Social Engineering and Human Capital Development in Urban Community Product Innovation

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ABSTRACT:

This study examined community product development through the social engineering process and its effects on development outcomes. A qualitative research design was adopted, employing participant observation in ongoing community occupational activities, semi-structured interviews with 14 members of the Wat Sawaswareesrimaram Community Occupational Group, and an in- depth interview with one community leader. In addition, participatory workshops were conducted with household leaders, faculty mentors, and students, involving 11 participants in the application of social engineering process tools. Finally, focus group discussions were organized with beneficiaries of five prototype community products developed through the social engineering process. The social engineering process was designed as both hard skills, drawing on knowledge of social development, occupational group management, and product design for innovation and value creation, and soft skills, including analytical reasoning, communication, collaboration, and innovation, which also enhanced the competencies of participating students. The research highlights that community product development through social engineering primarily aims to develop human capital. Tools such as the 'Fapradarn' enabled cause-and-effect analysis of problems, potentials, and needs, particularly among elderly participants who often lacked modern design, skills, and sustained support in funding and marketing. Development and process timelines revealed that community identity could be strengthened by transforming historical narratives into product value. Furthermore, the M.I.C. (Modify–Improve–Create) model provided a systematic framework for tailoring products to market demand, fostering community participation, and addressing root problems in product development. This model operationalizes the transfer of academic knowledge to communities through the principle of critical reflection, volunteerism, inclusivity, and social responsibility. By integrating technical and social skills, it reinforces community resilience from within and evolves into a broader social development ecosystem. The approach systematically cultivates self-reliance, reduces dependency on state support, and provides a sustainable pathway for urban community development.

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Introduction

Human capital has long been understood as a key mechanism for social development at the global level. As early as the 18th century, scholars emphasized that human capabilities, acquired and beneficial to all members of society, function as a form of personal capital. Adam Smith analyzed the factors shaping economic prosperity and individual and societal welfare, including the division of labor, education, human capital, learning by doing, increasing returns to scale, and technological change (Smith, 1776; Hollander, 1927; Sweetland, 1996; Psacharopoulos & Patrinos, 2004; Ucak, 2015). The Organization for Economic Co-operation and Development (OECD) conceptualizes human capital as encompassing all skills and competencies individuals acquire through education, learning, and experience, including abilities shaped by motivation, behavior, and physical, emotional, and mental health—whether tacit or explicit cognitive skills (OECD, 2010; 2011). Because of this complexity, international organizations have emphasized the importance of investing additional resources in measuring human capital to better understand cross-country differences (United Nations, 2016).

At the macroeconomic level, investments in human capital also play a crucial role in economic growth. As human capital increases, the elasticity of employment growth tends to decline, leading to reduced reliance on labor and higher economic output. This underscores the micro-level link between human capital and labor markets (Son, 2010). Today, both developing and developed countries invest heavily in human capital development as a foundation for engaging competitively in the global arena. Beyond economic dimensions, education systems, particularly government education policies—are vital in strengthening human capital (Sodirjonov, 2020).

In Thailand, human capital development has been positioned as a central driver for accelerating progress toward the Sustainable Development Goals (SDGs), with particular attention to populations most at risk of being left behind. Priority areas include ending hunger (SDG 2), ensuring healthy lives and well-being for all (SDG 3), providing inclusive and equitable quality education and lifelong learning opportunities (SDG 4), achieving gender equality and empowering all women and girls (SDG 5), and promoting sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all (SDG 8) (United Nations Thailand, 2022). These goals are explicitly reflected in Thailand's 13th National Economic and Social Development Plan (2023–2027) and the 20-Year National Strategy (2018–2037), which aim to eradicate poverty, foster balanced development, reduce inequality, and enhance local competitiveness. The approach emphasizes strengthening local communities, both urban and rural, through a "from within" development model rooted in the Sufficiency Economy Philosophy (NESDC, 2018; 2023).

Despite extensive policies and research on human capital development; The strengthening of human capital begins in early childhood within the family environment, extends into formal schooling, and generates long-term effects on future labor force outcomes (Currie & Almond, 2011), the key abilities that job applicants must possess, such as collaboration, communication, and problem-solving, are largely cultivated through SEL. When combined with traditional academic skills, these social and emotional competencies enable students to succeed in an evolving digital economy. The essential skills identified include complex problem- solving, critical thinking, creativity, people management, and coordination with others (World Economic Forum, 2016), Which largely focuses on macroeconomic indicators, educational levels, or labor market outcomes, a significant gap remains

in research. Much attention has been paid to the process-based mechanisms that can cultivate human capital within structurally vulnerable urban communities, particularly among marginalized groups such as older adults working in the informal sector. Furthermore, research on community product development and social innovation often emphasizes economic output rather than the systematic integration of technical (hard skills) and social-emotional (soft skills) capabilities as complementary dimensions in human capital development.

This gap becomes even more apparent when considering the theoretical concept of social engineering. In the late 19th century, Jacques van Marken introduced the phrase "social engineer" (sociale ingenieur). Jacques van Marken argued that modern industrial society required specialists capable of solving human and social problems with the same systematic rigor that is applied to technical challenges. Importantly, his definition of social engineering was not technocratic or manipulative but emphasized the integration of technical expertise with moral responsibility to enhance worker well-being and overall productivity. (Larsson, Letell, & Thörn, 2012; Cadogan, 2013). However, most current interpretations of social engineering have shifted towards managerial or political meanings, neglecting its foundations for strengthening human capital within local community ecosystems by linking academic knowledge, community participation, grassroots economic resilience and this concept is still lacking in the application of participatory urban community development processes.

Therefore, this research aims to use the social engineering process as a framework for developing human capital at the urban community level, with a case study of Wat Sawaswareesrimaram Community in Dusit District, Bangkok. The focus is on empowering the elderly, who possess local wisdom, to participate in designing and developing community products to generate supplementary income and strengthen the grassroots economy. Through a structured participatory process integrates social skills (cause & effect analysis thinking, communication, coordination, innovation) with academic skills in social development through interdisciplinary learning, mentorship from both universities and the community, and hands-on practice by students and community members (Issaro, 2019; 2021; Phukamchanoad, & Thitwong, 2021). Furthermore, research has suggested that social engineering processes serve as a resilience mechanism within the grassroots economy through the integration of hard skills and soft skills to enhance self-reliance, reduce dependence on the government, develop a sustainable social development ecosystem (Phukamchanoad, 2023), and integrate with the Sufficiency Economy Philosophy (Bhumibol Adulyadej, H.M. King, 2009; Chaipattana Foundation, 2007; NESDC, 2018).

Accordingly, this study does not merely focus on income outcomes derived from community-based products; rather, it advances a conceptual framework positing human capital as the center of the development process. Within this paradigm, social engineering functions as both a theoretical construct and a practical instrument that enables systematic, endogenous, and sustainable growth over the long term.

