical model is a form that uses mathematical equations as a medium for expressing the relationships of various variables. This type of form is commonly used in both psychology and education including educational administration as well.

4. A causal model is a model developed from a technique called Path Analysis and the principles of creating a Semantic Model by bringing the variables together with cause and effects, such as The Standard Deprivation Model, which shows the relationship between the conditions socioeconomic of parents, educational environment at home and the intelligence level of the child, etc.

Both the semantic model and causal model found mostly in step 3(quasi-experimental) in research and development. The purpose of this study was to present a new technique of modeling for doing R&D in public health with both semantic models and a causal model.

Brown and Moberg [18] synthesized the model from the System Approach and the Contingency Approach. The composition of the model consists of 1) Environment 2)

Technology 3) Structure 4) Management Process and 5) Decision Making.

2. Methods

A literature search for research articles, books published within these several principles.

3. Results

Results of articles, books published within these several principles reviewed.

Keefe [19] has discussed a broad principle to create a pattern in 4 ways as follows:

1. The model should be composed of a more structured relationship (of a variable) than a simple linear relationship. However, simple, straight-line connections are useful. Especially in research studies early in the development of the model.

2. The model should be used as a guideline to predict the effects of using the model, can be examined by observing and finding support with empirical data

3. The format should identify or point out the logical mechanism of the subject being studied. Therefore, besides the model can be a forecasting tool. It should also be used to describe the phenomenon.

4. In addition to features as mentioned above the format should be a tool for creating new ideas and creating relationships of variables in a new way which is to expand the body of knowledge in the subject being studied as well.

Meason, Albert & Khedourri [20] has proposed the process of creating the form as follows:

1. Problem formulation stage to know what is the real problem.

2. The model construction phase is carried out after problem gathering, determining the initial objectives of the construction and the required characteristics of the output, based on the necessary information, and taking into account the cost of building and the needs of the user Because if the model is expensive and unacceptable to users, technical principles should be used to determine which variables should be placed in the form to be created, carefully evaluated and variances, When finished, have to see if all the variables are covered or not, and what flaws are there.

3. Testing process

4. How to use (Implementation) to see if it has been achieved or has completeness or not

5. Development of modernization (Model updating) suitable for the organization and the situation that affects from outside and within the organization

Model development, Willer [21] said that model development is generally divided into 2 phases:

- 1) Constructing Forms and

- 2) Validity of Patterns

Main steps of doing research and development in public health include Step 1: Studying Situations, Problems, and Needs, Step 2: Creating and Auditing Innovation, Step 3: Experimenting and Studying Results of using Innovation, and

Step 4: Assessing and Improving Innovation [2-3].

From the study of concepts and research processes regarding model development, it can be concluded that the model development is divided into 2 steps, which are 1) creating or developing the model and 2) checking the accuracy of the model, a technique of modeling for doing R&D in public health which has the following details:

1. To create or develop forms
 - a. Study of relevant documents and research
 - b. Study from real context
 - i. Situation, Problem, Need

Example: Studying primary data [2]

Survey about situations (agent, host, environment), problems, and needs their own work (health promotion, prevention, treatment, and rehabilitation of Communicable Diseases; CDs and Non-Communicable Diseases; NCDs) according to the PMQA [Leadership (LD), Strategy planning (SP), Customer and stakeholder (CS), Information technology (IT), Human resource (HR), Process management (PM), Result based management (RM)] and Six Building Blocks Plus (Service Delivery, Workforce, IT, Drug & Equipment, Financing, Governance, and Participation), 7S (Structure, Style, System, Strategy, Staff, Skill, and Shared values), PESTLE (Policy, Economic, Social, Technology, Law, and Environment) from samples of population with 3 methodologies as follows: 1) Cohort study/ Prospective studies are the most trustworthy observational study, but like any observational study, they are subject to confounding, 2) Case control/Retrospective studies are often much more feasible, but potentially subject to recall bias and unrepresentative sampling, and 3) Cross sectional studies provide a quick snapshot of an association, but need to be interpreted with care.

Example: Studying secondary data [2]

Do the same with primary data from documents of office and/or other offices by using SWOT analysis then analyze the organization in the following two sections, 1) Using PESTLE for analyzing Opportunity and Threat; OT in the part of external organization, 2) Using 7S for analyzing Strength and Weakness; SW in the part of internal organization. After that use SIPOC Model for analyzing own works details. Write process or flowchart (one of five elements of SIPOC Model) their work then use the team to brainstorm by using the multi-voting method to find the team's settlement. Problems will take place in 3 parts of SIPOC Model are SIP in part of OC are just monitor. When the problems have been analyzed then set priority the most important issues to determine the root causes with fishbone diagram to solve the root causes.

