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Sustainable BOP Markets: Role of ICT in development of Inclusive Supply Chain Linkages in SMEs in Pakistan.

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ABSTRACT

This research examines the significance of ICT in developing Inclusive Supply Chain Linkages for Pakistani SMEs. We propose that Use of ICT mediates the favorable relationship between Access to ICT and Inclusive Supply Chain Linkages in Pakistani SMEs' BOP market business operations. This research surveyed 500 Pakistani SME owners, executives, and workers to test the concept. Using SMART Partial Least Square (PLS) software, SEM was used to analyze data. The research found that SMEs in Pakistani BOP markets utilize ICT to mediate the relationship between ICT availability and inclusive supply chain links that maintain BOP markets. ICT's influence on Inclusive Supply Chain Linkages at BOP in Pakistani SMEs' business operations are validated experimentally in the research. This study empirically tests a concept that SMEs' use of ICT mediates the beneficial relationship between Access to ICT and Inclusive Supply Chain Linkages.

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1.0 Introduction

Sustainable growth of more than 4 billion poor people belonging to lower classes of the society in underdeveloped and developing countries, who as per ute the Base of the Pyramid (BOP) of the world market, has been the focus of sociologists, development economists and lately the marketers as well for a long time. SMEs play a key role in sustainability of this BOP market by linking its people with the formal corporate sector. Access to and Use of Information and Communications Technology (ICT) in business operations in SMEs affect the development of inclusive supply chain linkages involving the people at the bottom for the sustainable development of these people.

1.1 Background

According to C. K. Prahalad and Fruehauf (2005), Multi-National Companies (MNCs) targeted ier-1, the wealthiest people in the globe, followed by Tier-2 and Tier 3. As seen in Figure 1.1, MNCs have disregarded the untapped market of approximately 4,000 million Tier-4, or Bottom of the Pyramid (BOP) individuals with per capita incomes below $15,00. The bottom of the market was nicknamed “The Fortune at the Bottom”.

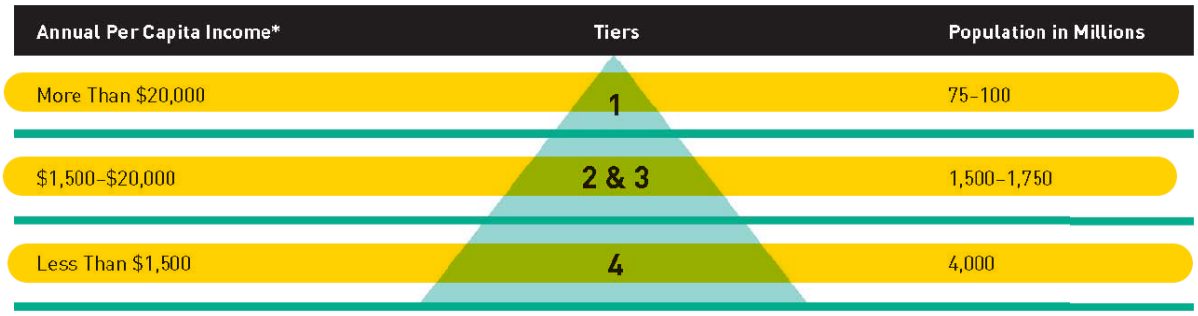


Figure – 1.1

Source: Author’s completion.

Multinational companies struggled to succeed in BOP due to inadequate local acceptance and incompatible strategies (Kolk, Rivera-Santos, & Rufín, 2014). Kolk, Rivera-Santos, & Rufín (2014). SMEs sprang up in BOP firms and quickly became a substantial component of the economy since they were entrenched in local settings and co-created value (Mbuyisa & Leonard, 2017). Due to lack of physical infrastructure and institutional gaps, SMEs, like other businesses, struggle to bridge market voids between product or service suppliers and end customers (Monideepa Tarafdar & Singh, 2011). With the advent of mobile communication and digitization of commercial activities through the internet (Chipidza & Leidner, 2019), ICT promotes manufacturers and producers by providing remote access to raw material suppliers and point of sales. In Pakistan, SMEs operating at