1. Literature Review

Scholarship on human development emphasizes both the natural capacity of individuals to live together and the intentional design of co-existence through knowledge, skills, and abilities acquired from learning and experience. Within this body of literature, human capital development is increasingly understood as a multidimensional process shaped by education, experience, social participation, and intergenerational knowledge exchange. These perspectives provide the conceptual foundation for understanding how community-based learning, local knowledge, and applied skill development can contribute to broader processes of human capital formation in urban contexts.

2.1 Human Capital

In this research, human capital refers specifically to community stakeholders who are elderly

residents (individuals aged 60 and above) and, despite the physical limitations of aging, possess extensive accumulated experience, knowledge, skills, and capabilities (UNHCR, 2024; WHO, 2002; 2024; Ministry of Social Development and Human Security, 2010). Students at Rajabhat Universities represent another key human capital group: youth who are cultivating the knowledge and skills necessary to transition into the workforce, making them a vital resource for national development. This aligns with the Rajabhat University Act B.E. 2547 (2004), which highlights the mission of Rajabhat institutions to develop local communities through teaching, research, and academic services.

Human capital development is embedded within global social development agendas. For example, the United Nations' Sustainable Development Goals (SDGs) include more than five goals directly related to people; in fact, all 17 SDGs contribute—either directly or indirectly—to improving human well-being (United Nations, 2025; United Nations Thailand, 2022). Thailand adopted a people-centered development approach 28 years ago in the Eighth National Economic and Social Development Plan (1997–2001), which sought to address the imbalance described at the time: "a strong economy but a troubled society, leading to unsustainable development." Its primary aim was to enhance the physical, mental, and intellectual potential of all individuals so they could remain healthy, acquire occupational skills, and adapt to economic, social, and administrative changes (NESDC, 1996). Since then, the human element has remained central in Thailand's development strategy from the Eighth to the Thirteenth National Plans. The current Thirteenth Plan (NESDC, 2023), aligned with the 20-Year National Strategy, further underscores the need to develop human capital based on the Sufficiency Economy Philosophy to ensure balanced and sustainable human development (NESDC, 2018).

Accordingly, this research focuses the scope of analysis on "human capital" which directly relates to capabilities that influences collaborative design, production, improvement, and value creation in the market positioning of community-based products. This scope is consistent with and does not overextend the reality of the community and clearly distinguishes human capital from other related concepts such as social capital (relationship networks), financial capital (financial assets), and institutional capital (policy framework), human capital comprises four interrelated dimensions:

1. Technical–Cognitive Capital: product design knowledge (Rauniar, Doll, Rawski, & Hong, 2008), production skills, quality control competencies (Mitra, 2016), ability to think analytically and logically (Ishikawa diagram) (Liliana, 2016, November; Wong, Woo, & Woo, 2016), and innovation capability. Represents the "Cognitive" side—how humans think and solve problems (Koshovyi, & Borkowski, 2025).
2. Socio-Emotional Capital: communication, collaboration, coordination, leadership, critical thinking, and creativity (Detmer Latorre, 2020; Falzetti, Longobardi, & Pagliuca, 2025; Phukamchanoad, 2025).
3. Experiential–Cultural Capital: tacit local wisdom, craft traditions, historical narratives, and community identity embedded in product meaning (Phukamchanoad, 2023; Hoaihongthong, & Tuamsuk, 2024; 2025; Phukamchanoad, Promdao, Palapin, & Nuanmeesri, 2025; Suriyankietkaew, Krittayaruangroj, Thinthan, & Lumlongrut, 2025; Pancharoen, Chara, Nithisiriwaritkun, & Chaisam-Ang, 2025).
4. Adaptive Capacity: the ability to learn, modify products, respond to market feedback, and integrate external knowledge into local practice (Pelling, & High, 2005; Armitage, 2005; Smit, & Wandel, 2006; Jones, Ludi, & Levine, 2010).

These dimensions collectively form the capability base necessary for transforming community knowledge into social and economic value.

2.2 Social Engineering

The concept of social engineering has its origins in the essay "sociale ingenieur" by Dutch industrialist Jacques Van Marken (1845–1906), who argued that modern societies required

specialists capable of addressing human and organizational problems in much the same way that industrial engineers solve technical issues involving materials, machinery, and production processes. This early formulation positioned the "social engineer" as an expert facilitator of social systems and relationships. The idea gained further prominence in the early twentieth century. In 1911, Edwin L. Earp published The Social Engineer, which appeared alongside Frederick Taylor's seminal The Principles of Scientific Management. Together, these works contributed to the rise of scientific management in the United States by blending rational, efficiency-oriented principles with the moral ethos of the Social Gospel movement (Larsson, Letell, & Thorn, 2012). During this period, various terms were used to describe emerging forms of applied social expertise, but the term "social engineering" eventually became standard, emphasizing approaches that treat social relations as systems that can be organized, adjusted, or optimized (Östlund, 2007).

Beyond management science, the concept also entered legal and sociological theory. Roscoe Pound (1870–1964), a leading figure in sociological jurisprudence, developed the Theory of Social Engineering to describe law as a mechanism for balancing competing individual, social, and public interests in order to promote social welfare and progress (McManaman, 1958; Gochhayat, 2010). Furthermore, in his landmark work The Open Society and Its Enemies (1945), Karl Popper famously distinguished two types of social engineering for understanding how "ability diagnosis" applies to governing people: Utopian Social Engineering (Hammersley, 2025) and Piecemeal Social Engineering (Mishra, 2020). As regards living as, first and foremost, a process of problem-solving (Gladish, 2019). The concept of Paulo Freire and Robert Chambers, in their view of participatory social engineering, posits that "social engineers" are no longer designers but facilitators of "capability"—they must know how to ask the right questions so that the community can analyze the problems themselves (Chambers, 1994; GAMBLE, 2012). In the Peter Drucker & Geoff Mulgan's view, it's about diagnosing whether a society has the innovative capacity to solve its own problems—like poverty, aging populations, or inequality. Social Innovation Engineering is the "Art of the Possible." It uses the tools of management (Drucker) and the tools of systemic design (Mulgan) to create public value (Murray, Caulier-Grice, & Mulgan, 2009; Ning, Wenwen, & Qitaisong, 2009, December; Ney, & Meinel, 2019). This broadened the meaning of social engineering from industrial and organizational settings to wider concerns of societal governance and problem-solving. Contemporary applications of social engineering emphasize the development of human-centered competencies that align with 21st- century skill frameworks. These include analytical reasoning, communication, coordination, and innovation—skills required to navigate complex social systems and address community challenges. Training approaches in this tradition typically combine interdisciplinary learning, mentoring in both classroom and community settings, local problem-based tasks, and self-directed practice (Issaro, 2019; 2021; Phukamchanoad & Thitwong, 2021).

Drawing from this literature, social engineers are understood as individuals capable of systematic and logical analysis, cross-disciplinary integration, effective communication and coordination with diverse stakeholders, and the creation of social innovations that respond to community or national needs (Phukamchanoad, 2021). In the context of this research, these competencies are fostered through five foundational tools: Fishbone Diagram, Life Clock, Development Timeline, Process Timeline, and Modify–Improve–Create (MIC) Model (Issaro, 2021). These tools originate in Thailand and are widely used in social engineering pedagogy, particularly within Thai Rajabhat Universities, to support community-based learning and human capital development. They serve as structured reflective and analytical instruments that help learners assess their personal capacities, map life experiences, understand community development processes, and generate social innovations. Together, these tools guide students

and community members in developing products and strengthening elderly occupational groups.

