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Interlinkages Between Digital-Social Entrepreneurship and Technological Capabilities for Sustainable Value Creation

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ABSTRACT

Indian agricultural value chains are marred with a lack of financial inclusion of smallholder farmers, lengthy payout times, poor quality of products, lack of traceability issues, and lack of industrialization in the value chain. Social entrepreneurs have indispensable tools as information and communication technologies are making inroads in rural developing economies. This study studies the impact of technological capabilities on social entrepreneurship for creating sustainable value creation using survey data from 557 respondents associated with farming and allied activities. The results highlight that digital technology capabilities mediate the relationship between social entrepreneurship and sustainable value creation. The findings present essential insights for academia, practitioners, and policymakers to better shape policies and decisions on social entrepreneurship.

KEYWORDS

Digital Entrepreneurship, Digital Technologies, Rural Economy, Social Entrepreneurship, Sustainable Value Creation, Technological Capabilities

1. INTRODUCTION

Entrepreneurship is a critical aspect of farming as the farmers possess the unique ability to adapt, organize, become market-oriented, and take calculated risks to create innovative offerings. The seasonal and economic nature of agricultural products makes entrepreneurship a necessity. The lives

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of farmers and their families can subsequently be enhanced when agricultural prosperity enhances, considering farming to be a social enterprise (Tinsley & Agapitova, 2018; Ge et al., 2020). Farmers, as social entrepreneurs, with their market-based solutions, can help address challenges that can improve productivity and growth and foster sustainability. By using information and communication technology and leveraging digital technology platforms, farmers as social entrepreneurs can close the gaps in the agricultural value chain, such as lack of financial access/ inclusion, lack of knowledge about farm inputs, low technology adoption, and usage, lack of timely weather and market data, and infrastructural challenges such as poor market linkages (Sharma & Parhi, 2017; Zhang et al., 2008).

As most of the workforce in developing economies relies on agriculture, farmers as social entrepreneurs form an important cog that links agricultural value chains with business development activities. In the agricultural value chains, farmers and other important stakeholders (such as traders and processors) play a crucial role in decision-making as they are integrated into the socio-economic context (Ratten, 2018). Of late, the rise in availability and affordability of technology has resulted in increased usage by the participants in the agricultural value chain for creating more significant social impact opportunities. This article focuses on the participants in the agricultural value chain as social entrepreneurs who use digital technologies for sustainable value creation. There are various farming-based social enterprises in India. The prominent ones are: AgroStar[1] (service: direct to-farmer m-commerce); Kisan Raja[2] (product: cellular-based mobile motor controller); Ekgaon[3] (service: direct from farmer produce to urban customers); Digital Green[4] (service: online training platform for farmers); Skymet[5] (product: weather forecast services); Nanopix[6] (product: nanosorter for sorting and grading the agricultural produce); Barrix Agro-Sciences Pvt. Ltd.[7] (product: integrated pest management solutions); and NubeSol Technologies[8] (product: remote sensing solutions).

Research has highlighted that entrepreneurial activities in rural regions can lead to positive societal impacts such as job creation, poverty reduction, emphasis on local production, and participation of women and youth in farming and allied activities (Dzisi, 2008). Therefore, the government and policymakers can develop policy interventions that support their entrepreneurial ventures and help add value to the rural economy. The intersection between social entrepreneurship and digital technologies gives rise to using digital technologies to overcome the information and financial asymmetries that hinder rural prosperity. The penetration of digital technologies in rural landscapes will improve social welfare, reduce the digital divide, and improve services that affect the quality of life, i.e., sustainable value creation. While much of the literature has emphasized the economic value creation by the ecopreneurs for gaining competitive advantage, there needs to be more research focusing on the three aspects/ elements of sustainable value creation, namely, economic, social, and environmental value creation. The simultaneous management of these three elements is still to be investigated (Sinthupundaja *et al.*, 2020). Also, most of the research on social entrepreneurship has been conducted in developed economy settings (Dwivedi & Weerawardena, 2018); therefore, there is much to be explored about the nuances of social entrepreneurship in developing countries. In this study, we use the theoretical lens of effectual logic and dynamic capabilities to address the bellow mentioned research questions (RQs):

RQ1. What impact do digital technology capabilities have on social entrepreneurship?
RQ2. How do digital technology capabilities impact sustainable value creation?

Based on responses from 557 key participants in the Indian agricultural value chain, the study investigates the critical links between social entrepreneurship, digital technologies, and sustainable value creation. It also highlights the mediating effect of digital technologies in sustainable value creation.

Following this introduction, Section 2 highlights the theoretical, hypotheses, and conceptual research framework. The research methodology, data analysis, and study results are presented in Sections 3 and 4. Contributions from the study, i.e., theoretical contributions and practical implications, are highlighted in Section 5. The concluding Section 6 presents the conclusions, limitations, and scope for future research.

2. THEORETICAL UNDERPINNINGS AND RESEARCH HYPOTHESES

India is an agricultural powerhouse with the world's largest area under cultivation for various commodities such as cotton, paddy, and wheat. India is also one of the world's largest producers of milk, pulses, and spices (Bank, 2017). The economic reforms have been resurgent in recent times to revive agriculture. Despite numerous technological tools at their disposal, the farming community still suffers. This can be attributed to a need for knowledge of demand and storage, adequate market infrastructure, market inaccessibility, and ineffective price discovery (Sharma & Parhi, 2017). The Indian agricultural value chain comprises key stakeholders: farmers, traders, processors, and distributors. Farmers as entrepreneurs operate in a complex and dynamic environment wherein they learn to think and act effectually and thereby explore economic opportunities. The effectual logic effectively portrays entrepreneurial decision-making in resource constraint environments (such as marketing in uncertain conditions on small farms) (Dwivedi & Weerawardena, 2018). Farmers rely on a variety of real-time information for capturing value within the value chain. In this context, ICT resources play a significant role. The agricultural extension services facilitate farmer-farmer and farmer-research partnerships for identifying, developing, and testing innovative technologies. The present study utilizes effectual logic and dynamic capabilities as a theoretical foundation to support the arguments.

2.1 Theoretical Background

2.1.1 Effectuation Logic

When defining entrepreneurial skills and capabilities, we must delve into causal and effectual logic (also known as representative decision-making logic) (Zhang et al., 2023; Kamble et al., 2023). Many scholars have pointed out that most entrepreneurs apply effectual logic in achieving singular goals in contrast to causal reasoning, which relies on formal reasoning and business thinking (Duening *et al.*, 2012). The effectual logic lens, proposed by Sarasvathy (2001), highlights how entrepreneurs imagine a possible new singular goal using a given set of contingent means, both on the people they interact with and the dynamic environments. Effectual logic begins with a clear goal rather than with the currently controlled resources and how the entrepreneur creates several successful future outcomes by deploying those resources while evaluating, managing, and mitigating risks.