- ii. Case study
- iii. Focus Group Discussion
- c. Formatting

i. Use the information obtained in Item 1.1 and 1.2 to analyze and synthesized to be a research framework for making the model (draft or create a model with content analysis or statistical analysis results)

- ii. Focus Group Discussion, Delphi Technique
- iii. Modify a table
- iv. Classify, compile and arrange the same words and

messages from all reviewed literature to bring together each of the documents

- v. Bring details to add in the table
- vi. Matrix the same text together
- vii. Consolidate data from the matrix
- viii. Sum data into percentages
- ix. Selected >50% and <50% if needs with policy/ knowledge management; KM/ best practice/ community results/experts/ other reason that is consistent with the context of the stakeholder according to the research issue
- x. Rearrange the order of words and messages
- xi. Check the model quality
2. Verification of model accuracy

The assessment design can apply the concept of the Joint Committee on Standard of Educational Evaluation [22] to apply in the evaluation of the model.

Also, various evaluation concepts can be applied as follows Model-Based assessment concepts such as Tyler's Objective-Based Model [23], Objective-Based Modeling, Scriven's Goal-Free Evaluation Model [24] Formative Evaluation and Summative Evaluation of Scriven, an evaluation model that focuses on the use of results (Utilization-Focused evaluation) by Patton [25], Empowerment Evaluation of Fetterman [26], Assessment based on theoretical propulsion (Theory-Driven Evaluation) of Chen [27], participatory evaluation and collaborative evaluation the concept of evaluating model by using the logic model consists of Inputs/ Resources, Activities, Outputs, Initial Outcomes, Intermediate Outcomes, and Long Term Outcomes/ Impact. However, due to the evaluation of the creation and development of this type of model haven't tried the trial or tested the model assessment roles are therefore just basic assessments to prepare for implementation. Most of them apply only 2 standards, which are feasibility standards and suitability standards with the definition of assessment.

a. Model testing with assessments following specified standards Assessments developed by The Joint Committee on Standards of Educational Evaluation under the operations of Stufflebeam and the Board has presented the assessment principles as the norm of the formative review activities. Consists of 4 standards [28] as follows:

- i. Feasibility standards
- ii. Utility standards
- iii. Propriety Standards
- iv. Accuracy standards

b. Pattern testing with assessment by the qualified person Eisner [29] has proposed the concept of testing or evaluating the model using who are experts with the following concepts:

- i. Assessment by the qualified person
- ii. Assessment model that is specialized in (Specialization)
- iii. Personal style
- iv. Styles that allow flexibility in the work process of experts

c. Format testing by surveying opinions of relevant personnel

Often used with Developed the model using Delphi technique when the researcher developed the model using

Delphi technique then the researcher will use the final developed model to create a rating scale questionnaire to survey the opinions of relevant parties regarding the suitability and possibility of the model as item 3.2: example of modeling of causal model.

d. Format testing by testing the format

Format testing by experimenting with this format the researcher will use the developed model to try and use it with the target group. There is a complete implementation of the activity. The researcher will use the findings obtained from the evaluation to improve the model further.

Keeves [30] states that forms can be utilized. There should be specifications (requirement) 4 things as

1. Models should consist of structural relationships rather than associative relationships.
2. The model should be used as a guideline for forecasting. The outcome can be verified by observing which is possible to test the basic model of the empirical data.
3. The form should specify or indicate the logical mechanism of the study, Therefore, aside from the model can be a tool for forecasting should also be used to describe the phenomenon
4. The format should be a tool for creating new concepts and create relationships of variables in a new way which is an extension of the matter being studied.

3. Examples of both cases as follows;

a. Example of Modeling of Semantic Model

The concept of educators and academics, the author has synthesized process of research and development (R&D) to find the process with the consistent frequency and score of more than 50% there are 10 steps: Evaluation situations, problems, needs (87.50%); Finding and consideration new alternative/ Construct a hypothesis (62.50%); Develop preliminary form of product (100.00%); Preliminary field testing (75.00%); Main product revision (62.50%); Main field testing (62.50%); Operational product revision (62.50%); Operational field testing/ Operational (87.50%); Final product revision/ Evaluation/ Create conclusion (100.00%); and Distribution (75.00%). Thus, the process of research and development included 10 steps as follows [1].

1. Evaluation situations, problems, needs.
2. Finding and consideration new alternative/ Construct a hypothesis.
3. Develop a preliminary form of product.
4. Preliminary field testing.
5. Main product revision.
6. Main field testing.
7. Operational product revision.
8. Operational field testing/ Operational.
9. Final product revision/ Evaluation/ Create conclusion.
10. Distribution.

Details showed as Table 1 and Figure 2.

Table 1. Example of Modeling of Semantic Model: R&D Process [1].