BOP have had limited access to ICT and its use in their business operations, so they have not fully benefited from ICT-enabled inclusive supply chain linkages. SMEs are the majority shareholder in Pakistan's economic units (99 percent), but only 40% of the GDP. First, there is little literature on the role that ICT plays in SMEs' businesses to sustain BOP markets through inclusive supply chain linkages. Second, there are few quantitative studies in Pakistan on the role of ICT to develop sustainable BOP markets. This quantitative study in Pakistan addresses these two research gaps. The research examines how SMEs may access and integrate ICT into their business operations and how ICT affects their inclusive supply chain integration with formal sector corporate enterprises. As part of strategic planning, this research will assist SMEs invest in ICT infrastructure and educate their workers in IT skills to create inclusive supply chain links. The research will contribute to BOP market literature, notably on the role of ICT in developing sustainable BOP markets with SME supply chain involvement. We used a quantitative research strategy with structured questionnaires, collecting data from 500 convenience-sampled individuals. For data analysis, PLS-SEM was utilized. Literature evaluation of study-related works will establish the hypothesis and theoretical framework in the following parts. The methods section will explain study design, equipment creation, and data collecting. In the findings and discussion phase, the theoretical framework will be used to analyse the data and evaluate the hypothesis and model. Study conclusions, consequences, and limits will be presented in the last part.

2.0 Literature Review and Hypotheses Development

2.1 BOP Markets

Prahalad (2002) analysed the global economic dispersion from a "per capita income" perspective and found a pyramid with four stages based on yearly per capita income ranges. He further said that Multinational Companies (MNCs) sought Tier-1, which had a per capita income of above $20,000, followed by Tier-2 and Tier-3, which had $1,500–$20,000. Figure 1.1 shows that MNCs have disregarded the untapped market of approximately 4,000 million Tier–4 (BOP) persons with per capita incomes of less than $1,500. This approach of Prahalad was like Bartels (1968) on social and economic restrictions in marketing. Like the General Theory of Marketing (Bartels, 1968), Prahalad (2002) outlined four BOP market restrictions that needed business and technical advances. Creating Buying Power, Shaping Aspirations, Improving Access, and Tailoring Local Solutions are the restrictions. MNCs should target this untapped Fortune at the Bottom market of over 4 billion people. In addition to untapped potential, MNCs choose BOP markets due to market saturation and Tier-1 rivalry. For BOP market success, MNCs must solve the four restraints mentioned.

2.2 Sustainability at BOP

Sustainability is maintaining future generations' quality of life, environmental integrity, and social equality while creating TBL-aligned financial values via economic transactions. Sustainable BOP

product and service development and education may change expectations (Prahalad, 2002). Marketers should avoid utilizing environmental and cultural degradation in their campaigns since BOP people dislike it. Success in BOP requires maximizing output from limited resources and winning with BOP workers (Reynoso & Cabrera, 2019). Sustainable supply chain management improves BOP ecology's social, economic, and environmental aspects (Gold, Hahn, & Seuring, 2013). BOP ecological collaboration encourages social entrepreneurship in BOP marketplaces, according to Goyal et al. (2017). 4 Integrating local factors into the Availability, Affordability, Acceptability, and Awareness model has helped launch new products in BOP markets (Reynoso & Cabrera, 2019). BOP's social problems management enhances institutional structure and the quality of life of disadvantaged people in relevant areas, helping social firms prosper financially (De Beule, Klein, & Verwaal, 2020). Innovative business models for poor, inclusion by BOP small and micro entrepreneurs using TBL frameworks improve market sustainability (Heuër, 2017). Poor and rural microenterprises feed themselves and their families and increase community wellness by addressing fundamental survival requirements (Saleh & Ndubisi, 2006). BOP enterprises must promote human rights and social progress (Arnold & Valentin, 2013). BOP has moved from perceiving its people as a latent market to shared ideals that drive its businesses to create and sell products and services for the base of the pyramid (Follman, 2012). Partner development, integrated communication, stakeholder participation, shared innovations, indigenous and external technology integration to provide personalized BOP solutions, and learning are common in BOP and SSCM research. BOP families will pay more for high-nutrition meals if marketers can convince them of its sustainability via pamphlets or other advertising, depending on their knowledge and economic status. Sustainable business models (SBMs) provide meaningful values in company operations to earn financial profits, enhance community quality of life, and conserve the environment by using multi-actor and multi-dimension elements, including social and environmental settings. Delivery to BOP markets, Sourcing to make and sell items to non-BOP sectors and Reorganizing to improve productivity and quality of life. Entities, initiatives, and platforms may use SBMs. Most study shows that FMCG companies have green and sustainable supply chain policies.
Multiple stakeholders collaborate to benefit the value chain for social and commercial reasons. BOP providers co-creating products and services to meet TOP customers' demands improves BOP workers' social and personal well-being and TOP consumers' altruism, improving BOP and TOP social sustainability. To meet the UN's Sustainable Development Goals, businesses' BOP strategies must prioritize local knowledge, community awareness, local capability, and knowledge gap reduction. ICT reduces vulnerabilities, bridges infrastructure gaps, creates inclusive linkages, and improves access to distant resources (Ahmad., 2019). Reverse-logistics, which turns litters into commodities, may be profitable and sustainable.