VanSandt *et al.* (2009) suggested that the effectual logic paradigm is built on strategic partnerships and lays stress on leveraging contingencies. Entrepreneurs practicing the effectual logic method can be compared to explorers who enter a discovery process in uncharted waters or uncertain/ dynamic market conditions (Karami & Tang, 2022). Scholars and researchers have argued that over time, this most often leads to a virtuous cycle causing an ever-expanding network, more resources at disposition, and more significant consequences (Moreno et al., 2012). An effectual outlook on social entrepreneurship (SE) urges social entrepreneurs to question the existing mental models, resulting in innovative solutions for tackling societal and global issues. Using the effectual logic approach, the social entrepreneurs begin using the following means: knowing themselves, i.e., their traits, capabilities, and abilities; knowledge and experience they have accumulated over the years, i.e., their level of education and training; and the network they have established over the years, i.e., their professional and social networks. The effectual logic approach is highlighted in Figure 1. Three phases comprise the effectual logic approach. In the opportunity recognition phase, entrepreneurs use effectual logic to assess their capital, recognize their weaknesses and strengths, and conceptualize the opportunity they wish to engage. Social entrepreneurs use their creativity, and thereby, their innovativeness increases the problem space, which can be investigated by deploying the resources under their control. Therefore, social entrepreneurs seek to solve the societal challenges primarily ignored by governments and markets using their innovative capabilities. With effectual logic, social entrepreneurs constantly challenge the status quo presented by the mental models, and in the long run, as effectuation increases, so does their reputational capital and social acceptability. Studies in the past have highlighted that effectual logic can lead to the financial growth of new enterprises, improvement in the innovation capabilities of the enterprise, and risk performance (Karami & Tang, 2022). Effectual logic is categorized into four subdimensions viz., experimentation (through unstructured and unguided searches), affordable loss (in terms of dealing with change and unpredictability), flexibility (responding speedily to seize market opportunities), and precommitment (as it plays a critical role in guiding action) (Chandler et al., 2011; Ko et al., 2022).

2.1.2 Dynamic Capabilities

There are volumes of literature highlighting the essence of dynamic capabilities in organizations for sustainable competitive advantage in turbulent business environments, as they are valuable lenses accounting for the amalgamation of information and communication technology (ICT) with organizational and functional abilities (see Cyfert *et al.*, 2021; Steininger *et al.*, 2022; Teece, 2018; Teece *et al.*, 1997; Weaven *et al.*, 2021; Ge et al., 2020; Zhang et al., 2008). Dynamic capabilities suggests that organizations must continuously innovate their various capabilities and resources. This can be done by integrating, building, and reconfiguring their internal and external competencies. It also serves as a means for the organizations to purposefully extend, create, or modify the existing resource base through organizational activities that *sense* (scanning, creating, learning, and interpreting actions for identifying new opportunities) and *seize* opportunities (by developing new processes and products, investing, creating innovative business models) and at the same time maintain sustained competitive advantage through *reconfiguration* (of organizational structure and assets) in a dynamic market/ technological landscape (Moreno et al., 2012). Dynamic capabilities support the understanding of actions undertaken to effect organizational change. Figure 2 shows the use of dynamic capabilities in our study.

The present study extends the idea of dynamic capabilities as an entrepreneur's ability to challenge the status quo existing in the current business environment through actions enabled by ICTs and digital technologies. The essential components of digital entrepreneurship are humans and digital technologies (Dong, 2019). Through digital technologies, the human element can continuously monitor the activities flow in the context of entrepreneurial actions. Drawing upon the digital innovation literature, the implementation of digital technologies often leads to disruption in the business processes (Gkeredakis *et al.*, 2021; Skog *et al.*, 2018; Yang & Yi, 2021), the creation of new business models (Bohnsack *et al.*, 2021), flexibility in operations (Aversa *et al.*, 2021; Dolgui & Ivanov, 2022), and afford reorganized use (Nambisan, 2017) for understanding the mechanism through which a digital entrepreneur/ digital startup is likely to identify new opportunities and create innovative business models in a dynamic environment.

Figure 1. The effective logic framework, adapted from VanSandt et al. (2009)

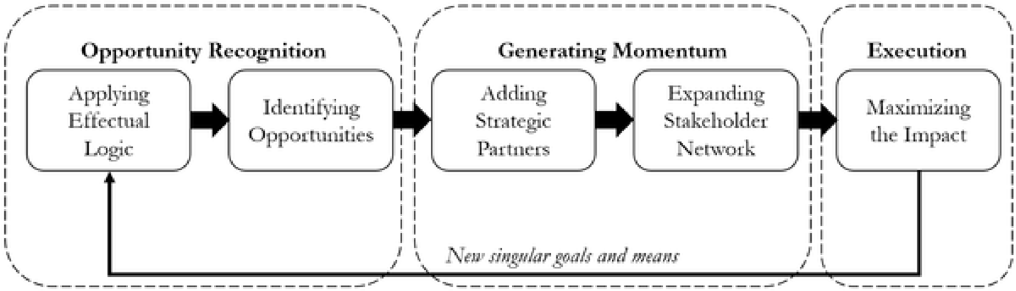
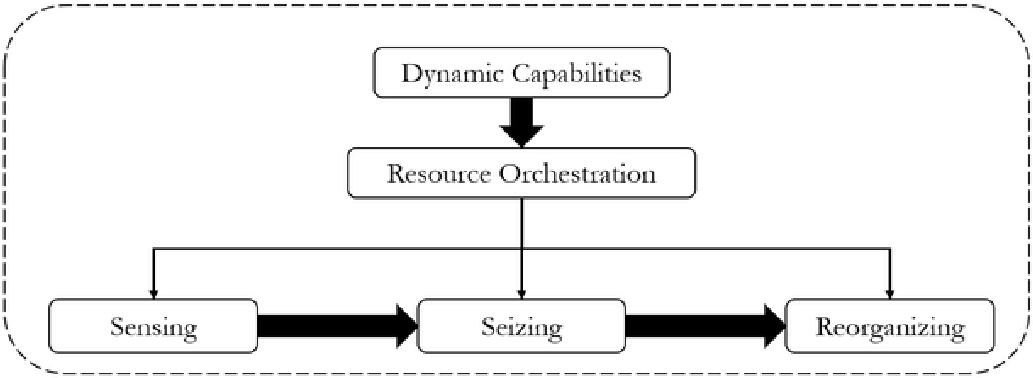


Figure 2. Dynamic capabilities



Recent literature highlights that digital technologies create novel value, enabling cross-boundary disruptions (Saunila *et al.*, 2018; Yoo & Roh, 2021; Yang & Yi, 2021). Digital technologies facilitate the digitization of business processes leading to enhanced efficiency and optimal resource utilization. Various digital technology capabilities defined in the literature are interoperability (Ghobakhloo, 2020; Gilchrist, 2016; Kamble *et al.*, 2018; Ge et al., 2020; Zhang et al., 2008); computing capabilities (Ghadimi *et al.*, 2019; Ghobakhloo, 2020; Manavalan & Jayakrishna, 2019); smart human resource capabilities (Luthra *et al.*, 2021; de Sousa Jabbour *et al.*, 2018); cognitive capabilities (Marino *et al.*, 2021; Zheng *et al.*, 2021); and cybersecurity (Pandey *et al.*, 2021; Sawik, 2022). Table 1 highlights the definitions of digital technology capabilities. Digital technology capabilities offer the requisite flexibility and responsiveness while taking entrepreneurial actions to respond quickly to market demand.

