



Research article

Heartfelt ventures: The power of empathy in driving social entrepreneurial

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ABSTRACT

Although the notion of social entrepreneurship is not new to us today, it has not yet gained widespread acceptance and development in Vietnam. Although there are numerous study publications on the relationship between empathy and social entrepreneurial intentions, this problem has yet to be studied much in the context of Vietnam's, particularly among youth. The goal of this study is to see if young empathy is linked to their desire to start a social enterprise. Reliability analysis using PLS-SEM software and a binary regression model will be used to examine data obtained from 339 university students in Vietnam. According to the findings, as well as the theory of planned behavior and the theory of action phases, (1) empathy does not directly affect social business intention, but rather indirectly through two mechanisms, social worth and social entrepreneurial self-efficacy, and (2) individuals who are confident in their own abilities have more social entrepreneurship intentions. We provide recommendations based on these findings to inspire young people to pursue social entrepreneurship, contribute to the development of a sustainable economy, and contribute positive values to society.

1. Introduction

Since the early 1990s, there has been a surge in study on entrepreneurial intention (EI) models, with the goal of assessing their relevance in each era. One of the areas of research that develops in the theory of entrepreneurship is social entrepreneurship (SE) [1]. Unlike the classic definition of EI, which is "the intent to start a business, to launch a new venture" [2] - SE can be defined as the desire to start a business with the goal of pursuing a social mission or launching a social venture. According to Professor Muhammad Yunus, SE is a social enterprise that does not pay dividends and instead reinvests income in order to have a positive impact on society. Psychological studies relating empathy or attentiveness to other people's experiences are used to explain the social dimension of social entrepreneurial intentions (SEI) [3]. People who have had a long exposure to businesses are more likely to empathize with them and to have a sense of entrepreneurship from a young age. Although the government has many policies to support businesses that use social resources for business, the number of people intending to start a social enterprise in Vietnam is still on the minuscule side, because many people believe that socially responsible activities belong to big players, big money corporations. The majority of Vietnamese social enterprises are micro-enterprises (with fewer than 15 employees and annual revenues of less than 1 billion VND, or \$43,000 USD), with the goal of creating jobs for disadvantaged people in society such as women and people with disabilities, as well as encouraging young leaders in fields ranging from agriculture to education [4].

Social entrepreneurs are increasingly mentioned when discussing innovative business solutions used to address social issues [5].

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Social entrepreneurs are considered the primary agents of the economic system due to their role in providing sustainable and systemic solutions to persistent social problems and improving quality of life [6]. Social entrepreneurs examine social issues from a business perspective and use commercial plans to address these issues, such as poverty, disease, etc. [7]. It is evident that social entrepreneurs have a vision directed towards the advancement and collective development of society rather than merely profit-driven objectives. Empathy is closely linked to social entrepreneurship, serving as a driving force that shapes how social entrepreneurs perceive issues, devise solutions, and interact with their communities. At the core of this connection is the ability of social entrepreneurs to deeply understand and share the emotions of others, enabling them to identify pressing social issues from the perspective of those living through them. Empathy also allows individuals to pinpoint social problems, comprehend the compassionate needs and desires of others, and develop innovative solutions to address these issues [8]. This empathetic understanding leads to a deeper insight into the needs and challenges faced by the communities they aim to assist and serve, often revealing problems that those without such compassionate perspectives might overlook. Empathy is considered a crucial factor in forming social entrepreneurial intentions as it relates to the ability to understand and share the emotions of others [9]. Empathy, stemming from perspective-taking, can inspire individuals to develop solutions addressing the difficulties of others, thereby fostering social entrepreneurial actions. Perspective-taking is a cognitive process in which individuals adopt the perspectives of others to understand their preferences, values, and needs [10]. In the context of social entrepreneurship, perspective-taking allows social entrepreneurs to adopt an empathetic view rather than merely critiquing an unresolved issue. Perspective-taking is akin to opening one's mind to embrace diverse life viewpoints rather than holding onto long-standing prejudices. Additionally, perspective-taking not only increases empathy towards specific individuals but can also enhance empathy towards entire stigmatized groups [11].

Social entrepreneurs derive their sense of purpose and motivation from the social value they create. Unlike traditional entrepreneurs, who may primarily seek financial profit, social entrepreneurs are driven by the desire to make a meaningful difference. Their success is measured by metrics such as the number of lives improved, the reduction of social inequalities, and the enhancement of community welfare. Social worth, as a sense of being valued by others, reinforces individuals' recognition of their current behavior and deepens their desire to continue engaging in relevant actions in the future [12]. This intrinsic motivation to create social worth fosters a sense of fulfillment and deep commitment, encouraging social entrepreneurs to persevere despite obstacles and challenges. When social entrepreneurs recognize the values they create, they feel needed by others and valued by society [13]. When individuals realize that their intentions can bring benefits and be appreciated by others, they find it meaningful and necessary to continue performing similar tasks in the future [14]. Their projects are designed to address these issues in innovative and scalable ways, aiming to create lasting change.

Consequently, social entrepreneurs also require a certain level of self-efficacy in their thinking and actions. The self-efficacy of social entrepreneurs refers to the confidence and belief that individuals can contribute to solving social problems [15]. This means that potential entrepreneurs believe they can succeed in creating new social enterprises [16]. High self-efficacy empowers social entrepreneurs with a certain confidence to tackle complex social issues. Believing in their ability to make a difference, they are likely to undertake challenging projects and persist through difficulties. A strong sense of self-efficacy helps social entrepreneurs maintain focus and motivation, driving them to find innovative solutions and overcome obstacles.

In many developed and developing countries, the inability of state institutions to provide adequate welfare for all citizens significantly contributes to the formation of social needs [17]. Social enterprises have evolved into a significant field of study for scholars and practitioners [18–21]. Current academic research on social entrepreneurial intention delves into various aspects of social enterprises, including impact measurement, funding models, innovation, policy support, and the personal characteristics of social entrepreneurs. Researchers have emphasized the need for robust frameworks to measure social impact through both quantitative and qualitative metrics, with calls for more long-term studies to assess sustainable impact. Some researchers have also attempted to identify factors influencing the formation of SEI [14–16,22–24]. According to the well-established theory of planned behavior, entrepreneurial intention is determined by three main factors: perceived attitude (evaluation of the desirability or undesirability of the behavior's outcome), perceived behavioral control (perception of the ease or difficulty of performing the behavior), and subjective norms (perceived social pressure from significant others regarding a specific behavior) [22]. Ajzen explained that this theory could be extended to include new variables [23]. This means the impact of underlying factors (such as personality traits, demographics, religion, architecture, etc.) on intention needs to be examined and demonstrated further through empirical research. Besides, the current research on social entrepreneurship still faces some limitations in understanding SE regarding the term "social." First, not all empathetic individuals have the intention of SE, nor do they all find the idea of SE appealing. Second, most models explaining SEI are based on the self-oriented perspective of classical business studies. Traditional business objectives are self-oriented and require personal competence and skills, whereas for SE, the motivation stems more from connecting and promoting respect for others (i.e., shared motivation).

