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# What is ‘smart’ about smart village?

## Emerging discourses and future research directions

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### Abstract

This paper takes stock of how ‘smart’ is conceptualized in smart cities literature and how the concept is getting re-appropriated in different smart village initiatives across Europe and the Global South. Emerging discourses on smart village espouse the concept of ‘smart’ to strategically leverage ICTs to bring inclusive and sustainable rural development, however these visions are ambiguous about the nature of ICT artifacts and its interactions with rural community and people’s goals and abilities and how they can shape actions and outcomes of sustainable development. Finally, future research directions for ICT4D researchers are proposed to address the current shortcomings and to expand the knowledge and practice of smart village interventions.

Keywords: smart village, smart cities, smart, sustainable rural development, ICT4D intervention

### 1. Introduction

There has been an emergence of ‘smart village’ interventions for strategic use of ICTs for rural development across Europe [1] and in many parts of the Global South [2, 3]. Many of these interventions come as a response to appropriate and expand the concept of smart cities in a rural context with the aim to facilitate the achievement of sustainable rural development. Authors also highlight smart village as a nascent but potential research area to address the shortcomings of extant smart cities literature [4]. They argue that since smart village has a small scale and limited focus on specific village level communities than large scale smart cities, it potentially offers better and manageable empirical focus on local contextualization of problems and ICT based interventions, benefiting both researchers and practitioners.

Interest in ICTs and rural development isn’t a recent trend. Historically, rural studies authors as well as ICT4D authors have explored the potential roles of information technology for rural development [5-8]. For instance, what roles telecommunication and publicly accessible IT infrastructures like telecentres play to diversify the local rural economy and facilitate social change. Therefore, the novelty of smart village must be weighed in a historical context of previous and existing rural ICT interventions.

However, the discourses on smart village are concurrently emerging in public sector agendas, civil society initiatives, academic literature, and corporate efforts. This paper argues that it is important to identify how these multiple interpretations of smart village overlap and differ, and how this so-called new approach addresses rural issues, the idea of ‘development’ and the nature of information technology. Given that ‘smart’ has become a buzzword, uncritically importing the smart agenda from the smart cities approach and applying it to a novel area comes with its own set of drawbacks [9]. Therefore, this paper aims to critically explore how the idea of smart gets re-appropriated in rural context and how this context contributes in re-defining the discourses around smart itself.

This paper is conceptual in nature and bases its evidence on a selective review of existing smart cities and smart village literature, as well as smart village policy documents, project reports, and project websites. Taking an ICT4D (Information and Communication Technology for Development) perspective, it critically questions how the concept of ‘smart’ is shaped in the smart village discourse. An ICT4D perspective allows us to conceptualize smart village as a socio-technical phenomenon and to discuss not only its technological side but also the social processes and developmental implications [10, 11]. This complements the growing consensus in the related domain of smart cities research that emphasizes a holistic view that crosscuts dimensions of technology, society, economy, and environment [12]. On one hand, this perspective equips us to unpack the underlying assumptions about technological artifact(s) and their interactions with organizational structures, processes, and human agency [13-15]. On the other hand, it enriches our understanding of an ICT4D phenomenon by looking at the role of the context in which it is embedded and by focusing on the phenomenon’s role in bringing transformational change at societal level [16].

The paper is organized in the following way. First, it synthesizes how the conceptualization of ‘smart’ has evolved within the smart cities literature. Second, it highlights selected smart village interventions and smart based rural development literature to make sense of emerging conceptualization of smart in the smart village discourse. Finally, it proposes relevant future research directions to contribute to the practice and research of smart village.

## 2. Evolution of ‘smart’ in smart cities

A commonly agreed upon definition of smart cities is hard to find. Numerous survey articles have come up with plethora of definitions. Ismagilova et al. [17] in their literature review note that smart cities are conceptualized with a major focus on technology integrated with related themes of citizens, interaction, sustainability, and quality of life. Another review article [12] found that a techno-centric view of smart cities is promoted through the grey literature published by North American business companies, while a holistic view of smart cities in terms of human, social, economic, environmental and technological dimensions, is generated in peer-reviewed articles published by European universities.

