Article

Design Thinking for Social Change: Exploring Stakeholder Collaboration in Poverty Alleviation

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ABSTRACT

Design thinking, recognized for its potential in addressing intricate challenges, has been applied to the complex issue of poverty reduction in the city of Saint John, New Brunswick. This paper delves into the innovative application of design thinking by engaging stakeholders and exploring their perspectives within a poverty-reduction framework. The study employs mixed qualitative and quantitative methodologies, including surveys, secondary data analysis, and qualitative coding techniques, to comprehensively investigate the potential of design thinking in poverty alleviation efforts. Through this rigorous examination, the research reveals the efficacy of involving beneficiaries and intermediaries in the design thinking process, culminating in the development of Canada's first food bank platform and demonstrate the potential for design thinking to successfully address complex social issues.

KEYWORDS: design thinking; poverty; stakeholders; beneficiaries; intermediaries

INTRODUCTION

Design thinking is a "human-centered, possibility-driven, option-focused, and iterative" [1] approach to problem-solving that involves the participation of key stakeholders. Unlike traditional methods, design thinking makes the skills of effective designers accessible to those without design training, allowing all key stakeholders to participate in the design process [2]. This ability to bring together multiple stakeholders is particularly useful for addressing multifaceted challenges [3–5] such as poverty. However, the role of stakeholders in design thinking projects aimed at reducing poverty has not been thoroughly explored in the literature. The question then becomes, how can the design thinking process be adjusted to effectively include and address the needs of these vulnerable individuals in poverty-reduction efforts?

Working from a multidimensional conceptualization, studying and working on poverty-reduction projects calls for a multidisciplinary vision to measure poverty, identify its causes, and recommend practical solutions

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[6,7]. Identifying the main causes of poverty such as "income, housing, employment, and health" [8] in a community is a key step in poverty-reduction projects. The main target groups of poverty-reduction projects are vulnerable individuals, marginalized populations, and low-income families (beneficiaries) who face critical challenges in participating in a design thinking project as one of the main stakeholders. In order to ensure the inclusion of these beneficiaries, intermediaries such as service-providers, managers, volunteers from non-for-profit (NFP) organizations, charities, academics, and government agencies can play a crucial role in representing their interests and adjusting their input through the design thinking process. This paper aims to address the lack of research on how to involve both beneficiaries and intermediaries in design thinking projects focused on reducing poverty by addressing poverty in the city of Saint John, New Brunswick through a case study. The four main steps of design thinking proposed by Beausoleil [9] were applied to the case study to understand how key stakeholders should be involved in poverty-reduction efforts.

Within the realm of poverty reduction, conventional approaches often overlook the inherent complexities and interconnectedness of various challenges faced by vulnerable communities. Traditional methods may inadvertently sideline key stakeholders' insights and exclude them from the decision-making process. This research gap underscores the need for innovative strategies that prioritize stakeholder engagement, emphasize collaboration, and adapt to the unique nuances of each community's poverty challenges.

This paper aims to address the research gap by investigating the application of design thinking as a dynamic and inclusive approach to poverty reduction. The research goals are two-fold:

- To examine the effectiveness of design thinking in poverty-reduction projects by evaluating the engagement and contributions of key stakeholders, including beneficiaries and intermediaries.
- To identify the nuances and complexities of stakeholder involvement in design thinking processes specific to poverty reduction, shedding light on potential pathways for more sustainable and collaborative solutions.

By explicitly specifying these research goals, the study seeks to underscore the significance of stakeholder-centered approaches in poverty reduction and contribute insights that bridge the gap between design thinking theory and practical implementation.

The city of Saint John, situated in the south-central region of New Brunswick, serves as a compelling case study for exploring the application of design thinking in addressing the intricate and persistent issue of poverty. Despite its historical significance as Canada's inaugural incorporated city and its array of cultural and natural attractions, including the Saint John River, Rockwood Park, and the Uptown heritage

preservation area, Saint John grapples with enduring challenges linked to poverty. The city's negative population growth of −2.2% [10] further amplifies the predicament, with Saint John exhibiting a poverty rate higher than the national and provincial averages. Particularly noteworthy is the city's child poverty rate, ranking as the second highest in Canada, trailing only behind Windsor, Ontario [10].

Against this backdrop, the research endeavors to illuminate the role of key stakeholders in poverty-reduction projects, specifically by employing a design thinking process to address the multifaceted challenges confronting the city of Saint John. Through a meticulous examination of the participation of stakeholders, encompassing beneficiaries and intermediaries, in each stage of the design thinking process, the study aims to unveil insights into the efficacy of this approach in ameliorating poverty and fostering enduring change.

This paper presents an extensive overview of the Saint John project, elucidating the methodology deployed to gather perspectives from both beneficiaries and intermediaries. Through the findings, the research contributes to the burgeoning body of literature on design thinking and poverty reduction, accentuating the potential for stakeholder engagement and collaborative problem-solving in confronting intricate social issues. By presenting the methodology and insights derived from the Saint John project, the study seeks to provide a valuable resource for researchers, practitioners, and policymakers who seek innovative approaches to address poverty in communities confronting akin challenges. The following sections of this paper delve into the specifics of the literature review, methodology, findings, and implications, furnishing a comprehensive exploration of the role of design thinking in poverty reduction.

LITERATURE REVIEW

Stakeholders in a Design Thinking Process

While the previous section provides an overview of the literature on design thinking, it is essential to include additional perspectives and insights from scholars who have contributed significantly to the field. Authors such as Buchanan [11], Dorst [12], Kimbell [13], and Manzini [14] have made notable contributions to the understanding of design thinking, particularly in the context of social innovation and addressing complex societal challenges like poverty. Their works offer valuable insights into the theoretical underpinnings of design thinking and its practical applications in diverse contexts. Buchanan is renowned for his seminal work in the field of design theory, particularly his articulation of the "four orders of design" framework. This framework offers a comprehensive perspective on the various levels at which design operates, ranging from traditional artifact design to more abstract systems and services. Buchanan also emphasizes the importance of design thinking as a means of addressing complex, ill-defined problems by leveraging creative

problem-solving methods. His insights into the philosophical foundations of design and its potential for social innovation have had a profound influence on the field.

Dorst's work focuses on the theory and practice of "frame innovation", which involves reframing problems in order to generate innovative solutions. He argues that design thinking should involve not only problem-solving but also problem-framing, as the way a problem is defined greatly influences the range of possible solutions. Dorst advocates for a holistic approach to design that integrates analytical, intuitive, and generative thinking processes. His research underscores the importance of empathy, collaboration, and iteration in the design process, particularly when addressing complex social challenges like poverty.

Kimbell's scholarship explores the intersection of design, innovation, and social change. She emphasizes the role of design thinking in fostering participatory approaches to problem-solving, where diverse stakeholders collaborate in the co-creation of solutions. Kimbell advocates for a shift from problem-solving to "social sense-making", wherein designers and stakeholders engage in dialogue to collectively understand and address underlying social issues. Her work highlights the potential for design thinking to empower marginalized communities and catalyze transformative social change.

Manzini is a prominent figure in the field of design for social innovation and sustainability. He defines social innovation as new ideas (products, services, models) that simultaneously meet social needs (more effectively than alternatives) and create new social relationships or collaborations. Manzini's research focuses on designing for systemic change, where interventions are aimed at reshaping social systems and structures to address root causes of poverty and inequality. He advocates for a transition from a consumer-oriented economy to a more participatory and sustainable model, where design plays a central role in fostering resilience and well-being at the community level.

Drawing on relevant studies and theoretical frameworks, the paper will highlight the synergies between design thinking and co-design methodologies in tackling complex social issues and promoting sustainable solutions. By integrating insights from the design research literature, the paper aims to enrich its theoretical foundations and provide a more comprehensive understanding of the role of design thinking in poverty reduction efforts.

Design thinking encompasses a variety of approaches that emphasize stakeholder engagement throughout the problem-solving process. While each perspective offers unique insights and methodologies, they share a common goal of centering stakeholders' needs and perspectives. For instance, the double diamond model, introduced by the Design Council, emphasizes divergent and convergent thinking stages, enabling designers to explore a wide range of solutions before narrowing down to the most viable options [15]. This approach encourages collaboration with stakeholders at every stage, from problem framing to solution

prototyping, fostering a sense of ownership and empowerment among participants.

Similarly, the Stanford's design thinking framework emphasizes empathy as a foundational principle, encouraging designers to deeply understand the experiences and aspirations of end-users [16]. By engaging stakeholders in immersive research activities such as ethnographic interviews and observation sessions, designers can uncover latent needs and insights that inform the development of more human-centered solutions. Moreover, the iterative nature of design thinking allows for continuous feedback and co-creation with stakeholders, ensuring that solutions are responsive to evolving needs and preferences.

Co-design approaches place even greater emphasis on participatory decision-making and collaboration with stakeholders. Co-design, or participatory design, involves collaborating with end-users and stakeholders throughout the design process to ensure that solutions are responsive to their needs and aspirations. In the context of poverty alleviation, co-design approaches prioritize community engagement, agency, and ownership. Researchers have highlighted the importance of participatory methodologies in co-creating sustainable solutions that resonate with local contexts and cultures [17]. By involving marginalized communities as active participants in the design process, co-design enables the development of interventions that address the root causes of poverty and promote social inclusion [18].