No	Process of R&D	Borg & Gall (1979: 627)	Scientific Method	Rattana (2013)	Sirichai (2016)
1	Evaluation situations, problems, needs/ Research and development collection	✓	✓	✓	✓
2	Planning	✓			✓
3	Finding and consideration new alternative/ Construct a Hypothesis		✓		✓
4	Develop a preliminary form of product	✓	✓	✓	✓
5	Preliminary field testing	✓	✓		✓
6	Main product revision	✓	✓		✓
7	Main field testing	✓	✓		✓
8	Operational product revision	✓	✓		✓
9	Operational field testing/ Operational	✓	✓	✓	✓
10	Analyzing Data		✓		
11	Final product revision/ Evaluation/ Create conclusion	✓	✓	✓	✓
12	Writing report				✓
13	Distribution	✓		✓	✓

Table 1. Continued.

No	Process of R&D	Supak (2006)	Tanate (1997)	Tisana (1997)	Phongpisanu (2018)	Total	Percentage
1	Evaluation situations, problems, needs/ Research and development collection	✓	✓		✓	7	87.50
2	Planning					2	25.00
3	Finding and consideration new alternative/ Construct a Hypothesis		✓	✓	✓	5	62.50
4	Develop a preliminary form of product	✓	✓	✓	✓	8	100.00
5	Preliminary field testing		✓	✓	✓	6	75.00
6	Main product revision		✓		✓	5	62.50
7	Main field testing		✓		✓	5	62.50
8	Operational product revision		✓		✓	5	62.50
9	Operational field testing/ Operational	✓	✓		✓	7	87.50
10	Analyzing Data	✓	✓			3	37.50
11	Final product revision/ Evaluation/ Create conclusion	✓	✓	✓	✓	8	100.0
12	Writing report	✓	✓			3	37.50
13	Distribution	✓	✓		✓	6	75.00

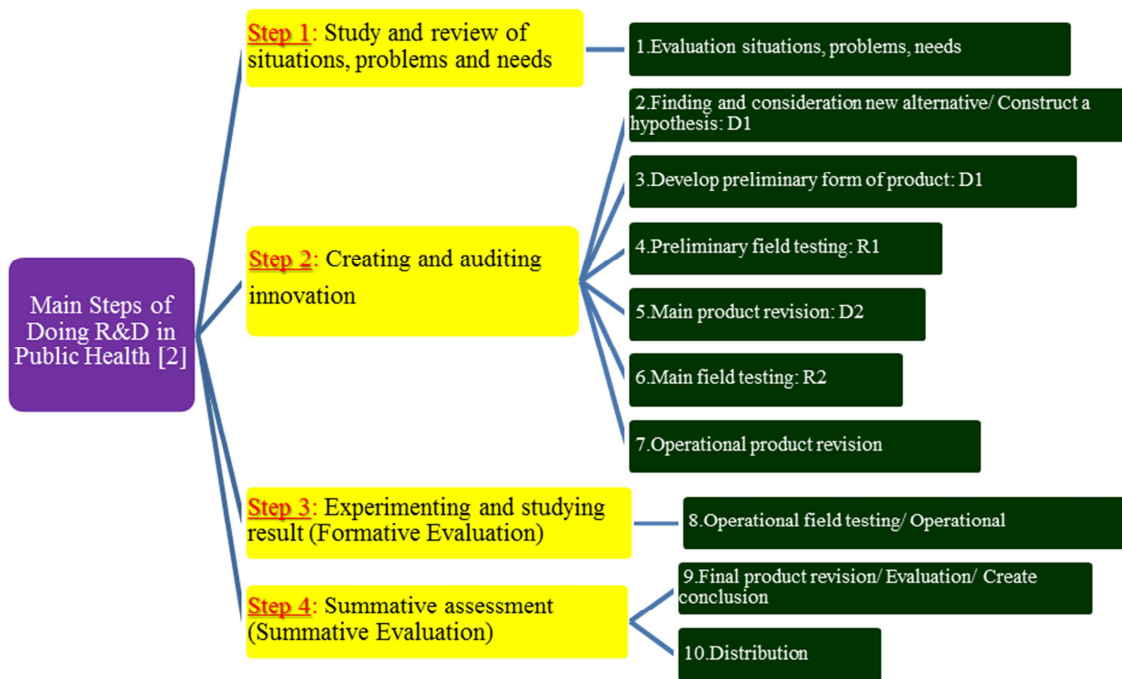


Figure 1. 10 processes and correlation of 10 processes in the research and development with the main steps of doing R&D in public health [1].

b. Example of Modeling of Causal Model

In this section, the author will give examples from research on the “Conducting a Path analysis of Virtual Service Provider Office Management (VSPOM) Structure for Service Plan in the Regional Health Service in Thailand” [31], this indicates that Causal Model is a subset of Semantic Model which under process 1-3 of Semantic Model and Step 1 of main steps of doing research and development in public health [2]: Studying Situations, Problems and Needs will not be able to be tested only will let the researchers know the size and direction of the important variables only and means that it is still not possible to resolve the cause of the problem completely and to the point.

