

A study of systems thinking process: a review of the literature

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Abstract. The purpose of this study is to conduct a literature review by utilizing system thinking process through document analysis, which is then presented through an analytical description by using secondary data. Correspondingly, the gathered information from related documents and researches were studied and researched through electronic databases. The finding suggests that the system thinking process includes 1)Specify problem or issue. 2)Data Inquiry. 3)Identify boundaries, inputs, and outputs of the systems. 4)Explain cause-effect relations by draw a causal loop diagram: CLD. 5)Creating problem solving plan and describing the probability. 6)Test a solution. and 7)Discussing and concluding.

1. Introduction

Systems thinking is the primary conceptual frameworks as a school of thought, as a holistic approach to problem-solving and analysis[1], as a framework which studies patterns and correlations, observes and condenses big subjects, is related to environmental context, a vacillating process. The systems thinking accommodate the management of complexity[2], which has the special characteristic of studying the world in complex holism.

Systems thinking has a dynamic, complexity and connection to subordinate elements in order to search and construct the pattern which will lead to the maximum developmental changes of problems or practices. [3] Systems thinking is the ability to think reasonably, logically, with consecutive plans, sequence arrangement and the comprehension of a phenomenon through system connectivity, correlative envisioning between reasons and consequences in order to transform the systems effectively. Moreover, systems thinking accommodates solution planning designs [4] and efficient decisions[5].

2. Methods

The study uses a literature review, document analysis, and analytical description through the use of secondary data by research and the gathering of related documents and researches as well as research through electronic databases such as Science Direct, Scopus, Web of Science, Google Scholar. In this regard, the keywords are Systems Thinking, the title of the research.

3. Result

From the literature review, the details of system thinking process can be concluded and distinguished through different ideologies of the authors, as presented in Table 1.

Table 1 Related Conclusion of Systems Thinking Process Research

Author	Systems thinking process
Sarawut Patcharachompoo (2016) [6]	<ol style="list-style-type: none"> 1. Analyze the issue explicitly or specify problems or issues with principles and reasons. 2. research issue-supportive information. In the case that the address of the information is obscure, research from other sources. 3. Analyze variable factors, issue-related causes through the consideration of the variable factors reasonably and briefly. 4. Describe the connection of factors and causes by showing circle connection. 5. Describe related connection by composing Causal loop diagram (CLD) to illustrate the connection of the causing factors concretely. 6. Specify the details of causing factors to illustrate concretely in favor of the comprehension convenience in the process of the leading to a practice by composing mind maps 7. Adapt the self-created thoughts to a practice.
Jiranan Chatchainano, Maream Nillapun (2016) [7]	<ol style="list-style-type: none"> 1. Facing the Problems: the students will be presented with questions, problems or issues and will study them cooperatively as well as signifying problems and specifying hypothesis. 2. Data inquiry: the students will cooperatively specify sources, research information and gathering methods to answer the questions. 3. Enhancing Knowledge: students will cooperatively specify the causes, which they think relates to the problems and conclude the problem as well as setting related variables by presenting in the form of diagrams, chart or graph, as follows: <ol style="list-style-type: none"> 1) the students will cooperatively examine variables related to problems and specify the names of the variables. 2) Compose a Behavior Over time: BOT graph. 3) Compose a pie chart and specify results. 4. Developing Thinking: the students in each group present their collective works and cooperatively examine the variable, behavior graph and pie chart and results. 5. Creating Problem Solving Plan and Describing the Probability: students from each group cooperatively plan and design more than 1 solution methods and estimate the results of the solutions. 6. Discussing and Concluding: Discussing and Concluding: the students from each group will present the solution method cooperatively. Discuss the solution method as well as conclude the lessons cooperatively. 7. Reflecting Thinking: Reflecting Thinking: each student will revise the lessons learned. Evaluate the quality of his/her own thought, obtained experience through a reflecting thinking journal

Table 1 Related Conclusion of Systems Thinking Process Research (continue)

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Author	Systems thinking process
Megan Aline Hopper (2007) [8]	<ol style="list-style-type: none"> 1. Recognizing Interconnection 2. Identifying feedback 3. Understanding dynamic behavior 4. Differentiating types of flows and variables 5. Using conceptual models 6. Creating simulation models 7. Testing policies
Brenda Breil, Tracey Ritchie and Hollie Greer (2017) [9]	<ol style="list-style-type: none"> 1. Identify what you want to improve. ^[L]_[SEP] 2. Identify boundaries, inputs, and outputs of the system in which the changes will take place. ^[L]_[SEP] 3. Identify the interactions within the system. ^[L]_[SEP] 4. Draw a diagram. ^[L]_[SEP] 5. Identify potential solutions ^[L]_[SEP] 6. Test your solutions using your diagram. ^[L]_[SEP] 7. Select the “best” solution(s). ^[L]_[SEP] 8. Record your plan of action. ^[L]_[SEP]
Woei Hung (2008) [10]	<ol style="list-style-type: none"> 1. Identification of crucial variables 2. Linearity 3. Interconnectivity 4. Cause-effect relations (causal-loop) 5. Feedback processes (positive and negative) 6. Dynamics processes 7. Contextualization 8. Underlying mechanism (explanatory knowledge)
Ross D. Arnold, Jon P. Wade (2015) [11]	<ol style="list-style-type: none"> 1. Recognizing Interconnections 2. Identifying and Understanding Feedback 3. Understanding System Structure 4. Differentiating Types of Stocks, Flows, Variables 5. Identifying and Understanding Non-Linear Relationships 6. Understanding Dynamic Behavior 7. Reducing Complexity by Modeling Systems Conceptually 8. Understanding Systems at Different Scales

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From Table 1, the system thinking process of the foretasted ideology can be synthesized into 7 procedures, as presented in Table 2

Table 2: The synthesis of systems thinking process

Systems thinking process	S. Patcharachompoo (2016)	J. Chatchainanon, M. Nillapun (2016)	M. Hopper (2007)	B. Breil, T. Ritchie and H. Greer (2005)	W. Hung (2008)	R. Arnold, J. Wade (2015)
1. Specify problem or issue	/	/		/		
2. Data inquiry	/	/				
3. Identify boundaries, inputs, and outputs of the system	/	/		/	/	/
4. Explain Cause-effect relations by draw a Causal loop diagram : CLD	/		/	/	/	/
5. Creating problem solving plan and describing the probability	/	/	/	/		/
6. Test a solutions	/		/	/	/	
7. Discussing and concluding		/		/	/	/

3. Conclusion

The purpose of this study is to analyze systems thinking process. The result of literature reviews can be concluded into 7 procedures, the details of which are as follows:

1. Specify problem or issue: Defining problems vividly, analyze issues explicitly with sensible principles and reasons.
2. Data inquiry: research information in order to discover solutions from different learning sources.
3. Identify boundaries, inputs, and outputs of the system: analyze the variables which are issue-related factors by examining the issue-related variables reasonably.
4. Explain cause-effect relations by draw a causal loop diagram : CLD: illustrate the connectivity of root factors concretely
5. Creating a problem-solving plan and describing the probability: readily present problem-solving methods.
6. Test a solution: utilize the problem-solving methods and examine whether the result is as specified.
7. Discussing and concluding: revise lessons, evaluate self-thinking quality, acquired experiences by composing reflecting thinking journals.

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