Making Indian Cities Smart: Framing Incongruencies and Reconciliation

Completed Research Paper

# Introduction

Many governments and city administrations around the world are increasing investments in smart city initiatives in the hope of transforming their congested urban regions. While the investments in such initiatives across the world is nearing USD 100 billion (IDC 2019), much remains to be done to make our cities liveable, sustainable and inclusive. Apart from developed economies such as UK, Denmark, Canada, Japan and others, which are using the smart city bandwagon to restructure their cities, many developing countries such as India, China, Brazil, Rwanda are not far behind (Eden 2018). The Smart Cities (SC) Mission in India, launched in June 2015, provides policy directions and funding to municipal governments for executing urban infrastructure projects, particularly those that apply advanced planning techniques and information technology (IT) to urban management. One hundred cities in India were nominated by the different states for funding under the SC mission of which 20, 13, 27, 30 and 9 cities were selected under five rounds of applications respectively (GoI 2016) over a twenty-four-month period between 2016 and 2018. Since then, cities have received funding, initiated projects, executed them and implemented associated information technology application environments. The policy is unique because it is one of very few instances globally where a government, at the central level, has taken it upon itself to shepherd local governments through the process of becoming “smart”, a model whose consequences are conditional upon the integrative capabilities of the implementing agency (Praharaj et al. 2018).

At heart, IT has been pivotal to the concept of “smartness” (Hollands 2008; Khan et al. 2018), world over and India has been no exception. The SC mission states as its purpose “to drive economic growth and improve the quality of life of people by enabling local area development and harnessing *technology*, especially *technology* that leads to Smart outcomes”, emphasizing the expectation of extensive technology enablement in both area-based development (ABD) and pan-city solutions (see Appendix 1 for description). However, unlike some other country contexts where SC initiatives have progressed; significant economic, educational and digital divides prevail in the Indian context (Khan et al. 2018) thus drawing critical eyes to a technology-driven urban regeneration initiative. It is precisely this very dichotomy that renders the SC mission in India an interesting canvas to examine diversity of perspectives as both, an urban redesign and re-development exercise (Hoelscher 2016) as well as, a large scale inter-organizational IT-enabled transformation that gives rise to many interesting, yet answered, questions (Shaw 2018).

Large scale inter-organizational information systems such as the SC projects often give rise to participation and adoption related challenges mainly due to the multiplicity of stakeholders and their diverse agendas (Boonstra and de Vries 2008; Pouloudi and Whitley 1997). Developing a deeper understanding of people’s sense-making of technology and its associated consequences in such large-scale IT-enabled change (Davidson 2006) such as at the urban city-level, is both necessary and useful given the increasing IT-enabled interactions between cities and residents through demand-pull and technology-push approaches (Kummitha 2018). Understanding the divergence in stakeholders’ perspectives; and the process of sense-making leading to reconciliation of divergent perspectives would also allow us to identify means and ways of improving outcomes at the inter-organizational level. In this context, we view stakeholders broadly, as people, groups or institutions who are likely to affect or be affected by the phenomenon. In identifying stakeholders, we sought to apply, broadly, the principles suggested by Pouloudi and Whitley (1997) taking cognizance of context, time frames, inter-relationships, and political issues. Identifying the stakeholders involved in SC initiatives and exploring their perspectives, albeit complicated, is essential to help understand the interactions, negotiations and process of mutual adaptation that further the project.

We therefore ask

*What are the different stakeholder perspectives in the context of smart cities project? and*

*How are the different stakeholder perspectives reconciled?*

To enable us to appreciate the nuances in the different perspectives, we draw upon the technological frames of reference (TFR) theory (Orlikowski and Gash 1994) and its extensions (Young et al. 2016) to understand the inconsistencies and incongruencies in the various stakeholder perspectives and their reconciliation.