2.3 Small and Medium sized Enterprises (SMEs)

SME personnel and resources are limited. Country and industry requirements depend on workforce (Stockdale & Standing, 2004). MNCs should help BOP start microbusinesses. Shared ownership helps micro-franchises. According to geography, small enterprises employ under 100 workers and big organizations 100–500. The State Bank of Pakistan defines micro-enterprises as 5 workers and Rs 1 million in sales, small-enterprises as 20–100 million, and medium-enterprises as 250–800 million The General Manager or owner of microenterprises takes all strategic and routine decisions. Micro enterprises have 1-9 employees with a turnover of less than R 2 million, small businesses 10-50 and less than R 13 million, and medium businesses 51-200 and less than R 51 million. Informal, service-oriented microbusinesses help communities survive. Friends and family microentrepreneurs improve community health (Saleh & Ndubisi, 2006). Karnani (2007) suggests that SMEs may decrease poverty by developing skills and generating jobs better than MNCs. Social capital lets SMEs supply, subcontract, etc. MNCs via local networks. MNC-mediated technology transfer may boost SMEs' market competitiveness (Prasanna et al., 2019). Small SMEs are localized, have easy access to markets, funding, and other financial resources, and are technologically adaptable, whereas MNEs cannot include local communities in product and service co-design and co-creation. Strategic worldwide commercial connections between SMEs and MNCs as suppliers, contractors, contract manufacturers, supporting industries, and franchisees changed Singapore's economy (Choy, 1995). SME supply chains let local and MNC customers tailor goods. Singapore improved SME globalization laws, regulations, and incentives. Pakistan may aid SMEs. Phase-1 (1978–1992) saw enormous SMEs growth as the government developed Townships, collective and self-employed firms. The 1992–2002 Phase-2 overhauled SOEs and private SMEs. Chinese government SME Promotion Law (2002 Phase-3) Since 1992, China has promoted commercial and public sector SMEs, and the 2003 SME Promotion Law was significant. Tax reduction spurred innovation and entrepreneurship to level the playing field for SMEs. Cheap labour and “Guanxi” boost Chinese SMEs. Built on integrated inclusion, Chinese SMEs are distinctive. Most Chinese businesses are SMEs due to growth. After the 1970 Malaysian New Economic Policy encouraged SMEs, Industrial Master Plans (IMPs) developed integrated approaches to grow them. In 2002, 93.8% of Malaysian manufacturing was SMEs. The Malaysian SME ICT adoption gap is enormous. Local roots and micro-entrepreneurs' adaptation make SMEs more competitive than MNCs in BOP markets (Heuër, 2017). SMEs directly connect with local supply chain players; indirect inclusion creates BOP micro-entrepreneurs for sourcing or distribution. Culture and technology make social strata involvement simpler for SMEs to adapt new business models (Lashitew, Bals, & van Tulder, 2018).

2.4 Information and Communication Technology

Voice, data, and content networks and user-end devices or interfaces are ICT (Greene, 2016). ICT improves marketing collaborations (Sheombar, 2010). ICT-based CRM improves customer and social networks (Chen & Popovich, 2003). By automating, replacing, and informing human decision-making and changing manufacturing and business processes, IT may reduce market separations and restructure organizations. ICT automates CRM, creates, analyses, and targets customer datasets in relationship marketing. ICT4D encouraged social and economic services in remote and scattered regions for the poor utilizing tele-centres, but it failed to help poor development. Four phases of ICT4D 2.0 growth as telecommunications advance: Plan for extensive ICT infrastructure availability; Implement ICT infrastructure in the BOP; Adopt and utilize ICT for user benefit; Impact on poor development. Telecentre computer literacy programmes in rural and distant areas failed (Pal, 2009). ICT development may improve freedom, welfare, productivity, and inclusion in disadvantaged areas by reducing power inequalities (Chipidza & Leidner, 2019; Sein et al., 2019). National efforts should prioritize infrastructure, good governance, and digital empowerment of disadvantaged groups to reduce the digital gap and improve the population's social, economic, and capital foundation (Raj & Aithal, 2018). The Universal Service Fund (USF), a government-controlled fund financed by ICT service providers by contributing a percentage of their earnings, can encourage marginalized people to work in small businesses and social enterprises to improve their standard of living by spreading internet connectivity to underdeveloped and remote areas A remarkable ICT revolution in 1997–2017 boosted economic development. BOP companies use the poor as upper and downstream suppliers and distributors, resulting in various supply chain interactions. For an efficient supply chain that assists the poor, ICT minimizes transaction costs. The Digital Divide affects “haves” and “have nots” as computers and other data and video devices become more common. Strategic rural public-sector ICT development using USF. Industry competitiveness increases with ICT investment, according to P. Neirotti & Pesce (2019). Enterprises may use BOP ICT networks to link social intermediaries to the supply chain (Heuer & Seuring, 2020). Awan, Suleman, Huiskonen, & Kraslawski (2020) observed that BOP organizations must collaborate with other firms and build supply chain networks to include local communities in operations, improving profitability and market sustainability.