Furthermore, this study integrates the mechanisms and processes of social engineering, a traditional humanistic framework of social engineering presented by Jacques van Marken, to develop the capability and design of communities focused on collaborative learning in the production of community goods. The work contributes to the welfare of community members. It is based on the concept of social engineering as a process mechanism that integrates technical, social, and emotional capabilities through systematic participatory development. It views human capital development as dynamic and capable of being developed through targeted intervention. The social engineering process involves four stages:

1. **Capability Diagnosis** – identifying latent skills, experiential knowledge, Root Cause Identification, and structural constraints. A Capability Diagnosis ensures that resources are spent on the specific "bottleneck" holding the system's community-driven development (Pham, 2018). The community participation in problem solving and developing a viable community Capability (Abatena, 1997).
2. **Participatory Skill Integration** – combining hard and soft skills through collaborative design and problem analysis (Motschnig-Pitrik, 2006, October; Malinin, 2018; Phukamchanoad, 2023; Aghaee, Karunaratne, & Bandelin, 2025, October; Brieven, Moraes, Pawelczak, Vasilache, & Donnet, 2025, February).
3. **Iterative Product Innovation** – refining and adapting products to market and community identity (Wynn, Eckert, 2017; Miller, Thomas, & Roeller, 2020; Majka, 2024).
4. **Reflective Learning and Institutional Embedding** – consolidating knowledge for sustained local application (Minogue, Murphy, & Salmons, 1759; Gertler, & Wolfe, 2004; Sedlacek, 2013; Erkelens, van den Hooff, Huysman, & Vlaar, 2015).

This process transforms dispersed individual capacities into coordinated collective productivity.

2.3 Product Development

Product development is adopted in this study as a core activity through which students and community members apply social engineering principles to address real-world challenges. The target community, Wat Sawaswareesrimaram, consists largely of elderly residents who play significant roles in community life and are therefore central to local economic and social development efforts. Understanding the community's "black box" in product development, defined as the underlying factors that shape decision-making and outcomes (Krishnan & Karl, 2001), is crucial for designing products that are both feasible and responsive to community needs.

The literature identifies several conditions for successful product development. These include managing cost, quality, development time, and knowledge acquisition, as well as ensuring uniqueness, customer focus, market orientation, rigorous preliminary research, early and accurate product definition, effective execution, a supportive organizational climate, strong project selection practices, and clear communication strategies. Additional factors such as top management support, development speed without compromising quality, and the availability of systematic processes also contribute to success (Mital, Desai, Subramanian, & Mital, 2014). As Fuller (1994) notes, product development enables income generation and business sustainability and may take forms such as line extensions, repositioned products, new variations of existing products, reformulations, new packaging, innovative modifications, or entirely new creations.

Systematic approaches are widely emphasized in the literature. Effective product design and commercialization typically involve sequential stages, including feasibility assessment, concept development, product planning, engineering, market testing, and product launch (Haruethaithanasan, 2007; Wanchupring, 2010).

Community-based product creation is similarly supported by streamlined frameworks such as conceptual modeling, prototype development, and iterative design selection (Plengdeesakul & Plengdeesakul, 2018). These processes provide structured pathways for transforming community knowledge—particularly that of elderly residents—into meaningful economic opportunities, thereby reinforcing human capital development within the local context.

2.4 Participation, Co-Learning, and Community Ecosystems

Community participation and shared learning constitute a second key framework underpinning this research. Participation, deeply rooted in democratic practice, typically encompasses stages such as awareness, decision-making, implementation, benefit-sharing, investment, and evaluation (Reeder, 1974; Williams, 1976; Cohen & Uphoff, 1977a; 1980b). In urban community development, these processes often involve collective awareness, problem identification, mutual analysis, collaborative action, shared benefits, shared responsibility, and continuous assessment.

A central mechanism that supports effective participation is cooperative learning, originally conceptualized in educational settings to promote group work and maximize collective potential (Slavin, 1980; Lee Manning & Lucking, 1991). When applied in communities, cooperative learning involves establishing shared goals, dividing tasks, exchanging knowledge, and providing mutual support. This approach strengthens collective identity, enhances social cohesion, and generates shared responsibility for addressing community challenges (Johnson et al., 2006; Felder & Brent, 2007). Cooperative learning relies on five core components: positive interdependence, individual and group accountability, supportive interaction, appropriate social skills, and group processing (Johnson & Johnson, 1989a; 1998b; 1982c).

In the Thai context, many communities employ the Home–Temple–School (H–T–S) ecosystem as a collaborative structure for area development, product creation, and quality-of-life improvement (Phukamchanoad, 2024). This ecosystem strengthens inter-institutional relationships and mobilizes local knowledge, particularly among elderly residents. Successful cases—such as the Phaya Nyo Green Oil herbal product developed by the Wat Pracharabue Tham Community (Phukamchanoad, Promdao, Palapin, & Nuanmeesri, 2025)—illustrate how community ecosystems can facilitate sustainable product development. These examples parallel the social and cultural dynamics of the Wat Sawaswareesrimaram community, where this study is situated.

Given these characteristics, the cooperative learning model aligns strongly with the principles of social engineering and is particularly suitable for action research involving community product development. It provides a structured framework through which students and residents of the Wat Sawaswareesrimaram community can collaborate, integrate experiential knowledge, and co-create meaningful solutions.

2. Methods

3.1 Research Design

This study employed a qualitative research methodology, participatory action research (PAR) design involving four key participant groups; members of the Wat Sawaswareesrimaram community occupational groups, student social engineers forming the community product development team, coaching advisors, community leaders, and representatives of civil society. In total, 30 participants engaged in the action research. The participatory action research (PAR) approach was implemented to promote collaborative learning and shared decision-making in real-world community contexts. A qualitative approach enabled an in-depth understanding of social dynamics, community participation, and knowledge creation.

This research integrates a framework that applies Jacques Van Marken's social engineering framework to human capital development through participatory processes in community product development. Therefore, participants were specifically selected to ensure the reliability,

transferability, and trustworthiness of the research findings (Etikan, Musa, & Alkassim, 2016; Campbell, Greenwood, Prior, et al, 2020).

Field surveys were conducted between April and September 2025 in Wat Sawaswareesrimaram community, Dusit District, Bangkok, Thailand, where community members actively participated in occupational group activities related to the development of household and community products.

This research was conducted as an extension of the project "Sustainable Right-livelihoods Development by Design Thinking Based on Urban Community Capital According to The King's Philosophy," approved by the Human Ethics Committee at Suan Sunandha Rajabhat University (Approval No. COE 2-03/2023, Study Code: 66-044-2-1). All authors completed Human Subject Protection (HSP) training through the National Research Council of Thailand (NRCT).

3.2 Integrating the social engineering process

The integration drawing on Jacques Van Marken's social engineering principles is designed in four interconnected steps, guiding the design of field activities and data collection in the community.

