

Co-Creating Built Environment Knowledge for Sustainable Development: Case Study Report from Thailand

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Abstract

Co-creation has been used widely in many fields of development. Many development projects in Thailand apply co-creation as an approach to development. However, the academic knowledge about co-creating built environment in Thailand is limited and remains unclear about how to involve the community in co-create the built environment for sustainable development. Therefore, this study aimed to describe the processes and the practices of co-creating built environment as appeared in the context of Thailand through the description and analysis of cases. A case study of Ban Moh is described and analysed in details and study

comparatively with other four well-known case studies in co-creating built environment knowledge for sustainable development. The result of the study includes the processes and practices of co-creating built environment in Thailand, it can be used for educational purposes. It also identifies key success factors, problems, and obstacles in the implementation of co-creation concept learning.

Keywords: Co-creation, Participatory design, Co-design, Built environment, Sustainable development

1. Introduction

Even though paradigm shift in the planning policy from top down development to decentralized development or place-based development occurred since 1970s (Bødker, Grønbaek, & Kyng, 1995), the concept has recently been accepted in Thailand in 1990s. The constitution in 1997 is a legal structure that emphasizes public participation. However, the development projects still often neglect this matter or have the limitations in creating real participation. Learning can be occurred in every place, learning environments in the 21st century requires an integration for all.

There are several unsuccessful development projects that do not get cooperation from people and the community. The problems of development always occur because of the lack of participation in thinking and operating stages. These problems bring the development project to unsustainable development, because of the top-down policy without understanding the real needs of people who have to engage in the development. The misunderstanding in the problems of users and not getting cooperation always lead the development in the wrong direction that affects the wasting of budget and opportunities in the development. Besides, the development ideas that do not come from the users of the development project usually have not been accepted and cannot apply in the working processes and the implementation.

Moreover, disadvantaged people and local communities often experience non-inclusive development. They cannot reach a good quality of the built environment that affects their quality of life, health, social, and economic well-being as well. Furthermore, the built environmental with top-down designs in several government projects do not match with the community context and the requirements of the users. These development projects are costly but are not pertinent to the real problems and needs of the users.

There are new concepts and experiments that bring architects, designers, or planners to work together with users in the development, particularly in the built environment development projects. Among these, there is a concept of co-creation that has been developed to create new solutions or innovations for the smarter built environment by engaging users, designers, and other stakeholders in the participatory design process. The co-creation concept, also called co-design, supports the end-users to take part in the design process with professional designers. Co-creation not only helps to create the solution or the innovation that precisely answers the real requirement of the users but also to raise the right of the users by engaging with the designer and other stakeholders in the whole process of co-creation.

Several cases of built environment design in Thailand use co-creation in the working process.

Some cases use the exact term of co-creation, but some use the words like “participatory design”, “community-based design”, or “participatory action research”. The development of these various terms in the field of built environment should be studied in order to understand the processes and practices of co-creating built environment in the context of Thailand. This is done through the description and analysis of cases in this present research.

Co-creation has been applied in the built environmental design in different scales, including large-scale district planning, community development, housing development project, and public building. Therefore, it is essential to study several cases in order to compare the processes and practices among them. The cases in this study can be categorized into four groups as follows:

- (1) Large-scale district planning, such as co-creating Chum Saeng District (Nakhon Sawan Province) and co-creating Charoen Krung Street Area (Bangkok).
- (2) Community development project, such as the Chanthaboon riverside community (Chanthaburi Province) and Ban Pred Nai community (Trat Province).
- (3) Housing development projects, such as Baan Mun Kong (housing projects carried out by Community Organizations Development Institute or CODI (Public Organization); and Baan Eua Arthorn (housing projects carried out by National Housing Authority or NHA).
- (4) A group of buildings or individual building with co-created architectural design and/or development like community hospitals like Pru Nai Community Hospital (Phang Nga Province) and Benchalak Chaloeam Phrakiat Hospital (Si Ka Ket Province).

This study focuses on exploring and analyzing the concepts, experimentations, and practices of co-creating built environment in the context of Thailand. This is done by exploring the sample cases of Chanthaboon riverside community in Chanthaburi Province, Ban Pred Nai fishing community in Trat Province, Baan Man Kong Project at Ta Kok in Samut Prakan Province, and Pru Nai community hospital, on Koh Yao Yai in Phang Nga Province.

An in-depth study is done in Ban Moh, the traditional pottery community in Mahasarakham Province. Ban Moh project used co-creation approach in housing renovation and community infrastructure development. Ban Moh is an interesting case as it is a unique project that combined community development with housing renovation development including house design and construction.

The co-creation of Ban Moh community project was funded by the National Housing Authority (NHA) during the launch of an overall study of Thailand’s rural housing development to find out suitable development for low-income rural villagers. The project was a pilot project to study about the North-eastern rural housing development plan in 2005-2006, led by the researchers from the Faculty of Architecture, Urban Design and Creative Arts, Mahasarakham University.

Ban Moh rural community development project focused upon and supported people's participation in order to create “self-reliance community” and to lead the village to the path for long-term sustainable development. The researchers collaborated with the members of the

community to develop built environment in the community, including common infrastructure and housing renovation.

This project developed guidelines for community improvement through a participatory process with surveys and interviews of 144 households. After that, the community and the researchers agreed to improve selected 30 houses by self-relied design and construction process. The community and researchers set up the Housing Development Fund (HDF) to operate this development project, including setting up rules and agreements together with HDF Committee. Later the “Evaluation Committee” was set to follow up the workflow. The researchers collaborated with the house owners to renovate these selected houses, and the HDF committee approved the budget to buy the materials for use in renovation. The house owners received building materials from HDF instead of money to prevent the misuse of money or corruption. The house owners agreed to pay back to HDF by instalments, and the returned money would be circulated to develop the rest of the houses in the community. For this reason, every house in the community would be developed in different phasing in the long-term plan.