2.4.1 Access to ICT

ICT access involves internet-based networks and technical assistance to improve businesspeople’s soft IT abilities (Alderete, 2017). Investment affects ICT access. Irani et al. (2013) quantified “Access to and Use of ICT”. Through network links, ICT enhances product responsiveness and economic value in company processes (Belvedere, Grando, & Bielli, 2013). A quantitative poll of 1,376 supply chain executives found this. Alderete (2017) created 66 company ICT access and

usage indicators. VoIP can bridge the "language divide" by translating web pages and offering educational and useful applications in local languages. Mobile telephony, the most significant ICT innovation to improve BOP people's lives and introduce a new generation of BOP initiatives, has increased their access to market information, medical services, easy money remittances from remote areas, banking services without bank branches, and affordable mobile-recharge ICT businesses that link rural and underserved poor and create inclusive innovation succeed socioeconomically (Sheombar, 2010). Chatterjee, Gupta, and Upadhyay (2020) suggest that ICT adoption may boost entrepreneurship and micro-entrepreneurship in BOP marketplaces, reducing poverty and fostering shared ideas. ICT-driven development reduced poverty sustainably, particularly when backed by institutions (Adejumo, Adejumo, & Aladesanmi, 2020). BOP's ICT access provides a digital community that may conduct business on a single platform to decrease environmental and market barriers between producers and customers (W. Zhao, Wang, Chen, & Liu, 2021). The firm's ICT infrastructure, strategy, and policy for ICT development, including staff ICT skills development, are accessible. ICT hardware and networks, IT teams and coordinators, the firm's ICT vision and strategy, and employee ICT development programs enable SMEs to overcome their context's inherent hurdles and market separations. SMEs' ICT strategy and staff ICT assets rely on their environment (Neirotti et al., 2018). Local entrepreneurs incorporating ICT into company operations (Chatterjee et al., 2020) and rural BOP residents using E-commerce (Ahmed, Rahman, & Ohsugi, 2011) establish inclusive supply chains. Telecom Service Providers (TELCOs) in Pakistan and other nations give a tiny percentage of their income to create telecom infrastructure in undeveloped BOP regions to boost ICT access and bridge the digital gap for BOP market viability.

H1: Access to ICT in SMEs Business Operating at BOP significantly affects the Inclusive Supply Chain Linkages.

H2: Access to ICT in MSMEs Business Operating at BOP significantly affects the Use of ICT of MSMEs at BOP.

2.4.2 Use of ICT

ICT adoption in distant and underprivileged places needs cheap and durable terminals, huge wireline or wireless communications infrastructure, and innovative power sources. Zabir, Ahmed, & Yasuura (2008) suggest excellent marketing helps BOP workers buy new gadgets. ICT enhances supply chains, SOPs, and goods, increasing revenue. Co-designing ICT improvements may reduce end-user resistance (Bennis, 2015; Gcora, Zaber, & Chigona, 2017). Tech-savvy BOP staff with clear information will encourage online use (Chauhan, Gupta, & Jaiswal, 2018). PE, EE, SI, and PMV predicted “Behavioural Intention” (BI) and “Use Behaviour” (UB) in ICT adoption by Baishya & Samalia (2020). PMV was in TAM's tech adoption strategy. Reengineering and