To bridge the current research gap and contribute additional value to the academic repository, the present study proposes specific objectives. First, this research aims to extend the theory of planned behavior by investigating the role of perspective-taking and empathy in predicting social entrepreneurial intention. Several studies have identified self-efficacy and social worth in social entrepreneurship as primary antecedents of social entrepreneurial intention. Therefore, self-efficacy in social entrepreneurship and social worth may serve as significant mediating roles in explaining the mechanism behind the formation of social entrepreneurial intention [18,27–29]. Although the importance of empathy has been recognized, further research is needed to develop reliable metrics to assess empathy in social entrepreneurs and to explore the correlation between the degree of empathy and social entrepreneurial intention. Second, understanding how empathy manifests across different cultural contexts and fields, along with exploring the long-term impact and potential empathy fatigue in social entrepreneurs, are ripe areas for further research. Therefore, this study conducts an empirical investigation targeting young individuals, specifically university students in Vietnam. In South Africa, focusing on individuals and

young students to educate them about social entrepreneurship is imperative to promote sustainable development and address the nation's socio-economic challenges [24]. The research contributes to expanding the context of a developing and emerging economy like Vietnam. Third, current concepts of empathy and perspective-taking in social entrepreneurship remain limited. Empathy, when considering social entrepreneurial intention, is understudied [17]. This research aims to contribute to the broader discourse on the conceptual framework of empathy and perspective-taking within the social entrepreneurship context more explicitly. Finally, with the growing concern and desire to assist those in need, social entrepreneurial intention requires further research to develop innovative models, attract significant interest from genuinely potential social entrepreneurs, and motivate actions towards this end. Moreover, societal development is a long-term vision and a grand mission that every citizen should care about. The more attention given to social entrepreneurial intention, the more social inequities will be addressed. No individual should be left behind, and no issue should go unresolved, this is one of the ultimate contributions this research aims to make towards advancing social development in Vietnam specifically and globally in general.

2. Literature review and hypothesis development

2.1. Theoretical foundation

The current study applies the theory of Entrepreneurship event model [25], Theory of action phases [26,27], Goal setting theory [28], The Theory of Planning Behavior [29] as background theories. According to this model, EI is related to many factors, such as perceived desirability (perceived entrepreneurial opportunity or attractiveness of opportunity), disposition to act, and perceived feasibility (perception of the capacity of the entrepreneur). In order for the intention to be realized, it needs to have a number of pushing (negative) factors that change people's lives such as: dissatisfaction with the current job, divorce, job loss, ... Or, some effects (positive) consequences such as finding a good partner or having financial support. According to Theory of action phases (TAP) was developed by Ref. [26] in the 90s. There are two types of intentions: goal intention and implementation intention. Target intent refers to "I intend to do X", while action intent corresponds to "I intend to act targeting X when I encounter situation Y". Thus, action intention-makers determine when, where, and how they plan to enact their intent [27] which in turn leads to action. Thus, the target intention will be in the general form (a form of signal), and the action intention is the detailed intention to concretize the target intention.

The theory of goal-setting motivation suggests that there are two factors determining cognitive behavior: value and intention. While goals are defined as what individuals perceive and strive to accomplish, value is the outcome individuals desire to achieve. Goals need to be clear and specific (no vagueness accepted) but also challenging to help increase individual motivation to achieve them. The more detailed the goals, the higher the motivation to perform the behavior. Another approach to this issue is to look at the relationship between belief and behavior of an individual, categorizing beliefs into three main types: behavioral beliefs, normative beliefs, and self-control beliefs. This idea was put forth by research [29], aiming to improve the predictive ability of the Theory of Reasoned Action by incorporating a model of perceived behavioral control. This method brings many benefits in predicting and explaining an individual's behavior in a specific context, and has become one of the most popular and widely applied theories in the field of behavior research [30].

2.2. Hypothesis development

2.2.1. Social entrepreneurial intentions

Intention is one of the best predictors of any planned behavior [31], including entrepreneurship [25]. Understanding the complex behaviors of humans is a challenging task that can be approached from various angles [22]. This complexity has posed difficulties in understanding and identifying the factors predicting entrepreneurial intentions [32]. Social entrepreneurial intention refers to an individual's motivation and commitment to initiating and managing projects that address social issues and create social value. Intentions, related to mental orientation and the desire to act, provide guidelines for better understanding the decision-making process [33]. Social entrepreneurial intention refers to the willingness to create a social enterprise to pursue a social mission beyond the desire for profit generation [17]. According to the theory of planned behavior, attitudes toward a behavior, subjective norms, and perceived behavioral control predict behavioral intentions [34]. Social entrepreneurial intention is a complex and multifaceted construct influenced by personal motivation, perceived feasibility, social support, and external factors. Understanding these intentions is crucial to fostering an ecosystem that encourages and supports social entrepreneurship, ultimately leading to innovative solutions for pressing social issues. In practice, the goal of social entrepreneurs is to offer innovative solutions to social problems to improve the well-being of those in need and distress, not for personal self-interest [14,18,41–44]. Social entrepreneurial intention is an important driver of social innovation and sustainable development. Moreover, the rise of social entrepreneurship has significant implications for the broader business landscape.

2.2.2. Perspective-taking, empathy and social entrepreneurial self-efficacy

2.2.2.1. Perspective-taking and social entrepreneurial self-efficacy. Perspective-taking is the act whereby an individual either voluntarily or upon request imagines themselves in another person's situation under specific circumstances. This concept has been widely utilized in literature across various contexts and can enhance the effectiveness of empathy that an individual perceives towards a particular

social target [11]. Perspective-taking is a cognitive process in which individuals adopt another's viewpoint to attempt to understand their preferences, values, and needs [10]. Individuals with high levels of concern for perspective and empathy "are likely to possess pre-existing intrinsic norms and values related to helping and the importance of understanding others' needs" [3], thereby potentially forming social entrepreneurial intentions. When a person has a particularly strong ability for perspective-taking, they are more likely to feel integrated with themselves and others [35], reduce prejudice, and diminish negative stereotypes [36], which can help create and maintain social relationships [37], facilitate social interaction [38], and promote altruistic helping behaviors [39]. It can be said that perspective-taking in the context of social entrepreneurship acts as a motivation for social entrepreneurs to gain deeper insights into various aspects of life, environment, and economy. Perspective-taking, the ability to consider and understand the world from another's viewpoint, enhances empathy and social understanding, which are crucial for social entrepreneurs. Individuals proficient in perspective-taking are better at recognizing opportunities, mobilizing resources, and leading social initiatives, thus enhancing social entrepreneurial self-efficacy and concentrating more resources on social entrepreneurial intentions. Perspective-taking skills foster a deeper sense of empathy and social responsibility, which are key motivators driving social entrepreneurial intentions. From the above discussions, the study proposes the following hypothesis.