The development of Ban Moh community succeeded in the design and construction of community pottery centre, in solving the problem of landlocked household, and in the co-creation, construction or renovation of selected houses.

However, the problem in the development project occurred after several house owners borrowed construction materials to renovate their houses but do not pay instalments back to the HDF, and the committee could not collect the debt and could not continue to operate the next phase of the project. Finally, the researchers decided to terminate the project after helping the community to summarize and close the project account.

Ban Moh together with the sample cases represent the built environmental development in various scales and processes. The study will identify key success factors of the co-creation process, the problems, and obstacles of co-creating built environment from these cases (Polyiem & Nuangchalerm, 2022). The analysis finally leads to guidelines for the co-creation of community built environment knowledge for sustainable development. It can be used for educational purposes, curriculum development, and instructional activities.

1.1 Objectives of the Study

- (1) To understand the processes and practices of co-creating built environment in the context of Thailand through the description and analysis of cases.
- (2) To identify key success factors, problems, and obstacles in the implementation of co-creation concept through a case study of Ban Moh Community.
- (3) To propose guidelines for co-creating built environment for sustainable development.

1.2 Literature Reviews

The development of co-creation started in the 1960s in Scandinavia where the trade unions raised the right of the workers to cooperate in workplace design, there were many

experiments for improving higher productivity and increasing job satisfaction. Since 1973, the delegated workers in Sweden had the right to represent the board of directors of the company. Sweden declared an Act on board representation for private sector employees in 1987 (from original legislation in 1973) (European Foundation for the Improvement of Living and Working Conditions, 1998).

Co-creation had emerged again in the 2000s by Prahalad and Ramaswamy (2000, 2004) in the business and marketing field to empowered the customer voices to change the market and products. The co-creation between the customers and the enterprises expanded to open innovation, collaborative innovation, and customer-led innovation. Ramaswamy and Gouillart (2010) released the book “The Power of Co-Creation: Build It with Them to Boost Growth, Productivity, and Profits” and described the benefits of co-creation in the business of the successful companies like Apple, Microsoft, Unilever and Nike that had used co-creation with the customers in the product development and design process.

Table 1. Summary of the terms and definitions

Term	Definition	Used by
Cooperative Design	Involve the users in the design process	Bødker et al. (1995) Scandinavia in the early 1970s
Participatory Design	A collection of design practices to involve the user of the project in the design process	Heron (1971); Velden & Mörtberg (2014)
Service Design	Not focus only users need, but include the idea from all stakeholders	Shostack (1982); Kimbell (2015)
User-Centered Design	Design based on the needs and interests (decreases the focus on usability)	Norman (1988)
Human-Centered Design	Expand the scope of user than UCD. Use as the tool to create innovative solutions to problems	IDEO (1991); Norman (2013)
Design Thinking	Related to HCD but divided into 5 steps	IDEO (1991)
Co-creation	Engage the users and public in the development projects and innovations	Prahalad & Ramaswamy (2004)
Co-design	Include the users and other stakeholders to design together with the designer	Sanders & Stappers (2008)

Source: Developed by the authors.

Co-creation is the process that new solutions are designed with people, not for them (Sanders & Stappers, 2008); this concept based on an idea of cooperative inquiry by Heron (1971).

Co-creation is strongly connected to the notions of “participatory design”, “co-design”, “design attitude” and “design thinking” that have been emphasized in recent years as absolutely central to innovation (Boland., Collopy, Lyytinen, & Yoo, 2008). Co-creation can bring a different creative process, diverse participation of people, and multi-disciplinary knowledge to the people inside and outside the organization throughout the process.

Co-creation is the key to recognize that everyone can be creative; they can be actors, social innovators, and, not the least, end-users like communities, families, and individual citizens and businesses. The co-creation concept was widely used in the various fields to engage the broad stakeholders in the design process and the problem-solving process as co-designer (Gioia, 2015).

The benefits of co-creation are divergence and execution (Bason, 2018). Divergence means to gather various ideas and opinions from a variety of participant groups by opening up the design process to the public. The public sector can choose from alternate ideas before developing the prototype and decision-making. Multi-disciplinary knowledge can join in to suggest conceptual design and schematic design. Execution means the selected co-creation idea can strengthen the implementation. Co-creation brings a cost-effective solution because it eliminates the clumsiness and disappointment of the implementation and take a shorter time in the operation process (Hartley, 2005; Scharmer, 2006).

1.3 Co-Creating Built Environment Projects in Thailand

The concept of co-creating built environment has been used overtimes in the concept of participatory design. The participatory design development projects that allowed multi-stakeholders from the various organizations design collaborate with the users. However, the early project in Thailand that uses term co-creation is the Co-create Charoenkrung project in 2016 by collaborative work between Thai Health Promotion Foundation and Thailand Creative and Design Centre (TCDC) (www.tcdc.or.th).

The co-create community development before the Co-create Charoenkrung project still used the different term. For example “The participatory architecture for change” by Arsom Silp Institue of Arts (2017) that applied in the Preservation and revitalization of the Chantaboon riverside community project since 2009.

There are many development projects that operate by participatory design with the users, included the members of the community and other stakeholders from the different organizations, to participate in the development project before TCDC used the term co-creation. The term co-creation has been used widespread in the field of built environmental design from product design, architectural design and particularly in the community design and the city planning. The well-known co-creation in architectural design project is the participatory design hospital at Koh Yao Yai island followed by the Benchalak Chalodem Phrakiat Hospital, Sisaket Province and Phanom Dong Rak Hospital, Surin Province developed by the CROSSs community architect firm. This hospital design is not only listening to opinions from an architect or owner. But also listening to the users of the hospital in a way like a group discussion, draw maps, sketch ideas, do the model etc. to listen

to the true needs of the people involved. Then adjusted to become the type of a dream hospital.