Table 1. Digital technology capabilities

Digital Technology Capability	Definition
Interoperability	Various ICTs can interact and transact via the Internet of Things and other platforms (blockchain, cloud, to name a few). It enhances the system's flexibility and responsiveness through real-time decision-making.
Computing Capability	Capabilities such as data shareability, data integrity, data accuracy, data storage, and data retrieval enable different components of ICTs and their systems/ subsystems to work independently and achieve shared localized decision-making.
Smart HR Capability	ICTs are supported on socio-technical pillars; intelligent systems can help minimize wastage by meeting real-time demand instead of projected demand, thereby reducing work-related stress and industrial hazards and injuries.
Cognitive Capability	Various ICTs (such as AI) focus on developing, validating, and deploying multiple machine learning algorithms for industrial applications to achieve sustainable performance. This helps in the integrated simulation and synthesis of the process, leading to collaborative diagnostics, real-time responsibility, self-configuration capabilities for resilience, and customizability. AI facilitates the development of innovative business models (such as service-oriented, cloud-based, customizable, and flexible manufacturing systems).
Cybersecurity	The cybersecurity capability of ICTs highlights their unique attributes in overcoming unwanted malware attacks. The possible measures to counter such cyber threats are threat monitoring and detection mechanisms, preventive cybersecurity policies, and workforce awareness through risk management training programs.

2.2 Hypotheses Development

2.2.1 Social Entrepreneurship, Digital Entrepreneurship, and Digital Technology Capabilities

Over the years, social entrepreneurship has garnered much attention from policymakers, practitioners, entrepreneurs, and academia. Social entrepreneurship helps solve societal problems and drives social purpose through innovation and management. This, in turn, helps generate income and keeps the efforts sustainable (Hockerts, 2017). Farming as a social entrepreneurship activity can create a host of opportunities that have profound social impacts (such as the participation of women in agriculture and the rise of women entrepreneurs in agriculture). Social entrepreneurship, therefore, plays a critical role in creating and sustaining social welfare. As the social purpose is driven by innovation, digital technology and ICTs contribute immensely to transforming the economy and society (Ciriello *et al.*, 2018; Yang & Yi, 2021). Affordability and availability of technology have transformed the entrepreneurial landscape by disrupting the existing business models in social entrepreneurship and have given rise to *digital social entrepreneurship* (Ghatak *et al.*, 2020).

The evolution of technologies and innovation were the catalysts leading at the forefront of every industrial revolution. Digital technologies have given rise to Industry 4.0 or smart factories. Nambisan (2017) reports that digital technologies amalgamate three related elements independently distinct: digital artifacts, digital infrastructure, and digital platforms. The concept of digital entrepreneurship finds its roots in the creation of new enterprises and digital transformation of the existing ones by the development of innovative technologies, and digital technologies enable a component of the business model that is vital to the enterprise (Abubakre *et al.*, 2020). In the dynamic business environment, many organizations are shifting to digital or internet-driven business models (Battisti *et al.*, 2022). Digital technologies, namely, the Internet of Things, cloud computing, blockchain technology, artificial intelligence, and big data analytics, reduce barriers between innovation and digital entrepreneurship; therefore, the uptake is high by the stakeholders in the agricultural value chains. An essential aspect of digital entrepreneurship is social technologies (for example, social media platforms), wherein user-generated content is created and exchanged through the coordination of innovation and knowledge (Morris & James, 2017; Sarkar *et al.*, 2022). Therefore, social technologies in digital entrepreneurship help create social value with digital technologies and technology capabilities (Ziemba, 2019). Therefore, in this study, we posit that:

H1: Social entrepreneurship has a significant positive impact on digital technology capabilities.

The transformative power of social technologies in agricultural marketing and allied activities can lead to sustainable outcomes for the stakeholders in the agricultural value chains. Social entrepreneurs use technological platforms in their business models and then leverage the social impact of their entrepreneurial activity. Digital technology capabilities enhance the exchange of valuable information between social entrepreneurs and customers, enhancing the social enterprise's outreach (Carrigan *et al.*, 2020). In the agricultural value chain, ICTs play a crucial role in ensuring the competitiveness of the social enterprise as timely and real-time information helps in making decisions related to farm and allied operations. Entrepreneurial activities and outcomes are impacted to a great extent by the generative and reprogrammable nature of digital technologies (Nambisan, 2017; Zaheer et al., 2019). Digital technology capabilities can help create new products and services, thereby improving coordination among the stakeholders in the agricultural value chain. Data standardization brings equity among all the stakeholders as the digital technology capabilities will help provide access to helpful information for all stakeholders to improve financial gains and sustainability outcomes. Therefore, in this study, we posit that:

H2: Digital entrepreneurship has a significant positive impact on digital technology capabilities.

2.2.2 Digital Technology Capabilities and Sustainable Value Creation

Sustainable value creation comprises three elements, namely, economic, social, and environmental value creation. The philosophy behind the creation of sustainable value creation was to have sustainable business models for minimizing global socio-economic and environmental challenges. Economic value creation reflects the firm's profits/ assets that social entrepreneurship will use to establish, grow, and survive in a dynamic competitive environment. Sustainable value creation reflects the SE's benefits to the community and society, creating social impact for improving lives (health, safety, and well-being). Environmental value creation reflects the tasks done by social entrepreneurship to safeguard, preserve, and protect the natural environment by resolving environmental issues such as tackling climate change, global warming, and pollution reduction. Zahra *et al.* (2009) reported that social value creation focuses on social value, an intangible element that cannot be quantified financially. Various stakeholders and digital technology capabilities create social value through network linkages at different phases in the agricultural value chain. By deploying unique resources and assets, economic value is generated by creating social value. The social entrepreneurships have capabilities that help manage, control, and deploy various tangible and intangible assets along the triple bottom line dimensions to enhance an social entrepreneurships ability to achieve socio-economic goals and get a sustained competitive advantage (Sinthupundaja *et al.*, 2020). Therefore, in this study, we posit that:

H3: Social entrepreneurship has a positive impact on sustainable value creation.