Hypothesis 1a. (H1a) Perspective – taking is positively related to social entrepreneurial self – efficacy

2.2.2.2. Empathic concern and social entrepreneurial self-efficacy. When facing the emotions of others, people often spontaneously share that emotional state; your sorrow can become my sorrow, your happiness can become my happiness. Such indirectly formed isomorphic emotions in an observer of another's emotions are referred to as empathy [40]. Empathy is a distinguishing feature between social entrepreneurship (SE) and conventional entrepreneurship, which emphasizes integrity and does not overly focus on profit and personal gain, implying a community-oriented and socially shared perspective. Empathy is considered a crucial factor leading to social entrepreneurial intention (SEI). Empathic concern is defined as the emotional responses stemming from an individual's kindness, along with anxiety when seeing others in distress and in need of help [41,42]. This is closely related to social entrepreneurship because empathy is considered an essential personality trait for entrepreneurial activities [43], thus making empathy a significant precursor of SEI. Empathic concern can also be understood as when a person feels compassion and concern for the less fortunate based on their perspective [44] and is also considered to contribute to moral judgments. People with high empathic ability can easily put themselves in others' positions [45]. Empathy can help social entrepreneurs identify social needs, design human-centered solutions, and build trust and cooperation among stakeholders. This deep understanding helps enhance the self-efficacy of the entrepreneur, fostering confidence in their ability to effect change. Self-efficacy refers to something akin to an individual's belief in their authority to handle desired behaviors [46]. Empathetic social entrepreneurs are better able to identify problems and develop solutions, making them more confident in their ability to create social change. Additionally, the strong personal connection to social issues driven by empathy enhances motivation and persistence, further reinforcing self-efficacy. Higher levels of empathic concern lead to higher self-efficacy among social entrepreneurs by reducing an individual's instinctive arousal in challenging situations [47]. Based on these arguments, the research proposes the following hypothesis.

Hypothesis 1b. (H1b) Empathic concern is positively related to social entrepreneurial self – efficacy

2.2.3. Social entrepreneurial self-efficacy and social entrepreneurial intention

Social entrepreneurial self-efficacy refers to an individual's perception of their ability to become a social entrepreneur [48]. It can be defined as an individual's confidence in their ability to perform tasks and fulfill roles that lead to outcomes in the field of social entrepreneurship [49]. Self-efficacy is not specific to an individual but relates to a particular challenge or the tasks associated with a specific field [46]. Social entrepreneurial self-efficacy represents the strength of an individual's belief that they possess the skills and capabilities to execute the roles and tasks of a successful social entrepreneur [50]. An individual with self-efficacy will reinforce their self-belief, trust in their ability to succeed, and be more willing to take action on their ideas. High self-efficacy leads to greater motivation and persistence in pursuing challenging tasks. Individuals with high social entrepreneurial self-efficacy are driven by a profound desire to bring about positive social change through innovative solutions. Therefore, confidence in entrepreneurial intentions becomes a crucial factor, reflecting an individual's belief in creating change and innovation towards more sustainable social development, overcoming challenges, and making meaningful contributions to societal improvement through entrepreneurial efforts [49]. In Nigeria, the study by Ref. [51] demonstrated a strong link between self-efficacy and entrepreneurial intentions among students. Similar patterns have been observed in the United States, where students exposed to entrepreneurship courses show a positive correlation between self-efficacy and entrepreneurial intentions [52]. In the journey of pursuing entrepreneurship, individuals encounter challenges and uncertainties due to unforeseen obstacles and risks, requiring social entrepreneurs to have strong self-belief to overcome challenges and persist in pursuing their goals [49]. Higher social entrepreneurial self-efficacy is likely to manifest in stronger social entrepreneurial intentions, as individuals are confident in their ability to navigate the complexities of social entrepreneurship. Observing successful social entrepreneurs and receiving encouragement from peers can also enhance social entrepreneurial self-efficacy, increasing the likelihood of pursuing social entrepreneurial endeavors. From the above discussion, the study proposes the following hypothesis.

Hypothesis 2. (H2) Social entrepreneurial self – efficacy has a positive effect on social entrepreneurial intentions

2.2.4. Perspective-taking, empathy and social worth

2.2.4.1. Perspective-taking and social worth. Social worth is conveyed to nurture empathy, understanding, solidarity, and mutual respect. Therefore, it is believed that this can reduce morally disengaged behavior and encourage concern for others and the learning of perspective-taking within society [53]. Perspective-taking awareness allows an individual to feel empathy, understand, and strive to engage in helping behaviors when witnessing their own suffering or that of others, rather than being immersed in those sufferings [54]. Consequently, individuals tend to create value through socially helpful behaviors and feel a sense of accomplishment when participating in sharing activities [13]. There is still a lack of experimental studies discussing the relationship between perspective-taking and social worth individually. However, within the context of current research and based on substantiated discussions, this study proposes a hypothesis for this relationship. When individuals engage in perspective-taking, they may respond better to the needs and emotions of others, which strengthens social relationships and increases their perceived worth within their social circles. This empathic interaction often leads to reciprocity, wherein the individual who understands another's perspective is also seen as more compassionate and thoughtful, thereby further enhancing their social worth. It can be said that social entrepreneurs have meaningful initiatives that can benefit society and those in need, thus the recognition they receive from society makes them feel valued in their actions. Empirical analyses have also revealed a positive and significant relationship between prosocial behavior and most measures of empathy based on perspective-taking and non-prejudicial tendencies [55]. The interaction between these concepts is synergistic; perspective-taking enhances social worth by ensuring that initiatives resonate deeply with the community, while a strong sense of social worth motivates social entrepreneurs to remain empathetic and attentive to the needs of others. From the above discussions, the study proposes the following hypothesis.