Co-creation has been applied for finding the solution in community development like co-create Chum Saeng in 2016 organized by The Community Architects Network (CAN), a network of architects, planners, researchers, and institutions across Asia that work on community-driven projects. Co-create Chum Saeng had held in the eight days workshop in July 2016. This project had created strategies and areas for development while allowing their own areas and ideas to be created together with nature. CAN integrate communities in communities and built environment experts from 15 Asian and non-Asian countries and approximately 180 attendees attend the workshop. The event was hosted by the collaboration of organizations included the Asian Coalition for Housing Rights (ACHR), Community Organization Development Institute (CODI), Association of Siamese Architects under Royal Patronage (ASA), Community Act Network, Phranakhon Rajabhat University, Chum Saeng Municipality, and Chum Saeng My Beloved (Huang & Castanas, 2016). This project emphasized on the community-led process to find out the vision and solution for improving the district in the future.

2. Research Methods

This study develops the research methodology by (1) identify the datasets and data collection method; (2) develop the question guidelines; and (3) Data analysis method.

This study uses qualitative research with the case study methodology. Starting from study basic the information and the secondary data from desk study such as research reports, books, newspapers and medias. Then the researcher does the field surveys using observation and conversation to obtain empirical data, making a temporary conclusion from various users. Follow by using the focus group and in-depth interview with the key person to find out the details and cross check the finding. This finding is used to define the conceptual framework and then find theoretical answers by analysing the data simultaneously with data collection.

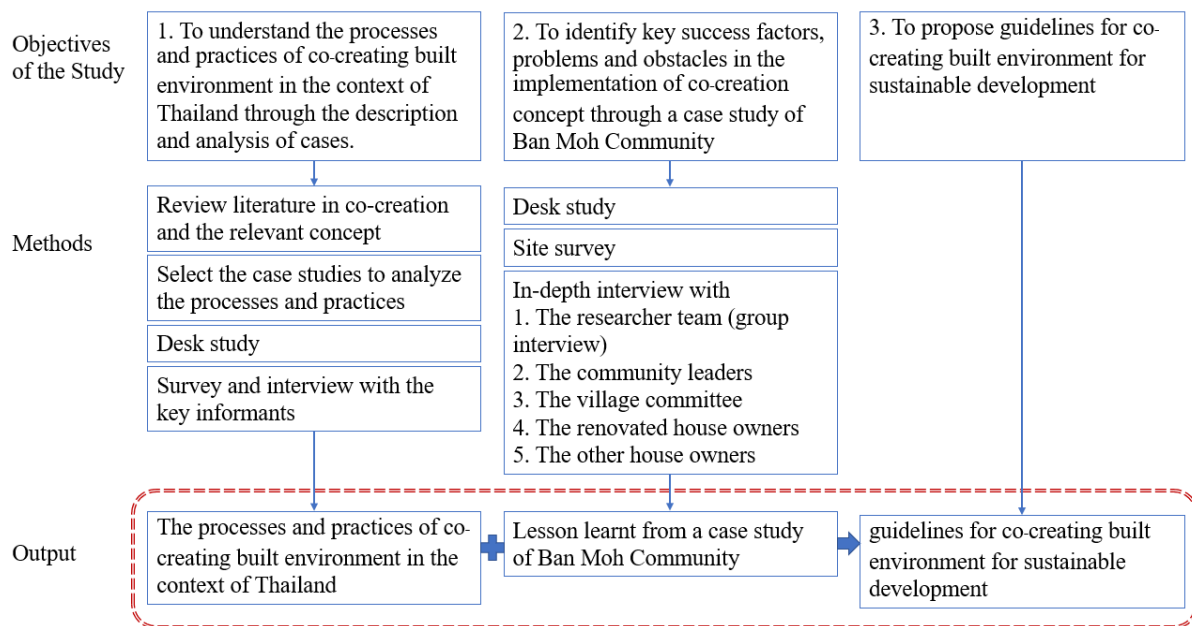


Figure 1. Process of the study

Source: Developed by the authors.

3. Results

It focuses on a case study of Ban Moh community to find out the practice of co-creation in the participatory action research in the development of community including the development of house renovation of the villagers.

3.1 Background Information of Ban Moh

Ban Moh is a village located in Khwao Subdistrict, Mueang District, Maha Sarakham Province, which is a distance from the city of Maha Sarakham heading to Roi Et Province. The general condition is a small village with a population of around two hundred households, having their own language, culture and way of life unlike other villagers in Maha Sarakham. In the neighbourhood as well as the villagers also preserving the pottery profession that has been held since the ancestors.

Sudsakorn Chaiyot, one of the community leaders, described the legend of setting up Ban Moh village. “About two hundred years ago the ancestors of the Ban Moh villagers migrated from Korat to gather from many districts such as Phimai District, Non Sung District, Bua Yai District, Non Thai District, etc., and settled in the area near Nong Loeng Ben lake. Because Nong Loeng soil can be used as a raw material for pottery.”

From the found, most villagers still use Korat language. And the villagers have inherited this pottery career by the nature of wisdom from generation to generation. The villagers still dive into the water and use the boat in order to dig the soil in the swamp up to make a pot, just as the ancestors did in the past in the same area. Therefore, the water in Nong Loeng Ben lake is

becoming deeper.

Most pots that popular in selling are pots for performing various rituals of the Isan people, such as housewarming rituals, funeral rituals, etc. These things are still necessary for the general villagers, therefore, the villagers who have pottery occupation can hold this profession as the main occupation for incomes. Nowadays, there are new generations who still inherit traditional production methods and at the same time try to create new design of the pottery as well.