Step 1: Studying situations with five scales of Likert - scale Questionnaires [32].

Step 2: Create a causal model with statistical analysis results from surveys

Step 3: Exploratory factor analysis; EFA to analyze 90 variables, the results for testing the suitability of the variables were obtained by conducting Kaiser-Meyer-Olk in test to measure the sampling adequacy (MSA). KMO or MSA at 0.890, which is over 0.80, showed that the variable series appropriated to be analyzed at a good level based on Kim & Mueller. Moreover, Bartlett’s test of sphericity found the variables to be correlated significantly (p-value <0.001), which shows that different variables can be used to analyze the elements. Results of the extraction method of the principal component analysis showed commonality of each variable used in the analysis of the VSPOM factors. The total number of 90 characters ranged from 0.740 to 0.901 is a lot size - the most tends to move in the composition of other components [31]. Orthogonal rotation with varimax shown in Table 2. The results of the variable component in the

restructuring and named the element. Table 2 showed that the variables used in the analysis can be grouped into a total of 90 elements has 13 elements with the Eigenvalue that exceeds 1.00, which means that each component can be explained by the variance of all 90 elements more than 1.00, features all 13 elements could explain the variance of all 90 characters, representing 83.33 percent. However, because researchers want to use only the variable that weights the composition ≥ 0.50 many 74 elements with the weight of the composition 0.504 to 0.846, selected variables that make full use of the 74 elements in 11 components. Due to the effects of the input variables found in some of the elements, components consisted of variables up to 22 and the variable from the different sides [31].

Step 4: Researchers restructure the elements

Researchers restructure the elements slightly so that each element consists of the same number of variables. The composition was reduced to 10 from 74 elements that were present initially. Ten modified elements were given a meaningful name, consistent, and cover all the variables as shown in Table 3.

Step 5: Confirmatory factor analysis; CFA/ Path analysis; PA

(1). The results of the second-order CFA were analyzed to confirm that the ten elements listed above are the four aspects. The results indicated that the ten aspects are the main elements. To obtain a model of the real overall VSPOM in the form of VSPOM with the help of the main element is desirable, as detailed in Figure 2 and Table 4. Table 4 and Figure 2 found that the model element of the VSPOM structure is desirable and consistent with the empirical data of the administrators and practitioners due to a statistical measure of harmony through them. It showed that the variables model has good construct validity. It can be seen that the VSPOM factors are

desirable since it includes the following four aspects: (1) Material: the tools to support the work of health services consists of two elements; (2) Administration: the general management includes three elements; (3) Setting: the framework for the establishment of the Health Service Virtual Office consists of three elements; and (4) Man: the administrative staff consists of two elements [31].

(2). *The results of PA* following on from the CFA, the investigator has analyzed the PA of the VSPO administration to show the reason of influence between the variables in both ten observed variables and four latent variables that this technique was invented by Wright. The analysis of the model showed that a causal model of VSPO administration for the health services system of Thailand that researchers made is consistent with empirical data was collected. (Not statistically significant $p\text{-value} = 0.272$), with the corresponding index of 0.98 [31]. The results of PA are desirable as shown in Table 5 and Figure 3. Table 5 and Figure 3 found that the model element of the VSPOM structure is desirable and consistent with the empirical data of the administrators and practitioners

due to a statistical measure of harmony through them, showing that the model has good construct validity. It can be seen that the VSPOM structure is desirable since it includes the four aspects: (1) Material; the tools to support the work of health services consists of two elements; (2) Administration; the general management includes three elements; (3) Setting; the framework for the establishment of the Health Service Virtual Office consists of three elements; and (4) Man; the administrative staff consists of two elements [31].

The model of the VSPOM structure for a service plan in the Regional Health Service in Thailand is causal model which is a form developed from a technique called Path Analysis by using Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), and Path Analysis (PA) which is studying primary data of item 1, sub-item b.(i) to analyze and synthesized to be a research framework for making the model (draft or create a model with content analysis or statistical analysis results).

Next, proceed with process of Semantic Model from item 1, sub-item c. (i-xi), respectively.

Table 2. Results of the orthogonal elements with varimax rotation [31].

Component	Extraction Sums of Squared Loadings		Rotation Sums of Squared Loadings			
	Total (Eigen value)	% of Variance	Total (Eigen value)	% of Variance	Total (Eigen value)	% of Variance
1	47.847	53.163	53.163	15.993	17.770	17.770
2	4.644	5.161	58.324	15.708	17.453	35.223
3	3.771	4.190	62.513	7.786	8.651	43.874
4	3.267	3.630	66.143	7.339	8.154	52.028
5	2.882	3.202	69.346	5.909	6.565	58.593
6	2.178	2.420	71.765	5.375	5.972	64.565
7	1.843	2.048	73.813	4.014	4.460	69.025
8	1.827	2.030	75.843	2.687	2.985	72.011
9	1.626	1.806	77.649	2.505	2.783	74.794
10	1.524	1.694	79.343	2.176	2.418	77.212
11	1.292	1.436	80.779	2.058	2.286	79.498
12	1.164	1.293	82.072	1.880	2.089	81.587
13	1.132	1.258	83.330	1.569	1.744	83.330

Table 3. Structure of the VSPOM factors for a service plan in the regional health service in Thailand [31].