Hypothesis 3a. (H3a) Perspective-taking has a positive effect on social worth

2.2.4.2. Empathic concern and social worth. In practice, social worth often emerges through the experience of "being appreciated in relationships with others" [12]. This is perceived through a profound sense of empathy and social support. The sense of social worth is frequently felt most strongly by individuals with high levels of empathy, especially when engaging in social activities that provide positive experiences aimed at supportive goals. This reflects that, through understanding and supporting others, individuals can experience a deeper sense of meaning in their social relationships [56]. Moreover, empathy can stimulate social worth by helping individuals comprehend the potential impact of their actions on their future. Those who can understand the perspective of social welfare recipients may value the recipients more through social activities. Because they can understand and empathize with the needs of those being supported, they can gain a better understanding of the true value of those actions. In other words, empathetic individuals often feel that others appreciate the help they receive. Due to their ability to empathize with others' emotions, they often perceive that support is appreciated in alleviating the distress of those they assist [57]. Empathic concern enhances social worth by demonstrating the genuine dedication of a social entrepreneur to improving others' lives, thereby attracting support, resources, and credibility. A heightened sense of social value can amplify empathic concern by reinforcing the social entrepreneur's commitment to their mission. The recognition and affirmation of their positive impact encourage social entrepreneurs to continue engaging empathetically, fostering greater motivation to address social issues with increased passion and efficacy. Based on these discussions, the study proposes the following hypothesis:

Hypothesis 3a. (H3a) Empathic concern has a positive effect on social worth.

2.2.5. Social worth and social entrepreneurial intentions

Social worth is the feeling of being respected by others, promoting an individual's recognition of current behavior and motivating their desire to continue performing relevant actions in the future [12]. When individuals perceive social worth, they feel important but not ostentatious, sensing that they are needed by others and valued by society [13]. This typically occurs in those who genuinely wish to help others and feel happy when genuinely acknowledged. For social entrepreneurs, when they intend to bring benefits and are appreciated by others, they feel that continuing similar work in the future is meaningful and necessary [14], thereby encouraging the pursuit of social entrepreneurial intentions. These positive outcomes allow participants to feel significant to those they assist or esteemed by others [58]. When potential social entrepreneurs recognize that their actions can have a positive and meaningful impact on society, they are more likely to develop strong intentions to engage in social entrepreneurial activities. When participants realize their worth, they agree to participate in sharing activities because they believe their behavior will improve the well-being of beneficiaries [12].

Creating social worth also reinforces the legitimacy and credibility of social entrepreneurs. When their initiatives bring tangible benefits to the community, they gain trust and support from stakeholders, including beneficiaries, partners, investors, and policy-makers. This trust is crucial for building resources, forming partnerships, and expanding their impact. For example, projects like Muhammad Yunus's Grameen Bank, which provides microcredit to the poor, and Blake Mycoskie's TOMS Shoes, which donates a pair of shoes for every pair sold, have received widespread support due to their clear and significant social impact. Furthermore, this sense of support and appreciation motivates them to engage in similar work in the future and contribute positively to the environment, society, and the economy [13]. Based on these discussions, the study proposes the following hypothesis.

Hypothesis 4. (H4) Social worth is positively related to social entrepreneurial intentions

2.2.6. Proposed structural model

The proposed research model, based on established theoretical foundations and hypotheses, is illustrated in Fig. 1.

3. Research methodology

3.1. Survey instrument

The primary data collection tool is a questionnaire (using Google Forms) – a popular method for quickly gathering opinions from many individuals [59]. The questionnaire was developed by following the necessary steps to meet the required standards for a high-quality questionnaire, thereby enabling researchers to obtain reliable and valid data. The first step involved finalizing the questionnaire. Initially, the questionnaire was presented in English; the author then translated it into Vietnamese and sought the assistance of several expert translators to improve the questionnaire. Once the questionnaire was deemed valid in relation to the original document, the author sent it to three experts in the same field for further evaluation. Subsequently, the questionnaire was pre-tested with 38 university students who matched the desired target population to gather the best possible feedback for the final version before the official survey. This pilot survey aimed to assess the clarity of the questionnaire content and the respondents' ability to answer the survey questions. Following this step, the questionnaire was finalized and ready for the official survey. The structure of the questionnaire consists of two main parts: respondent information and the survey questions. The authors developed Likert scale questions. Selected questions, with additional reference to research papers, are measured on a scale of 1–5, specifically: “Strongly disagree”, “Disagree”, “Undecided”, “Agree”, and “Strongly agree”.

3.2. Data collection

The current research collects primary data to derive empirical research results. The target population of the study includes university students in Vietnam. Researchers suggest that the millennial generation, individuals born between 1980 and 2000, tends to become social entrepreneurs more than previous generations [50]. There are real-world experiences indicating that millennials have witnessed corporate scandals, seen their parents lose jobs due to downsizing and outsourcing, and have faced high unemployment rates. These conditions have driven millennials to seek business opportunities [50]. Furthermore, millennials may have a particular interest in social entrepreneurship because they desire meaningful work that makes a difference in the world [50]. Encouraging social entrepreneurship among university students has rapidly become an essential factor for economic growth and development in emerging economies globally [60,61]. Providing young people with the tools for innovation, critical thinking, and collaboration can empower them to develop and implement impactful solutions, thereby fostering positive change in their communities [62]. Therefore, investing in the development of social entrepreneurship among young people facilitates the cultivation of a generation that is not only socially aware but also capable of addressing complex challenges and shaping a more sustainable and inclusive future [49]. This indicates that promoting and motivating students and young individuals to engage in social entrepreneurship will empower them to take responsibility for their own futures, instill a sense of agency, self-efficacy, and ultimately, commitment to social entrepreneurial endeavors [49].

The research collects data solely online through Google Forms. The survey was distributed in groups with high student interaction at universities in Vietnam. The study employs a non-probability sampling technique, with convenience sampling being the chosen method. Key considerations in sampling include determining an appropriate sample size, ensuring diversity and inclusiveness, and adhering to ethical standards such as informed consent and confidentiality. The survey collected 339 observations selected from 500 survey responses (representing 67.8 %) based on personality traits and intentions to start a business to eliminate irrational variables and ensure more accurate survey samples. The responses of these 339 individuals will be used as primary data for the remainder of the paper.

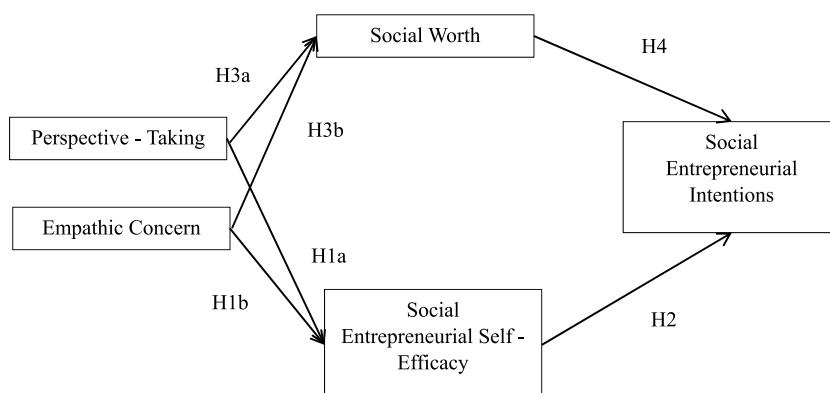


Fig. 1. Structural model.