3.2 Phases of the Development Project

The Ban Moh research project consists of two phases as follow:

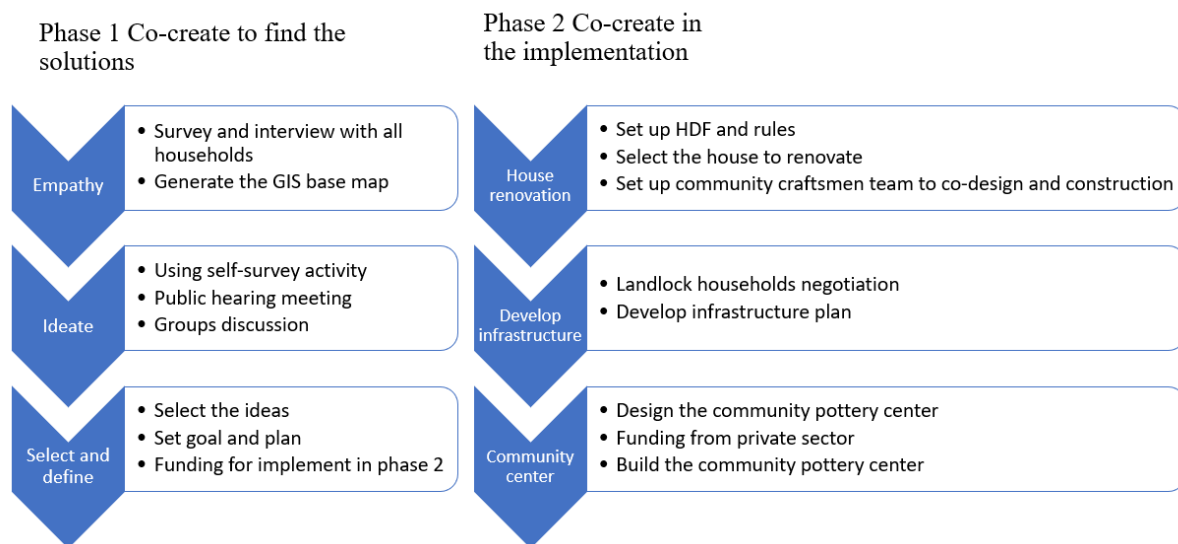


Figure 2. Phases of the development project

Phase 1. Ban Moh rural housing study and development project started in 2005. The researchers suggested the villagers to involve in the development project by self-survey and workshops, then the researchers began a community survey for doing the village maps. After the public hearing meetings, the researchers and community members agreed to solve the physical conditions of built environment problem of the community.

Phase 2. The researchers collected data and requirements about the operation in the first phase. In this second phase, the researchers and the community, including village headman, village committee members, and villagers were well-acquainted with one another. After receiving the development funding from NHA, they continued the project by having 4 sub-projects including

(1) Infrastructure development—they improved the drainage and sewage system, and they helped negotiating with the surrounding neighbours to find the solution for landlocked houses.

(2) Finding more funding—they asked for donation from construction materials supplier firm (Siam Cement Group or SCG) to cover for the design and construction of the community pottery center.

(3) Designing and finding venue for new products—the research staff from the Creative Design Department designed and developed new pottery products for the community. Moreover, the faculty also developed small pottery showroom in front of the Faculty of Architecture, Urban Design and Creative Arts building to promote and sell pottery products from Ban Moh community.

(4) Setting up House Development Fund (HDF)—The researchers and the community developed house improvement plan (or self-reliance renovation) by setting the criteria for selecting the appropriate houses. Then House Development Fund (HDF) was established for the project operation.

3.3 Development Activities in the Operation of Research Project

In the operation of the development project in 2005-2006 the main concept that was applied is the Participation Action Research. The researchers play roles as the leader of the project to drive the whole of the development. Therefore, the level of participation in phase 1 still in the low level. The researchers started from survey and do the map to understand the physical conditions of the village. Followed by held a public meeting with the community members to hear the problems and the requirements and make the program for developing. In phase 1, they developed the village infrastructure such as drainage system and solve the landlocked problems for some houses. In addition, the community pottery center has been designed and built for doing the pottery and storage.

3.4 Develop Guideline for House Improvement

- Participatory process with survey and interview of 144 households
- Survey the needs of people in the community.
- Create a sequence plan or development.
- Create community plans by people in the community
- Communities survey housing conditions, problems, and needs of the community

3.5 Develop Guideline for Landlocked Households in the Settlement and Negotiate with the Neighbour

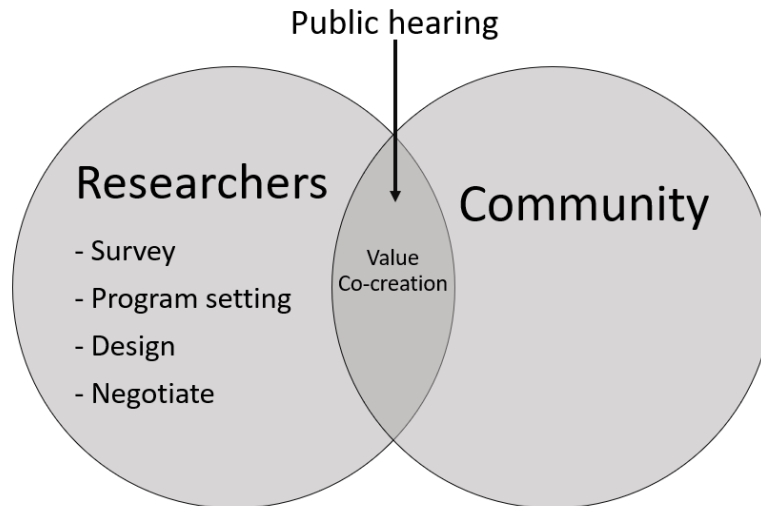


Figure 3. Study the problems of the community then set program by inform and consult with community by public hearing in phase 1

Source: Adapted from the joint space of creation (Koning, Crul, & Wever, 2016) by the authors.