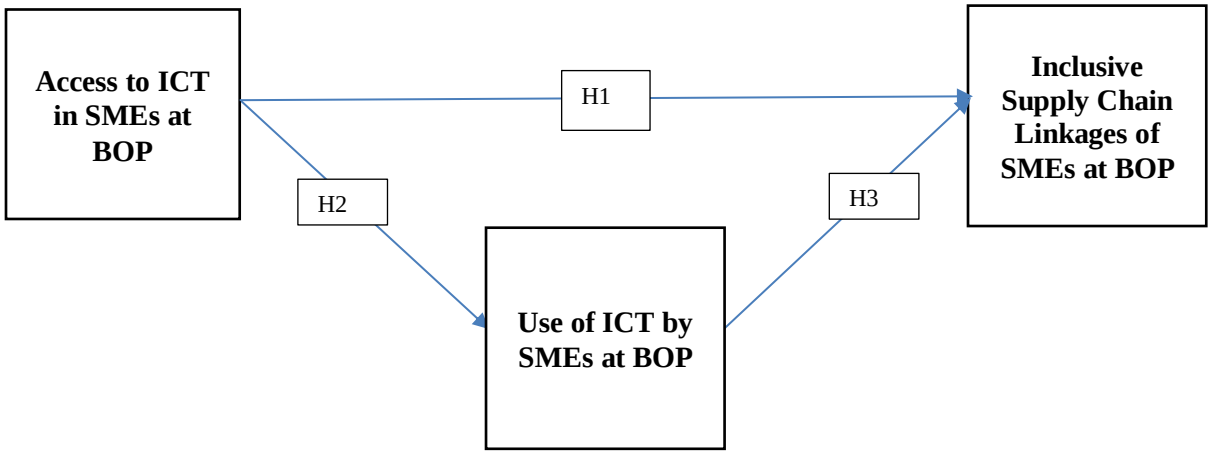
innovation are required to digitally transform BOP enterprises for customer pleasure (Zabir et al., 2008). In e-commerce, the supplier publishes all products and services with detailed specifications on a website, the prospective customer selects a product, pays online using credit cards or other remote banking service tools, and the supplier issues an electronic receipt and arranges delivery. Abraham (2012) and Ahmed et al. (2011) argued BOP companies require non-traditional customer engagement to save money. E-commerce may help. Shah Alam, Ali, and Mohd. Jani (2011) concluded that Malaysian SMEs select e-commerce for its advantages, compatibility, organization preparedness, management, and security. E-Chopal, ITC's successful ICT innovation, connected villages to Internet kiosks so farmers could sell their soybean crops to ITC and get the latest soybean prices in different mandis to plan profitable sales from high-priced mandis, removing BOP market information isolation. E-commerce shipping is more expensive in remote areas, thus BOP consumers pay more. Effective e-commerce needs bulk and optimum distribution to reduce BOP Penalty. E-commerce development needs BOP SMEs to adopt ICT and reorganise sales and marketing (Sodhi & Tang, 2016). First, industry ICT progress pressures organizations to adopt ICT-enabled innovations. Second, deteriorating internal processes lead organizations to seek technologically efficient structural restructuring. Trust, system features, and ICT product perceived ease of use and utility increase e-commerce entrepreneurial attitude and technology adoption, whereas product distinctiveness moderates it (Pipitwanichakarn & Wongtada, 2019). Spreading ICT infrastructure, particularly in poor areas, and training disadvantaged individuals digital applications will boost ICT adoption and inclusion (Fu, Ghauri, Lu, & Kabir, 2021). E-kutir, an Indian farmer-helping digital tool, uses stakeholders' theory to recommend BOP use micro entrepreneurs as models for age, community esteem, and social impact on digital goods (Sengupta, Narayanamurthy, Hota, Sarker, & Dey, 2021). Through inclusive supply chains, entrepreneurs utilize ICT to empower themselves socially and economically and link with high-end enterprises via digital shared works, enhancing income and community sustainability. ICT's BOP market sustainability value chain with stakeholder engagement and inclusive supply chain systems helps the poor (Raja Usman Khalid, Jajja, Beske-Janssen, & Neutzling, 2022). BOP SMEs using ICT reduce market separations and promote inclusive supply chains and shared innovations by remotely integrating local workers in product development and operations (M. Tarafdar et al., 2013). ICT and its applications are embraced when people see its advantages, large picture, and simplicity of use. ICT can develop digital services (2022) (Raddats, Naik, & Bigdeli). ICT fosters creativity. To succeed, e-commerce must build trust between vulnerable BOP and enterprises (Pipitwanichakarn & Wongtada, 2019). Adejumo et al. (2020) found that mobile phone-supported apps increased employment, national income KPIs, company productivity, and revenues in developing nations, enabling sustainability. ICT access and infrastructure affect micro-firm and macro-economic

performance. Access to ICT, economic performance, and sustainable socioeconomic growth reinforce this link. Aksentijević, Ježić, & Zaninović (2021) found that ICT for sustainable living at the BOP impacts human development in developing countries with moderate and low incomes.

H3*:* Use of ICT by MSMEs in Business Operations in BOP significantly affects the Inclusive Supply Chain Linkages of MSMEs in BOP.

H4: Use of ICT by SMEs in Business Operations in BOP significantly mediates the relationship between Access to ICT in SMEs Business Operating at BOP and Inclusive Supply Chain Linkages of SMEs in BOP.

Based on the above discussion, the following model is proposed.



Theoretical Model
Source: Author's Completion.

3.0 Methodology

Quantitative research approaches data validation and reliability using codal procedures, statistical tools to analyze and interpret the data, and systematic hypotheses testing to reach a conclusion. The study's research model's predicted associations were tested using a quantitative survey and pre-structured questionnaire. Member must be a paid MSME employee. The person must be 18 years old and in middle or upper management of the company. Convenience sampling is employed (Shockley et al., 2016). While collecting data, the response rate and quality stay in mind. This research employs convenience sampling.