In the context of this paper, the principles of co-design hold particular relevance for engaging stakeholders in poverty reduction initiatives within the city of Saint John. By adopting a co-design approach, researchers and practitioners can empower local communities to actively participate in the identification and development of solutions that address their unique needs and challenges [19]. Moreover, co-design methodologies offer a framework for fostering collaboration and trust among diverse stakeholders, transcending traditional power dynamics and hierarchies. By involving community members as co-creators of solutions, this paper can ensure that the perspectives and voices of those most affected by poverty are central to the decision-making process. Through meaningful engagement and co-creation, the resulting interventions are more likely to resonate with the lived experiences and aspirations of the community, leading to more sustainable and impactful outcomes.

Furthermore, co-design principles align closely with the values of equity, inclusion, and social justice, which are central to effective poverty reduction efforts. By actively involving marginalized and underrepresented groups in the design process, this paper can contribute to dismantling systemic barriers and amplifying the voices of those who are often overlooked or marginalized. Through a collaborative and participatory approach, the research conducted in Saint John can serve as

a model for community-driven poverty reduction initiatives that prioritize empowerment, agency, and collective action.

In the following paragraphs, a synthesis of the literature on design thinking and co-design is provided, focusing on their relevance to the main topics addressed in the paper. The discussion centers around the key concepts and methodologies highlighted in the literature, with a particular emphasis on the Radical Participatory Design (RPD) meta-methodology [20].

As mentione earlier, design thinking is widely recognized as a human-centered approach to innovation that emphasizes empathy, ideation, prototyping, and testing to address complex problems. It has garnered significant attention in various fields, including poverty reduction, due to its effectiveness in fostering creative solutions that resonate with the needs of end-users [21]. Co-design, on the other hand, emphasizes the active involvement of stakeholders, including beneficiaries, in the design process, with the goal of creating solutions that are co-created and owned by all parties involved [17].

Udoewa's RPD meta-methodology builds upon the principles of design thinking and co-design, advocating for a radical reimagining of traditional design processes to promote inclusivity, empowerment, and social justice [20]. By integrating elements of participatory action research, systems thinking, and critical theory, RPD offers a holistic framework for addressing complex social challenges such as poverty.

In the paper, insights from the design thinking and co-design literature, as well as Udoewa's RPD meta-methodology, are drawn upon to inform the research methodology and theoretical framework. By synthesizing these diverse perspectives, the aim is to provide a nuanced understanding of the role of stakeholder engagement, collaborative problem-solving, and inclusive design practices in poverty reduction efforts.

To better understand the role of key stakeholders in poverty-reduction projects, it is helpful to first define design thinking and highlight its key elements. David Kelley of IDEO, a global design company, described design thinking as "a process for creating customer experiences rather than physical products" [22]. Design thinking is also defined as "a methodology that imbues the full spectrum of innovation activities with a human-centred design ethos" [21]. The key point in this definition pertains to one of the main elements of a design thinking process: a human-centred methodology [23]. It is a human-centered methodology that allows multidisciplinary teams to develop relevant solutions to complex or wicked problems by focusing on the needs of end-users [24]. Design thinking is characterized by a user-oriented approach and a focus on addressing complex or difficult issues that may be difficult for end-users to even agree upon [1,25].

Overall, design thinking solutions should meet the following criteria: desirability, practicality, viability, human-centeredness, inspiration, idealization, implementation, and iteration [26]. Desirability refers to

whether the solution is something that people want. Practicality refers to the potential for the solution to be applied to other similar issues. Viability means that the solution must be financially feasible. Human-centeredness emphasizes the focus on addressing the needs and challenges of humans. Inspiration involves understanding the problem through empathy. Idealization involves generating ideas and suggestions. Implementation involves prototyping for feedback. Iteration refers to the non-linear nature of the process, which involves continually refining and improving the solution.

It is important to consider the above criteria when evaluating the outcomes of a design thinking project, as they represent the key characteristics of design thinking and its solutions. Design thinking can be understood as both a unique perspective and a set of activities and methods that reflect and support that perspective [27,28]. The various activities and stages of design thinking in the literature highlight the importance of the role of key stakeholders and the best methods for involving them in the process.

The three common stages of design thinking are inspiration, ideation, and implementation [29]. The Institute of Design at Stanford [16] outlines five steps for the design thinking process: empathy to understand target groups, definition to clarify the main challenge, ideation to generate new solutions and ideas, prototyping to create cheap and quick products/solutions to receive feedback and address gaps, and testing to investigate the appeal of the final product to the target group. Involving key stakeholders is crucial from the beginning, starting with the empathy stage, and their understanding is necessary for the success of the following stages. Beausoleil [9] also proposed a four-step process for design thinking, including initiation, investigation, integration, and implementation. The initiation stage involves answering questions such as “What problems are we trying to solve? For whom? What is our problem hypothesis?”. Key stakeholders must be included in the initiation stage by answering the “For whom?” question.

Liedtka et al. [30] proposed four main questions/stages in design thinking and recommend some activities to better answer these questions:

1) What it?—journey mapping, value chain analysis, and mind mapping.
2) What if?—brainstorming and content development.
3) What wows?—assumption testing and rapid prototyping.
4) What works?—customer co-creation and learning launch.

In this framework, stakeholders are typically involved throughout the entire process, from the first step to the final step.

There are various tools and techniques that can be used to encourage key stakeholders to share their thoughts and ideas in a design thinking process. Design thinking encompasses a wide array of tools and methods that can be leveraged to tackle complex social challenges such as poverty. Brainstorming sessions, for example, foster creativity and generate a

multitude of ideas by encouraging diverse perspectives and free-flowing ideation [21]. Prototyping allows stakeholders to bring their ideas to life through tangible representations, enabling rapid iteration and refinement based on feedback [31]. User testing involves gathering insights from end-users through observation and feedback, ensuring that solutions are user-centered and meet the needs of the intended beneficiaries [32]. Co-design workshops provide a collaborative space for stakeholders to collectively generate, refine, and co-create solutions, fostering ownership and buy-in throughout the design process [33]. Another effective tool is mapping [34], which involves participants in the collection, capture, and analysis steps. Some examples of mapping in design thinking include stakeholder maps, offering maps, actor maps, community journey maps [19], empathy maps, and experience maps map [35]. Beausoleil [9] has created a simple, yet comprehensive mapping and navigation system that aligns with the four suggested steps for design thinking and includes several sub-categories:

1) Start (initiation): challenge brief; team profile and innovation design brief.
2) Find (investigation): data collection; data analysis; needs analysis and problem statement.
3) Frame (integration): persona(s); ideas/concepts; rapid prototypes and customer journey map.
4) Solve (implementation): alpha prototype, prototype solution; implementation plan and performance measures.

The four steps of design thinking outlined in this paper are used to gather input from key stakeholders and involve them in the problem-solving process. This framework was chosen for several reasons: it is applicable to social challenges as well as business-oriented projects, it is easy to follow, it aligns with popular stages of design thinking, it is suitable for addressing complex challenges like poverty, and it has the potential to result in innovative solutions.

Stakeholders in Poverty-Reduction Projects

The relationship between wicked problems and design thinking is a pivotal aspect of the theoretical framework underpinning this study. Wicked problems, as conceptualized by Rittel and Webber [36], represent complex, ill-defined issues characterized by uncertainty, ambiguity, and interdependencies. These problems defy conventional problem-solving approaches due to their multifaceted nature and often involve conflicting stakeholder perspectives and values.

Design thinking, as a problem-solving methodology rooted in empathy, creativity, and collaboration, offers a promising approach for tackling wicked problems [37]. Unlike traditional linear problem-solving methods, design thinking embraces ambiguity and complexity, encouraging iterative exploration and experimentation [2]. By reframing wicked problems as opportunities for innovation and systemic change, design

thinking enables stakeholders to develop holistic, contextually relevant solutions that address the underlying causes of social challenges.

Positioning the relationship between wicked problems and design thinking within the theoretical framework of the study provides a conceptual lens through which to analyze and interpret the research findings. By acknowledging the inherent complexity and uncertainty of poverty as a wicked problem, the study underscores the relevance of design thinking principles and methods for poverty reduction initiatives. Moreover, exploring how design thinking can be applied to address wicked problems contributes to the scholarly discourse on the role of design in fostering social innovation and transformative change.

Poverty is a wicked problem that requires a thorough understanding of all its challenges faced by affected groups to effectively address it. Design thinking has the potential to address such problems, but one challenge is engaging the appropriate stakeholders in the process. A lack of understanding of the root causes of poverty can hinder the success of poverty-reduction efforts [38]. To address this challenge, it is important to gather insights and perspectives from key stakeholders through focus groups, interviews, and surveys [39]. These stakeholders may include those directly affected by poverty, such as low-income families, vulnerable individuals, and marginalized populations, as well as service providers, academics, NFPs, government agencies, charities, donors, and funding agencies [40]. In this paper, the first group is referred to as beneficiaries and the second group as intermediaries.