The sustainable value creation elements align with the firm's digital technology capabilities as they consider the economic, social, and environmental perspectives. Previous studies have highlighted that the mission of the social entrepreneurships is a critical element that contributes toward sustainable value creation in the form of social rewards, improved reputation, and customer goodwill (Flota et al., 2016). It is often highlighted that the digital technologies capabilities would enhance the efficiency of the social entrepreneurships economically and enhance the organizational performance improvement across economic, environmental, and social dimensions. In the economic dimension, digital technology capabilities would significantly reduce manufacturing and production cost, enhance profits and energy savings, and reduce inventory and procurement costs (Kamble *et al.*, 2020; Sharma *et al.*, 2022). In the social dimension, digital technology capabilities will provide many opportunities to the workforce of the digitalization era, thereby improving morale and productivity (Peukert *et al.*, 2015). Digital technology capabilities propose to improve working conditions, enhance worker safety, and improve labor relations. In the environmental dimension, digital technology capabilities would help reduce emissions, optimize energy usage, improve water footprint, reduce solid waste generation, and lead to sustainable procurement practices (Kamble *et al.*, 2020).

Therefore, in this study, we posit that:

H4: Digital entrepreneurship has a significant positive impact on sustainable value creation.

Studies in the past (Mancuso et al., 2023; Gregori & Holzmann, 2020) have highlighted that digital technology capabilities profoundly impact value creation. Digital technologies can increase value creation through enhanced connectivity with the stakeholders. Various organizations have found ways to create, deliver, and capture value through innovative digital business models. Digital technologies are deployed with the existing business models, which are leveraged for business model innovation (Mancuso et al., 2023; Bosler et al., 2021). Digital technology capabilities allow specific organizations to transform their business models (*through dynamic capabilities*) rapidly and can create value during uncertain events. Another way digital technology capabilities spur value creation is by reducing information asymmetries through real-time communication and minimizing waiting times (Mason, 2019). Therefore, in this study, we posit that:

H5: Digital technology capabilities have a significant positive impact on sustainable value creation.

In the present research study, the Digital Technology Capabilities construct is a mediating variable between social and digital entrepreneurship and sustainable value creation. The conceptual research model is depicted in Figure 3.

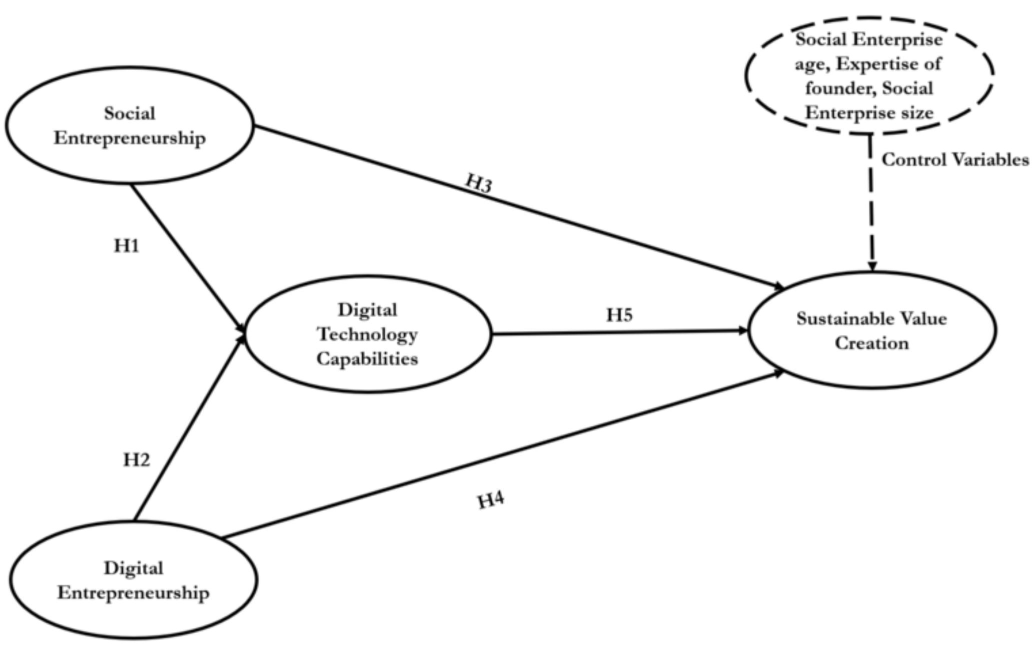
3. RESEARCH METHODOLOGY

3.1 Sampling

To test the formulated hypothesis, data collection was done from key stakeholders working in the agricultural value chains in India (farmers, traders, processors, cooperatives, and distributors) by performing *mandi* visits with the help of Agricultural Universities, Krishi Vigyan Kendras, and *mandi* board personnel. The data collection was coordinated by the first author using his professional network The selection criteria for the stakeholder were that they should have a minimum experience of three years of using technology and must have a minimum educational qualification as matriculation. The initial sample consisted of 2759 stakeholders. Responses from 853 stakeholders' startups were received and further segregated for complete responses. Eventually, we received 557 total responses with a success rate of 20.2 percent. Google Forms, telephone calls, and personal visits were used for collecting the survey data. To familiarize the respondents with the research, the survey was translated into the local language, and responses to the questions were limited to one person per startup. Therefore, the adequate sample size for this study was 557 key stakeholders in the agricultural value chains. The respondent summary is highlighted in Annexure I. The survey was conducted between fall 2021 and winter 2022.

After the survey was designed, it was pre-tested to remove subjective validity and non-response bias (Kamble *et al.*, 2020). During the validation phase, a group of agribusiness practitioners and academicians (twenty-three in number) with an average experience of 15.3 years were used. Wave

Figure 3. Conceptual research model



analysis was used to test the presence of non-response bias by placing the responses into two distinct categories. The first category represented 351 early responses (collected from early October 2021 to late January 2022) and 206 late responses (collected from early January to late March 2022). The differences between the two categories were tested using a t-test, highlighting a lack of non-response bias.