Stage 1: Social Diagnosis

The first step focused on identifying the challenges within households and their socio-economic contexts through community meetings, observation, interviews, and informal discussions with stakeholders. Researchers and community members collaboratively identified problems, analyzed causes and effects, selected participants, and identified local knowledge and resources relevant to community product development.

Stage 2: Collective Design and Innovation

In this second step, participatory workshops were organized to provide a space for collaborative idea generation and product design. Participants shared community wisdom, offered suggestions, and experimented with new product ideas to create innovations that could increase community income and cultural value. This step reflects the concept that social engineers facilitate the integration of knowledge, management, and creativity within community systems.

Stage 3: Learning and Implementation

During the third stage, the proposed product concepts were implemented within the community's occupational activities. The researchers conducted participatory observations to record the behavior of community members during the production process, modified the design, and shared knowledge among group members.

Stage 4: Reflection and Social Learning

The final stage involved collaborative reflection through discussions and interviews to evaluate development outcomes and identify directions for future community innovation. This reflects social engineering as an iterative process of collaborative learning and adaptive development.

3.3 Research Site and Participants

The research was conducted in the Wat Sawaswareesrimaram Community Occupational Group, a community-based organization engaged in local product development.

Participants were selected through purposive sampling to include individuals who were directly involved in community production activities and innovation processes.

A total of **30 participants** were included in the study:

A. Selection of Community Participants

A community coordinator was appointed using purposive sampling. This community leader served as the central contact and selected "potential participants" based on the following criteria:

- residency in the community for at least 10 years,
- availability to participate full-time,
- ownership of a household product, and
- membership in existing community occupational groups.

Based on these criteria, eight community occupational members (one per household product group) were selected as community social engineering practitioners. Three community observers were selected from civil society, including village health volunteers, elderly group representatives, and small business operators.

B. Selection and Preparation of Student Social Engineers

Two coaching advisors selected sixteen second-year students from social development and community development programs. Eligible students had previously completed coursework in community studies, social science research methods, and community-strengthening innovation.

Students completed a two-day training program on four core skills: analytical reasoning, communication, coordination, and community innovation, and learned to apply five foundational social engineering tools: the Fishbone Diagram, the Life Clock, the Development Timeline, the Process Timeline, and the M.I.C. model.

These participants were selected because of their active participation in occupational activities and their role in shaping community development initiatives.

3.4 Data Collection Procedures

Data collection was conducted using multiple qualitative methods to collect both the social engineering process and community learning dynamics.

A. Participant Observation

Researchers conducted participant observation, documenting how student social engineers and community members collaboratively practiced social engineering techniques during occupational practices and participatory processes. Observations focused on group interactions, collaborative problem-solving, and the integration of local knowledge into new product concepts.

B. Orientation and Identification of Product "Pain Points"

An initial meeting was held with community leaders and committee members to explain the research process and expectations. Each of the eight household product groups served as a case for identifying key challenges. The product groups included:

- fermented pork (naem);
- traditional Thai desserts;
- sewn clothing and bags;
- knitted/crocheted yarn products;
- bakery items;
- powdered beverages (tea and coffee);
- funeral flowers and handmade footwear;
- cooked-to-order dishes and clay-oven grilled fish.

C. Fieldwork and Small-group Discussions

Researchers and student social engineers conducted discussions with each of the eight product/household groups to assess existing knowledge of social engineering processes and test the application of foundational tools previously used in community development.

D. Semi-Structured Interviews

Semi-structured interviews were conducted with 8 community members to explore their experiences in community product development, their perceptions of the collaborative design process, and the social learning that emerged during the activities.

Each interview lasted approximately 45–60 minutes, was audio-recorded with participant consent, and subsequently transcribed.

E. In-Depth Interview

An additional in-depth interview was conducted with the 1 community leader, 2 coaching advisors and 3 representatives of civil society to gain insights into the broader vision of community development, leadership strategies, and the role of collective action in sustaining innovation.

F. Participatory Workshops and Collaborative Problem-solving

Two participatory workshops were conducted as part of the collective design stage of the social engineering process. These workshops facilitated

idea generation, product concept development, and group reflection on development strategies.

Workshops were conducted to practice the four core skills using the five foundational tools. Participants worked collaboratively using colored pens, flipchart paper, rulers, and tool templates. Observational notes were recorded by civil society observers and coaching advisors throughout. This stage exemplifies participatory practice in community action research (Cohen & Uphoff, 1977; 1980).

G. Validation and Presentation

Researchers, community leaders, and coaching advisors jointly validated the accuracy and coherence of the data produced through the tools. Each group presented its findings to ensure shared understanding. Discussions informed the formal establishment of community-based occupational groups.

3.5 Data Analysis

To ensure credibility, the research employed data triangulation across three participant groups:

- the eight product/household groups,
- community leader and civil society members, and
- student social engineers and coaching advisors.

Data were analyzed using a combination of content analysis and thematic analysis. The *Summative Content Analysis* (Hsieh & Shannon, 2005; Chuangtrakul & Wongprasit, 2019) was first applied to categorize the collected data into major domains related to:

- community participation
- knowledge exchange
- product development processes
- social learning dynamics

Following this stage, thematic analysis was conducted to identify deeper patterns and recurring themes associated with the social engineering process in community innovation. The analysis followed the six-step framework proposed by Braun and Clarke (Braun, & Clarke, 2006; Terry, Hayfield, Clarke, & Braun, 2017):

- Data familiarization
- Initial coding
- Searching for themes
- Reviewing themes
- Defining themes
- Interpretation

This combined analytical strategy enabled the researcher to examine both the structural aspects of community development activities and the underlying social processes that facilitated collective innovation.

3.6 Researcher Reflexivity

Because this research employs a participatory social research methodology, the researcher plays three roles: coordinator, coaching, and observer. Reflective fieldwork is documented throughout the research process to critically reflect on the researcher's interactions with participants and their potential influences on the research methodology. Significantly, maintaining this reflective record ensures transparency and reduces interpretive bias in the analysis.

3.7 Trustworthiness

Several approaches were employed to enhance the rigor of the study. Data triangulation through interviews, observations, and workshops; member checking by sharing preliminary findings with participants. Detailed description to provide detailed contextual explanations of community dynamics. These approaches strengthened the credibility, dependability, and confirmability of the research findings.

3. RESULTS

This research builds on the community-development mandate of Thailand's Rajabhat Universities and applies its focus on human capital, social engineering, and community-based product development to the Wat Sawaswareesrimaram Community in Dusit District, Bangkok. The findings below outline the community context and key challenges that shaped the design of the intervention.

4.1 Historical and Socio-Spatial Context

Wat Sawaswareesrimaram Community has a long historical trajectory. Since 1832, the area has been originally known for its abundance of dok khae trees. It served as a settlement along the northern bank of the Samsen Canal, a natural waterway used for transport since the Ayutthaya period. During the reign of King Rama III, palace officials established Wat Sawaswareesrimaram, locally known as "Wat Khae."