In a now influential paper, Hollands [18] claimed that smart cities initiatives were driven by techno-deterministic values and pro-business and entrepreneurial ethos of high tech corporate companies and municipal governments. He calls for a more progressive conceptualization of smart cities that put people and human capital first and doesn’t blindly put its trust solely on technology to drive change. More recent work has followed his call and shifted towards conceptualizing smart cities by integrating the view of sustainability [19-21] and inclusiveness [22-24].

Drawing on these conceptual debates, it can be argued that visions of ‘smart’ crosscuts four broad conceptualizations: (1) smart as technological (2) smart as entrepreneurial (3) smart as sustainable (4) smart as inclusive.

**Table 1.** Multiple conceptualizations of ‘smart’ in the smart cities discourse

Concepts of ‘smart’ in smart cities	Technological system	Social system	Area of interest
Smart as technological	High focus (supply driven)	Low focus	Supply side needs to build smart systems
Smart as entrepreneurial	Low focus	High focus	Entrepreneurial development, collaborative business networking
Smart as sustainable	Low focus	High focus	Social and environmental values generated in addition to economic values
Smart as inclusive	High focus (demand driven)	High focus	Citizen participation, inclusion of marginalized groups in design, deployment, and evaluation of projects and planning

### **2.1. Smart as technological**

The dominant imagination of ‘smart’ in the smart cities discourse connects the concept primarily to the role of ICT infrastructures [25]. This vision of smart largely comes from researchers working in the domains of computer science and engineering, as well as corporate companies that develop, produce, and help municipal governments implement smart technologies and datafication processes like Internet of Things (IoT), cloud computing and Big Data [12, 17]. For instance, a highly cited paper by Zanella et al. [26] on IoT sees the realization of smart city concept through exploitation of advanced technologies for management and optimization of public services and for increasing the transparency and evidence based strategizing of cities.

Angelidou [27] notes that such visions promote a smart city product economy where ICT infrastructures are pushed in a market of smart city products and solutions to pull the demand of cities seeking to address urban problems. For Zanella et al. [26], deployment of IoT system is at the core of smart city initiatives and critical factors for successful deployment are twofold: the technological complexities of integrating and standardizing heterogenous systems to support a dynamic urban IoT system, and a sustainable market mechanism that allows steady investment and commercial demand of smart technological systems. Therefore, ‘smart as technological’ discourse is of top-down nature with development and marketing of technological systems taking primary attention whereas citizen centric and demand side social processes getting overlooked [18, 24].

### **2.2. Smart as entrepreneurial**

Entrepreneurial spirit is a recurrent idea in smart cities initiatives that is also closely interlinked with technocentric vision of smart cities [18]. Designated smart cities aim at stimulating economic growth and job opportunities by providing seedbed conditions not only for local enterprises and entrepreneurs to grow but also for attracting foreign investors and expanding non-local markets [28]. Collaboration and innovation are two interconnected themes when discussing about the entrepreneurial spirit of smart cities. Barcelona, one of the pioneer smart cities, puts digital innovation at the fore of its Barcelona Digital City Plan [29]. It claims to support entrepreneurs and businesses by providing them with collaborative networking opportunities through digital hubs and incubators, as well as funding opportunities for innovations with social impacts. Similarly, business and management scholars have investigated the smart city phenomenon as an opportunity to explore the role of smart cities in fostering entrepreneurship [30] and to develop framework for collaborative entrepreneurial ecosystems [31].

Authors note that entrepreneurialism and techno-centrism are dual agendas of a corporate model of smart city promoted by city governments and corporate tech suppliers [9, 24]. Much like the technological conceptualization of smart cities, the entrepreneurial view favours a supply-driven focus and a dominant market logic to boost local economy. Though the entrepreneurial discourse might seem to make up for the shortcomings of the technology discourse by putting attention back to social systems and processes of collaboration and networks, we need to understand that underlying these social systems are strong neo-liberal pursuits of profitmaking and economic growth rather than democratic and pro-public values [32].