3.1 Measures

Sorrel (2010) employs Likert scales for probability and likelihood. Prior study tools and operationalized variables (Access to ICT, Use of ICT, and Inclusive Supply Chain Linkages) were employed (Annex -1). Research gave ICT tools access (Ruben Vanderlinde & van Braak, 2010). Support and coordination for ICT supply, corporate vision and strategy on ICT promotion, and firm employee infrastructure are important. Tool for measuring ICT is essential for social networking,

information search, E-commerce, and E-marketing (Khairuddin, Ahmad, & Omar, 2021). Research informed the Inclusive Supply Chain Linkages tool (R. Khalid, U. et al., 2020). Supply chain inclusion requires supplier, reseller, and BOP business participation. According to Rummel (1970), the item-to-response ratio should be 1:4, although Schwab (1980) advises 1:10. Nearly 1:5 of research participants responded. According to Lee Anna & Watson (1995), 200 respondents should be evaluated, the surveys were sent to 500 potential participants. Of these, 471 gave input. Responses Data analysis was performed on 446 completed participants. Data collect from public (23%) and private (77%) firms in diverse fields. Male responses were 83% and female 52, 17%. Additionally, 83% of respondents were from Multan, 7% from Lahore, and 10% from other locations, mostly in sub-urban areas of both cities. 86% were permanent, 14% contractual, mostly elderly managers. 82% of participants have 5–43 years of experience.

4.0 Results

This study used Smart-PLS for data analysis. Results of the investigation follow. The PLS method assessed convergent validity. Convergent validity ensures that each measure item measures one variable. Convergent validity is determined using factor loadings, AVE, CR, and Cronbach's Alpha (Hair et al., 2010). Convergent validity of the study's items should be OK if all four standards are satisfied. In general, factor loading, AVE, CR, and Cronbach's Alpha should be more than 0.50 and 0.70, respectively. Table 1 shows "factor loadings, average variance extracted, and composite reliability".

Table 1 Measurement model.

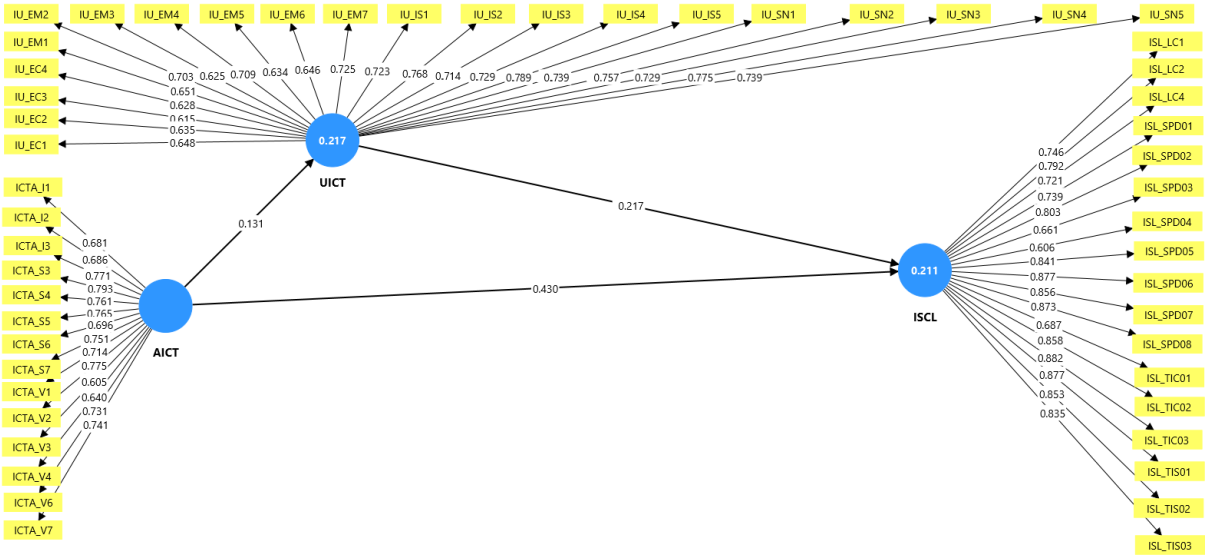
Variable	Abbreviation	Loadings	A	rho_A	Cr	AVE
Access to ICT	ICTA_S3	**0.793**	**0.819**	**0.866**	**0.885**	**0.666**
	ICTA_S4	**0.761**				
	ICTA_S5	**0.765**				
	ICTA_S6	**0.696**				
	ICTA_S7	**0.751**				
	ICTA_V1	**0.714**				
	ICTA_V2	**0.775**				
	ICTA_V3	**0.605**				
	ICTA_V4	**0.641**				
	ICTA_V5	**0.731**				
	ICTA_V6	**0.741**				
	ICTA_V7	**0.742**				
	ICTA_I1	**0.681**				
	ICTA_I2	**0.686**				
	ICTA_I3	**0.771**				
Inclusive Supply Chain	ISL_LC1	**0.746**		**0.902**	**0.925**	**0.713**
	ISL_LC2	**0.792**				
	ISL_LC4	**0.721**				
	ISL_TIC01	**0.687**				
	ISL_TIC02	**0.858**				