Major developments followed:

- 1904: Construction of Suan Suphan Palace under King Rama V.
- 1932: Establishment of Wat Sawaswareesrimaram School (now under the Bangkok Metropolitan Administration), which opened the area for residential settlement beginning with approximately 10 households.
- Subsequent expansion occurred as the temple allocated additional land for rental housing.
- 1991: Residents formally organized into a community with elected leadership under the name "Wat Sawaswareesrimaram Community."

At present, the community comprises 386 households with 538 residents. Economically, most individuals work in informal or miscellaneous occupations, followed by daily wage labor; some remain unemployed. The average household income ranges from 5,000–10,000 baht per month. Structurally, the community reflects the Home, Temple, and School (HTS) model—as interdependent institutions shaping everyday social life (Naengnoi Saksri, 1982; Bunchan, 2004; Klamsom, 2006; Limhasanaikul, 2018; W. Seniwong Na Ayutthaya, 2019; Palapin, 2022).

4.2 Human Capital Development through the Social Engineering Process

The study results indicate that social engineering processes have high potential for developing technical and social capabilities in community members, product development group members, and students participating in collaborative activities through participatory workshops. Participants receive practical training in product design, group management, and problem analysis.

Members of the Wat Sawaswareesrimaram community occupational groups reported that the participatory product development workshops fostered new skills in product design, the exchange of different ideas, and improved teamwork among all participants.

"Before I participated in this activity, clothing was still produced based on traditional methods and a rustic style, for everyday use. However, after the product development workshop through the social engineering process, I learned how to improve product design and develop patterns that are more suitable for modern times." (Participant 3, Pornphong K., age 71***)***

Students reflected that working with community members improved students' empathy for practical, hands-on learning outside the classroom (social lab) in areas such as problem analysis, community research, and social planning in real community contexts.

"Working with the community allowed us hands-on experience with social engineering tools, both hard and soft skills. We learned how to analyze problems alongside community members and how to communicate and collaborate with teams, occupational groups, and community leaders." (Student leader participant)

These findings suggest that the social engineering process functioned as a collaborative learning approach that strengthened both community capabilities and student competencies, particularly those of Rajabhat University students who are capable of local development.

4.3 Identifying Community Needs through the Fapradarn Analytical Tool

Preliminary qualitative data collection conducted prior to the PAR process identified the community's core problems and priority needs. This aligns with King Rama IX's development philosophy emphasizing the importance of "understanding the local context before initiating development," often described as "igniting development from within" (Office of the

NESDC, 2011). Findings reflect three major stakeholder perspectives:

(1) Community leaders and committee members identified the following pressing problems:

- High levels of household debt
- Insufficient income relative to expenditures
- Spending on non-essential consumer goods
- Drug-related issues affecting some residents

(2) *Local government officials* (from Community development and social welfare divisions) highlighted structural challenges such as:

- Limited occupational development and income-generating opportunities
- Underuse of traditional knowledge in creating new products
- Lack of marketing channels for existing community products

(3) *Academic researchers* (from local development and academic service projects) observed additional gaps:

- Lack of systematic vocational skills and knowledge on income generation
- Challenges in improving family quality of life
- Absence of organized occupational groups, reducing collective bargaining power

Applying the Fapradarn tool enables research participants to systematically analyze problems, potentials, and needs for community development using a structured cause-and-effect framework. Participatory analysis reveals several limitations and causes that directly impact community product development, particularly among the elderly.

Participants emphasized that while traditional knowledge exists, it lacks a systematic and effective link to modern product design, new contents knowledge in social communication, and access to markets outside the community.

"Most of us are elderly and we know traditional production methods, but we do not know how to design products that appeal to modern customers." (Participant 9, Yoljoho, N., Wat Sawaswareesrimaram community leader)

Workshop observations indicated that the Fapradarn analysis helped participants identify key root problems, including limited marketing knowledge, a lack of product differentiation, insufficient methods for leveraging traditional knowledge to develop new products, and inadequate financial support.

The researchers utilized a collaborative synthesis approach, employing a fishbone diagram as a case study for shared learning among all participants, 'Fapradarn' or the Fishbone Diagram was applied to diagnose challenges within each household's product line.

Through collaborative brainstorming, participants identified the actual root causes affecting product quality and marketability. Based on the Fishbone Diagram approach (Ishikawa & Loftus, 1990; Ilie & Ciocoiu, 2010; Liliana, 2016), one example—the analysis of tailored fabric products—showed that the central problem, namely lack of product variety, stemmed from multiple root causes, such as outdated or insufficient sewing equipment, inadequate available time for skills upgrading, and the lack of financial capital for product modernization or diversification.

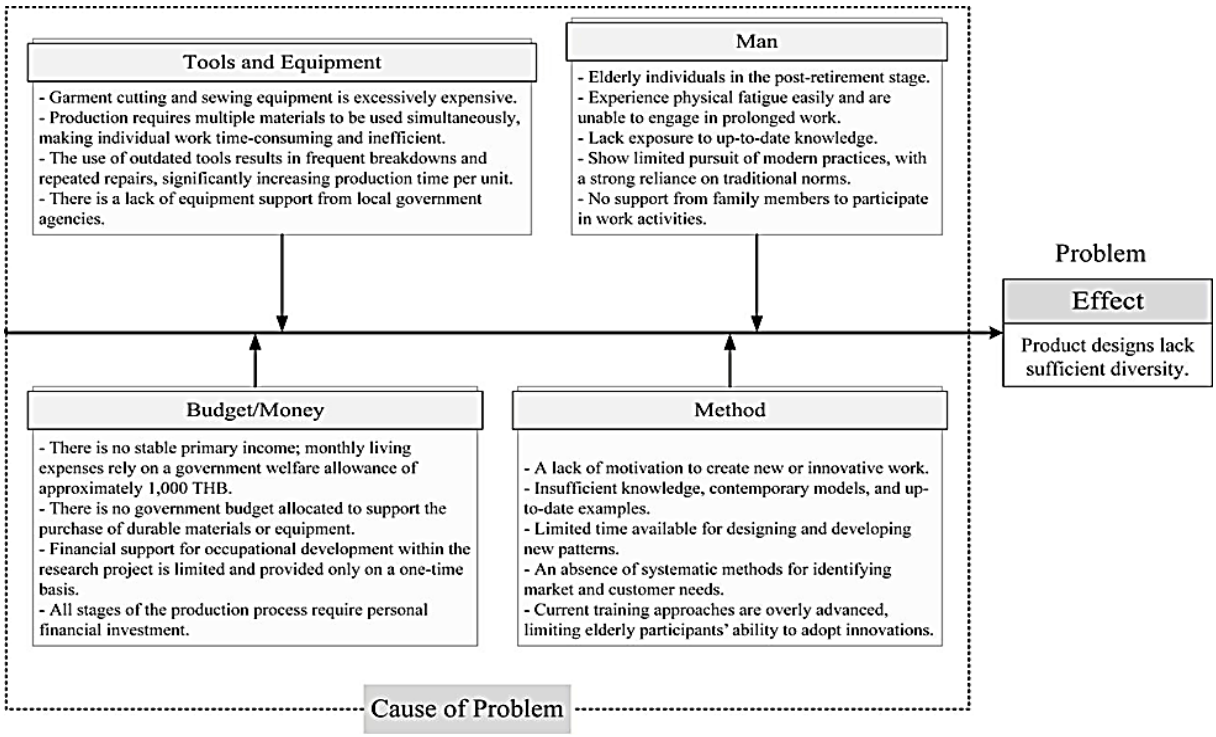

Figure 1. A causal diagram of the problems faced by elderly individuals in developing garment products in urban community

Furthermore, the Fapradarn tool facilitated collaborative discussions on how to utilize local resources, strengths, weaknesses, unique local intellectual assets, and cultural knowledge to develop new product ideas.