3.2 Measurement Items

The final survey instrument included a total of 67 measurement items. Digital entrepreneurship was measured as a latent construct using 12 items. It included the dimensions of the digital knowledge base and ICT market (DK), digital business environment (DB), access to finance (AF), and digital skills and e-leadership (DS) developed by Bogdanowicz (2015). Social entrepreneurship was measured as a latent construct using 12 items, and the dimensions used were social innovativeness (SI), social risk-taking (SRT), social proactiveness (SP), and socialness (SO) developed by (Dwivedi & Weerawardena, 2018; Kraus *et al.*, 2017). Social and digital entrepreneurship are well-established measurement items in the literature (see Franco *et al.*, 2021; Nambisan & Baron, 2021), indicating good reliability. Sustainable value creation is a single-factor construct having three dimensions economic (EVC), social (SoVC), and environmental (ENVC), measured using 12 items. It is based on similar studies on social entrepreneurship literature (Sahasranamam & Nandakumar, 2020; Spieth *et al.*, 2019). Digital technology capabilities (as a reflective construct) were adopted from Sharma *et al.* (2022). Twenty-four industry practitioners were consulted for subjective validation of the items (the panel included six academicians and eighteen startup founders). The items were then critically evaluated to remove ambiguity, improving clarity. Under the digital technology capabilities construct, a total of thirty-one items were operationalized under five attributes, which are interoperability (IO), smart human resources (SHR), cognitive capability (CoC), cybersecurity (CS), and computing capability (CC), were used in the study. A seven-point Likert scale was used for assessing the measurement items. The survey instrument used in the study is highlighted in Annexure II.

4. DATA ANALYSIS

We followed the procedure set by Hair et al. (2019)'s because the model used in this investigation is reflective. Before the model testing, the Harman one-factor test was utilized to determine the presence of Common Method Bias (CMB) (Hair Jr et al., 2021). The value of 41.26% (less than 50%) for the single-factor contribution revealed the absence of CMB. The Variance Inflation Factor (VIF) was then used to assess the multicollinearity among the components employed in the investigation. The VIF ranged from 1.002 to 4.764, falling below the suggested threshold value of 10, which indicated the lack of multicollinearity problems. Construct validity and reliability results are highlighted in Table 2.

4.1 Measurement Model

The present research study used PLS-SEM on SmartPLS 3.0 to validate the hypothesized model. The Average Variance Extracted (AVE), Fornell-Larcker criterion, and Heterotrait-Monotrait Ratio (HTMT) were used to establish the convergent and discriminant validity of the first-order constructs (Hair Jr *et al.*, 2021). As reported by Hair et al. (2022), Cronbach Alpha (0.60) and CR (0.75) values were within the prescribed threshold limits. It is found that AVE values are more significant than 0.50. Therefore, the model results satisfactorily (Fornell & Larcker, 1981). Rho_A (the Dijkstra-Henseler's rho) was used to estimate precise data consistency. The acceptable values should typically be greater than 0.7 (Ramírez & Palos-Sánchez, 2018).

Per the definition, divergent or discriminant validity establishes whether constructs that ought to be unrelated to one another are unrelated. This can be verified by comparing the average variance extracted (AVE) with the squared correlations of all latent variables in a matrix, as highlighted in Table 2. We assessed the discriminant validity to ensure that each construct in the model was distinct

Table 2. Construct validity and reliability results

Constructs	Cronbach's Alpha	rho_A	CR	AVE
AF	0.805	0.806	0.806	**0.580**
CC	0.919	0.920	0.920	**0.510**
COC	0.850	0.851	0.850	**0.531**
CS	0.899	0.901	0.899	**0.641**
DB	0.819	0.825	0.820	**0.603**
DK	0.787	0.787	0.787	**0.552**
DS	0.819	0.819	0.819	**0.601**
DE	0.877	0.878	0.876	**0.605**
DTC	0.950	0.952	0.950	**0.517**
EVC	0.875	0.875	0.875	**0.637**
ENVC	0.834	0.835	0.834	**0.558**
SHR	0.884	0.885	0.885	**0.605**
IO	0.873	0.873	0.873	**0.579**
SI	0.790	0.790	0.789	**0.555**
SO	0.820	0.824	0.820	**0.604**
SP	0.762	0.763	0.762	**0.517**
SRT	0.771	0.772	0.772	**0.530**
SoVC	0.810	0.814	0.810	0.518
SE	0.913	0.914	0.913	0.552
SVC	0.925	0.927	0.925	0.509

Note: CR is composite reliability; AVE is the average variance extracted.

Legends: DE- digital entrepreneurship; DK- digital knowledge base and ICT market; DB- digital business environment; AF- access to finance; DS- digital skills and e-leadership; SE- social entrepreneurship; SI- social innovativeness; SRT- social risk taking; SP- social proactiveness; SO- socialness; SVC- sustainable value creation; SoVC- social value creation; EVC- economic value creation; EnVC- environmental value creation; DTC- digital technology capabilities; IO- interoperability; CC- computing capabilities; SHR- smart human resources capabilities; CoC- cognitive capabilities; and CS- cybersecurity]

from the others, and the findings are shown in Table 3. We used the Fornell-Larcker criterion (Fornell & Larcker, 1981), which compares each construct's AVE to the inter-construct squared correlation. According to the Fornell-Larcker Criterion, no discriminant problems exist if the square root of each variable's AVE is more significant than its association with other variables. All of the HTMT values supported the discriminant validity of the selected constructs and were within the threshold value of 0.9 (highest obtained value = 0.841) (Hair Jr. *et al.*, 2021; Henseler *et al.*, 2015).

4.2 Inferences From the Structural Model

The traditional Stone-Geisser's Q^2 test assessed our model's predictive relevance (power) (Mitrega et al., 2017; Stone, 1974). A blindfolding algorithm calculates this test and then runs a predetermined number of resamples (Kock, 2020). Values over zero adequately demonstrate the model's predictive ability (Hair et al., 2019; Kock, 2020). To reflect the prediction accuracy of the structural model for a given endogenous construct, Q^2 values for that construct should, as a rule, be greater than zero. Q^2 values greater than 0, 0.25, and 0.5 represent the PLS-path model's small, medium, and significant predictive importance (Hair et al., 2019). As a result, the overall model's Q^2 values were consistent with previously published research studies (see Hair et al., 2019; Kock, 2015), where the greater the

Table 3. Fornell-Larcker criterion test and Heterotrait-Monotrait (HTMT) ratio test