3.3. Data analysis method

This study adopts a quantitative methodology and utilizes Partial Least Squares Structural Equation Modeling (PLS-SEM) for data analysis. There are several reasons for selecting PLS-SEM to analyze the primary data collected. Firstly, PLS-SEM allows for the simultaneous analysis of both the measurement model and the structural model, thereby improving the accuracy of the results [63]. Secondly, PLS-SEM is a contemporary multivariate technique that can estimate causal relationships, supported by theoretical foundations [64]. Finally, PLS-SEM offers advantages over covariance-based SEM methods in identifying the variance relationships between dependent and independent variables [65]. Hence, the current model is well-suited for a quantitative approach using PLS-SEM. The results will be used to evaluate the reliability of the scales, convergent validity, and discriminant validity. These evaluations will be conducted using Cronbach’s Alpha, factor loadings, average variance extracted (AVE), composite reliability (CR) [66,67], the square root of AVE, and the Fornell-Larcker criterion [68]. Bootstrapping results will be utilized to assess the measurement model, structural model, and hypotheses.

3.4. Variables and items

Several modifications have been made to the measurements of these structures based on credible past studies to align with the context of this current research. Table 1 enumerates all factors for each variable’s scale, as well as the source of the inherited scale’s credibility. The proposed scales have also been adjusted to suit the context of each research variable in the current study, thereby aiding in achieving the study’s objectives concerning each variable under investigation.

4. Results

4.1. Sample description

The data shows in Table 2 that women account for 82.3 percent of responders, which is 4.5 times greater than men. In actuality, the 500 survey participants are mostly university students, with the majority being female students. At the same time, it can be deduced from data on university percentages that the highest number of students studying economics is 64.6 percent, followed by management at 13.9 percent, that these students are interested in economics. Because this employee has had more exposure to the business world, he

Table 1
Constructs and items.

Construct	Item	Description	Sources
Perspective-Taking (PT)	PT1	I try to envision how I would feel if I were in their place before criticizing them	[69]
	PT2	I attempt to imagine how things might appear to my pals in order to better comprehend them.	
	PT3	I believe that every question has two sides to it, and I attempt to consider both of them.	
	PT4	Before I make a decision, I strive to consider both sides of a debate.	
	PT5	When I’m upset with somebody, I try to “walk in his shoes” for a bit.	
Empathic Concern (EC)	EC1	When I witness someone being taken advantage of, I feel compelled to protect them.	[69]
	EC2	I often have tender, concerned feelings for those who are less fortunate than me	
	EC3	I consider myself to be a tender-hearted individual.	
	EC4	Things that I witness often leave a quiet touch on me.	
Social Entrepreneurial Self – Efficacy (SESE)	SESE1	Identifying new social change business possibilities.	[70]
	SESE2	Creating new products/services to address social issues.	
	SESE3	Thinking outside the box to benefit others	
	SESE4	Commercializing a social enterprise proposal	
	SESE5	Creating a substantial societal impact.	
	SESE6	Increasing community support	
	SESE7	Putting established methods of thinking to the test	
	SESE8	Making a commitment to a common goal	
	SESE9	Committing to assisting others.	
	SESE10	Detecting societal issues.	
Social Worth (SW)	SW1	The people I assisted made me feel respected as a human	[12]
	SW2	The people I assisted made me feel valued as an individual.	
	SW3	I felt like I made a positive difference in the lives of the folks I assisted	
	SW4	I felt a strong connection to the people I assisted	
	SW5	I felt a lot of trust from the people I assisted	
	SW6	I felt significant to the folks I assisted	
Social Entrepreneurial Intentions (SEI)	SEI1	I am willing to go to any length to use my business skills to make a substantial difference in decreasing social injustices	[1]
	SEI2	My professional objective is to work in an environment where I can apply my commercial knowledge to solve social issues	
	SEI3	I will do all in my power to leverage my business expertise to effect social change.	
	SEI4	In the future, I am determined to have a direct societal impact through my job.	
	SEI5	I’ve seriously considered working for a social enterprise.	
	SEI6	I am determined to launch a social enterprise someday	

Table 2
Demographic characteristics.

Demographic characteristics	N = 339	(%)
Gender		
Male	60	17.7
Female	279	82.3
Age		
<20	243	71.7
20–24	94	27.7
25–29	2	0.6
Major		
Economics	219	64.6
Administration	47	13.9
Marketing	31	9.1
Pedagogy	1	0.3
Accounting - Auditing	9	2.7
Finance - Banking	8	2.4
Law	8	2.4
English Studies	3	0.9
Science - Technology	9	2.7
Architecture	2	0.6
Tourism	2	0.6
Volunteering experience		
Used to	206	60.8
No	133	39.2
Work experience		
Yes	137	40.4
No	202	59.6

Source: Author's work

Table 3
Construct Reliability and Validity of the final measurement model.

Variables	Items	Factor loading	Cronbach's Alpha	CR	AVE
Perspective - Taking	PT1	0.799	0.686	0.810	0.518
	PT2	0.786			
	PT3	0.676			
	PT4	0.601			
Empathic Concern	EC1	0.733	0.756	0.842	0.572
	EC2	0.829			
	EC3	0.721			
	EC4	0.738			
Social Entrepreneurial Self - Efficacy	SESE3	0.717	0.808	0.862	0.510
	SESE4	0.721			
	SESE6	0.698			
	SESE7	0.689			
	SESE8	0.734			
	SESE9	0.726			
Social Worth	SW1	0.805	0.824	0.872	0.535
	SW2	0.782			
	SW3	0.755			
	SW4	0.747			
	SW5	0.608			
	SW6	0.671			
Social Entrepreneurial Intentions	SEI1	0.739	0.834	0.879	0.548
	SEI2	0.785			
	SEI3	0.784			
	SEI4	0.752			
	SEI5	0.686			
	SEI6	0.687			

Source: Author's work

has a stronger personality attribute of wanting to start a firm.

The age group is roughly under 30 years old, with those under 24 years old having a greater entrepreneurial spirit. This can be explained by the young dynamic and passionate attitude, which has a strong willingness to accept risks. As people become older, the likelihood of establishing a business decreases, with those under the age of 20 accounting for the biggest percentage. In the over 25-year-old age category, the highest percentage is 71.7 percent, while the lowest is 0.6 percent.