### **2.3. Smart as sustainable**

Recent scholarship has tried to question the holistic and ecological dimensions of smart cities, thereby trying to move away from market-driven urban growth to people-centred and urban ecology-centred concerns. They ask how is the smart city agenda improving the citizen’s quality of life and making urban systems sustainable for the future[19]? The integrated concept of ‘smart sustainable city’ is one such example. Höjer and Wangel [20] define smart sustainable city as “a city that meets the needs of its present inhabitants without compromising the ability for other people or future generations to meet their needs, and thus, does not exceed local or planetary environmental limitations, and where this is supported by ICT” (p. 347). This reorientation also emerges from critical studies that find problems with non-ideological, pragmatic, and commonsensical views [33] when imagining smart as “technological” and/or “entrepreneurial”. Authors emphasize the political and non-neutral impacts of neo-liberal corporate management of cities and the dangers of overlooking varying levels of contextual factors across regions when drawing up a one-size-fits-all framework of smart city.

Limited but growing literature on smart cities and sustainable development suggests that sustainability discourse within smart cities should espouse models, frameworks, and indicators that explore and measure better

sustainability targets and assessments of impacts, and not just economic indicators and models of growth [19, 21, 34].

#### **2.4. Smart as inclusive**

Closely related to the sustainable development agenda is the growing scholarship that puts social justice and citizen centric agendas at the forefront of smart cities research. They are interested in asking questions like how smart cities will benefit marginal communities? [22], how initiatives may increase urban inequality? [23] and how to improve the role of marginalized groups in conceiving, designing, implementing and evaluating smart cities projects? [35]. Here marginalized groups are any heterogeneous groups of people like migrant workers, slum dwellers, ageing population, and people with disabilities.

Building their argument from a European context, Engelbert et al. [36] caution that ‘inclusiveness’ may be prevalent in the smart city rhetoric, but the underlying logics benefit technologists and experts, de-socialize urban problems through business frames and hold an unproblematic view of participation that in return leads to exclusion of citizen participation and perspectives. It is pertinent to understand that normatively, inclusiveness discourse demands integration of bottom-up approaches to ensure citizens not only the right to use the technology as users but also the right to shape the city with technological solutions for sustainable development as co-designers [24], thus taking account of both technological and social system. Therefore, it can be argued that ‘smart as inclusive’ discourse puts high focus on technological systems, but this focus is normatively different from the high technological focus in ‘smart as technological’ discourse. While ‘smart as technological’ discourse imagines businesses and experts driving and designing technological systems without any input from citizens, ‘smart as inclusive’ imagines technological systems to emerge from democratic dialogues and deliberations between citizens and technology producers.

In sum, the concept of ‘smart’ has dynamically evolved in smart cities literature. From the knowledge generated in the last decade itself we can trace the shifting conceptualization of smart cities: from techno-centric values to holistic values of sustainable and inclusive urban development. However, it is challenging to critically assess the discourses around smart village, since the knowledge around the concept is still emerging and not clearly understood. The next section highlights this emerging field of research and practice.

### **3. Emerging discourses of ‘smart’ in smart village**

Smart cities literature highlights municipal government and corporate sector as the two main dominant drivers of the smart city initiatives [25, 33], while civil society and academia have recently become important drivers with the need to integrate sustainability and inclusiveness in the conceptualization of smart cities [24]. For critically assessing how ‘smart’ is operationalized in smart village, this paper therefore sought to present how these different drivers like governments, civil society, private sector, and academic literature were contributing to the ongoing discourses.

This paper takes a strategy to generate a variety of narratives from policy documents, program and project reports, and academic articles to assess their views on technology, people, processes, and rural development. This resulted in identification of five major smart village interventions at a global level. These include two policy guided public sector interventions, two civil society led interventions, and one corporate sector supported intervention. In addition to these practice-based discourse, the paper also briefly presents theoretical discourse of the concept of smart village in the extant academic literature.

#### **3.1. Public Sector**

European Union (EU) is one of the few governing bodies that has taken up ‘smart village’ as a wide scale policy intervention. It defines smart villages as “communities in rural areas that use innovative solutions to improve their resilience, building on local strengths and opportunities” [37]. EU imagines ICTs to play an important but not a defining role in creating innovative solutions. Similarly, it considers smart village as a non-radical strategy that builds upon existing interventions, strategic governance mechanisms and a flexible funding modality that welcomes private and public partnerships. Multiple smart village projects are running in many EU member countries [1]. For instance, innovation in service delivery through community centres and business hubs and mobile clinics, social innovation for rural development through rural hackathon events, crowdsourcing, and co-working space. Some smart village projects are also offering flexible workspace for professionals to telework from villages and make use of local resources. In all this, the overarching purpose is to reconfigure local resources and knowledge primarily with social entrepreneurship and ICTs.