After phase 1, the researchers and the community started to understand one another and to co-create value together for setting the goal of developments at the end of the first phase. National Housing Authority (NHA) continued to offer research fund for developing the houses in the community in step 2. Therefore, they raised the participation level by the co-creation of value and setting the goal and planning together.

Phase 2 was developed in the year 2006. The researchers and community used the participatory process to make an agreement in the house improvement activities as follow:

- Develop guidelines for house improvement;
- Set up the Housing Development Fund (HDF) led by the researchers, the village head and village leaders. Then HDF set the rules for the project operation;
- HDF recruited house improvement participants. HDF considered and selected the houses for improvement/development by the criteria of house conditions including the financial ability of the house owners to pay instalment back to HDF. They improved the selected 30 houses by the self-relied process.

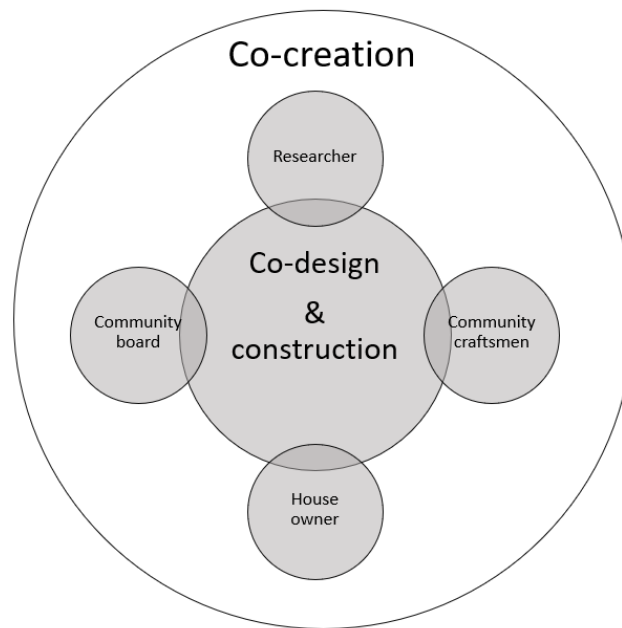


Figure 4. Co-creation in house improvement (self-reliance renovation) in phase 2

Source: Developed by the author.

In phase 2, they set up the community craftsmen to assist both researchers and the house owners in the process of a design decision in the actual location and choosing materials from the store. The community craftsmen were identified from the members of the community who have experiences in the construction of built environment. There were 4-5 groups of community craftsmen and each group consisted of 3-4 persons. They consulted with the house owners on the construction process and cost control. However, construction cost estimation was done by the researchers in the house selection process together with the community committee, so there was a high level of participation in decision making.

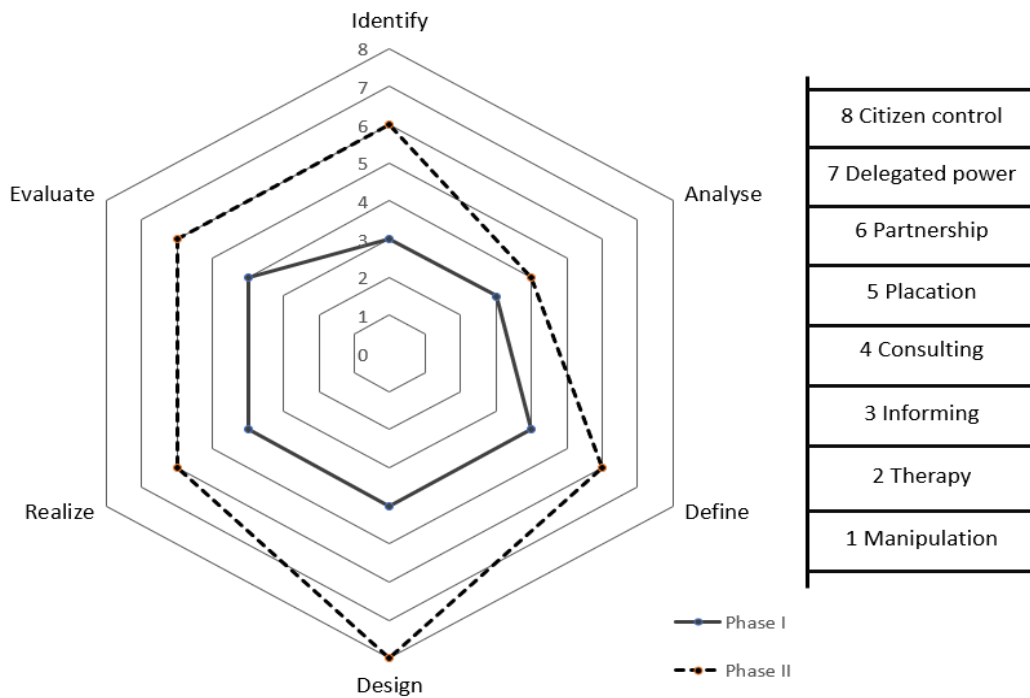


Figure 5. Levels of community participation in each phase of research

Source: Adapted from Arnstein’s ladder of participation by the author (Arnstein, 1969).