	AF	CC	COC	CS	DB	DK	DS	DE	DTC	EVC	ENVC	HR	IO	SI	SO	SP	SRT	SoVC	SE	SVC
AF	0.761																			
CC	0.440	0.714																		
COC	0.307	0.695	0.721																	
CS	0.563	0.396	0.434	0.800																
DB	0.626	0.365	0.247	0.537	0.776															
DK	0.662	0.348	0.271	0.533	0.672	0.743														
DS	0.487	0.710	0.549	0.483	0.479	0.430	0.775													
DE	0.643	0.590	0.435	0.662	0.635	0.633	0.731	0.777												
DTC	0.513	0.684	0.648	0.600	0.460	0.436	0.671	0.689	0.719											
EVC	0.500	0.723	0.598	0.467	0.469	0.446	0.600	0.700	0.709	0.798										
ENVC	0.562	0.698	0.565	0.475	0.528	0.531	0.628	0.716	0.722	0.707	0.749									
SHR	0.312	0.739	0.645	0.318	0.302	0.237	0.599	0.461	0.698	0.651	0.577	0.777								
IO	0.506	0.710	0.610	0.476	0.491	0.461	0.644	0.695	0.774	0.714	0.679	0.616	0.759							
SI	0.519	0.722	0.630	0.480	0.501	0.466	0.646	0.670	0.625	0.647	0.724	0.687	0.721	0.745						
SO	0.530	0.577	0.464	0.406	0.444	0.465	0.609	0.644	0.651	0.661	0.734	0.473	0.703	0.682	0.777					
SP	0.523	0.650	0.607	0.422	0.452	0.492	0.705	0.684	0.710	0.694	0.702	0.578	0.684	0.714	0.700	0.719				
SRT	0.523	0.643	0.604	0.480	0.473	0.509	0.697	0.693	0.716	0.701	0.687	0.571	0.706	0.703	0.716	0.699	0.720			
SoVC	0.593	0.619	0.521	0.452	0.505	0.519	0.697	0.712	0.713	0.711	0.704	0.485	0.715	0.702	0.661	0.709	0.707	0.719		
SE	0.568	0.702	0.625	0.485	0.507	0.523	0.802	0.712	0.715	0.728	0.717	0.626	0.727	0.675	0.641	0.655	0.651	0.679	0.742	
SVC	0.581	0.623	0.596	0.493	0.529	0.525	0.695	0.766	0.663	0.698	0.699	0.610	0.644	0.664	0.625	0.517	0.680	0.642	0.664	0.712

DE- digital entrepreneurship; DK- digital knowledge base and ICT market; DB- digital business environment; AF- access to finance; DS- digital skills and e-leadership; SE- social entrepreneurship; SI- social innovativeness; SRT- social risk taking; SP- social proactiveness; SO- socialness; SVC- sustainable value creation; SoVC- social value creation; EVC- economic value creation; EnVC- environmental value creation; DTC- digital technology capabilities; IO- interoperability; CC- computing capabilities; SHR- smart human resources capabilities; CoC- cognitive capabilities; and CS- cybersecurity] value, the better the model's predictive ability. For depicting the path significance and associated explanatory powers, a nonparametric Bootstrapping technique using SmartPLS 3.0 was used for examining the structural models. All the hypotheses were accepted (standardized path coefficients can be inferred from Table 4).

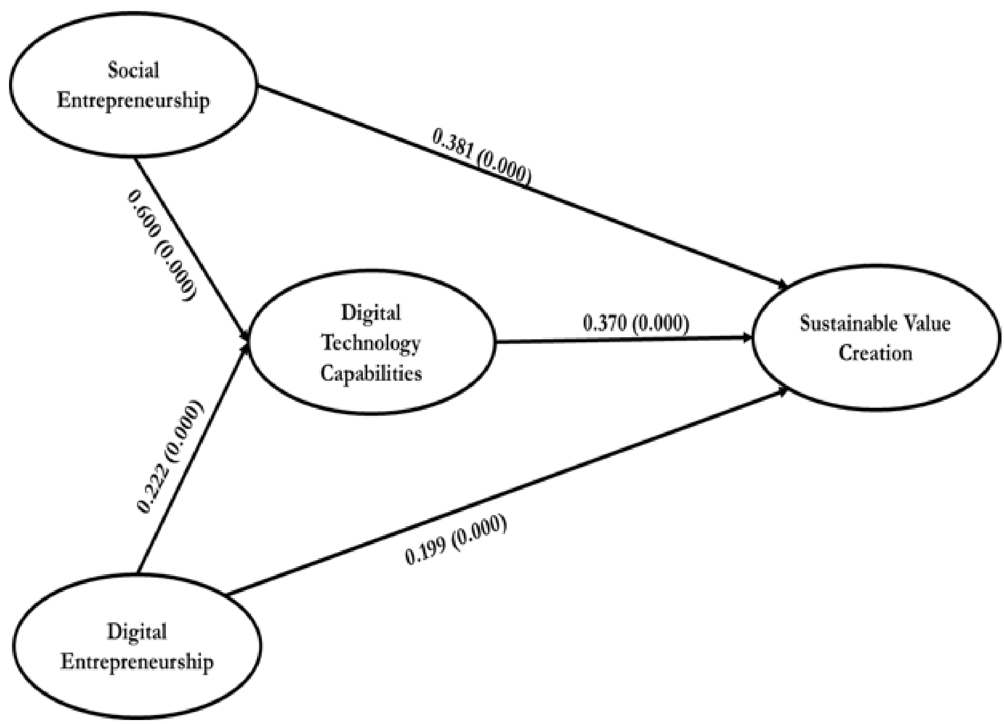
The model with the results is highlighted in Figure 4. Social entrepreneurship has a significant direct effect on sustainable value creation; similarly, digital entrepreneurship has a significant direct effect on sustainable value creation. Also, social entrepreneurship and digital entrepreneurship have a significant direct effect on digital technology capabilities.

Table 4. Hypothesis test results using PLS-SEM3

Hypotheses	Hypotheses	Estimation	SE	TS	Significance	Result
Direct Effects						
H1*	SE→DTC	0.600	0.05	13.26	***	Validated
H2*	DE→DTC	0.222	0.05	4.64	***	Validated
H3*	SE→SVC	0.381	0.04	8.872	***	Validated
H4*	DE→SVC	0.199	0.04	5.487	***	Validated
H5*	DTC→SVC	0.370	0.05	7.447	***	Validated

[*Note: n=557; SRMR= 0.088.
*Signifies only the direct effects investigated using PLS-SEM3.
***Implies significance at $p < 0.001$]
SE: Social Entrepreneurship, DE: Digital Entrepreneurship, DTC: Digital Technology Capabilities, SVC: Sustainable Value Creation

Figure 4. Model with results



4.2.1 Control Variables

The control variables used in the present study included the age of the social enterprise, the founder's experience, and the size of the enterprise. These were regressed against the variable sustainable value creation. The entrepreneur's experience considerably impacted the performance of the enterprise. The effect of the control variables was insignificant. The findings highlight that SVC for social enterprises was not influenced by the amount of funding or size of the team but rather by choice of suitable strategies and decision-making, which is related to the entrepreneur's experience. Per the protocol (as highlighted by Neter *et al.,* 1996), we retained control variables for further analyses concerning the dependent variable (sustainable value creation).

4.2.2 Mediation Result

In the present study, we used the Baron and Kenny (1986) mediation method for testing the mediation effects. From Table 5, the variable digital technology capabilities partially mediate the relationship between social entrepreneurship and sustainable value creation and the relationship between digital entrepreneurship and sustainable value creation.