To fully understand and address the poverty challenge, it is crucial for key stakeholders to accurately and clearly articulate its root causes [41,42]. However, it can be difficult to strike a balance between the needs and demands of beneficiaries and the action-oriented perspective of intermediaries. To effectively engage stakeholders in a design thinking process for poverty reduction, it is important to identify those who have lived experience [43], relevant knowledge and expertise, and the ability to collaborate and contribute to long-term, multidisciplinary solutions [44].

Beneficiaries are directly impacted by the project and have lived experience of poverty. Intermediaries work with or represent the beneficiaries, and they typically have more knowledge and expertise on the issue. Also, if intermediaries have any sort of experience in poverty, their inputs and opinions will be more meaningful and impactful [45]. Both groups have unique characteristics that can contribute to the success of the project. It is important to involve both beneficiaries and intermediaries in the design thinking process in order to effectively address the problem of poverty. This group usually lacks a multi-disciplinary vision, and their concentration is mostly one-dimensional [46] based on the main goals and perspectives of their organization including economic, social, political, environmental, cultural, and medical aspects. On the other hand, beneficiaries have no multi-disciplinary vision, and they intend to address their monetary issues [47] in most cases through a

short-term procedure. Beneficiaries in poverty-reduction projects are more approachable and impacted by the project, while intermediaries invest more in the project. Both beneficiaries and intermediaries may have a long-term vision and the ability to continue collaborating.

It is often difficult to get beneficiaries to consistently participate in the design thinking process for poverty-reduction projects. Incentives may be necessary to encourage this group of stakeholders to actively contribute their thoughts, challenges, and ideas [48] and attend all meetings. Beneficiaries often lack scientific knowledge about poverty reduction approaches and methods, relying instead on their own experiences to define poverty, identify root causes, and propose solutions. While these experiences are valuable, they need to be carefully considered to arrive at effective outcomes. There is a lack of information in the literature about how stakeholders should be involved in poverty-reduction projects using a design thinking approach. However, the existing literature does highlight the potential of design thinking to address complex social problems like poverty, the possibility of dividing target groups in design thinking into two categories of end-users (beneficiaries) and internal stakeholders (intermediaries), the role of intermediaries in guiding beneficiaries to find solutions using design thinking techniques such as wayfinding, and the importance of the "start, find, frame, and solve" steps in addressing social challenges. In the following section, the main method will reveal how this paper applied a design thinking process to a case study to answer the main question of the study.

Participatory methodologies like the Citizen Science approach [49], RPD meta-methodology [20], and Research Through Co-design theory [50] advocate for the inclusion of diverse perspectives, including those of beneficiaries, in the co-creation of solutions to complex challenges such as poverty. These approaches emphasize the importance of valuing and leveraging the lived experiences and insights of individuals directly affected by the issue at hand. However, the statement in the above paragraphs suggesting that beneficiaries lack scientific knowledge and rely solely on personal experiences may seem incongruent with the principles of participatory methodologies, which prioritize the empowerment and agency of all stakeholders in the decision-making process.

Rather than negating the principles of participatory methodologies, the findings underscore the importance of recognizing diverse stakeholder perspectives, including both their lived experiences and potential knowledge gaps. The authors' position is not to discredit participatory design approaches but to offer a nuanced understanding of stakeholder dynamics in poverty-reduction projects. By acknowledging the limitations of beneficiary perspectives in certain contexts, the authors aim to promote a more holistic approach to stakeholder engagement that integrates diverse insights while recognizing the need for additional support and capacity-building efforts.

In the context of poverty reduction, participatory methodologies underscore the significance of engaging with beneficiaries as active participants rather than passive recipients of interventions. By incorporating the perspectives of those experiencing poverty firsthand, these approaches aim to foster a more nuanced understanding of the challenges faced and co-create contextually relevant solutions that address the root causes of poverty. Moreover, participatory methodologies emphasize the democratization of knowledge and expertise, challenging traditional hierarchies and power dynamics that may marginalize certain voices within the decision-making process.

METHOD

The methodology employed in this study is rooted in a design thinking process and a case study approach, aimed at investigating the pivotal roles played by key stakeholders in poverty-reduction projects within the context of the city of Saint John, located in the south-central region of New Brunswick, Canada. The choice of Saint John as the research location was informed by its historical significance as Canada's inaugural incorporated city, coupled with the urgent need to address its marked poverty challenges. The city of Saint John was chosen as the case study because it is grappling with the issue of poverty that spans multiple generations. The city of Saint John has a long history of poverty that affects multiple generations, defined as "having been in poverty for at least two generations" [51].

The study's focus was centered on individuals closely associated with poverty-related challenges in the city. This encompassed a diverse group, including service providers, academics, and experts well-versed in the nuances of poverty issues. A meticulous review of relevant data sources led to the identification of 185 individuals who possessed the requisite knowledge and expertise to contribute meaningfully to the study.

This research used a design thinking process and a case study approach to examine the role of key stakeholders in poverty-reduction projects in the city of Saint John. The four-step process (start, find, frame, solve) was applied to the case study, using secondary data and two qualitative and quantitative surveys to gather the perspectives of key stakeholders on the poverty challenge in the city. As a part of the qualitative survey, four open-ended questions about the positive and negative aspects of Saint John both internally and externally were also asked (i.e., SWOT—Strengths, Weaknesses, Opportunities, and Threats [52]). The researchers obtained approval from the ethics board of their academic institution before conducting the survey, which was online and had no time limit for completion. The opinions of beneficiaries were collected from a secondary data source and the invited individuals to participate in the two surveys were all intermediaries. The data collection process adhered to a specific timeline from August to October 2018. As mentioned above, ethical clearance from the ethics board of the academic institution was secured

prior to data collection, aligning with established protocols for research involving human subjects.

The first activity of the research involved administering a survey to intermediaries in order to gather their perspectives on poverty challenges in Saint John. The survey was designed to be cross-sectional and included three main sections: personal/organizational information, poverty causes/challenges, and pairwise comparison questions. The first group of questions asked for demographic information about the respondents. The second section asked about the perceived poverty causes and challenges in Saint John, and the third section assessed the importance of each group of causes. The survey included four demographic questions, 20 questions about unique poverty challenges using a 5-point Likert scale, and 10 pairwise comparison questions. Each question in the survey presented one of the poverty challenges, and respondents were asked to indicate their level of agreement or disagreement with each statement on a scale ranging from “Strongly Disagree” to “Strongly Agree”.

The Likert scale responses were then tabulated and analyzed to determine the overall distribution of responses for each poverty challenge. This involved calculating the mean score and standard deviation for each question based on the Likert scale responses. The poverty challenges were ranked based on the mean scores calculated from the Likert scale responses. Challenges with higher mean scores were considered to be more significant or impactful, while challenges with lower mean scores were considered to be less significant or impactful. The rankings of root causes of poverty were compared between beneficiaries and intermediaries to identify any discrepancies or differences in perception between the two groups. The rankings of root causes of poverty were interpreted in conjunction with qualitative insights obtained from open-ended survey questions and interviews with stakeholders. This helped provide a comprehensive understanding of the underlying factors contributing to poverty in the city from both quantitative and qualitative perspectives.

NVivo’s text-mining capabilities [53] facilitated the extraction of key insights from the data, enabling the authors to discern the salient attributes of beneficiaries and intermediaries. Thematic analysis [54], coupled with NVivo, allowed for a comprehensive exploration of stakeholder perspectives and behaviors. Each piece of qualitative information was systematically assigned codes based on its relevance to predefined categories related to stakeholder characteristics, such as approachability, collaboration, impact, investment, knowledge, and vision. The coding process facilitated the recognition of commonalities and differences across stakeholder attributes, leading to the identification of overarching themes representing key characteristics. Themes were derived from patterns observed within the coded data, reflecting the diverse roles and perspectives of beneficiaries and intermediaries in poverty-reduction projects.

The qualitative survey, consisting of four open-ended questions designed to elicit stakeholders' perspectives through a SWOT analysis, served as a valuable tool for capturing rich, detailed insights into the challenges and opportunities associated with poverty reduction efforts. These open-ended questions allowed stakeholders to articulate their experiences, perceptions, and suggestions in their own words, providing qualitative data that offered depth and context to the research findings.

On the other hand, the quantitative survey was instrumental in gathering structured, quantitative data on key variables related to poverty reduction, such as stakeholders' demographics, perceptions, and preferences. By administering close-ended questions with predetermined response options, the quantitative survey facilitated the collection of standardized data that could be analyzed statistically, enabling researchers to identify patterns, trends, and associations within the data set.

The integration of insights gained from the qualitative SWOT analysis with the quantitative survey data occurred during the data analysis phase. Qualitative data from the open-ended questions were coded and thematically analyzed to identify recurring themes, patterns, and emergent categories. These qualitative insights were then triangulated with the quantitative survey findings to corroborate and contextualize the results.

Data collection was executed via an online survey platform, which afforded participants the flexibility to complete the surveys at their convenience. Additionally, the opinions of beneficiaries were sourced from existing secondary data, while the participants engaged in the surveys were intermediaries closely linked to the topic. This paper used the expert non-probability sampling technique [55] to cover the involved knowledgeable population, that was those people who had any kind of relationship to the poverty challenges in the city of Saint John. An invitation along with three reminders was sent to all of them every 20 days to encourage a higher rate of response for the two surveys, resulting in a response rate of 35.7% with 66 participants completing the survey.