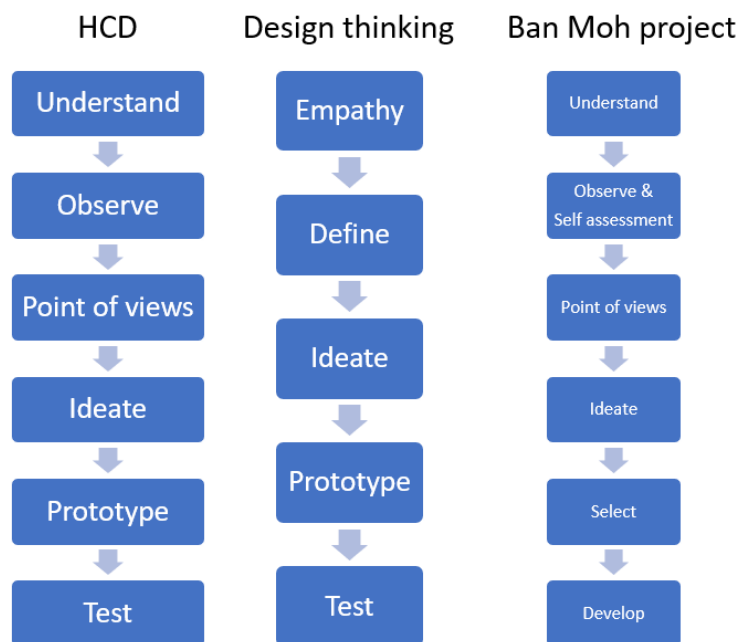


Figure 6. Comparison of steps in Human-Centered Design (HCD), Design Thinking, and the practices in Ban Moh project

Source: Adapted from IDEO.org (2018).

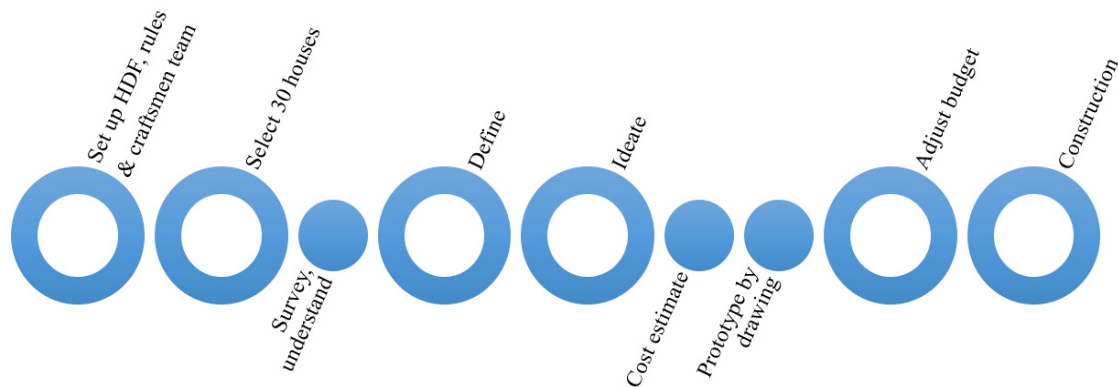


Figure 7. Processes in house renovation

Source: Developed by the author.

Note. *dot = steps by the researchers; circle = steps in co-creation.

It was found in the first phase, the researchers worked in the village with the community leaders and interviewed all of the house owners. However, this was for understanding the needs and requirements of the community, so, the participation level was in the 3rd rung (informing) of Arnstein's ladder (in the identify and analysis process). Then the participation level became higher in the define, design, realize and evaluate steps by the public hearing method.

In the second phase, the participation level was elevated to level 6 due to the partnership from the establishment of HDF and community craftsmen teams as the partners to co-create with the selected house owners in the renovation. In the design phase, the participation level became the highest because the house owners designed the house by themselves with suggestions on technical aspects (like structure and construction details) from the professionals. The project was then evaluated by the house owners after the renovation was completed.

Co-creation is like creating the neuron network that the creature needs in order to function the whole body. Co-creation can connect the small groups or parts to think and do together, to synergize and bring creativity for the different solutions. However, co-creation is mostly emphasized on thinking rather than doing, but participation in the implementation is a must. The outcome of co-creation includes values, ideas, plans, activities, projects, and most important is long-term relationship that will carry through during the project development, implementation, or even after.

On the other hand, co-creating built environment usually emphasized on the co-design and in some cases, the implementation, construction and renovation. Co-creating built environment needs higher levels of participation in order to meet the satisfaction of all stakeholders. The prototype of the co-designed project cannot be tested on the real site because it takes time and

cost to build. However, many projects use the drawing and model to simulate the prototype for a clear understanding with all stakeholders and participants.

Co-creating built environment has more influence on the output than co-creation as an innovative approach because the product of the co-design or co-creating built environment is tangible.