Among those surveyed, the percentage of students who participate in and have experience with volunteer activities is high, at about 60.8 percent, 1.5 times higher than those who have no experience, at 39.2 percent.

People with work experience make up 40.4 percent of the population, which is lower than those without. Given the age range, it's safe to assume that the majority of respondents are students or recent graduates, which explains why the number of persons with work experience is so low.

4.2. Measurement model assessment results

According to Ref. [71], Outer loading (normalized loading coefficient) represents the reliability of the observed variable, with the requirement that it should be 0.708 or more to ensure quality. In the SMART PLS analysis, most of the outer loading values in the range 0.4–0.7 can be combined with the extracted mean variance AVE, in order to consider excluding the variable from the scale if excluding the variable improves reliability. The average variance extracted AVE is to evaluate the convergent validity. AVE value ≥ 0.5 is required for good convergence. Realizing that AVE (PT) = 0.443 < 0.5 shows low reliability, decided to remove the variable with Outer loading (PT5) = 0.525. Next is AVE (SESE) = 0.452 < 0.5, respectively remove the variables SESE1, SESE2, SESE5, SESE10.

After removing the variables (Table 2) in order to increase the reliability of the scale based on the correlation of the observed variables. We see that the weight of the Outer loading coefficient increases and the variable values in the two weights CR and AVE reach a high level of confidence.

The internal consistency reliability assessed by Cronbach's alpha index ranges from 0.686 to 0.834. For the composite confidence coefficient, it ranges from 0.810 to 0.879, which is slightly lower than that without excluding the variable (see Table 3).

To evaluate the discriminant value of each scale, the group will first base on the Fornell - Larcker model (Table 4). The coefficient of SQRT (AVE) on the diagonal of the model is larger than the remaining coefficients. Next, the group evaluated the discriminant value according to the HTMT index of the Heterotrait-Monotrait method, which is considered more accurate. The HTMT index on the highest diagonal is 0.783 (Table 5) which is less than 0.85, showing different concepts from each other. We can conclude that the scale has a distinct pattern between the variables.

4.3. Structural model assessment results

The coefficient of determination R^2 represents the quality of the structural model, according to Ref. [72], with values of 0.265, 0.313, and 0.407. Because this form of predictive model is rather sophisticated, and the research topic is based on social contributions with the purpose of social entrepreneurship, these values are assessed as high, and the structural model is of good quality.

The effect coefficient f^2 (see Fig. 2), on the other hand, indicates how strongly or weakly one independent idea influences another independent concept. The Effect Size coefficient $f^2 = 0.043$ indicates that EC has a small impact on SW; $f^2 = 0.156$ indicates the average impact of PT on SW; $f^2 = 0.259$ indicates the average impact of PT on SESE; $f^2 = 0.108$ indicates that EC has a small impact on SESE; $f^2 = 0.051$ indicates that SW has a small impact on SEI; $f^2 = 0.407$ indicates that SESE has a big impact on SEI.

Finally, Table 6 shows that the VIF values < 2 reveal no evidence of multicollinearity; the independent variables are not strongly correlated with one another, and there is little variation and change in the direction of their interaction with the dependent variable.

Structural modeling was performed by the group using the bootstrap technique [73] with a repeat magnification sample of 5000 samples, with an initial sample size of 339 samples. The results show that 6 hypotheses are accepted (Table 7). Based on the value of the table, we see that the P Values of the impact relationships of the two variables are equal to $0.000 < 0.05$, showing that it is statistically significant. Based on the Original Sample value (normalized impact factor), SESE, SEI and SW are affected by two variables. PT affects SESE more than EC ($0.447 > 0.289$); SESE affects SEI more than SW ($0.389 > 0.202$); PT affects SW more than EC ($0.387 > 0.202$).

The results of the difference test:

Used to have volunteering experience and No volunteering experience (Table 8).

Have work experience and No work experience (Table 9).

Table 4
Discriminant validity used Fornell-Larcker.

	EC	PT	SESE	SEI	SW
EC	0.757				
PT	0.480	0.720			
SESE	0.503	0.585	0.714		
SEI	0.421	0.390	0.526	0.740	
SW	0.388	0.484	0.590	0.462	0.731

Source: Author's work

Table 5
Discriminant validity used HTMT.

	EC	PT	SESE	SEI	SW
EC					
PT	0.638				
SESE	0.614	0.783			
SEI	0.508	0.511	0.641		
SW	0.470	0.629	0.713	0.557	

Source: Author’s work

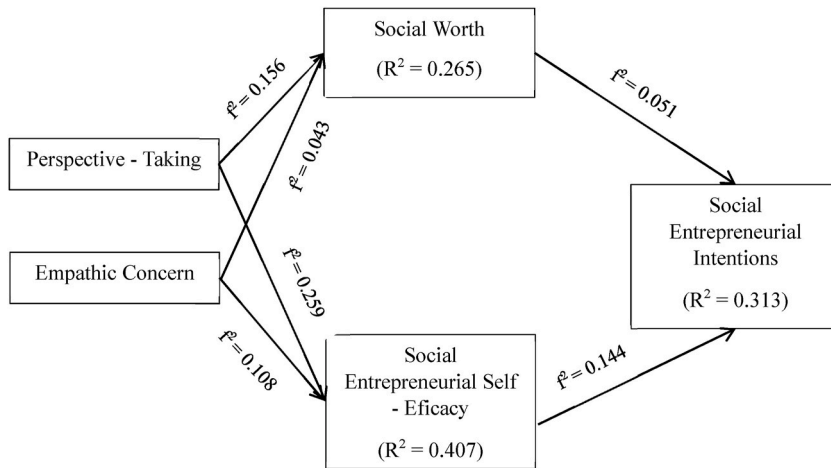


Fig. 2. Structural model assessment results.

Table 6
Collinearity Statistics (VIF).

	EC	PT	SESE	SEI	SW
EC					
PT					1.300
SESE				1.533	
SEI					
SW				1.533	

Source: Author’s work

Table 7
Hypothesis test results.

Hypothesis	Original Sample (O)	T Statistics	P - Values	Conclusion
H1a: PT → SESE	0.447	8.841	0.000	Supported
H1b: EC → SESE	0.289	5.882	0.000	Supported
H2: SESE → SEI	0.389	7.104	0.000	Supported
H3a: PT → SW	0.387	6.551	0.000	Supported
H3b: EC → SW	0.202	3.572	0.000	Supported
H4: SW → SEI	0.202	3.665	0.000	Supported

Source: Author’s work

Have experience working in both and work part-time but not at the company, office and worked or interned at the company, office (Table 10).