Similarly, International Telecommunication Union (ITU), a United Nations specialized agency for ICTs, and the government of Niger have piloted a multi-million dollars smart village project in some villages in Niger with a long-term aim to expand the project to cover all the villages of the country. The project draws upon Niger 2.0, a national level policy to achieve sustainable development goals (SDGs) by exploiting the opportunities of digital economy [38]. As such, digital technologies play a prominent role in ITU and Niger's definition of smart village. They define smart village as "a community in rural areas that leverages digital connectivity, solutions and resources for its own development and transformation towards the SDGs" [2]. They claim smart village to be a radical departure from previous top-down approaches, focusing on networked and integrated governance, and multi-stakeholder alliances that work to achieve holistic goals, while sharing and reusing resources. The project is also very explicit about ICT driven sustainable development by adopting the nine guiding principles of digital development [39]. These principles advocate user-centric, scalable, and sustainable design, data privacy, local contextualization, data driven decision-making and open standards.

While EU's smart village policy ranges across rural areas of Europe and covers variety of projects in member countries, ITU and Niger's smart village strategy is a developing country specific project that if successful will be spread across Africa and Global South. They both differ in several other ways too. EU's policy intervention is incremental in the sense that it wants its already existing rural development policies to work as building blocks for their smart village actions. In other words, smart village projects do not begin from scratch and work at new set of problems, but they bring about innovative "ways" and "means" to support ongoing processes of rural development programs [40]. Thus, role of digital technologies is secondary, as in deriving from rural development policies, and more broadly defined as "not a pre-condition to become smart village" and "means to innovative solutions and not solutions" [37]. As such, EU's imagination of smart is closer to 'smart as entrepreneurial' iteration where technological system's interaction with social systems is reduced to a tool view [13], while the focus is more on social interactions and processes to improve market and entrepreneurial mechanisms for villages.

On the other hand, ITU and Niger's version of smart village is radical in its ambition and clear on the imperative role of ICTs in achieving sustainable development. As mentioned earlier, smart village is deemed as a complete restructuring of Niger's governance structure to bring a "whole-of-government-approach" that reforms the old governance structure of fragmented policy interventions to move away from narrowly defined goals that lead to duplication of programs and funding [2]. Unlike EU, smart village interventions don't derive from existing policy governance structure, but these interventions aim at reengineering a new "whole-of-government" policy structure with implications to political will and leadership. Furthermore, if EU's intervention can be argued to be innovation-based, ITU and Niger's intervention is more problem-based as it is driven by the "ends" of achieving sustainable development goals [40]. 'Smart as sustainable' and 'smart as inclusive' agendas through combination of ICTs and structural change to meet SDGs drive the vision of smart in ITU and Niger's smart village.

### **3.2. Civil Society**

Numerous smart village projects are spearheaded through civil society initiatives. Among these, two initiatives will be highlighted here. First is the Smart Village Initiatives, funded by Cambridge Malaysian Education and Development Trust and Templeton World Charity Foundation. Second is the Smart Village IEEE, funded by the Institute of Electrical and Electronics Engineers (IEEE).

Both initiatives share similarities in their focus for improving access to off-grid, sustainable energy services to rural communities of Global South and actualizing overall developmental benefits from energy access. They claim sustainable energy access to be a prerequisite to connectivity possibilities offered by ICTs. They also share notable differences. Smart Village Initiatives has so far mainly occupied itself with developing a smart village framework to understand needs and problems of communities through interactions with multiple stakeholders in different developing regions in the form of workshops and capacity building events [3]. The smart village framework advocates certain policy recommendations for governments and donors to create supportive conditions for sustainable technological solutions with access to finance, gender inclusion, capacity building and integrated collaboration as main policy imperatives.