The research team, comprising individuals adept in survey design and ethical considerations, spearheaded the design of the surveys, oversaw data collection, and ensured the observance of ethical standards. Stringent data editing protocols were applied to guarantee the accuracy and dependability of the collected data. Subsequently, data were securely preserved to safeguard confidentiality and facilitate subsequent analysis. The research team conducted the following activities to follow the four steps (shown in Figure 1) of the design thinking process in addressing poverty in Saint John:

1) Start: reviewing literature, understanding the roles of key stakeholders, identifying the challenge, and examining past poverty-reduction projects related to Saint John at local, provincial, and national levels.

2) Find: analyzing secondary data to gain insight into the challenges faced by beneficiaries, identifying common themes for the root causes of poverty to conduct a quantitative survey, identifying the main needs and demands, conducting a qualitative survey to understand intermediaries' perspectives and roles, and analyzing SWOT tables.
3) Frame: generating ideas and solutions, prototyping, rapid testing, and collecting feedback.
4) Solve: implementing the finalized idea and implementing the project at a local center.

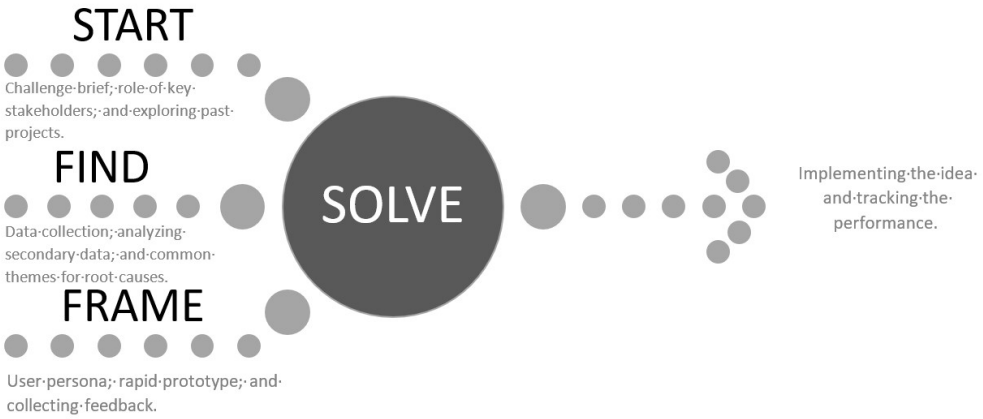

Figure 1. The flow of the design thinking process in poverty alleviation.

"Start" Phase

Involved People: The "Start" phase involved a research team of three members, including one design experts and two social scientists. Additionally, two coordinators were responsible for managing stakeholder interactions.

Methods and Tools: The primary methods used were comprehensive literature reviews and systematic analysis of existing research, policy documents, and reports. The team employed thematic analysis to identify key stakeholders and understand the socio-economic conditions of Saint John.

Duration and Sessions: This phase spanned over two months, with weekly meetings lasting approximately two hours each, resulting in a total of eight sessions.

Data Analysis Methods: Data collected from literature and reports were analyzed using thematic coding to extract recurring themes and insights relevant to poverty-reduction efforts. The analysis focused on identifying stakeholder roles, challenges, and opportunities for intervention.

"Find" Phase

Involved People: The research team included the same three members from the "Start" phase. Additionally, 66 participants responded to the quantitative survey, and 36 participants responded to the qualitative

survey. Participants included representatives from the private sector (4.5% and 5.6%), academic institutions (15.2% and 19.4%), government agencies (25.8% and 33.3%), and non-profit organizations (54.5% and 41.7%).

Methods and Tools: The team used secondary data analysis, quantitative surveys, qualitative surveys, and SWOT analyses. The surveys were conducted online and designed to capture both quantitative data on community needs and qualitative data on intermediary perspectives.

Duration and Sessions: This phase lasted three months, with survey distribution and analysis occurring concurrently. Each survey session spanned two weeks for data collection, followed by two weeks for data analysis.

Data Analysis Methods: Quantitative data from surveys were analyzed using statistical methods to identify key community needs and demands. Qualitative data were analyzed using thematic analysis to extract insights on intermediary roles and poverty dynamics. SWOT analysis was used to identify internal strengths and weaknesses, as well as external opportunities and threats.

“Frame” Phase

Involved People: This phase involved the core research team, 20 stakeholders (including 10 beneficiaries, 5 intermediaries, and 5 subject matter experts), and two facilitators. Participants were selected based on their expertise and involvement in poverty-related initiatives.

Methods and Tools: Tools used included co-design workshops, brainstorming sessions, mind mapping, affinity diagrams, prototype development, and user testing. Each tool facilitated different aspects of idea generation and prototype refinement.

Duration and Sessions: The “Frame” phase extended over four months, with bi-weekly workshops and sessions lasting three hours each, resulting in a total of 8 sessions.

Data Analysis Methods: Feedback and data from co-design workshops and user testing were analyzed iteratively. Affinity diagrams were used to categorize and prioritize ideas, while user feedback was used to refine prototypes. The process involved continuous evaluation and adaptation to ensure solutions were feasible and effective.

“Solve” Phase

Involved People: The implementation phase involved 30 beneficiaries and 15 intermediaries, in addition to the core research team. Community partners and local stakeholders played significant roles in this phase.

Methods and Tools: Implementation involved pilot testing at a local food bank, regular feedback sessions, and iterative refinement of solutions based on participant input. Tools included implementation checklists, feedback forms, and progress monitoring templates.

Duration and Sessions: This phase lasted six months, with monthly feedback and evaluation sessions lasting two hours each, totaling six sessions.

Data Analysis Methods: Feedback from beneficiaries and intermediaries was collected using structured forms and analyzed to identify areas for improvement. Progress monitoring involved tracking key performance indicators (KPIs) to assess the impact and sustainability of the implemented solutions.

The authors employed a variety of tools, including surveys and SWOT analyses, to gather data and insights. They involved beneficiaries by administering both qualitative and quantitative surveys to understand their perspectives and needs. The obtained data were analyzed using thematic analysis techniques, facilitated by software like NVivo, to identify patterns and themes relevant to poverty reduction in Saint John. The research team embraced generative co-design methodologies, a common practice in projects focused on stakeholder engagement and collaborative problem-solving. These methodologies emphasize the active involvement of diverse stakeholders, including beneficiaries, in the process of generating and refining innovative solutions to complex challenges such as poverty. By facilitating meaningful collaboration and co-creation, generative co-design methodologies ensure that the resulting solutions are informed by the unique perspectives, experiences, and needs of those directly affected by the issue. This inclusive approach enhances the relevance, effectiveness, and sustainability of the interventions developed through the research process.

Addressing the active involvement of beneficiaries in the design thinking process is crucial for ensuring the relevance and effectiveness of interventions aimed at addressing complex social challenges like poverty. In this study, the authors recognize the importance of incorporating the perspectives and experiences of beneficiaries throughout the various phases of the design thinking process. Beneficiaries were active participants in phases 3 (Frame) and 4 (Solve) through various means.

During the framing phase, beneficiaries were engaged in generating ideas and solutions through focus group discussions, and participatory design sessions. Their insights and feedback were instrumental in shaping the design concepts and prototypes developed during this phase. Additionally, beneficiaries were invited to provide feedback on the prototypes through iterative testing and refinement cycles, ensuring that the solutions were aligned with their needs and preferences.

In the solving phase, beneficiaries played a central role in the implementation and evaluation of the finalized solution. Their active participation in project implementation activities, such as community outreach, and pilot testing, empowered them to take ownership of the intervention and drive its success. Furthermore, beneficiaries were involved in the ongoing monitoring and evaluation of the intervention, providing valuable feedback on its impact and effectiveness.

Throughout the design thinking process, a variety of tools and techniques were employed to facilitate idea generation, solution prototyping, and rapid testing. These tools included brainstorming sessions, mind mapping exercises, affinity diagrams, prototype development, and user testing [34]. Each tool was carefully selected based on its ability to foster creativity, collaboration, and user-centric design principles. In total, five brainstorming sessions and three mind mapping exercises were conducted to generate and organize ideas. Affinity diagrams were used in four sessions to categorize and prioritize these ideas based on common themes. The prototype development phase involved creating low-fidelity mock-ups, which were refined through three iterative rounds of user testing involving direct feedback from beneficiaries. These tools were selected for their effectiveness in fostering creativity, collaboration, and adherence to user-centric design principles. The design solutions emerged through a systematic process of ideation, feedback, and refinement, transforming initial concepts into actionable design interventions tailored to the needs of the community.

As a useful technique for analyzing collected qualitative data, 'coding' [56] was employed to better examine the SWOT results. In this regard, NVivo was used to facilitate this process by generating nodes as analytical codes. NVivo is designed to investigate qualitative data using a text-mining technique [52] and word-mapping graphs. After identifying the most frequent keywords, the researchers conducted a text-mining analysis to explore the data related to each word. The researchers also ran a Key Word in Context (KWIC) search [57] to test the consistency of the usage of words and their meaningfulness. Overall, this analysis used three specific techniques, including thematic analysis (i.e., coding and then examining the collected data) [54], content analysis (i.e., categorizing the answers based on the coding) [58], and discourse analysis (i.e., analyzing the outcome concerning the existing knowledge about the design thinking concept and poverty-reduction projects) [59].