	ISL_TIC03	**0.882**				
	ISL_TIS01	**0.877**				
	ISL_TIS02	**0.853**				
	ISL_TIS03	**0.835**				
	ISL_SPD01	**0.739**				
	ISL_SPD02	**0.803**				
	ISL_SPD03	**0.661**				
	ISL_SPD04	**0.606**				
	ISL_SPD05	**0.841**				
	ISL_SPD06	**0.877**				
	ISL_SPD07	**0.856**				
	ISL_SPD08	**0.873**				
Use of ICT	IU_SN1	**0.739**	**0.899**	**0.902**	**0.925**	**0.713**
	IU_SN2	**0.757**				
	IU_SN3	**0.729**				
	IU_SN4	**0.775**				
	IU_SN5	**0.739**				
	IU_IS1	**0.723**				
	IU_IS2	**0.768**				
	IU_IS3	**0.714**				
	IU_IS4	**0.729**				
	IU_IS5	**0.789**				
	IU_EC1	**0.648**				
	IU_EC2	**0.635**				
	IU_EC3	**0.615**				
	IU_EC4	**0.628**				
	IU_EM1	**0.651**				
	IU_EM2	**0.703**				
	IU_EM3	**0.625**				
	IU_EM4	**0.709**				
	IU_EM5	**0.634**				
	IU_EM6	**0.646**				
	IU_EM7	**0.725**				

Average Variance Extracted (AVE), Composite Reliability (CR)

Source: Author's completion.

All factor loading values are more than 0.5, satisfying one parameter. Every variable has an average variance extracted value more than 0.5 and a composite reliability greater than 0.8. Widodo (2018) recommends average variance extracted and composite reliability values of 0.5 and 0.8. Every value meets convergent validity criteria. Figure 1 depicts the research model's factor loadings.



4.1 Discriminant-Validity

Next, test discriminant validity. How much the other variables are not represented in the total is measured. The "Fornell-Larcker Criterion" is an outdated discriminant validity test that requires a variable's correlation with itself to be greater than other variables. However, researchers are adopting a revolutionary method termed "HTMT (Hetrotrait-Monotrait Ration)". Every correlation value must be below 0.85 for this strategy. Discriminant validity is demonstrated if Table 2 values are less than 0.85.

Table 2: Heterotrait-Monotrait Ratio (HTMT)

	ICA	ICU	ISL_
ICA			
ICU	0.106		
ISL_	0.41	0.088	

Access to ICT (ICA),Use of ICT (ICU), Inclusive Supply Chain (ISL)

Source: Author's completion.

4.2 Structural Equation Modelling

After confirming convergent and discriminant validity, structural equation modelling evaluates the study's expected correlations.

Table 3 Hypotheses testing mediation results.

Hypothesis	Relationship	β	SE	t	p	Remarks
H1	AICT → ISCL	0.43	0.084	3.129	0	Supported
H2	AICT → UICT	0.131	0.051	2.032	0	Supported
H3	ICU →ISCL	0.217	0.079	8.202	0	Supported
H4	AICT→ UICT → ISCL	0.19	0.06	3.163	0	Mediation

Access to ICT (ICA),Use of ICT (ICU), Inclusive Supply Chain (ISL)

Source: Author's completion.