Meanwhile, since 2010 Smart Village IEEE supports and collaborates with community level entrepreneurs and activists. IEEE equips them with technologies to generate sustainable energy, for instance solar panels, chargers, and batteries [41]. IEEE follows an entrepreneurship model of sustainability whereby it looks at enhancing market mechanisms to create user demand for energy. For that it conducts activities and trainings for local entrepreneurs so they can create innovative local services that make diverse use of clean energy, thus increasing its demand and ensuring financial stability to maintain and upgrade off-grid energy services [42].

The imagination of smart as sustainable, inclusive, and entrepreneurial is evident in the two civil society-led smart village initiatives. Even though they don't explicitly discuss about digital technologies, they see technology through a holistic approach as they are simply not looking at villages adopting sustainable energy services but how communities take ownership of these energy services, how they activate their agency to create new services from energy access and how their action benefits the community at large.

### **3.3. Private Sector**

It was highlighted earlier that private and corporate sector have had prominent stake in promoting and defining the smart city agenda. But in the case of smart village, corporate sector's presence is still very negligible. Nokia, a multinational telecommunications company, is one rare example. The company has embraced smart village, albeit in the capacity of corporate social responsibility. Its smart village project in India, named Smartpur, claims, "The Smartpur model has been theorized in a way that redefines the existing ideas of smart villages, by not only deploying digital infrastructures but also integrating the use of the infrastructure into their daily lives thereby promoting socio-economic growth" [43]. The project is still in early phase and spans across seven Indian states and ten districts.

The central idea of Smartpur is to build a village ecosystem connecting a hub village to nodal villages [44]. A hub village is where primary services are provided by rural entrepreneurs and nodal villages are where these services will be redistributed through local rural entrepreneurs of these nodal villages. Smartpur's entrepreneurship model is like Smart Village IEEE's model with the underlying assumption that local entrepreneurs will help create locally appropriate services and help sustain services, while donors will facilitate conditions for entrepreneurial growth. As such, Smartpur too strongly links entrepreneurship and sustainable development in its conception of 'smart'. Nevertheless, it should be pointed out, Smartpur's position in broader Indian policy domains remains unclear. Given its status as a corporate social responsibility initiative, it would be just wishful thinking to expect Smartpur to engage in dialogues to reform or inform policy actors.

### **3.4. Academia**

Only limited academic deliberation about smart village has taken place so far. Exceptions include two edited volumes [45, 46] that have tried to discuss the area at length. Within and outside these volumes, we find variety of academic lens exploring the smart village phenomenon. Some investigate the more computational side of smart technologies in rural contexts. Like studies on precision farming or smart farming with focus on using IoT and Big Data to improve agricultural production and management [47]. Then there are scholars who argue to broaden the scope of smart technologies to non-agricultural domains like healthcare, transportation, and waste management [48]. Meanwhile researchers from rural planning and development, and geography lead the academic discussion on smart village [4, 45] investigating its implications for sustainable development. IS and ICT4D have much to offer in the theoretical and empirical development of smart village but so far IS and ICT4D researchers have given little explicit attention to the phenomenon. This is same for smart cities as well. In their survey of smart cities research in the IS domain, Ismagilova et al. [17] note smart cities research is still at a nascent stage in IS. For instance, they found 43 IS journals publishing articles on smart cities but more than half of the journals had published not more than one article, while the remaining had published not more than three articles.



**Table 2.** Emerging discourses of ‘smart’ in smart village across multiple levels

Sector	Example(s)	Smart as	Area of interest
Public	<i>European Union’s Smart Village</i>	‘entrepreneurial’	Rural entrepreneurship, innovative services, collaborative partnerships,
	<i>ITU and Niger’s Smart Village</i>	‘sustainable’ and ‘inclusive’	Digital development for sustainable development, integrated and networked governance
Civil Society	<i>IEEE Smart Village</i>	‘entrepreneurial’, ‘sustainable’ and ‘inclusive’	Accessing sustainable and affordable energy and generating socio-economic returns from energy access
	<i>Smart Village Initiative</i>		
Private	<i>Nokia’s Smartpur</i>	‘entrepreneurial’ and ‘sustainable’	Rural entrepreneurship based and digital technology-based innovation of rural services
Academia	<i>Visvizi et al. [46] and Patnaik et al. [45]</i>	‘technological’, ‘entrepreneurial’, ‘sustainable’ and ‘inclusive’	IoT based smart systems in agriculture, rural entrepreneurship, links with sustainable rural development