In the implementation phase of the project at the local center, the research team worked closely with food bank managers and users to ensure smooth integration of the platform into existing operations. The team conducted training sessions to familiarize food bank staff with the registration process and platform functionalities, addressing any concerns or questions that arose. Additionally, user feedback was continuously collected and incorporated into iterative improvements to the platform, ensuring that it remained responsive to the evolving needs and preferences of food bank users. Through ongoing monitoring and evaluation, the research team tracked the platform's usage and effectiveness, identifying areas for optimization and refinement. Overall, the implementation phase was characterized by collaborative engagement with stakeholders and a commitment to enhancing the platform's usability and impact within the local community.

RESULTS

This section demonstrates the results and main outcomes of the design thinking process through the mentioned four steps and eventually shows how beneficiaries and intermediaries as two main groups of stakeholders can address a poverty challenge collaboratively.

To provide a comprehensive overview of the study's outcomes, a summary table encapsulating the key findings is presented below:

Table 1. Summary of the findings of the study.

Key Themes	Findings
Stakeholder Roles	Beneficiaries played a pivotal role in identifying root causes and needs, while intermediaries contributed by providing insights on potential solutions.
Design Thinking Steps	The application of the design thinking process (start, find, frame, solve) offered a structured framework for addressing poverty-related challenges.
SWOT Analysis	The SWOT analysis (Strengths, Weaknesses, Opportunities, Threats) highlighted critical areas requiring intervention and opportunities for innovation.
Beneficiary Insights	The qualitative survey provided valuable insights into beneficiaries' perspectives on the challenges and opportunities within Saint John.
Intermediary Views	Intermediaries underscored the importance of collaboration and co-creation in poverty alleviation efforts.
Feasibility Assessment	The feasibility of design thinking as a tool for poverty reduction was evident through the successful development and implementation of the first food bank platform in Canada.
Stakeholder Engagement	The involvement of both beneficiaries and intermediaries fostered a holistic approach to addressing the multifaceted issue of poverty.
Design Thinking Efficacy	Design thinking proved effective in generating innovative solutions to complex social challenges, with the potential for broader applicability.

Table 1 succinctly captures the salient findings of the study, encompassing stakeholder roles, the design thinking process, SWOT analysis outcomes, beneficiary and intermediary insights, feasibility assessment, stakeholder engagement, and the efficacy of design thinking. These findings collectively contribute to the advancement of knowledge in the realms of design thinking, poverty reduction, and stakeholder engagement. The subsequent sections further expound upon each of these key findings, providing a comprehensive exploration of their implications, nuances, and significance in addressing poverty within the context of the city of Saint John.

In the following paragraphs, the findings are organized in the four stages of the process used.

Start

Reviewing the past poverty-reduction projects related to Saint John was the first step in identifying the nature of the challenge. This led the authors to scrutinize *The New Brunswick Economic and Social Inclusion Plan* [60], *A Choir of Voices* [61], *Overcoming Poverty Together* [62,63], *Tackling Poverty Together* [64], and *Poverty 101: Looking for Answers* [65]. The

source of the data that identified existing poverty challenges in New Brunswick was *A Choir of Voices* [61] report, which included opinions of provincial residents, including those from Saint John. The report consisted of the findings from more than 2500 face-to-face interviews with beneficiaries, either people who previously or currently experienced poverty in New Brunswick, about the meaning of and reasons for poverty. This research used a text-mining technique [52] to analyze these provincial data, identifying 132 reasons for poverty at the provincial level. While these data provided a useful starting point to examine poverty challenges in Saint John, they were insufficient. First, they were related to the province, not the city; second, they were derived from a project in 2009 and were therefore not up to date; and finally, some of them had common roots and characteristics so needed further analysis to categorize them. After running an analytical text-mining technique on the report by the first author, the 132 reasons were categorized into five major groups and 20 unique causes, informed by the approaches of *The New Brunswick Economic and Social Inclusion Plan* [62], and *Opportunity for All* [40].

These categories encompassed education, employment, health, social inclusion, and personal issues, providing a comprehensive framework for examining the multifaceted nature of poverty in the community. The 20 poverty challenges identified in the analysis included: Adult Education, Child Care, Children's Education, Children's Nutrition, Cost of Living, Hiring Criteria, Housing, Individual Issues, Job Skills, Lack of Information about Social Assistance Programs, Lack of Support, Medical Benefits, Payments/Benefits, Social Assistance Programs, Social Isolation, System Inflexibility, Tax Incentives, Temporary Jobs, Upbringing, and Lifestyle.

These challenges represent a wide range of socio-economic, environmental, and systemic factors that contribute to poverty in Saint John. By categorizing these challenges into broader themes, such as education, employment, health, social inclusion, and personal issues, the research team was able to gain a deeper understanding of the root causes and systemic barriers perpetuating poverty in the community. This comprehensive categorization provided a solid foundation for subsequent phases of the research, including the formulation of research questions, the identification of key stakeholders, and the development of research methodologies aimed at addressing the identified gaps and challenges in poverty reduction efforts.

In addition to the insights gleaned from text-mining techniques, the approaches outlined in strategic documents such as The New Brunswick Economic and Social Inclusion Plan [62] and Opportunity for All [40] informed the categorization and prioritization of these reasons for poverty. These documents provided frameworks, goals, and strategies for addressing poverty at the provincial and national levels, respectively, and offered valuable insights into prevailing perspectives and priorities regarding poverty reduction.

Find

The outcome of this stage was a ranking of the most to the least root causes of poverty in the city concluded from both beneficiaries' and intermediaries' opinions in the following order:

Children's Education; Adult Education; Job Skills; System Inflexibility; Lack of Support; Children's Nutrition; Payments/Benefits; Hiring Criteria; Medical Benefits; Temporary Jobs; Tax Incentives; Housing; Child Care; Social Isolation; Cost of Living; Social Assistance Programs; Lack of Information about Social Assistance Programs; Individual Issues; Upbringing; and Lifestyle.

The second activity, which consisted of an additional survey, focused on the role of intermediaries in poverty reduction projects and capturing possible solutions for the above-mentioned causes of poverty. The survey, with 37 open-ended questions, was designed for three purposes: (a) to determine the current status of poverty-reduction projects in the city; (b) to investigate the role of intermediaries; and (c) to explore positive and negative internal and external aspects of the city to alleviate poverty. The cross-sectional survey targeted a group of people who participated in the previous quantitative survey. After sending three reminders to target groups, an acceptable proportion of responses was achieved. There is no approved number/percentage for the participants in the second round of a survey in the literature, but some researchers use 50% as an acceptable amount [66]. The number of participants who completed the survey was 36, which accounts for 54.5% of the first-round survey participants.

Table 2 shows the demographic information of participants in the first and second surveys.

Table 2. Demographic results of the first and the second survey.

Category	Item	First Survey		Second Survey	
		Frequency	Percent	Frequency	Percent
Organization	Private Sector	3	4.5	2	5.6
	Academic	10	15.2	7	19.4
	Government	17	25.8	12	33.3
	NFPs	36	54.5	15	41.7
Activity	Less than 25%	26	39.4	19	52.8
	26–50%	10	15.2	4	11.1
	51–75%	8	12.1	4	11.1
	76–100%	22	33.3	9	25.0
Poverty Experience	Yes	25	37.9	11	30.6
	No	41	62.1	25	69.4
Role	Administrative	6	9.1	3	8.3
	Other	8	12.1	6	16.7
	Direct Service	13	19.7	9	25.0
	Leadership	39	59.1	18	50.0

The highlighting points about the demographic results are the high participation rate of NFPs with 54.5% and 41.7% in the first and the second survey, respectively. In total, 45.4% of participants indicated that 51–100% of their weekly activities were related to poverty in the first survey. This number was 36.1% for the second survey. Another key deliverable of the two surveys was the poverty experience of participants, which showed the value of intermediaries' responses as lived-experience individuals or as stated in this paper, beneficiaries. The survey found that 37.9% of participants in the first and 30.6% of them in the second survey noted that they have experienced poverty in the past. The last point is about the role of participants in the study. 59.1% and 50% of them had leadership roles in the first and the second survey, respectively. Direct service providers were also 19.7% and 25% of participants in the two surveys.

One of the most important reports generated by NVivo is cluster analysis, which assesses relationships among the answers, and groups those answers into homogenous categories. These clusters vary based on word similarity, coding similarity, and attribute value similarity. The output is a meaningful graph that allows researchers to analyze all questions and answers according to their categories, rather than evaluating them individually based on the content analysis method. According to all responses and based on the NVivo cluster analysis, the participants highlighted some significant points about poverty in Saint John. For example, they mentioned that although some services are offered by city NGOs to help marginalized individuals be prepared for interviews, there is no systematic method in the hiring process, in general, to invite all eligible applicants and evaluate them efficiently. Furthermore, there is no significant plan for hiring single parents, immigrants, or people with criminal records.