Multi-group analysis (MGA), according to Ref. [72], is used to assess the impact of incoming regulatory variables on the correlation of data groups in a research model. We can see the differences in parameter values using MGA, indicating heterogeneity between groups.

Results after PLS-MGA analysis, all values of P - value new are greater than 0.05, showing no difference in the two comparison groups, between “Used to have volunteering experience” and “No volunteering experience”, “Have work experience” and “No work

Table 8
Difference testing – Used to have volunteering experience and No volunteer experience.

Hypothesis	Path Coefficients - diff	P – value new (p < 0.05)	Conclusion
H1a: PT → SESE	0.010	0.931	Undifferentiated
H1b: EC → SESE	-0.027	0.797	Undifferentiated
H2: SESE → SEI	0.175	0.107	Undifferentiated
H3a: PT → SW	-0.108	0.367	Undifferentiated
H3b: EC → SW	0.060	0.605	Undifferentiated
H4: SW → SEI	-0.229	0.054	Undifferentiated

Source: Author’s work

Table 9
Difference testing – Have work experience and No work experience.

Hypothesis	Path Coefficients - diff	P – value new (p < 0.05)	Conclusion
H1a: PT → SESE	0.158	0.115	Undifferentiated
H1b: EC → SESE	-0.016	0.882	Undifferentiated
H2: SESE → SEI	0.115	0.273	Undifferentiated
H3a: PT → SW	0.130	0.279	Undifferentiated
H3b: EC → SW	-0.046	0.695	Undifferentiated
H4: SW → SEI	0.028	0.808	Undifferentiated

Source: Author’s work

Table 10
Difference testing - Have experience working in both and work part-time but not at the company, office and worked or interned at the company, office.

Hypothesis	Path Coefficients – diff (1)*	Path Coefficients – diff (2)*	P – value new (1)*	P – value new (2)*	Conclusion
H1a: PT → SESE	-0.077	0.261	0.713	0.601	Undifferentiated
H1b: EC → SESE	0.039	-0.209	0.783	0.627	Undifferentiated
H2: SESE → SEI	-0.05	0.463	0.81	0.217	Undifferentiated
H3a: PT → SW	-0.195	-0.459	0.716	0.352	Undifferentiated
H3b: EC → SW	-0.075	0.779	0.871	0.189	Undifferentiated
H4: SW → SEI	0.176	-0.043	0.456	0.857	Undifferentiated

(1) *: Have experience working in both - Work part-time but not at the company office.

(2) *: Have experience work in both - Worked or interned at the company, office.

Source: Author’s work

experience”, “Have experience working in both” and “Work part-time but not at the company, office and Worked or interned at the company, office”

5. Discussion

The current research investigates the impact relationship between empathy and social entrepreneurial intention through social entrepreneurial self-efficacy and social worth, with the survey subjects being students at universities in Vietnam. The study includes six hypotheses, all of which are discussed to form a positive impact relationship.

Hypotheses H1a and H1b are both supported, consistent with previous research findings [14,17]. First, hypothesis H1a discusses the relationship between perspective-taking and the enhancement of social entrepreneurial self-efficacy, subsequently promoting the formation of social entrepreneurial intentions among social entrepreneurs. Essentially, perspective-taking and empathic concern are components of empathy, complementing each other to foster intentions related to positive societal impacts. However, the current study will discuss each relationship separately to contribute new perspectives from the research results. The ability to understand and consider others’ viewpoints plays a crucial role in promoting social entrepreneurs’ self-efficacy and, through social entrepreneurial self-efficacy, fosters social entrepreneurial intentions. This perspective-taking not only helps identify the root causes of social issues but also boosts the entrepreneur’s confidence in developing relevant and impactful solutions. As social entrepreneurs become more proficient in understanding and addressing these issues, their social entrepreneurial self-efficacy increases, reinforcing their belief in their ability to make a difference. Thus, it can be said that an entrepreneur’s ability to take perspectives to feel empathetic and desire to help another person does not have a strong enough impact to lead to intention. Regardless of individuals’ empathy levels, their empathy does not directly predict their intention to become social entrepreneurs [14]. When social entrepreneurs believe in their ability to create significant impact, they are more likely to develop a strong intention to engage in social entrepreneurial activities, thereby enhancing the confidence gained through perspective-taking into higher intentions to create and lead social projects. Hypothesis H1b refers to the positive relationship between empathic concern and social entrepreneurial self-efficacy. Empathic concern fosters a deep, emotional connection with the social issues being addressed. This personal connection can significantly boost a social

entrepreneur's confidence and commitment to their mission. When entrepreneurs feel genuinely emotionally invested in others' well-being, they are more likely to believe in their ability to make a meaningful impact. This belief is the foundation of social entrepreneurial self-efficacy, as it strengthens the determination to overcome obstacles and persist in their efforts. Once individuals become social entrepreneurs, they are highly focused on achieving their social mission [50]; the more confident individuals are, the more quickly they will generate positive, effective impacts on the projects they pursue. Empathic concern enhances understanding and sensitivity to the needs and challenges faced by the target community. This heightened awareness enables social entrepreneurs to develop more suitable and effective solutions.

The second hypothesis (H2) posits the relationship between social entrepreneurial self-efficacy (SESE) and social entrepreneurial intentions, asserting that this relationship exerts a positive impact on intentions. This finding aligns with previous research [14,59]. The results indicate that SESE plays a crucial role in fostering social entrepreneurial intentions by nurturing individuals' belief in their ability to successfully initiate and manage social projects. When individuals possess high SESE, they exhibit greater confidence, which mitigates the fear of failure and encourages them to take the necessary risks associated with social entrepreneurship. This belief makes social entrepreneurship seem both feasible and desirable, aligning personal values with the potential social impact of their projects. Furthermore, high SESE drives individuals to set ambitious goals and persist in the face of challenges, thereby sustaining their entrepreneurial intentions over time. It also enhances their ability to recognize and exploit social opportunities, effectively mobilizing the necessary resources and networks. High SESE leads to a level of self-assurance in considering the potential success of their social projects [49]. Intrinsic motivation and a passion for social change, fueled by strong SESE, propel individuals to pursue social entrepreneurship for personal fulfillment and societal contribution. By nurturing SESE, we can encourage more individuals to engage in social entrepreneurial activities, thereby contributing to social welfare and sustainable development.