The results from the study highlight that social entrepreneurship has a significant direct effect on sustainable value creation. Additionally, digital technology capabilities partially mediate the relationship between social entrepreneurship and sustainable value creation. Therefore, social entrepreneurship directly contributes to sustainable value creation, and a portion of its effect is transmitted through digital technology capabilities. Similarly, the results from the study highlight that digital entrepreneurship has a significant direct effect on sustainable value creation. Additionally, digital technology capabilities partially mediate the relationship between digital entrepreneurship and sustainable value creation. Therefore, social entrepreneurship directly contributes to sustainable value creation, and a portion of its effect is transmitted through digital technology capabilities.

Therefore, it can be inferred that social enterprises contribute immensely to sustainable value creation by improving economic development, improving environmental conditions, and eradicating social inequalities (*direct effect*). Nevertheless, as the relationship between social entrepreneurship and sustainable value creation is not explained by its direct effect, digital technology capabilities play a crucial role in enhancing outreach and improving operational efficiencies, partially mediating the relationship between social entrepreneurship and sustainable value creation.

5. DISCUSSION

The present study has empirically validated the relationships between digital entrepreneurship, social entrepreneurship, digital technology capabilities, and sustainable value creation. The study highlights that digital technology capabilities partially mediate the relationship between social entrepreneurship, digital entrepreneurship, and sustainable value creation. The outcomes of the study are divided into theoretical and managerial implications.

Table 5. Mediation result

Hypotheses	Hypothesis	Estimation	SD	TS	Significance	Result
Direct Effects						
H2**	SE→DTC→SVC	0.231	0.035	6.36	***	Validated
H1**	DE→DTC→SVC	0.064	0.023	3.57	***	Validated

[Note: **Signifies the direct and indirect effects analyzed using the Baron and Kenny model.
***Signifies significance at $p < 0.001$]
SE: Social Entrepreneurship, DE: Digital Entrepreneurship, DTC: Digital Technology Capabilities, SVC: Sustainable Value Creation

5.1 Theoretical Contributions

The context presented in the study highlights the agricultural value chains in India, which exhibit their own distinctive social and cultural characteristics. The findings from the present study advance the literature on social entrepreneurship and sustainable value creation. This establishes an essential link in understanding why farmers as entrepreneurs perform better and have a more significant societal impact. Effectual logic and dynamic capabilities for sustainable value creation highlight the importance of integrating the three dimensions of sustainable value creation for sustained competitive advantage. The study tries to fill the literature gaps on studies about social entrepreneurship in a developing economy context. Also, the study establishes the relationships between digital entrepreneurship, social entrepreneurship, and digital technology capabilities for realizing sustainable value creation.

The farmers are also transitioning as they adopt digital technologies to reduce socio-economic disparities. The findings from the study highlight their inclination towards using digital technologies in their social ventures - this answers RQ1, which pertains to the relationship between digital technology capabilities and social entrepreneurship. Digital technology capabilities as dynamic capabilities aid social entrepreneurship endeavors and hold the potential to bring societal change. Digital technologies also form a medium for farmers to disseminate social impact to a larger audience effectively. Therefore, digital technology capabilities positively contribute to enhancing social value creation. This answers RQ2, which pertains to the relationship between digital technology capabilities and sustainable value creation (Yoo & Roh, 2021). Moreover, the theoretical findings from this study align with the findings of Sinthupundaja *et al.* (2020), which focuses on shared value creation from the triple bottom line perspective.

5.2 Managerial Implications

The present study offers various critical managerial implications for entrepreneurs/ practitioners. The study highlights that practitioners must give equal importance to social and environmental value creation alongside economic value creation. The study highlights a strong relationship between social entrepreneurship and digital technology capabilities. The effectuation logic is one of the possible ways for sustainable value creation. Therefore, practitioners should focus on implementing digital technologies to deal with change and unpredictability in their social endeavors to increase the outreach of their social impact. It is established from the study that digital technologies are the catalysts for bringing societal change (Shehata & Montash, 2019). Therefore, investments are made in digital technology infrastructure to minimize the hindrances of infrastructural challenges (Gurbaxani & Dunkle, 2019). Also, it should be highlighted that digital technology capabilities mediate the relationship between social entrepreneurship and sustainable value creation; therefore, the equal focus must be given to implementing and adopting digital technologies for solving societal challenges. Digital technology capabilities help enhance the impact of social endeavors and support seizing the opportunities that will help bridge the socio-economic divide. With digital technology capabilities, more focus can be laid equally on social and environmental value creation.

Practitioners can establish real-time monitoring systems to safeguard the environment and minimize harmful environmental impacts. The cooperatives have a significant role in marketing their products using digital platforms and, in turn, generate better economic gains. Using digital technologies will also aid the financial inclusion of smallholder farmers and allow for real-time settlement of dues and credits. Moreover, the cooperatives can target a global customer base using digital technology platforms and expand their outreach. The practitioners should also focus on using the resources to encourage rural youth's uptake of social entrepreneurship (Maseno & Wanyoike, 2022).

The present study also contributes to policymakers and regulators who will design social entrepreneurship strategies in rural regions. They should focus on setting up rural training centers and promoting digital technologies' adoption and implementation. Social enterprises such as Digital Green are leading the way for online training for farmers in various rural regions. The involvement of youth will further enhance the impact of social enterprise.

6. CONCLUSION, LIMITATIONS, AND FUTURE RESEARCH DIRECTIONS

The success of a social enterprise lies in its outreach and the impact it creates over time. Digital technology capabilities can improve the growth prospects of social enterprises. Social enterprises may develop innovative strategies using digital technology capabilities (effectual logic) and enhance their societal impact. The present study attempts to establish the relationship between social entrepreneurship and digital technology capabilities for sustainable value creation, thereby providing empirical justifications for key stakeholders in the agricultural value chains. We tested several hypotheses from the literature review based on data collected from 557 respondents. Some interesting results from the study include identifying digital technologies as a significant driver for social entrepreneurship and their presence as a mediator between social entrepreneurship and sustainable value creation. Using effectual logic, social enterprises can increase their risk appetite, enhancing value capture and creation. Considering digital technology capabilities, these immensely help social and digital entrepreneurs create and capture value through enhanced stakeholder connectivity.

Some limitations in the present study led to various avenues for future research. Firstly, the framework developed in the research and the constructs are based on dynamic capabilities and may not provide a holistic view of practical issues associated with digital technology capabilities. Therefore, future studies can use a mixed-method approach for examining the relationships proposed in the model. Secondly, as the quantitative analysis was based on cross-sectional data, the findings might have become static, although no non-response errors were reported. Future studies can conduct longitudinal examinations with larger sample sizes and different geographical settings to study the impact of social entrepreneurship and sustainable value creation. Thirdly, the uniqueness of the Indian agricultural value chains hinders the generalizability of the research as the constructs may vary in different cultural settings. Therefore, future studies can test the impacts in other developing economies. Future research could also explore the findings in other social entrepreneurship sectors, such as tourism, transportation, and healthcare.