In addition, the participants considered education as one of the most important factors in connection with poverty-reduction approaches. The educational system employs web-based platforms to make connections with parents and schools (e.g., Edmodo). There are also several organizations in the city offering educational services for adults and individuals in need (e.g., Learning Exchange). Technology has been employed by several organizations in general and not specifically for vulnerable individuals. Currently, social media is the only method to make connections with low-income families (parents).

Although paying attention to personal issues is on the radar of several organizations and they devote a notable portion of their budget and staff to provide counselling services, some organizations rely on provincial and national programs and do not have any significant local initiatives. The City of Saint John is working on some beneficial projects for low-income families, such as the Land Bank project to provide them with better services. Another significant point about the participants' responses is about how to collect data related to vulnerable individuals. Although organizations collect data related to their target groups, it is not through

an integrated process, which could potentially offer an allied database for other stakeholders. There is currently no platform, technology, device, website, or software targeting low-income families and marginalized populations. The main findings from the qualitative survey were as follows:

- Education is a top priority for intermediaries.
- Technology is used practically for various goals.
- There is no systematic approach to decision-making at the local level.
- Most intermediaries focus on their area of work in a one-dimensional way.
- There is no integrated and consistent connection between intermediaries.
- Intermediaries often do not have information about other organizations' future projects that could potentially be related to their own plans.
- There are several useful ongoing health and education programs in the city.
- There is a lack of connection between the job market and organizations serving low-income families.
- There is no significant platform or website targeting vulnerable individuals and their issues.
- There is no database including data on low-income families.
- The lack of an integrated real-time database creates many expenses for intermediaries.
- Some programs do not meet the needs and demands of target groups.
- There is limited diversity in programs for beneficiaries such as teenage parents, individuals with physical or mental disabilities, children, people with criminal records, and immigrants. These groups require special consideration.
- Programs should shift their focus from predictive to prescriptive approaches.

The SWOT questions formed the last part of the survey. The first question was about strengths, in which participants were asked to prioritize the top three positive aspects of the city. The question yielded 108 responses (not necessarily unique). In the content analysis, the researchers removed unrelated content such as punctuation marks and conjunction words and focused on the most frequent responses [67]. The researchers then followed the same method for weaknesses and categorized the positive and negative responses according to the mentioned strengths and weaknesses.

Several negative economic, social, and environmental disadvantages exist in Saint John. On the positive side, there is significant attention to the poverty challenge in the city at the national and provincial levels. As well, the results indicate that Saint John benefits from some potential development opportunities due to the existence of natural resources, low-

budget constructions, and low-price land. The most important threats targeting Saint John are related to geo-location indices, competition cities, weather, and a lack of a systematic approach towards mitigating social challenges. These positive and negative aspects of the city along with action plans suggested by previous national, provincial, and local poverty-reduction projects [62] have guided the paper to recommend strategic solutions in accordance with the discourse analysis method.

The recommendations can be listed based on four groups of solutions (opportunity strength (OS), opportunity weakness (OW), threat strength (TS), and threat weakness (TW) [68]) as suggested by the SWOT method:

(1) OS: use the strengths to take advantage of opportunities.

- Help parents work with their children and solve their homework problems, personal challenges, and the social isolation issue.
- Make sustainable connections between volunteers and retired experts with vulnerable individuals.
- Promote/develop targeted programs for teenage parents to assist them with babysitting, educating, working, and other challenging activities/tasks.
- Develop a platform making consistent connections with the marginalized population to give them an opportunity to share their problems and connect with experts.

(2) OW: overcome weaknesses by taking advantage of opportunities.

- Execute supportive policies to hire immigrants, single parents, and people with criminal records.
- Hold more digital skills programs and workshops for youth.
- Use up-to-date devices in public spaces to encourage citizens to become physically active.
- Identify relationships between food baskets at food banks and visitors' medical backgrounds to enable them to better meet their health needs.

(3) TS: use strengths to avoid threats.

- Offer specific services for single parents to pursue their education.
- Employ digital platforms for teaching at schools and encourage parents to participate in communicating via online systems.
- Keep citizens updated about social events, programs, and services by using online platforms, applications, or websites.
- Build a unique online communication channel with the marginalized population to share their issues, questions, and challenges anonymously.
- Collect and analyze data anonymously from low-income families to understand their basic challenges.

(4) TW: minimize weaknesses and avoid threats.

- Study and evaluate implementing innovative ideas for affordable housing projects.

- Invite all key intermediaries to share their ongoing and upcoming projects and plans through a collective impact model in order to focus on mutual goals and avoid overlaps.
- Provide job opportunities and special training sessions for those leaving social assistance programs.

Frame

As a result, a total of 50 initial ideas were generated during brainstorming sessions, covering a broad spectrum of potential interventions, from food distribution strategies to community engagement initiatives. The initial pool of 20 ideas was narrowed down to 5 based on criteria such as feasibility, potential impact, resource requirements, and alignment with the core objectives of the project. This selection process involved a collaborative evaluation by all stakeholders. The team then developed low-fidelity prototypes for the 5 selected ideas. These prototypes included physical models, sketches, and digital mock-ups, aiming to create tangible representations of the ideas to facilitate testing and feedback. The prototypes were subjected to rapid testing sessions involving beneficiaries and intermediaries, gathering immediate feedback on usability, effectiveness, and potential improvements. Based on the feedback from rapid testing, the prototypes were iteratively refined. Some ideas were modified to better meet the needs of the community, while others were merged or expanded to enhance their impact.

The prototypes were evaluated on several key criteria, including usability, feasibility, potential impact, and scalability. Each prototype underwent multiple rounds of testing and refinement. Out of the 5 prototypes, 2 were selected for further development and potential implementation. The selection was based on their positive reception during testing, their feasibility within the project's resource constraints, and their alignment with the project's goals. The 3 prototypes that were not selected were documented along with the reasons for their exclusion, which commonly included high implementation costs, low feasibility, limited impact, or feedback indicating that they did not meet the core needs of the beneficiaries.

For example, one of the selected prototypes was the Community Pantry Network, a decentralized network of small community pantries managed by local volunteers. This prototype received positive feedback on accessibility and community involvement but faced concerns about sustainability and inventory management. As a result, it was selected for further development with a focus on sustainability strategies. Another example was the Mobile Food Distribution Units prototype, which involved vehicles equipped to distribute food to remote or underserved areas. This idea received high marks for accessibility and reach but encountered logistical challenges, leading to its selection with plans to address these issues.

The Digital Food Bank Platform was another successful prototype. This online platform aimed to manage food bank operations and connect beneficiaries with services. It received very positive feedback on usability and its potential for data-driven insights, leading to its further refinement for pilot implementation. Additionally, Community Engagement Workshops aimed at educating beneficiaries on nutrition and food preparation were positively received for their impact on beneficiary knowledge and engagement. These workshops were selected with plans for regular sessions. The Volunteer Coordination App, designed to streamline volunteer efforts and operations, also proved effective in managing volunteer schedules despite some technical issues, and it was selected with plans for technical improvements.

One of the key recommendations was the need for an integrated database that includes information about vulnerable individuals. This database could provide real-time data on key causes of poverty and actions to address it, which would be valuable for all levels of government. Currently, research and poverty-reduction projects often rely on out-of-date data, but having access to real-time information about low-income families could significantly improve the validity of decisions made by community authorities and decision-makers.

To ensure the platform is accessible to target groups and to protect privacy, it should be located in a place where it can be accessed frequently and have strict privacy controls in place. It is important to communicate to those providing data about how and why the data is important, how it will be used, and by whom. Through discussions with beneficiaries and intermediaries, it was revealed that food banks are frequently used by low-income families and disadvantaged individuals. The platform could be used to understand their basic needs, such as food insecurity, and their personal and family challenges, and provide options for assistance such as employment, education, and skill development opportunities.

In this step of the process, the authors worked with a software development team to identify the main user persona and customer journey map for the food bank platform. They then created a prototype web application to share with key stakeholders for feedback. The approach involved extensive interaction and input from stakeholders to ensure the co-creation of solutions aligned with the needs and experiences of the beneficiaries. The study adopted a full co-design process, wherein the research team and beneficiaries collaborated closely throughout all stages of the design thinking process. This approach ensured that stakeholders played an active role in shaping and refining solutions to address poverty-related challenges in the community. The prototype was tested by employees, volunteers, and managers at the Saint John Community Food Basket, as well as other intermediaries involved in poverty reduction projects in the city. A team member spent three months at the food bank to test and gather feedback on the platform. After receiving suggestions and recommendations from beneficiaries and

intermediaries, the authors and the software development team used an agile methodology to develop the final version of the platform. The testers included 10 employees, 15 volunteers, and 5 managers, each providing unique insights based on their roles and experiences. Feedback covered aspects such as user interface design, functionality, and overall usability of the platform. The agile methodology was employed to iteratively improve the platform, incorporating suggestions and addressing any identified issues. The feedback revealed that the platform significantly improved operational efficiency and user satisfaction, leading to its final development.

Solve

In the final version of the platform, food bank users were asked to fill out a one-time registration form. The research and conversations with food bank managers and users showed that food bank users were willing to share their experiences and issues, and many of them (or at least one person in their household) had access to smartphones.