#### 4. Implications and Future Research Directions

Visions of smart village across sectors share some commonalities, but also significant differences. Sustainability and inclusiveness remain two intersecting agendas. Similarly, role of ICTs, in general, is to facilitate broader sustainable development of villages and rural areas. But the link between ICTs, sustainable development, and villages remains unclear and contested. Moreover, relevant differences exist between smart village initiatives in terms of the strategic role of ICTs. As mentioned earlier, most smart village policies and projects view technologies as “tools” or “means to an end” while setting greater interest on social processes like building entrepreneurial capacity. They narrow smart village projects as opportunities to digitalize processes and project activities within existing governance structure. Therefore, de-centering digital technologies, in other words nominalizing their role.

To understand why digital technologies are de-centered in rural development thinking, we need to take a turn towards rural development scholars’ view of technology driven development in general. Contemporary rural development thinking is highly critical of the modernist model of rural development. In the modernist view, rural development was equated to industrializing agriculture [49]. Farmers were expected to intensify their agricultural production through highly specialized seeds, chemical fertilizers, and irrigation facilities. Technological determinism afflicted the planning strategies as hopes for rural prosperity were hooked on genetically modified agricultural inputs and big irrigation projects that didn’t pan out to bring expected economic benefits but worsened the environmental impact of technology driven development projects [50].

The new rural development paradigm seeks to depart from the monopoly of agriculture, individual entrepreneurial capacity, and economies of scale. The shift is towards rural livelihood strategies that combine farm activities with non-farm activities, focus on collective actions that emerge from networking and partnership and widen the economies of scope [51]. In sum, the new rural development rectifies techno-determinism inherent in the modernist view, but it does so through social determinism. Technology in rural development gets refashioned into a monolithic, homogenous black box [52]. In other words, technology is relegated as a backdrop in much of the rural development literature.

But when we reduce technologies to neutral artifacts or relegate them as nominal entity of interest, we overlook the political nature of technologies [53], as in who designs technologies and what values and purpose shape them. Also, considering technologies as opportunities to automate, doesn’t fully explore the opportunities to redesign processes and strategies [54]. It is thus important to understand the dynamic relationships between technologies and multiple actors, and how they shape and not determine each other. This socio-technical approach sits in the middle, neither techno-determinist nor socio-determinist, and is suitable to explore the phenomenon of smart

village, where the meeting point is the notion of using ICTs for sustainable development of rural communities and villages. Future smart village research has opportunities to explore issues that highlight how multiple stakeholders interact with ICT interventions and how do these interactions enhance or can be enhanced to achieve sustainable rural development goals.

This is where the fields of information systems (IS) and particularly ICT4D has relative potential to contribute to the theoretical development of the concept of ‘smart village’ as a phenomenon mutually shaped by technological artifacts and social processes and having developmental implications. We do not claim that an ICT4D approach is the only and the right way to make theoretical contributions on smart village. We acknowledge the prevalence of socio-determinist (studies that only theorize social processes and development implications of interventions) trends and techno-determinist (studies that are only interested in theorizing the design and adoption of ICT artefacts) trends within ICT4D research itself [10, 11]. However, we argue that an ICT4D framework offers smart village researchers a socio-technical-developmental orientation and direction. Smart village scholars can draw from a rich body ICT4D literature that is focused exists at the intersection of rural development and ICTs. Secondly, the theoretical implications that emerge from such smart village research can be fed back for further development and refinement of the holistic ICT4D framework. Therefore, investigating the socio-technical phenomenon of smart village not only uses an ICT4D framework but also contributes to the theoretical development of an ICT4D approach that take account of all three elements of ICTs, social processes, and developmental outcomes.

This article proposes three future research directions for ICT4D researchers and smart village researchers to broaden scientific knowledge and practice of smart village.