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ENDNOTES

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2 http://www.kisanraja.com/
3 https://www.ekgaon.com/index.php
4 https://www.digitalgreen.org/
5 https://www.skymetweather.com/
6 https://www.nanopix-iss.com/
7 http://www.barrix.in/
8 https://www.bloomberg.com/profile/company/1429896D:IN#xj4y7vzkg

APPENDIX A. RESPONDENT PROFILES

Table 6.

Variable	Category	Frequency	Percentage
Gender	Female	169	30.34
	Male	388	69.65
Age	<25	156	28
	25 to 35	173	31
	35 to 50	138	25
	>50	90	16
Zone	North	117	21
	East	56	10
	West	168	30
	South	216	39
Phase in the Agricultural Value Chain	Pre-Harvest	84	15
	Harvest	67	12
	Post-Harvest	172	31
	Distribution	140	25
	Others	94	17
Enterprise Age	<5	84	15
	5 to 10	172	31
	>10	301	54
Enterprise Size (employees)	<5	95	17
	5 to 25	173	31
	25 to 50	117	21
	50 to 100	121	22
	>100	51	9
Funding Sources	Grants from Foundations	139	25
	Fundings in-kind (cash and donations)	48	8
	Grants from Government	122	22
	Capital Grant	77	14
	Loans	77	14
	Self-financed	94	17

APPENDIX B. QUESTIONNAIRE

Digital Entrepreneurship (DE) (Bogdanowicz, 2015)

Table 7.

Code	Digital Knowledge Base and ICT Market	1	2	3	4	5	6	7
DK1	Our organization embraces digital technologies and transforms the way goods are made and delivered							
DK2	Our organization fosters innovation by promoting the visibility of digital technologies and the commercialization of new digital services and ideas.							
DK3	Our organization focuses on up-scaling toward a digitized enterprise.							

Table 8.

Code	Digital Business Environment	1	2	3	4	5	6	7
DB1	Our organization has ease of doing digital business facilities							
DB2	Our organization has the required ICT infrastructure.							
DB3	Our organization has trusted electronic payment systems, trademark registration systems to boost the use, ease of access, and trust in digital markets							

Table 9.

Code	Access to Finance	1	2	3	4	5	6	7
AF1	Access to finance will assist the creation, survival, and growth of digital entrepreneurship							
AF2	Our organization deploys innovative forms of lending to support digital entrepreneurship							
AF3	Our organization utilizes enhanced tax and fiscal frameworks compatible with digital technologies.							

Table 10.

Code	Digital Skills and E-Leadership	1	2	3	4	5	6	7
DS1	In our organization, all employees have basic technical skills and ICT usage skills.							
DS2	Our organization facilitates, supports, and recognizes multi-disciplinary digital skills and entrepreneurial talent.							
DS3	Our organization supports e-leadership initiatives.							

Social Entrepreneurship (Kraus et al., 2017; Dwivedi & Weerawardena, 2018)

Table 11.

Code	Social Innovativeness	1	2	3	4	5	6	7
SI1	Social innovation is critical for our organization							
SI2	Our organization invests in advancing new ways to increase our social impact or to serve the stakeholders.							
SI3	Our organization comes up with innovative ideas to solve social problems frequently.							

Table 12.

Code	Social Risk Taking	1	2	3	4	5	6	7
SRT1	Our organization always engages in managing the risks associated with our projects.							
SRT2	Our organization will undertake a project considering the associated costs and benefits.							
SRT3	Our organization follows a cautious approach while making resource commitments.							

Table 13.

Code	Social Proactiveness	1	2	3	4	5	6	7
SP1	Our organization aims to be at the forefront of improving the world.							
SP2	Our organization is strongly inclined to be ahead of others in addressing its social mission.							
SP3	Our organization typically initiates actions that competitors copy.							

Table 14.

Code	Socialness	1	2	3	4	5	6	7
SO1	The objective to accomplish the organization's social mission precedes the objective to generate a profit.							
SO2	Our organization strongly focuses on partnerships with other organizations and governments to ensure a more significant and accelerated accomplishment of the social mission.							
SO3	The organization has set ambitious goals regarding sustainability and incorporates them in all strategic decisions.							

Sustainable Value Creation (Bacq & Eddleston, 2016; Maletic et al., 2018; Paulraj, 2011)

Table 15.

Code	Economic Value Creation	1	2	3	4	5	6	7
EVC1	Our organization has a high-profit growth rate							
EVC2	Our organization has a high return on investment.							
EVC3	Our organization has high sales growth.							
EVC4	Our organization has a good reputation.							

Table 16.

Code	Social Value Creation	1	2	3	4	5	6	7
SoVC1	Our initiatives have made significant progress in alleviating social problems.							
SoVC2	Our initiatives help improve overall stakeholder welfare or betterment.							
SoVC3	Our initiatives improve community health and safety.							
SoVC4	Our initiatives improve the awareness and protection of the claims and rights of people in the community served							

Table 17.

Code	Environmental Value Creation	1	2	3	4	5	6	7
EnVC1	Our organization consumes/ utilizes resources effectively and efficiently							
EnVC2	Our organization optimizes resource consumption.							
EnVC3	Our organization minimizes waste reduction.							
EnVC4	Our organization improves environmental conditions in communities.							

Digital Technology Capabilities (Sharma et al., 2022)

Table 18.

		1	2	3	4	5	6	7
Interoperability	IO1- Collaboration among stakeholders							
	IO2- Seamless information exchange and sharing							
	IO3- System communicability							
	IO4- Usage of robots and cobots in the facility							
	IO5- Visibility and traceability of the processes							
Computing Capability	CC1- Data integration							
	CC2- High-performance computing							
	CC3- Data reliability							
	CC4- Data storage							
	CC5- Data visualization							
	CC6- Data traceability							
	CC7- Localized decision-making							
	CC8- Self controllability							
	CC9- Analytics and optimization capabilities embedded with smart systems							
	CC10- Dynamic control							
	CC11- Sustainable-oriented decentralized organization							
Smart HR Capabilities	HR1- Improved working conditions							
	HR2- Training and capacity development/ HR skill development							
	HR3- Improved worker safety							
	HR4- Reduced labor claims							
	HR5- Machine and work design							
Cognitive Capability	CoC1- Intelligent systems							
	CoC2- Dynamic behavior of manufacturing systems							
	CoC3- Autonomous system							
	CoC4- Self-configurable, self-reasoning systems							
	CoC5- Self-predictive, self-sensing systems							
Cybersecurity	CS1- Cybersecurity policies							
	CS2- Data authentication and encryption							
	CS3- Data espionage (-ve)							
	CS4- Threat detection and monitoring							
	CS5- Cybersecurity awareness programs							

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