This food bank platform consists of all criteria of design thinking mentioned earlier. It was developed with the needs and desires of stakeholders in mind (desirability), is practical and feasible to implement in other food banks in Canada and potentially globally (practicality), is financially viable for policymakers and decision-makers (viability), is based on the feedback and input of stakeholders (human-centered), and was created through a process of understanding the problem through data collection, surveys, and analysis (inspiration) and iteratively adjusting and testing the design (idealization and implementation). All of these activities were carried out in an iterative process, with inputs being adjusted and outcomes evaluated along the way.

The food bank implemented as a result of the design process encompasses several key characteristics aimed at addressing the specific needs of the community and effectively mitigating poverty-related challenges. Firstly, the food bank operates as a centralized hub, strategically located within the community to ensure accessibility for beneficiaries facing food insecurity. This centralization facilitates ease of access and distribution of food resources to individuals and families in need.

Secondly, while the primary focus is to provide essential food items, the food bank also serves as a platform to connect visitors with relevant resources and services within the community. Understanding their needs and solving their problems through this platform is a key aspect of its operation. By serving as a central point of contact, the food bank aims to facilitate access to a wide range of support services, including healthcare, employment assistance, and social welfare programs. This holistic approach recognizes that addressing poverty requires more than just addressing immediate food needs; it also entails connecting individuals

with the resources and support networks necessary to improve their overall well-being and quality of life.

One of the key ways the food bank accomplishes this is by collecting and utilizing data related to beneficiaries. By systematically gathering and analyzing data on beneficiary demographics, needs, and experiences, the food bank can gain valuable insights into the underlying causes and dynamics of poverty in the community. This enables targeted interventions that address the root causes of poverty and ensure that support services are accessible and responsive to the diverse needs of beneficiaries.

Furthermore, collecting data on beneficiary experiences and feedback is essential for evaluating the impact of the food bank's services. By soliciting input from beneficiaries about their experiences with the food bank, including the quality and accessibility of services, the food bank can assess its effectiveness, identify areas for improvement, and make data-driven decisions to enhance program outcomes.

Moreover, collecting longitudinal data on beneficiary outcomes over time allows intermediaries to track progress, monitor trends, and evaluate the long-term impact of their services. In addition to informing programmatic decision-making, data collected from beneficiaries can also be used to advocate for policy changes and resource allocation. By presenting evidence-based research and data-driven insights, the food bank platform can influence policymakers, stakeholders, and funders to prioritize food security initiatives, invest in effective interventions, and allocate resources where they are most needed.

In addition to its core functions, the food bank platform offers several features and options to enhance its effectiveness in addressing poverty-related challenges. Firstly, the platform provides beneficiaries with comprehensive resource navigation tools to connect them with a wide range of support services available in the community. These tools include searchable databases, interactive maps, and directories of local organizations and agencies offering services such as housing assistance, employment training, and financial counseling. Secondly, beneficiaries have access to personalized support services tailored to their specific needs and circumstances. Trained staff members or volunteers work closely with individuals and families to assess their needs, develop personalized action plans, and connect them with relevant resources and services.

Moreover, the food bank platform offers educational programs and workshops aimed at empowering beneficiaries with the knowledge and skills needed to improve their financial literacy, nutrition, and overall well-being. These programs cover topics such as budgeting, meal planning, healthy eating, and food preparation. The platform also fosters community engagement and social connections by organizing community events, volunteer opportunities, and peer support groups. These initiatives provide beneficiaries with opportunities to build social networks, share

experiences, and access mutual support from others facing similar challenges.

While the implementation of the food bank platform was initially undertaken as a pilot project, its successful deployment has provided valuable insights into its potential long-term impact and sustainability. The pilot project has had a significant impact on the community, demonstrating the practical effectiveness of design thinking in addressing complex social challenges:

- Sustained Operations: During the pilot phase, the food bank effectively utilized the platform, and the training and resources provided have empowered the staff to consider its long-term adoption. The food bank has expressed interest in continuing to use the platform beyond the pilot period.
- Improved Efficiency and Reach: The platform streamlined food bank operations, reducing administrative burdens and allowing the staff to focus more on direct service delivery. The real-time inventory management and appointment scheduling features increased the efficiency and reach of the food bank, ensuring that more beneficiaries could access services promptly.
- Enhanced User Experience: Beneficiaries reported a more organized and user-friendly experience when accessing food resources. The platform's intuitive design and the ability to connect users with additional services significantly improved the overall user experience during the pilot.
- Data-Driven Insights: The continuous collection and analysis of data during the pilot phase provided valuable insights into the needs and behaviors of the beneficiaries. This enabled the food bank to make informed decisions and tailor its services more effectively to meet the community's needs.
- Holistic Support: By connecting users with a range of additional services, the platform addressed not only immediate food security issues but also other underlying factors contributing to poverty. This holistic approach fostered greater community engagement and support, addressing the multifaceted nature of poverty.

DISCUSSIONS

The findings and implications of this paper suggest that a design thinking process for a poverty reduction project can result in a new service, product, application, or procedure. Sharing the prototype with beneficiaries and intermediaries can often improve the final version. It is important to remember that beneficiaries are the end-users of the product and intermediaries are co-developers. Researchers should focus on identifying any shortcomings or gaps in the product when beneficiaries are using it and not expect technical or scientific feedback from this group. Intermediaries, on the other hand, can offer specialized comments and

suggestions as co-developers in the design thinking process for consideration by decision-makers.

Additionally, including intermediaries with lived experience can greatly enhance the project. They can help researchers identify key issues, understand the perspective of beneficiaries, and ensure that the project produces practical results. In general, the role of intermediaries is more important in the second and third steps of the process (Find and Frame). However, it is still important for researchers/designers to consider the opinions of beneficiaries.

Another important aspect of this paper is its focus on using a design thinking process to create an innovative solution for addressing poverty. This paper demonstrates the potential to gather the perspectives of intermediaries and beneficiaries through a four-step design thinking process using various techniques and methods. This fills a gap in the literature by connecting poverty and design thinking. The findings show that involving beneficiaries in the "Start" step to understand the nature and causes of the problem is more effective than relying on the opinions of intermediaries. However, including intermediaries in the process of adjusting and refining the input of other stakeholders can increase the validity of the results. Additionally, this study provides insight into how to involve a vulnerable community in a design thinking process, which can be applied to addressing other social challenges.

Some researchers [1] argue that all stakeholders should be involved from the very beginning and their opinions should be gathered through direct discussion. Thus, one limitation of this study is that it relied on secondary data in the "Start" step. This raises the question of whether the process used can truly be called "design thinking". While the practical outcome of this study, a food bank platform, meets all the criteria of a solution developed through design thinking, it is possible to question whether it is a semi-design thinking model due to the use of secondary data or if it can still be considered "design thinking". This could be a topic for future research. This paper demonstrates that it is possible to adapt tools, techniques, and methods for engaging stakeholders in a design thinking process for poverty reduction projects and still achieve an innovative solution with all the characteristics of a design thinking outcome. Researchers and decision-makers could consider developing a new design thinking model specifically for social projects addressing issues and challenges faced by marginalized and vulnerable populations.

Research on poverty is a dynamic and evolving field, with numerous studies contributing to our understanding of the multifaceted nature of poverty and its implications for individuals, communities, and societies. In light of this, it is essential to situate the findings of the current study within the broader context of existing research and identify key similarities, differences, and areas of divergence.

Recent research on poverty has highlighted various factors contributing to its persistence and manifestations across different

contexts. Studies have explored the structural, economic, social, and cultural dimensions of poverty, shedding light on its complex interplay with factors such as education, employment, healthcare, housing, and social welfare policies [69–71].

One notable aspect of recent research on poverty is the emphasis on stakeholder engagement and participatory approaches to poverty reduction. Studies have increasingly recognized the importance of involving diverse stakeholders, including beneficiaries, intermediaries, policymakers, and community members, in the design and implementation of poverty alleviation strategies [72]. The current study contributes to this body of literature by demonstrating the transformative potential of design thinking in engaging stakeholders and co-creating innovative solutions to poverty. By prioritizing stakeholder engagement, the study underscores the importance of understanding the needs, perspectives, and experiences of those directly affected by poverty in the design and implementation of interventions.

Furthermore, recent research has also emphasized the importance of addressing the root causes of poverty and adopting holistic, multidimensional approaches to poverty reduction. Studies have highlighted the interconnectedness of various social, economic, and environmental factors contributing to poverty and advocated for integrated, systemic solutions [73,74]. By situating the findings of the present study within the broader context of recent research on poverty, a deeper understanding of the complex dynamics of poverty and the diverse approaches to its alleviation can be gained. Through comparative analysis, opportunities for synergy, collaboration, and further research can be identified, ultimately contributing to more effective and sustainable strategies for poverty reduction.

Contribution to Poverty Reduction, Policy Practice, and Research

This study makes a significant contribution to the field of poverty reduction, policy practice, and research by synthesizing insights from design thinking literature, including works by influential authors such as Buchanan, Dorst, and Kimbell, among others. By integrating perspectives from design research and design for social innovation, the research offers a nuanced understanding of the role of design thinking in addressing complex societal challenges like poverty. Drawing on the theoretical underpinnings of design thinking, particularly its emphasis on stakeholder engagement and collaborative problem-solving, the study provides a comprehensive framework for guiding poverty reduction initiatives.