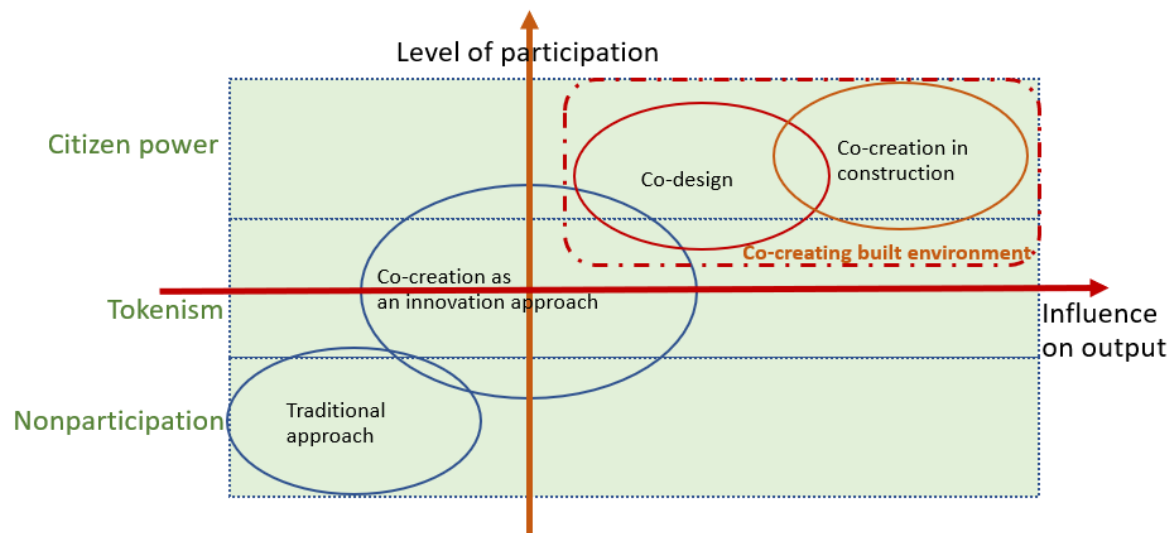


Figure 8. Co-creation in the different participation levels

Source: Developed from Koning et al. (2016) and Arnstein (1969).

The case of Ban Moh goes beyond co-design because it moves up to the stage of co-creation in construction that requires collaboration between the community craftsmen, the house owners, HDF, community committee, construction materials shop, the designer, and the researchers. So, the process of co-creation in design and construction improves the knowledge and skills of the participants, particularly the house owners, through interaction and exchange of ideas. Throughout the project implementation, the house owners have increased their skills in maintaining and improving their houses. Furthermore, after the development of co-creation network, some house owners can still use these craftsmen in their house improvement despite the termination of the project.

The result from the site survey and the interviews, affirms that many of houses are improved even after the renovation project in 2006. The physical condition of the whole community is also better than in 2006.

Co-creation in the built environment design and construction increases the value and happiness of the users and the neighbours. It creates a better environment and solves problems by developing from shared ideas. Although it usually takes more time in the planning and decision process, it is worth taking time to select an option that everyone is happy rather than to create an unwanted output like in a traditional approach.

3.6 Co-Creation Roles

Professional roles for enabling partnerships (Eggertsen Teder, 2018) found in the case study are as follow:

- (1) Professional role as the curator—connecting people and opportunities;
- (2) Professional role as the meta-designer—preparing for (re)design-in-use;
- (3) Professional role as the facilitator—providing/teaching design tools;
- (4) Professional role as the negotiator—addressing conflict.

The roles that are mostly found in the Ban Moh case study are the curator, the meta-designer, and the negotiator, while the facilitator role is the least apparent in the process of design. The researchers played a role of professional designer to do the design drawing and model instead of introducing the generative design tools for the participants. Still, the researchers continued to lead the project in the name of HDF both in construction and the debt collection procedure.

Co-working with the community craftsmen enabled the house owners to present their ideas and needs to be applied in the design process. Some house owners said in the interview that they did design their own house by themselves. Then they communicated with the community craftsmen and the researchers by conversation and by making a rough design on-site. Then, the researchers did the draft design to confirm their understanding and to be used in the cost estimation and construction as well.

When the house owners joined the craftsmen to repair the houses, they learned various construction skills. So, the house owners gain more knowledge and expertise in construction from this project as well.

Table 2. Comparison between two phases of development

Factors of the development	Phase 1	Phase 2
User/owner	Community	Private houses
Stakeholders	Researchers, village committee, SAO, villagers	HDF, house owners, craftsmen, material shop, researchers as the designer and cost-estimator
Participation level	Low-level	High-level
Participatory techniques	Self-assessment Public hearing workshop Interview House survey	Group discussion in the real location (working as a workshop) Construction drawing Construction tools
Loan funding	Research fund from NHA	Research fund from NHA With supported by the house owners
Financial mechanism	Not develop	HDF lend the materials and collect the debt by instalments
Outcomes	GIS base maps Co-creating value Development plan	Construction drawing The renovated houses
Network of learning	None	Exchange ideas and practice between each house

4. Discussions

4.1 Problems and Obstacles in the Implementation of Co-Creation Concept

According to the failure in the sustainability of the Ban Moh house improvement project, particularly in the economic and social aspects. This need to bring the professional from the financial and law sector to co-create in the process of development. Also, the community leaders of the success community like Baan Mun Khong should be invited to join in the project for exchanging knowledge, experience, and techniques in the development as well.

From an interview with the researchers, women are willing to join in the participation process like public hearing, while men are not interesting. So, this can improve by using other methods in the participation or co-creation like informal group discussion in the coffee shop.

The most critical variable for the sustainability of development is the strength of the community that came from the leadership of the community headman, community leaders, and their network. The social system needs to be strengthened by communication and participation in administration and response to 21st century learning' learners (Prachagool & Nuangchalerm, 2021).

For economy sustainability, social welfare should be provided by using financial systems and mechanisms such as the saving group, cooperatives (like in the case of Ban Pred Nai and Baan Mun Khong), or social enterprise (like in the case of Chanthaboon riverfront community).

For social sustainability, it needs to co-create value inside the community without the interfered factor from the outside community. In the case of Ban Moh, although pottery is the most well-known for the public, only less than 10 percent of the members are still doing the pottery. They need to include the other occupations in the community in value co-creation for developing in the inclusive direction.

Time limitation is the crucial obstacle of co-creation because it takes time in the process of work. But after they set the network, it will be much easier to divide tasks into small groups, and the collaborative working of members can implement each group.