4.4 Transforming Community Identity into Product Value

The research findings show that community identity and historical narratives are important resources for product innovation. During participatory workshops, participants discussed ways to integrate local stories and cultural heritage into product design.

One community member explained:

"When we integrate community stories and the stories of traditional household products into the product concept, the Thai banana leaf-wrapped desserts participating in this research activity become more meaningful in their storytelling and reflect our identity more clearly." (Participant 2, Noyphituk, B., age 56)

Development timelines also showed that participants gradually shifted from producing generic products to developing items that reflected the identity of the community. This transformation increased participants' sense of ownership and pride in the products.

Furthermore, this Development Timeline tool was used to trace the historical evolution of traditional banana-leaf Thai desserts—a craft transmitted across generations for more than 35 years.

The featured product, pyramid-shaped khanom thian, holds several distinctive attributes: a soft texture, non-sticky banana-leaf wrapping, natural ingredients with no preservatives, and a uniquely dry-stirred filling. The dessert has a shelf life of 3 days at room temperature (7 days refrigerated) and, once cooked, displays a glossy dark- violet color. The Development Timeline documented all major milestones in this culinary tradition.

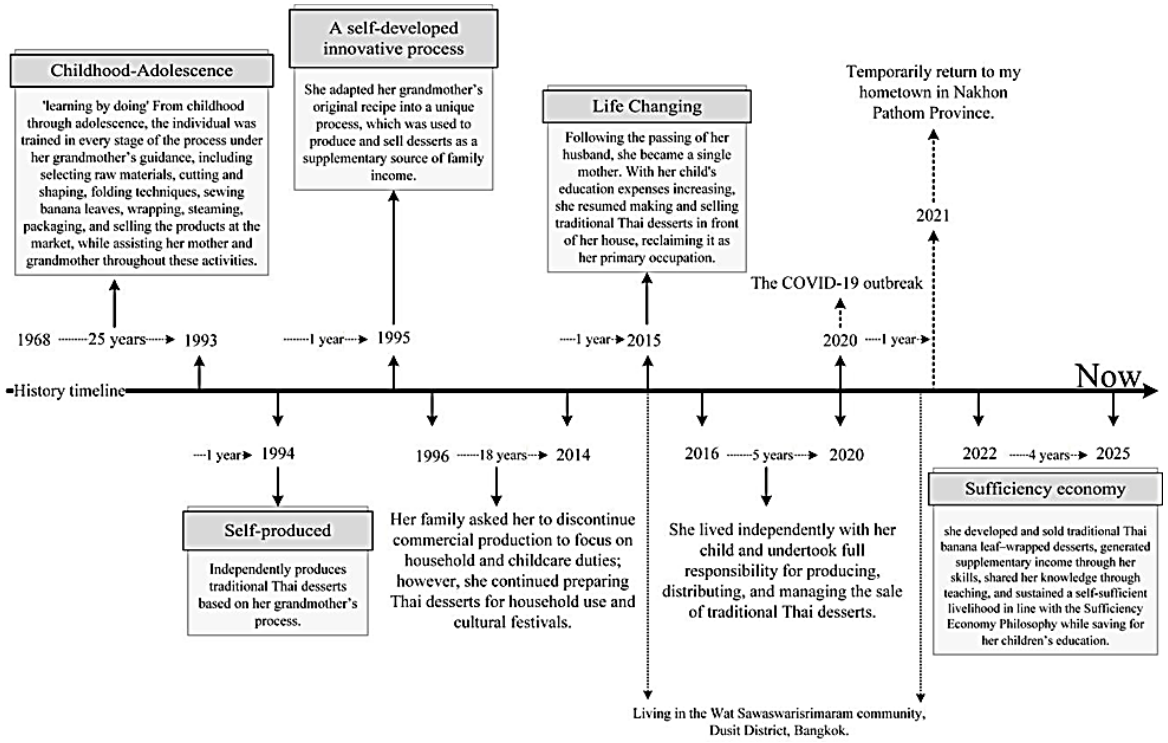

Figure 2. A developmental timeline of traditional Thai banana leaf–wrapped dessert products

Focus group discussions with stakeholders further suggested that products incorporating local identity were perceived as more distinctive and culturally valuable.

4.5 Community Product Innovation through the M.I.C. Model

The Improve-Develop-Create (M.I.C.) model is designed as a practical framework for individualized product development. Through this model, participants were encouraged to improve existing products rather than starting entirely new ones, making innovation more accessible for community members.

One participant described the process as follows:

"This process enabled us to rethink our products. Instead of discarding old products, I improved, refined, and created new versions that are marketable and suitable for my knitting and embroidery work, allowing me to earn more money." (Participant 4, Suksophi, V., age 69)

As a result of the development process, participants reported that the structured development process helped them better understand how to adapt products to market demand. The researchers produced one prototype community product using the Modify-Improve-Create (MIC) approach, which, combined with storytelling, was used to design new fabric products aligned with market demand. Households collaboratively developed narratives reflecting community heritage and identity.

The approach emphasized low-cost production, relying on minimal tools and household labor to maximize value. Examples of new products made from scrap fabric include tote bags with stitched motifs, hair ties, and coasters. These small, durable items can be sold year-round and help households generate income more quickly.

Figure 3. The modification, improvement, and redesign of leftover fabric scraps into value-added products for elderly individuals in urban community.

4.6 Strengthening Community Resilience and Self-Reliance

Beyond developing innovative local products, the social engineering process has enhanced and strengthened community collaboration and built mutual trust for future development activities in other sectors.

Participants in the study reported that the participatory development approach helped them realize their potential to develop products using local knowledge, lifestyles, and resources.

"Previously, we relied on external support to develop new products. Now, we believe we can continue developing them ourselves." (Participant 7, Moolsri, P., age 59)

Comparative observations revealed that levels of participation increased later in the research activities, demonstrating greater involvement, exchange of ideas, and a sense of ownership of the product among group members.

These findings demonstrate that integrating technical knowledge with collaborative learning can support community resilience and self-reliance, reducing long-term dependency on external assistance.

4.7 Community Development Outcomes of the Social Engineering Process

The social engineering process generated several interconnected outcomes across economic development, community capacity, and collaborative learning. First, the approach improved product design to better meet market needs, resulting in increased and more sustainable income for community product owners (Table 1). The integration of storytelling, structured analytical tools, and production refinements elevated both product quality and innovation, while the formation of occupational groups strengthened collective bargaining power and enhanced support from local government agencies.