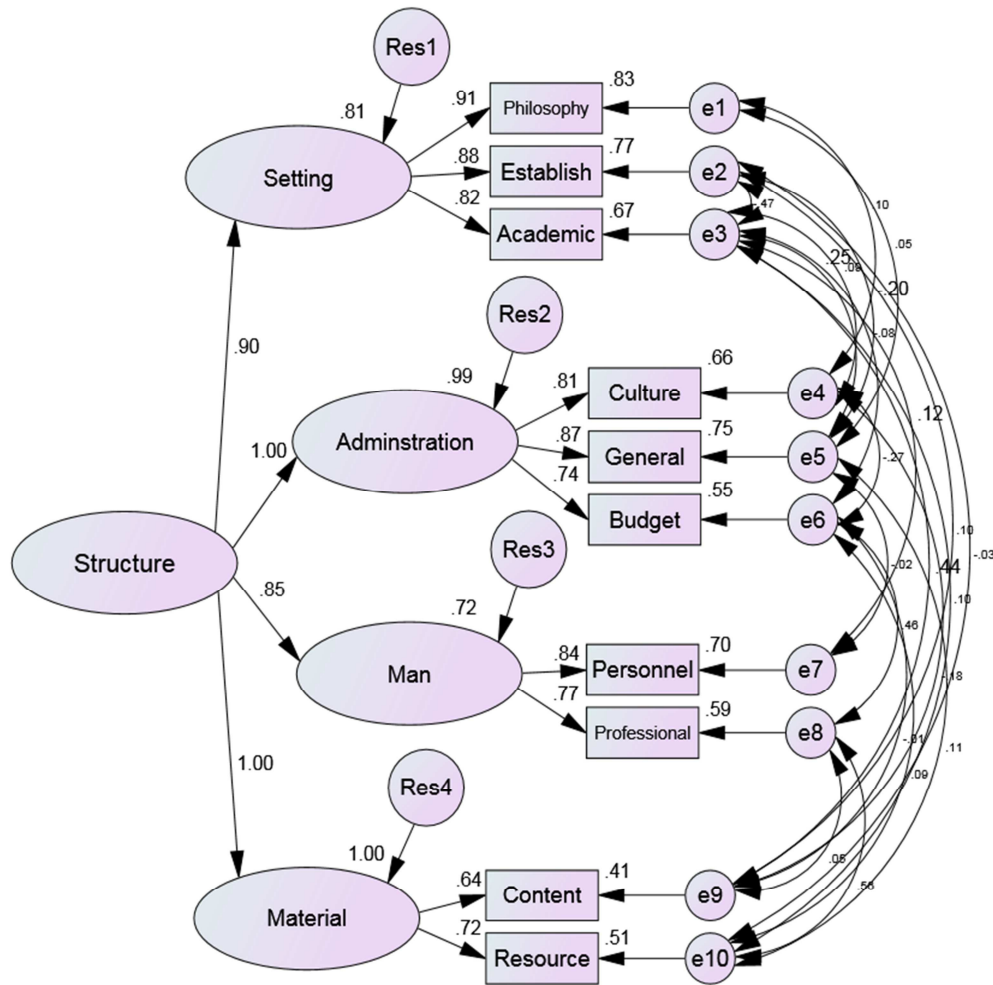
Side	Core Component
MATERIAL	RESOURCE (operating support resources management)
	CONTENT (developing academic subject)
	GENERAL (General Administration)
	CULTURE (building culture)
ADMINISTRATION	BUDGET (Budget Administration)
	PHILOSOPHY (philosophy, methodology)
SETTING	ESTABLISH (Establishing an Office Management Model with virtualization)
	ACADEMIC (Academic Administration)
MAN	PERSONNEL (Personnel Administration)
	PROFESSIONAL (Personnel who have a professional)

Table 4. Statistics measuring the harmony of the model with empirical data of the VSPOM structure for a service plan in the Regional Health Service in Thailand [31].