Subsequently, hypotheses H3a and H3b are also supported, indicating that both perspective-taking and empathic concern positively impact social worth. These research findings are consistent with previous empirical studies [14]. When social entrepreneurs engage in perspective-taking, they become more attuned to the fundamental needs and challenges faced by their target communities. This deeper understanding enhances their ability to develop solutions that are not only appropriate but also highly impactful, thereby increasing the perceived social worth of their efforts. By seeing the world through others' eyes, social entrepreneurs can identify more meaningful and effective ways to address social issues, which reinforces their commitment to creating value that truly resonates with and benefits society. Thus, perspective-taking fosters a greater sense of social responsibility and purpose, prompting entrepreneurs to prioritize social impact in their projects, ultimately leading to higher social worth for their initiatives. Empathic concern, the emotional investment in others' well-being, plays a crucial role in enhancing the perceived social worth of initiatives undertaken by social entrepreneurs. When individuals deeply empathize with the challenges and needs of their communities, they develop a heightened sensitivity that guides their efforts towards creating impactful solutions. This emotional connection not only motivates entrepreneurs to address pressing social issues but also fosters a genuine commitment to making a difference in people's lives. By prioritizing empathic concern, social entrepreneurs ensure that their initiatives are rooted in compassion and empathy, resonating authentically with the communities they aim to serve. This alignment between empathy and social worth enhances the credibility and effectiveness of their endeavors, as it reflects a sincere dedication to addressing societal needs. Consequently, initiatives driven by empathic concern are more likely to garner support and recognition, leading to greater social worth and sustainable impact over the long term. By nurturing empathic concern, social entrepreneurs not only enhance the quality of their solutions but also inspire broader social change that benefits individuals and communities alike.

Finally, the research results indicate that hypothesis H4 is also supported for the relationship between social worth and social entrepreneurial intentions. Previous studies by Refs. [9,14] have also demonstrated that this relationship is positive. When social entrepreneurs recognize the significant positive impacts their actions can have on the community, their motivation to engage in social entrepreneurial activities increases. This awareness of social worth strengthens their commitment to addressing social issues and enhances their confidence in their ability to make a meaningful difference. As individuals perceive higher social worth in their efforts, they are more likely to develop a strong intention to pursue social entrepreneurial activities. This heightened sense of purpose and responsibility drives them to create and implement innovative solutions that effectively tackle social challenges. Consequently, the recognition and appreciation of social value not only validate their efforts but also fuel their passion and determination to continue striving for social impact.

5.1. Theoretical implications

Applying various theoretical frameworks to this study can provide deeper insights into the theoretical implications of the research. The Entrepreneurship Event Model typically involves several stages, including opportunity recognition, resource acquisition, and venture creation. In the context of the study, empathy may play a crucial role in identifying social issues as opportunities, understanding the needs of the community, and creating a social venture that is truly responsive to those needs. The empathetic understanding can drive the entire entrepreneurial process from opportunity identification to venture creation. The Theory of Action Phases involves a sequence of cognitive and behavioral stages, such as predecisional processes, goal setting, and action implementation. Empathy could be a key factor in the predecisional processes, influencing how social entrepreneurs perceive and understand the challenges faced by the community. This understanding, driven by empathy, can then guide goal-setting processes and shape the actions taken during the implementation phase. According to Goal Setting Theory, setting specific and challenging goals can lead to higher performance. In the context of social entrepreneurship driven by empathy, the study might explore how the empathetic understanding of social issues influences the goal-setting process. Young people with a deep sense of empathy may set goals that go beyond mere economic outcomes, incorporating social and environmental impact metrics. The Theory of Planning Behavior focuses on

the role of intentions and planning in predicting behavior. In the context of social entrepreneurship, empathy may influence the intention to address social issues, and the planning process may be shaped by a deep understanding of the community's needs and aspirations. Empathy could drive the development of more comprehensive and community-centered plans for social ventures.

5.2. Practical implications

Empathy can play a crucial role in identifying and understanding the real and pressing issues faced by communities. Social entrepreneurs, armed with empathy, are better positioned to identify problems that truly matter to people. Empathy is a cornerstone of design thinking, an approach that emphasizes understanding users' needs and experiences. Social entrepreneurs who embrace empathy are more likely to develop innovative and effective solutions that genuinely address the needs of their target beneficiaries. Empathy fosters the development of authentic and meaningful relationships with stakeholders, including the communities being served. This can enhance collaboration, trust, and long-term sustainability for social ventures. Social entrepreneurs often face setbacks and challenges. Empathy can contribute to the development of resilience by helping them understand the emotions and needs of their team, partners, and beneficiaries, fostering a supportive and adaptive organizational culture. Empathy can be a powerful tool for influencing policy and advocating for systemic change. Social entrepreneurs who can convey the human impact of their work are more likely to garner support from policymakers and the wider community.

In general, the study of starting a business receives a lot of special attention from all economies. With the rapid development of Vietnam, risks and breakthroughs in starting a business are always required. The finding has implications for policymakers as well. Integrate empathy education into the national curriculum, particularly in business and entrepreneurship courses. This can include case studies, workshops, and practical experiences that emphasize the importance of empathy in addressing social issues. Establish and fund programs that provide mentorship and training specifically focused on developing empathy skills for young people. This could include partnerships with experienced social entrepreneurs, psychologists, and educators who can guide aspiring young people in understanding and addressing societal needs. Launch campaigns to raise awareness about the importance of empathy in business and its positive effects on societal well-being. These campaigns can target both students and the general public, fostering a supportive environment for socially responsible businesses. By implementing these policy components, we can create an environment that not only supports the growth of social entrepreneurship but also ensures that these businesses are driven by a genuine empathy for the well-being of the society they serve. This policy proposal seeks to integrate empathy into the core of Vietnam's entrepreneurial ecosystem, fostering a sustainable and socially responsible business culture. Besides, the findings of this study can be useful to educators in terms of teaching, assessing, and recognizing students' and learners' abilities. Pay attention to your personality and cognitive background.

5.3. Limitations of the study and directions for further research

The study investigates the impact of empathy on students' entrepreneurial intentions; however, there are still limitations that must be overcome, as shown below. The group's collected data only uses Google form questions; respondents do it passively, which may lead to errors in the implementation process. Especially in the SESE variable, four out of ten sub variables in the SESE variable were excluded, which could be attributed to poor sample collection. The number of samples collected is only an estimate; in larger studies, a higher number may have an impact on the overall results. The survey subjects are students, and the majority have future career intentions and choices; however, the sample diversity is low because it is concentrated in one specific area, UEH university, and some schools in Vietnam. The sample is chosen at random, so the study's findings may differ depending on the area and location where the sample is taken.

Data availability statement

The data that has been used is confidential.

Ethics approval

The research has been approved ethically by the author presenting the study in detail at the Research Management and International Cooperation Office of University of Economics Ho Chi Minh City (UEH), Vietnam. This research is funded by University of Economics Ho Chi Minh City (UEH), Vietnam.

CRedit authorship contribution statement

Truc Le Thanh: Writing – review & editing, Writing – original draft, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

There is no conflict of interest in this study.

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