#### **4.1. Theorizing smart village as a rural ICT4D phenomenon**

For long, ICT4D researchers have been interested in generating knowledge about rural and community driven ICT interventions. Investigating smart village interventions presents two opportunities for ICT4D researchers in this area. Firstly, relevant literature on rural ICT4D interventions, for example research on telecentres and digital transformation of rural businesses, has significantly theorized lessons from past failures of rural ICT4D projects. This knowledge can be used to critically appraise the promise and ‘newness’ of existing smart village interventions and redress the past flaws in future smart village interventions. Secondly, as smart village espouses values of inclusive and sustainable development, ICT4D researchers can theoretically contribute new knowledge about the interrelationship of ICTs and sustainable rural development.

As suggested earlier, ICT4D researchers need to bridge the divide between techno-deterministic visions of ‘smart’ and the underlying social constructivism of many rural and ICT4D empirical scholarship that fails to engage with the material agency of IT artifacts. Therefore, future theoretical contribution on smart village needs to better illustrate how materiality of IT artifacts, goals and abilities of rural people and community, and contextual conversion factors shape but do not determine future actions, practices, and outcomes of sustainable development.

#### **4.2. Conducting interdisciplinary and modest scale field-based studies**

Kitchin [33] argues to move the academic debate around smart cities beyond analysis of government and corporate documents, and to undertake fieldwork in cities and interview stakeholders to reveal underlying power dynamics, multi-level effects, costs, and benefits of initiatives. Similarly, he also urges more cross disciplinary collaborations between social science researchers and technical researchers to produce critical scholarship within technology driven initiatives.

These points are relevant to research in smart village as well. It is time for knowledge around smart village to come from empirical and field-based evidence and not from anecdotal and synoptic evidence reported in grey literature published by governments, donors, and NGOs. Likewise, many authors have been arguing on behalf of more modest and small size smart initiatives than large scale technological solutions [24]. Smart village with its focus on specific rural and marginalized community has scope for researchers to conduct such delimited and manageable empirical study that will also benefit from rich local contextualization [4].

#### **4.3. Adopting action research (AR) methodology for constructive knowledge**

Studies on rural ICT4D interventions, but ICT4D interventions in general, take an interpretive stance to better understand and evaluate already established projects despite several recent calls to diversify the discipline with

more action and intervention driven methods [11, 55]. Based on his survey of ICT4D researchers, Harris [56] claims that though ICT4D researchers express their desire to communicate and share their research with policymakers, practitioners, and the general public, very rarely ICT4D researchers get involved in engaged scholarship for collaborative action planning and problem solving. This finding contradicts with the most commonly understood knowledge within ICT4D that it is imperative to collaborate and partner with local stakeholders for the success and sustainability of ICT4D interventions [57].

Therefore, adopting an action research (AR) approach in studying and developing smart village, future studies should address the gap within ICT4D research on collaborative partnerships between researchers and local practitioners to build ICT4D interventions. For instance, within an AR framework researchers and practitioners can engage in dialogic communication where researchers bring in their theoretical understanding of smart village based on academic literature whereas local practitioners bring in their understanding of local contexts, knowledge, and lived experiences to define problems and design actions for change [58-60]. AR potentially enables researchers to generate and make relevant the scientific knowledge about how to support local communities to strategically leverage ICTs for sustainable development goals.

## 5. Conclusion

In this paper, we discussed how the framing of ‘smart’ in the smart cities literature has evolved from a techno-deterministic view (smart as *technological*) to that of a holistic view that takes into consideration the goals of social justice and sustainable development of urban settings. As we turned to the discussion of smart village, we found out that the emerging discourses tied the concept of ‘smart’ to *sustainable* and *inclusive*. However, adopting an information systems perspective to assume smart village as an ICT4D phenomenon, it was revealed smart village initiatives avoid techno-deterministic visions by putting more emphasis on social processes. They nonetheless overlook the ways technological system interact with social system and how they are co-shaping each other. Therefore, this paper urges future smart village researchers to take a holistic theoretical lens to conceptualize smart village as a rural ICT4D phenomenon, while engaging in more collaborative, field based empirical studies with local practitioners that are not only limited to understanding the problems of smart village but are interested in generating constructive and problem-solving actions.

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