Fit Index	Criteria of Fit Index	Results of CFA	Consideration	Decision
Chi-Square χ^2	> 0.05	.363	Meet the criteria	Well
CMIN/DF	< 2.00	1.093	Meet the criteria	Well
GFI	> 0.90	.997	Meet the criteria	Well
AGFI	> 0.90	.982	Meet the criteria	Well
ECVI	<ECVI for Saturated Model (0.290)	0.166	Meet the criteria	Well
Model AIC	<Saturated AIC (110.00)	110.00	Meet the criteria	Well
NFI	> 0.90	.998	Meet the criteria	Well
CFI	> 0.90	1.00	Meet the criteria	Well

Fit Index	Criteria of Fit Index	Results of CFA	Consideration	Decision
RMR	< 0.05	.003	Meet the criteria	Well
RMSEA	< 0.05	.012	Meet the criteria	Well

Note: AGFI, adjusted goodness-of-fit index; AIC, Akaike information criterion; CFI, comparative fit index; CMIN/DF, χ^2 statistics and degrees of freedom ratio; ECVI, expected cross-validation index; GFI, goodness-of-fit index; NFI, normed-fit index; RMR, root mean square residual; RMSEA, root mean square error of approximation.



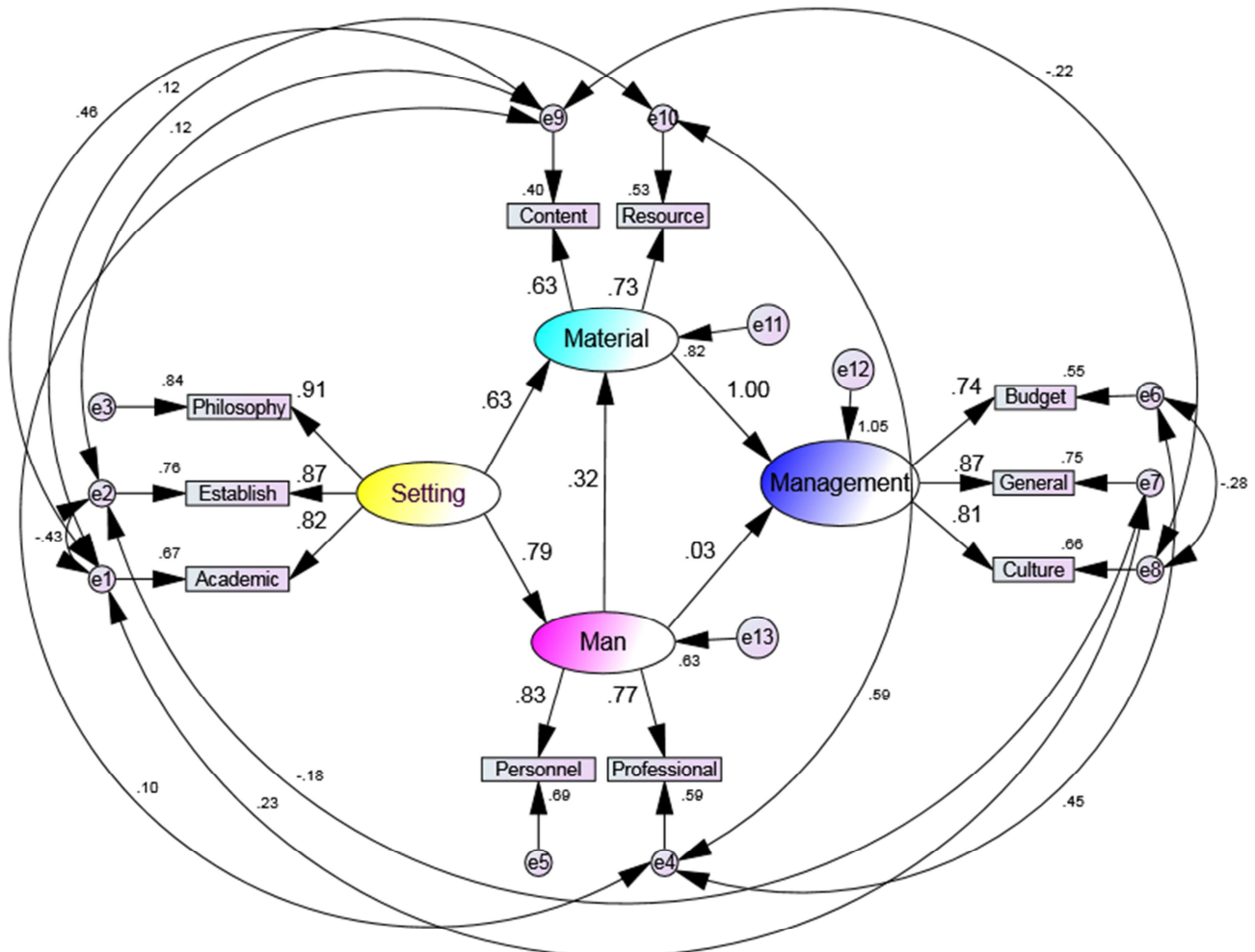
Chi-square=10.926, Degrees of freedom (DF)=10, Probability level (p-value)=.363, RMSEA=.012

Figure 2. The 2nd Order CFA Model of the VSPOM structure for a service plan in the Regional Health Service in Thailand [31].