Table 1. Increased household income outcomes among participants involved in community product development

Participatory households	**Original income data (THB/Year/2024)**	**Innovative products**	**New income generated from product sales (THB/5 months/2025)**	**Percentage increase in income for month**	**Thailand poverty line in 2025 (3,078 THB/person/month)***
Participant 1 (Nonyai, K., age 59)	25,500 (2,125 THB/mo.)	fermented pork (naem)	17,000 (3,400 THB/month)	+160.0%	Above Poverty Line (+322 THB)
Participant 2 (Noyphituk, B., age 56)	22,000 (1,833 THB/mo.)	traditional Thai desserts	15,500 (3,100 THB/month)	+169.1%	Above Poverty Line (+22 THB)
Participant 3 (Pornphong, K., age 71)	27,000 (2250 THB/mo.)	sewn clothing and bags	11,500 (2,300 THB/month)	+102.2%	Below Poverty Line (-778 THB)
4. Participant 4 (Suksophi, W., age 69)	29,000 (2,417 THB/mo.)	knitted/crocheted yarn products	13,500 (2,700 THB/month)	+111.7%	Below Poverty Line (-378 THB)
Participant 5 (Satrakom, S., age 59)	28,000 (2,333 THB/mo.)	bakery items	16,000 (3,200 THB/mo.)	+137.2%	Above Poverty Line (+122 THB)
Participant 6 (Suparat, N., age 54)	24,000 (2,000 THB/mo.)	powdered beverages (tea and coffee)	16,800 (3,360 THB/mo.)	+168.0%	Above Poverty Line (+282 THB)
Participant 7 (Moolsri, P., age 59)	30,000 (2,500 THB/mo.)	funeral flowers and handmade footwear	15,000 (3,000 THB/mo.)	+120.0%	Below Poverty Line (-78 THB)
Participant 8 (Sueaphong, C., age 38)	26,000 (2,167 THB/mo.)	cooked-to-order dishes and clay-oven grilled fish	19,400 (3,880 THB/mo.)	+179.0%	Above Poverty Line (+802 THB)

*2021 International Poverty Line: $3.00/day

Source: National Statistical Office (2025)

At the community level, the process built long-term capacity and fostered greater self-reliance. Participants developed skills in problem analysis, production improvement, and innovation, enabling them to manage their own development activities more effectively. Raw materials were sourced locally, and younger residents contributed by supporting digital marketing and distribution efforts. Seniors, in particular, became more confident in leading production, decision-making, and product development initiatives.

Collaborative learning also emerged as a central outcome. The participatory workshops created inclusive spaces for dialogue, creativity, and shared problem-solving. This reinforced a sense of ownership among community members and encouraged continuous collective learning.

Four key skills were strengthened through this process. Analytical reasoning was developed through the use of the Fishbone Diagram to identify problems and root causes. Communication skills were enhanced through the construction and interpretation of development timelines.

Coordination skills improved as participants engaged with product owners, community leaders, and advisors using both the Timeline and M-I-C tools. Finally, innovation skills were demonstrated in the co-creation of new products under resource constraints using the M-I-C model.

Finally, the researchers analyzed and compared the significant changes in product development approaches, community participation, and skills development (Table 2). Prior to the intervention, community production relied primarily on traditional methods with limited product differentiation. After implementing the social engineering process, the occupational groups developed three complete prototype products: knitted/crocheted yarn products, sewn clothing and bags, and traditional Thai desserts. The M.I.C. methodology was then utilized to guide product innovation.

Table 2. Comparative Changes in Community Product Development Before and After the Social Engineering Process

Dimension	Before the Social Engineering Process	After the Social Engineering Process	Empirical Evidence
Product Development Approach	Production based mainly on traditional methods without systematic product design	Application of the M.I.C. (Modify–Improve–Create) model for systematic product development	Workshop documentation and participant interviews
Product Variety	Limited variety of products with minimal differentiation	Development of Three prototype community products with improved design and value	Focus group discussions and workshop records
Use of Local Knowledge	Local knowledge existed but was not systematically integrated into product design	Community history and cultural narratives incorporated into product concepts	Interviews with community members
Problem Analysis Capacity	Limited ability to identify root causes of development challenges	Use of the Fapradarn analytical tool to analyze problems, potentials, and development needs	Participatory workshop observations

Community Skills	Limited skills in modern product design, marketing, and product improvement	Improved competencies in product design, collaborative problem-solving, and innovation	Interview quotations and observation records
Community Participation	Participation mainly limited to production activities	Increased participation in product design, analysis, and decision-making processes	Workshop participation records
Collaboration with Students and Academics	Minimal interaction with academic institutions	Active collaboration with students and faculty mentors during participatory workshops	Project activity documentation
Community Confidence and Self-Reliance	Dependence on external support for product development	Increased confidence in continuing product innovation using local knowledge	Participant interviews and focus group discussions

5. Discussion

This study highlights providing theoretical knowledge on how social engineering processes can function as an integrated framework for community-based innovation to improve the quality of life in communities, extending beyond traditional applications in problem diagnosis or educational skill development. Utilizing historical data to analyze the elements of social engineering, this study illustrates the potential of social engineering as an innovative process that amalgamates community knowledge, participatory development, and product innovation within a unified framework.

Social Engineering as a Framework for Community Innovation

The main study findings demonstrate that social engineering can function as a systematic framework for community product innovation rather than just a tool for analytical problem-solving.

The study utilizes a variety of social engineering techniques, such as fishbone diagrams, to identify the root causes of problems. These analytical methodologies align with the Buddhist principle of causal reasoning reflected in "Buddhist Four Noble Truths (Ariyasacca)" (Somdet Phra Buddhaghosacharya (P. A. Payutto), 2021). Similarly, Ishikawa diagrams have long been used in industrial quality management and risk analysis (Ishikawa, 1976; Ilie & Ciocoiu, 2010; Radziwill, 2017) and are sometimes used as educational tools to develop analytical thinking (Meyer, Cannon, & Kent, 1996). It is evident that the application of these methods, focusing on community diagnostic analysis, is a significant starting point for all community development and innovation

This research builds upon previous studies by demonstrating how classroom-based analytical methods can be integrated more broadly into community innovation pathways, from problem diagnosis to product development, through collaborative learning. Specifically, the integration of Fapradarn analytical tools, the development timeline, and the M.I.C. (Modify–Improve–Create) model demonstrates how social engineering skills developed as soft skills by Rajabhat University students can contribute to iterative innovation in community-based production systems. These findings support ongoing research into community innovation systems that utilize local knowledge and collaborative learning, which play an important role in establishing long-term economic and social value.

Participatory Development and Knowledge Co-Creation

Another conceptual aspect of design thinking, widely recognized as a human-centered innovation framework (Brown, 2008, 2009; Vianna, Vianna, Adler, Lucena, & Russo, 2012), is employed more frequently in the context of organizations or entrepreneurs than in community development. However, this research integrates design thinking with social engineering and participatory development through Participatory Action Research (PAR). This enables communities to collaboratively create innovative products that reflect their cultural identity and well-being needs.