5.0 Findings

The findings for SEM are shown in Table 3. Table H1 indicates that there is a substantial correlation between AICT and ISL, with a value of 0.43. So, H1 supported. This validates previous study on ICT's impact on supply chain network formation and growth. ICT helps BOP create inclusive supply chain linkages that improve corporate sustainability and impoverished people's lives. Access to ICT in MSMEs is the firm's vision and strategy for creating ICT hardware infrastructure and soft ICT abilities in workers, as well as the easily available ICT equipment and infrastructure. ICT Access' major pillars—ICT hardware and networks, IT teams and coordinators, the firm's ICT vision and strategy, and employee ICT development programs—help SMEs overcome their context's intrinsic obstacles and market separations. SME revenues and profits depend on business size and ICT assets. The more ICT assets a corporation invests in, the more workers may use it, increasing earnings. SMEs acquire ICT assets for their workers and policies based on their environment (Neirotti et al., 2018). Entrepreneurs and consumers in distant BOP regions may use E-commerce to include local people in supply chains and integrate ICT into local company operations (Ahmed et al., 2011). In Pakistan and other nations, Telecom Service Providers (TELCOs) donate a tiny proportion of profits to Universal Service Funds to build telecom infrastructure in impoverished BOP regions to increase internet access.
Our study shows that ICT availability affects BOP SMEs' competitiveness and sustainability. Digital platforms help SMEs save costs, improve operations, and reach new markets. Connecting SMEs to larger companies, export markets, and global value chains may create inclusive supply chains. ICT may help BOP SMEs in Pakistan overcome information, market intelligence, and infrastructural issues. Digital platforms provide real-time price, demand, and supply data for micro and small firms to make production, pricing, and marketing decisions.The second hypothesis, that AICT and UICT are correlated, is supported by 0.131.The link between ICT and ISCL is evaluated at 0.217, supporting the third hypothesis, which claims that there is a correlation between them. The findings indicate that UICT significantly mediates the interactions between AICT and the three ISCL. A positive mediator is shown by the fact that the beta values are positive. The outcomes of the mediation are all noteworthy. Accepting this hypothesis strengthens the study's theoretical model since access to CIT can only be successful for business operations if ICT is utilized appropriately to accomplish business plans utilizing suitable ICT-based business applications, as shown in prior research. Quality information sharing builds supply chain harmony and confidence (Baihaqi & Sohal, 2013; Hong et al., 2008; Marinagi, 2015). ICT is crucial. Pakistani SMEs serving BOP residents have inadequate resources, market possibilities, and technological infrastructure. ICT can link SMEs to suppliers, customers, and other supply chain partners, providing some relief. To benefit from ICT, SMEs must use it well. Small businesses use ICT. SMEs can streamline

operations, enhance efficiency, and compete using ICT tools and platforms. Which may help SMEs join the inclusive supply chain, reach new customers, and work with larger companies to increase production and sales. SMEs' usage of ICT in company operations may mediate the relationship between BOP SMEs' ICT access and inclusive supply chain connections. SMEs need ICT to benefit and participate in the inclusive supply chain, but they must use it well. Participant demographics include food and catering (45%), general finance (24%), general manufacturing (12%), general service (12%), and leisure and entertainment (7%). This diversity shows how varied enterprises use ICT to develop and sustain BOP marketplaces. Most participants (48%) aged 26–30. Our inquiry may include many generations' perspectives. The study found a favorable association between Access to ICT and Inclusive Supply Chain Linkages, but it was stronger when Use of ICT mediated in. The theoretical approach is supported. Strategically planning for ICT-based app development and staff training is feasible for SMEs. ICT helps BOP markets build inclusive supply chain linkages, boosting economic and environmental sustainability.

6.0 Conclusion

This study found that sustainability at BOP markets reduces market voids between consumers and producers because these markets are mostly in underdeveloped and underserved areas with dispersed populations in rural and urban slums. SMEs, BOP entrepreneurs who have access to ICT, by use of ICT in their business activities, reduce these gaps by creating inclusive supply chain linkages that include local residents in disadvantaged areas. The BOP can solve local business challenges by co-designing and co-creating with local people and their indigenous technology in an inclusive value chain. Which improves living at local communities via sustainable human development.

6.1 Implications and Recommendations

Thus, BOP-based SMEs must incorporate plans in their business strategy to establish an integrated ICT infrastructure to provide management and general staff with integrated access to ICT. In addition to it, corporate plans should include a complete strategy for successful ICT usage to connect with strategic business goals for developing bespoke ICT-based applications and staff development programs linked to them. This study recommends that public policymakers roll out ICT skill development programs in parallel with the expansion of ICT networks in underserved BOP markets to fully capitalize on ICT Access by enabling micro-entrepreneurs to use ICT for business development and progress. To help individuals in rural locations access the newest products and services online and improve their quality of life, ICT awareness workshops should be held for the public. This will reduce middleman exploitation and improve sustainability.

6.2 Limitations

This research's key limitation is ignoring government and regulatory agencies' ICT infrastructure

construction in Pakistan's undeveloped BOP marketplaces. Future study should include this key element since it seems to be linked to ICT access, especially for remote people and organizations. Few Pakistani studies address this. The range of sample sectors may provide distinct challenges and opportunities that may alter our results for different organizations. Since 59% of our participants had university degrees, the results may help educated people. Access and experience with ICT vary by schooling. Our sample was 58% male and 42% female, which may favour males. We recommend making future research more inclusive and representative by considering demographic gaps and varied views.

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