Table 5. Statistics measuring the harmony of the model with empirical data of the VSPOM structure for a service plan in the Regional Health Service in Thailand [31].

Fit Index	Criteria of Fit Index	Results of CFA	Consideration	Decision
Chi-Square χ^2	> 0.05	.272	Meet the criteria	Well
CMIN/DF	< 2.00	1.171	Meet the criteria	Well
GFI	> 0.90	.993	Meet the criteria	Well
AGFI	> 0.90	.980	Meet the criteria	Well
ECVI	< ECVI for Saturated Model (0.290)	0.166	Meet the criteria	Well
Model AIC	< Saturated AIC (110.00)	110.00	Meet the criteria	Well
NFI	> 0.90	.996	Meet the criteria	Well
CFI	> 0.90	.999	Meet the criteria	Well
RMR	< 0.05	.005	Meet the criteria	Well
RMSEA	< 0.05	.016	Meet the criteria	Well

Note: AGFI, adjusted goodness-of-fit index; AIC, Akaike information criterion; CFI, comparative fit index; CMIN/DF, χ^2 statistics and degrees of freedom ratio; ECVI, expected cross-validation index; GFI, goodness-of-fit index; NFI, normed-fit index; RMR, root mean square residual; RMSEA, root mean square error of approximation.



Chi-square=22.246, Degrees of freedom (DF)=19, Probability level (p-value)=.272, RMSEA=.016

Figure 3. The Path Model of the VSPOM structure for a service plan in the Regional Health Service in Thailand [31].

4. Discussion

Public health was a science that requires art to operate for health promotion, control and disease prevention, medical treatment, and patient rehabilitation. It was imperative to the specific operational model. The model was simple patterns from study and development to explain phenomena more easily understand. The model was constructed and developed from philosophy, theory, principle, concept, and belief for the representation of thought or element to the relationship of key elements step by step for knowledge, easy understand, conciseness, accuracy, measurement, and verification. The model was a guideline to the prediction of consequences, proven and empirical test, causal and structural relationships that can be explained, create imagination, conceptualization, and extension scope of inquiry.

The technique of modeling in public health research and development is one step/ step 2 of the 4 main steps of doing R&D in public health, specifically, these data illuminated patterns related to doing R&D procedural details. The patterns are a unique contribution to the qualitative literature because

they provide further insight into the doing R&D procedures and publishing practices used by qualitative researchers. It can inform future research as well as methodology concerning qualitative doing R&D. The above steps are used in the samples of academic articles and research of [1, 31] who has written about Process of Research and Development in Public Health, and the VSPOM structure for a service plan in the Regional Health Service in Thailand.

5. Conclusion

In general, the model was 4 types as 1) analogue model, 2) semantic model, 3) mathematical model, and 4) casual model. The model consists of 1) objective of the model, 2) basic theory and principles, 3) work systems and mechanisms, 4) procedure, 5) performance evaluation guidelines, 6) model annotations, 7) conditions of use, and 8) handbook. The model was principles and methods for constructing and developing as 1) study basic information, 2) define principles goals and elements, 3) define guidelines for adoption, 4) evaluation model, and 5) development and improvement with the defect. The model was verifying by

quantitative evidence using statistical techniques or attribute evidence with professional or expert to good quality to use in actual operation. Health operations needed guidelines to construct and develop a model for applied to construct knowledge, attitude, and practice of self-care skills for people in good health and quality of life. The aim and importance of creating and developing a model to support the operational process to achieve the organization's goals in which the public health operation model is numerous some formats may be used widely and all forms have objectives to improve operations the target group, the algorithm, the composition varies. Some formats are widely available. Some forms will be used in a narrow, specific area. The user of the model should study and consider and choose to be suitable for the operation according to the context and nature of the operation area and other contexts such as time, material, and budget. To create a model, it is necessary to undergo a study and development to explain the phenomenon to easily understood based on the philosophy, theories, principles, concepts, and beliefs to illustrate the structure of ideas or components and relationships of the important components step by step to be knowledgeable, easy to understand, concise, accurate, measurable, and verifiable leads to a prediction of the consequences that can be proven and empirical test. Causal relationships and explainable structures are helping to create images. Concepts and help expand the scope of the quest for knowledge. This article presents one technique for creating patterns in 2 types which consists of 1) create or develop forms (a. study of relevant documents and research, b. study from real context, and c. formatting); 2) verification of model accuracy (a. model testing with assessments under with specified standards assessments, b. pattern testing with assessment by the qualified person, c. format testing by surveying opinions of relevant personnel, and d. format testing by testing the format).