4.2 The Guidelines in Co-Create the Built Environment for Sustainability

According to the result of the study, it found the lesson learned to develop to the guidelines in co-create the built environment for sustainability including

- (1) It needs to co-create the value by the community of the development project for setting the goals and the direction of the development together. The co-created value is the main concept of the project approved by everyone.
- (2) The useful tool for co-create value is the sharing of ideas from everyone. There are several techniques for sharing, such as a slogan contest, storytelling, exhibit the dream image drawings, photography exhibition, knowledge exchange meeting or workshop, the field trip to the other sites, group discussion, deep listening, funding event, etc.
- (3) The concept of the co-creating project is the result of value co-creation, so the designers do not need to find out the idea from their imagination, but they have to respect the intrinsic co-created value from the community.
- (4) The role of the researchers and the designers should change from the leader of the development to the organizer, the network connector, the facilitator, the metadesigner, the negotiator, the technical advisor, and the design developer for the implementation and construction. It can increase much more effective co-creating results.
- (5) The social system is essential for the sustainability of co-creation. The critical success factors are including,
 - Groups and network
 - Leadership and working in a team
 - Inclusive development
 - Trust and transparency
 - Relatives social

- The same culture, occupation, language, and beliefs
- Awareness of the members
- Learning and working network

(6) The mechanism of co-creating built environment for sustainability is based on the financial system and social system, including the funding, saving, welfare, loan, rules, and enforcement.

(7) Co-creation can improve the satisfaction, ownership, and the awareness of the participants. Not only co-creating value can shape the built environmental design, but the co-creating built environment is also developing the value as well.

(8) It needs to enforce the co-creating rules by using social enforcement or law enforcement if needed.

(9) It needs to include the whole stakeholders in the development particularly the affected stakeholders from both inside and outside of the community for protecting their opportunity and benefit.

(10) Networks to exchange experience and knowledge are essential for building capacity of the development. It is usefully for improving the community development by sharing experiences and knowledge among the networks.

These suggested guidelines can be applied for co-creating built environment development by concerning the different contexts in each project.

4.3 Co-Creation & Sustainability

Creighton (2005) stated that the public participation can be separated into three phases including

- (1) Analysis of the decision-making; identify the problem, hearing from stakeholders.
- (2) Planning process: making the decision with concerned about stakeholders, technics, cost, time.
- (3) Implementation process.

Considering from cradle to grave of built environment, the development of built environment remained after finished the built implementation process. The sustainability of the built environment development is depending on how to use and maintenance the built environment. This study found the co-creation in the design and co-creation in construction of Ban Moh project, but the researchers left the area before the facility management phase. However, the community members still take care the usage of the community facility in the useable condition. For the house development, the house owners can maintenance their own house and some houses had been renovated as times go by.

Design → Construction (CM) → Facility management (FM)

In the other hand, the failure of this project is come from the HDF cannot collect the pay back instalment from the house owners, so other houses cannot be continued as the development plan. This is the most important problem of unsustainability in built environment development. The co-created value has been changed to value co-destruction because the lack of trust in the community. Although the house owners are happy with their houses and waiting for the other funds for their community, but the lesson from this project destroy the trust in value and credits of the community.

4.4 Lessons and Solutions

The authors find out the lesson and solution from the other development projects. The mistake of Ban Moh project is come from different parts including of,

4.4.1 The Researchers

The researchers had to work in the short time limitation but need the fast and large scale of physical results. So, the researchers cannot create the strength of the project by creating a system and mechanism of the community. The debt collecting by a team of researchers that live outside the community cannot be collected easily and lead to the Non-Performing Loan (NPLs).

4.4.2 The Method of Work

In the first phase of development need the higher level of participation and value co-creation. Furthermore, in the second phase, it needs to co-create with other aspect participants like financial experts, law experts and the experienced person from other community networks for predicting or finding the weakness of the systems, particularly in financial aspect and the enforcement.

4.4.3 The Community

The community is lacked of knowledge and practices to strengthening the system and mechanism of the community, particularly the saving group or cooperative. Therefore, the debt of the community cannot be controlled by risk insurance.

4.4.4 The House Owners

The house owners have got the credit without the financial discipline and cause the problem while pay back. There are many solutions such as the saving group to spend as debit instead of credit. The worst point is some house owners think that the loan is free, so they do not need to pay back. Furthermore, when one person does not pay back the debt and no enforcement effect, so the others also not pay back the instalment as well.

5. Conclusion

The results showed that in Thailand, the term is used with mixed meanings between participatory design, participatory action research, public participation, and co-creation without understanding the differences of these concepts. This study reviews the evolution of the concept from cooperative design through co-creation for understanding the origins and

uses of each term. Co-creation is the most advanced in engaging users in the design process. Because co-creation is shifting the paradigm from designer/planner/researcher-centered to involving users/relevant stakeholders in the design process. It is different from the earlier concepts where users' needs are the subject matter of a research, then the designing or development process lies in the hand of designer/planner/researcher.

Therefore, the result of co-creation usually fits the real needs of the users. The co-creating outcomes can vary from product, innovation, idea, value, activity, knowledge technique, experience, strategy, plan, policy, etc. So, it is going far beyond the scope of design but to create anything, everyone could take part in the co-creation process.

The professional designer skills are also important in the co-creation process, particularly in co-design. The designer should act as a coach to suggest and provide the design tools such as making a model, sketch, sticky note. These design tools are helpful for sharing ideas from everyone. After co-creation process, the designer should develop the selected ideas to the final design with professional skills.

The finding from the case studies includes (1) The sustainability of the built environment project depends on the strength, mechanism, and social systems of the community. (2) Raising the right of the people in development and design brings satisfaction to the users of the built environment. (3) Co-creation is the process of connecting people together in the creation of new ideas and innovations, while the participatory process can bring them to the implementation. The key informants from the in-depth interviews also affirmed that community trust system is an essential key to lead to sustainability.

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