In this sense, the social engineering process is not just a methodological approach but also a mechanism for collaborative knowledge generation between universities and communities. This is consistent with the Rajabhat University system's concept of social engineering projects, which emphasizes the development of analytical thinking, communication, coordination, and social innovation skills in students (Issaro, 2019, 2021). It demonstrates how these skills can be applied to work with community members to create tangible innovative outcomes, including the development of prototypes and improvements to production methods. The research findings are also consistent with the development principles of His Majesty King Bhumibol Adulyadej (Rama IX), which emphasize understanding, accessibility, and development.

Intergenerational Learning and Human Capital Development

The study emphasizes the significance of intergenerational learning in the creative process of community products. Elderly community members have local wisdom, significant production experience, traditional skills, and local resources but lack access to modern design concepts, technology-integrated design, and marketing strategies. Collaboration with social engineering students bridges these knowledge gaps through a co-learning process in which community members exchange cultural knowledge and production experience while students teach technological skills and digital marketing strategies.

This collaborative exchange strengthens human capital for both university students and older peoples in the community. Furthermore, it reflects the extensive research on experiential learning and service-oriented education, aligning with student outcomes and demonstrating that integrating social engineering with reflective learning enhances undergraduate students' ability to creatively apply knowledge in service-oriented projects (Srisawat & Promson, 2023). Other studies have demonstrated its utility in area-based development, such as the application of geoinformatics in Na Bo Kham Subdistrict, where social engineers developed five key outputs: community problem maps, pride maps, drought-risk maps, flood-risk maps, and land suitability assessments (Ruthamnong, 2023). These examples show that social engineering is adaptable to diverse social and spatial contexts.

Furthermore, it reflects the development of human capital in a geographical context in the form of community innovators, as well as the creation of spatial innovations to to solve problems according to the local community context. This approach aligns with Tripongpun (2021), who emphasizes that when social engineering is practiced collaboratively, community members can evolve into "community innovators" capable of improving local products, tourism services, and rural livelihoods. Likewise, research from Rajabhat Phetchabun University showed that students who underwent social engineering training were able to create new community-benefiting innovations—such as water-retention check dams— and demonstrated significantly improved competencies across analytical reasoning, communication, coordination, and innovation (Phiwphun, 2022).

Toward a Community-Based Social Engineering Ecosystem

In summary, the research findings indicate that social engineering should not be viewed merely as a tool for community analysis, but rather as a

community-centered innovation ecosystem design. Integrating participatory development, cross-generational learning, and collaborative product innovation will empower local communities and foster resilience. This approach will enable older persons to transform traditional knowledge into marketable products while simultaneously building confidence in their ability to engage in sustainable development activities.

This perspective, which emphasizes people-centered development in society, was pioneered by Jacques C. van Marken, who emphasized the role of social engineers in developing social systems that ethically improve the well-being of communities. At present, this research demonstrates that the principles of social engineering can be practically applied to the development of human capital and communities on a broader scale by promoting collaborative learning, strengthening human capital, and supporting deeply rooted innovation in local communities. Therefore, the social engineering process is a promising approach for sustainable urban community development.

However, from a Social Science Insights from the Community perspective, key issues related to social planning and human capital development within communities were also identified. These include: the crucial role of temple leaders, where abbots and community leaders act as key agents of change, coordinating actions and mobilizing resources; strong networks of relationships and long-term residency, which enhance social capital, trust, and collaborative problem-solving; the significant participation of the elderly as knowledgeable individuals and promoters of community learning, reflecting the transmission of knowledge from generation to generation; the persistence of the Home-Temple-School (H-T-S) model as an integrated model for participatory development and informal learning; and the influence of cultural and religious practices on shared values, motivations, and community participation. All of these contribute to the current social planning processes and human capital enhancement within communities.

The authors present a summary of the theoretical contributions of the research, focusing on its application in developing new knowledge and improving existing knowledge in the dimensions of community innovation and human capital development. They emphasize that applying the concept of social engineering to create an integrated framework focusing on "the process of creating unique community products" systematically integrates academic tools such as community diagnostic tools (e.g., Fapradarn approach, development timeline), participatory collaborative design, and iterative innovation mechanisms (e.g., the M.I.C. model). To transform local knowledge into value-added, market-oriented products within the community development ecosystem. Simultaneously, it strengthens the hard and soft skills of human capital. The research expands existing participatory development and design thinking approaches by embedding them into a people- and community-centered innovation system, which aims to enhance collaboration among community members and stakeholders to create sustainable solutions that address local needs. This is achieved through cross-generational learning, honouring cultural identity, collaborative knowledge creation among communities, and providing spaces for government agencies and academics to collaborate on goal-oriented development. Furthermore, the research shifts the perspective from the traditional view of human capital in community development, which focuses solely on individual characteristics, to a new perspective based on the utilization of socially constructed collective abilities through participation, reflection, and action. Finally, the research proposes an innovation ecosystem driven by social engineering, where technical skills and social learning are integrated. Collaboration between various institutions will interact to strengthen community resilience, reduce external dependence, build strength from within communities, and chart a path towards sustainable urban development.

6. Conclusion

This study demonstrates that social engineering can serve as an effective and practical framework for developing community-based products in urban settings, as shown in the Wat Sawaswareesrimaram Community in Bangkok. By integrating academic training with participatory action research, the process enabled undergraduate students and community members, especially elderly residents, to work together as co-learners and co-innovators.

The approach strengthened essential soft skills among students (analytical reasoning, communication, coordination, and innovation) while also enhancing community capacities in problem analysis, production improvement, and product innovation. Through tools such as Fapradarn, Development Timelines, and the M.I.C. model, participants were able to identify root causes of product challenges, document traditional production knowledge, redesign products, and generate new items with added value. These developments contributed to increased household income, stronger occupational groups, and greater economic resilience.

The process also fostered collaborative learning and built a shared sense of ownership. Community members gained confidence in their ability to manage product development, organize collective activities, and engage with external stakeholders. The integration of local institutions—Home, Temple, and School—reinforced long-standing social structures and supported the sustainability of development efforts.

Overall, this study shows that social engineering processes can strengthen human capital, stimulate innovation within communities, and empower local stakeholders to solve their own development problems by integrating community knowledge with participatory learning. This approach thus provides a concrete foundation for community-level product development. According to the research findings, a people-centered and participatory approach can help enhance long-term community development.

However, the research has several limitations. For example, it employs a qualitative case study approach (Wat Sawaswareesrimaram community), limiting its capacity to draw generalizations across contexts. The relatively small sample size (30 participants) is a budget restriction; data collection is primarily based on observation and interviews, which are subjective and lack supporting quantitative indications. Furthermore, the research was conducted over a relatively short period (April-September 2025), which may not adequately record long-term development outcomes. Finally, the researcher's diverse roles—as coordinator, coach, and observer—could lead to errors in data interpretation, despite efforts to promote self-reflection and transparency.

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Conflict of Interest

The author declares that there is no conflict of interest.

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