References

- [1] Phongpisanu B. (2019). Process of Research and Development in Public Health. *Int J Clin Case Stud Rep*, 2 (1): 61-65.
- [2] Phongpisanu B. (2018). Main Steps of Doing Research and Development in Public Health. *Med J Clin Trials Case Stud*, 2 (10): 000183. DOI: 10.23880/mjccs-16000183.
- [3] Phongpisanu B. (2019). Techniques for Writing Chapter I of Research and Development in Public Health. *Med J Clin Trials Case Stud*, 3 (4): 000222. DOI: 10.23880/mjccs-16000222.
- [4] Bardo, J. W. and Hartman, J. J. (1982). *Urban Society: A Systematic Introduction*. New York: F. E. Peacock Publishers.
- [5] Good, C. V. (1973). *Dictionary of Education (3rd ed.)*. New York: McGraw-Hill.
- [6] Keeves, P. J. (1988). Model and model building Education Research, methodology and measurement: *An International Handbook*. Oxford: Pegamon Press, 559.
- [7] Willer, D. (1967). *Scientific Sociology: Theory and method*. Englewood cliffs, New Jersey: Prentice-Hall.
- [8] Longman, C. (2009). *Longman Dictionary of contemporary English*. England: Pearson Education.
- [9] Hausser, D. L. (1980). *Comparison of different models for organizational analysis. In organizational assessment perspective on the measurement of organizational behavior and the quality of work life*. New York: John Wiley & Son.
- [10] Nadler, D. A. (1980). *Role of Model in Organization Assessment*. New York: John Wiley & Son.
- [11] Michael, H. M., Michael, A. and Khendouri, F. 1985. *Management: Individual and Organizational Effectiveness (2rd ed.)*. New York: Harper & Row.
- [12] Stoner, J. A. F. and Wankel, C. 1986. *Management (3rd ed.)*. Englewood Cliffs: Prentice-Hall.
- [13] Steiner, E. (1988). *Methodology of theory building*. Sydney: Ecology Research Associates.
- [14] Smith E. W. and others. (1997). *The education's encyclopedia*. New York: Prentice-Hall.
- [15] Keeves, J. P. (1997). *Educational research, and methodology, and measurement: An international handbook*. Oxford: Pergamon Press.
- [16] Keeves, P. J. (1988). Model and model building Education Research, methodology and measurement: *An International Handbook*. Oxford: Pegamon Press, 561-565.
- [17] Joyce, B. R. and Weil, M. (1972). *Model of Teaching*. New York: Prentice-Hall.
- [18] Brown, W. B. & Moberg, D. J. (1980). *Organization Theory and Management: A Macro Approach*. New York: John Wiley and Sons.
- [19] Keefe, W. J. (1994). *Leadership in Midlle Level Education*. Virginia National.
- [20] Meason, Albert & Khedourri. (1985). *Management*. New York: Harper & Row.
- [21] Willer, D. (1967). *Scientific Sociology: Theory and Method*. New Jersey: Prentice Hall.
- [22] Joint Committee on Standards for Educational Evaluations. (1994). *The program evaluation standards: How to assess evaluations of educational programs*. Newbury Park, CA: Sage.
- [23] Tyler, R. W. (1950). *Basic principles of curriculum and instruction*. Chicago: University of Chicago Press.
- [24] Scriven, M. (1973). "Goal-free evaluation." In E. R. House (ed.). *School Evaluation: The Politics and Process*. Berkeley, CA: McCutchan.
- [25] Patton, M. Q. (1986). *Utilization-focused evaluation*. California: Sage Publications.
- [26] Fetterman, D. M. (1996). "Empowerment evaluation: An introduction to theory and practice." In D. M. Fetterman, S. J. Kaftarian, and A. Wandersman (Eds.). *Empowerment evaluation: Knowledge and tools for self-assessment & accountability*. Thousand Oaks, CA: Sage.
- [27] Chen, H. T. (2004). "The roots of theory-driven evaluation current views and origins." In M. C. Alkin (ed.). *Evaluation Roots*. Thousand Oaks: Calif: Sage.

- [28] Madaus, G. F., Scriven, M. S., & Stufflebeam, D. L. (1983). *Evaluation Models viewpoints on educational and human services evaluation* (8th ed). Boston: Kluwer-Nijhoff.
- [29] Eisner, E. (1976). Educational connoisseurship and criticism: Their form and functions in education evaluation. *Journal of Aesthetic Education*, 39 (2), 192-193.
- [30] Keeves, P. J. (1988). Model and model building Education Research, methodology and measurement: *An International Handbook*. Oxford: Pergamon Press, 560.
- [31] Phongpisanu B. (2019). Conducting a Path analysis of Virtual Service Provider Office Management (VSPOM) Structure for Service Plan in the Regional Health Service in Thailand, *Indian Journal of Forensic Medicine & Toxicology*: 13 (4), 1793-1799. DOI: 10.5958/0973-9130.2019.00571.1.
- [32] Nemoto, T., & Beglar, D. (2014). Developing Likert-scale questionnaires. In N. Sonda & A. Krause (Eds.), *JALT2013 Conference Proceedings*. Tokyo: JALT.