Informed by co-design theory, the research methodology places a strong emphasis on the active involvement of beneficiaries and intermediaries throughout the design thinking process. This participatory approach ensures that diverse perspectives are considered in problem definition, solution ideation, and implementation, thereby enhancing the

relevance and effectiveness of poverty reduction interventions. By adopting generative co-design methodologies, the study fosters co-creation and co-production of solutions, empowering stakeholders to contribute their expertise and lived experiences to the design process.

The findings of this research have practical implications for practitioners and policymakers engaged in poverty reduction efforts. By recognizing the inherent complexities of poverty and the interconnectedness of social challenges, the study advocates for holistic and collaborative approaches to poverty alleviation. Insights gleaned from both beneficiaries and intermediaries highlight the importance of addressing underlying systemic issues, promoting social inclusion, and fostering community resilience. By leveraging the principles of design thinking and co-design, practitioners and policymakers can develop more responsive, context-specific interventions that address the root causes of poverty and promote sustainable development.

Moreover, this study sheds light on the relationship between design thinking and wicked problems, which are characterized by their complexity, uncertainty, and interconnectedness. By acknowledging the inherent wickedness of poverty as a social issue, the study underscores the need for innovative and adaptive approaches that embrace ambiguity and foster collective intelligence. Drawing on design thinking principles such as iteration, prototyping, and user-centered design, practitioners and policymakers can navigate the complexities of poverty reduction more effectively, co-creating solutions that resonate with the needs and aspirations of diverse communities.

At the research level, this study contributes to the growing body of literature on design thinking and poverty reduction. By employing a rigorous research design and methodological approach, the study advances our understanding of the dynamics of stakeholder engagement in poverty reduction initiatives. The identification of common themes, root causes, and needs enables researchers to develop more targeted and evidence-based interventions, while also informing future research directions. Furthermore, the study underscores the importance of interdisciplinary collaboration and knowledge exchange in tackling complex social issues, bridging gaps between theory and practice in poverty reduction efforts.

Despite the wealth of literature on design thinking and poverty reduction, a critical gap exists in the literature concerning the application of design thinking methodologies to address the nuanced challenges of poverty at the local level. Existing studies often overlook the complexities of stakeholder engagement and fail to provide practical insights into implementing design thinking approaches in real-world settings. Furthermore, the theoretical underpinnings of design thinking and its relationship with participatory methodologies like co-design remain underexplored in the context of poverty reduction initiatives.

This study bridges this research gap by investigating the application of design thinking as a dynamic and inclusive approach to poverty reduction. By conducting a comprehensive case study in the city of Saint John, New Brunswick, the research sheds light on the intricate dynamics of stakeholder involvement and collaborative problem-solving in poverty reduction initiatives. The study's findings offer novel insights into the effectiveness of design thinking methodologies in addressing complex social challenges, as well as the nuanced roles of beneficiaries and intermediaries in the design process.

In comparison to existing literature, the findings of the proposed study build upon previous research by providing a more nuanced understanding of the practical applications of design thinking in poverty reduction. While previous studies have highlighted the importance of stakeholder engagement, this study goes further by demonstrating how design thinking principles can be effectively applied in real-world contexts to co-create innovative solutions that resonate with the needs of local communities.

The insights gained from the study have significant implications for theory, practice, and future research in the field of poverty reduction and design thinking. From a theoretical perspective, the study contributes to advancing our understanding of design thinking as a powerful tool for addressing complex social challenges. From a practical standpoint, the findings can inform the development of more effective and targeted interventions aimed at poverty reduction, with implications for policymakers, practitioners, and community stakeholders alike. Looking ahead, future research could explore additional applications of design thinking in diverse contexts and investigate the long-term impacts of design-led interventions on poverty alleviation efforts.

CONCLUSION

This paper illuminated the transformative potential inherent in the application of design thinking to poverty reduction initiatives, with a specific focus on stakeholder engagement and collaborative problem-solving. Through a comprehensive case study conducted in the city of Saint John, New Brunswick, the research undertaken rigorously delved into the intricate dynamics associated with the involvement of key stakeholders in the design thinking process. By directly addressing the research gap pertaining to stakeholder-centered approaches within the realm of poverty alleviation, this study contributed to the advancement of both theoretical understanding and practical implementation in the field.

The scientific value of this study was underscored by its commitment to methodological rigor and the generation of empirical contributions. Employing a mixed qualitative and quantitative approach, coupled with the judicious application of data triangulation and coding techniques, served to ensure the robustness of the findings. The direct engagement of beneficiaries and intermediaries in the design thinking process

culminated in the successful development of Canada's inaugural food bank platform, thereby demonstrably showcasing the tangible applicability of stakeholder-centric design thinking principles in the context of poverty reduction efforts.

The main design result of the study is the comprehensive food bank solution developed and implemented based on the principles of design thinking. Through a rigorous design process comprising four stages—starting with understanding the problem, followed by ideation, prototyping, and finally delivering the solution—the researchers created a food bank system tailored to address the unique challenges faced by individuals experiencing poverty in the target community. This solution encompasses various components, including streamlined registration processes, innovative distribution methods, enhanced accessibility features, and improved user interfaces. The aim was to provide a user-centric and efficient food bank experience that meets the immediate needs of beneficiaries and contributes to long-term poverty alleviation efforts in the community.

Qualitative methods, such as interviews and open-ended survey questions, delved into the nuanced experiences and perspectives of beneficiaries and intermediaries in poverty reduction initiatives. Meanwhile, quantitative surveys, utilizing Likert scales, provided numerical data on the prevalence and significance of identified poverty challenges. Data triangulation ensured the consistency and reliability of findings by cross-verifying results from various sources and methods. Coding techniques were utilized to systematically organize and analyze qualitative data, facilitating the identification of recurring themes and patterns. Throughout the research process, efforts were made to address potential biases by ensuring sample representativeness, upholding ethical considerations, and practicing reflexivity. These methodological approaches collectively strengthened the reliability, validity, and rigor of the study's conclusions.

The incorporation of insights from design thinking luminaries has enriched our understanding of design thinking's application in addressing complex societal challenges. By contextualizing design thinking within the broader framework of co-design methodologies and the discourse on wicked problems, this research has underscored the importance of inclusive stakeholder engagement and participatory problem-solving in poverty reduction efforts. Moreover, the adoption of generative co-design methodologies has facilitated the active involvement of beneficiaries in the design process, ensuring that their voices and perspectives are central to the development of innovative solutions.

Beyond the advancement of our comprehension of design thinking's efficacy in addressing intricate social challenges, this paper extended insights into the nuanced intricacies surrounding stakeholder involvement. The implications gleaned from the findings held valuable significance for practitioners, policymakers, and researchers actively

engaged in the formulation of pioneering strategies for the mitigation of poverty. By acknowledging the multifaceted roles assumed by beneficiaries and intermediaries alike, this research contributed to the creation of a framework for more enduring and cooperative solutions that resonated harmoniously with the distinct needs of local communities.

Future research endeavors could seek to investigate the adaptability of stakeholder-centric design thinking across a broader spectrum of diverse communities, taking into consideration variances in cultural, economic, and social factors. Additionally, the study would benefit from an extended timeframe to assess the enduring impacts of the Canadian food bank platform on sustained poverty reduction efforts.

In summary, this paper not only accentuated the transformative capabilities of design thinking in the context of poverty reduction, but it also provided a comprehensive blueprint for practical implementation. By elevating the pivotal role of stakeholder engagement, this research contributed to the evolving discourse surrounding collaborative strategies for effecting social change. Consequently, this paper assumed a pivotal role in the broader landscape, serving as a foundational stepping stone for future investigations that explored the intricate intersections between design thinking, stakeholder engagement, and the enduring pursuit of innovative solutions aligned with the needs of marginalized communities.

One limitation of this study is that it relied on secondary data in the start step, which may have limited the depth of stakeholder involvement. Additionally, the study faced challenges in reaching out to beneficiaries and intermediaries during the data collection process. Despite efforts to involve them through surveys and interviews, there may have been limitations in the extent of their participation or the depth of their contributions.

DATA AVAILABILITY

The dataset from the study is not available because of the sensitive nature of the subject matter, which focuses on poverty-related issues. Ensuring the anonymity of participants, some of whom are from vulnerable populations, is a priority to protect their privacy. Additionally, the target groups involved in the research may face potential stigmatization, and sharing detailed data could inadvertently reveal their identities. Therefore, in order to maintain confidentiality and uphold ethical standards, we have decided not to make the dataset publicly available.

AUTHORS CONTRIBUTION

MP designed and conducted the study, performed the literature review, collected and analyzed the data, and drafted the manuscript. GF and RM provided supervisory support, guidance, and critical feedback throughout the research process. They also reviewed and contributed to revisions of the manuscript. All authors contributed to the writing of the manuscript,

with MP taking the lead in drafting the paper and GF and RM providing critical revisions and feedback. All authors approved the final version of the manuscript.

CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest.

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