The reminder of the paper is structured as follows. We begin with an overview of the theoretical background drawing from literature on SC and the technological frames of reference theory. We then describe our methodological choice, the context and our data sources. The findings from our analysis are presented as three dominant incongruencies in stakeholder perspectives. A discussion on the reconciliation mechanisms identified ensues. We conclude the paper, re-positioning our findings in the context of the literature on smart cities and TFR theory and discuss contributions and limitations of the current study.

# Theoretical Background

We briefly summarize the three streams of academic research that inform our current study – SC as IT-based initiatives, SC in India and the theoretical lens – technological frames of reference that we adapt in the current research. While there are contested meanings and ambiguities in the use of the term "smart cities" and its various forms (Bibri and Krogstie 2017), for this study, a practice-oriented definition of a smart city as a “*citizen-centric technology-enabled initiative to design and redevelop urban infrastructure, spaces and service delivery with the objective of making cities liveable, sustainable and inclusive*” seems more apt, given that this study is situated in the context of a developing country.

## Smart Cities as IT-based Urban initiatives

A variety of interpretations have been assigned to "smart" such as digital and intelligent city that incorporates sustainability and liveability (Chourabi et al. 2012), technology enabled (Harrison et al. 2010), forward-looking (Giffinger et al. 2007), resource efficient (Hoon et al. 2014) and assemblage of human and non-human actors (de Waal and Dignum 2017). Non-ICT based characterizations of “smart” in the context of SC have also been provided such as having infrastructure and services that serve local needs with intelligence (Anthopoulos 2017). The nature of urban administration is changing to one that collaborates with other departments and with communities in an attempt to “become more transparent and accountable, manage resources more effectively, and to give citizens access to information about decisions that affect their lives” (Nam and Pardo 2011). Gil-Garcia et al. (2015) combine practical tools with academic literature to create a comprehensive conceptualization of a smart city where the emphasis is on urban administrative elements, societal considerations and physical environment of the city while keeping the technology elements as the integrative layer. However, such elaborated conceptualizations of SC that includes the people, community and governance aspects have occupied far lesser space in the dominant discourse.

The two paths, i.e. the ICT-driven, technology-push approach to the concept of SC (Harrison et al. 2010) and a people-oriented, human-driven method to it seem to co-exist in academic literature (Kummitha 2018; Perez-Martinez et al. 2013). The need to go beyond technology perspective can hardly be emphasized more given the increasing possibilities that technology itself offers for a more socially-grounded, citizen-centric perspective. Webster & Leleux (2018) highlight that there is a disconnect in the discourse between the potential of ICTs to bring about transformation and the reality in public service environments especially since administrative and business-like solutions are easier to achieve than civic engagement, participative, co-production and co-creation of public services. The global discourse on SC thus leaves much to be desired in social, cultural and environmental aspects.

## Smart Cities in India

In the Indian context, the academic literature on SC has thus far focused on identifying key issues and challenges while also calling for a deeper inquiry into the design, implementation and governance of the policy (Khan et al. 2018). The idea of SC in India took formal shape when Ministry of Housing and Urban Affairs (MoHUA) announced an all-India cities challenge to participate and win funding for re-design, re-development and re-densify urban spaces (GoI 2016). Details of the challenge are presented in Appendix 1.

As the policy and its implementation evolved, two schools of thought have dominated the SC academic discourse in the Indian context - a populistic, aspirational narrative, ‘promotional bombast’ (as Harris 2015 terms it) that projects the mission as aiming to transform the currently ‘dysfunctional’ state of urban management by adopting technological solutions (Kumar et al., forthcoming) and another which cautions the policy makers against the excessive corporatization which can turn them into walled cities ‘dividing its elite citizens from the rest of the population’ (Khosla 2018). Dysfunctionalities in Indian cities, on the one side, have been seen as resulting from the lack of sufficient industrialization and therefore excessive dependence on the informal sector (Ramachandran 2014) while on the other, are attributed to the “take-off and industrialize” meta growth models which mimic the linear model of western development (Khosla, 2018) or simply as manifestations of recurring infrastructural breakdowns due to poor tendering processes and lack of quality control mechanisms in urban administration (Burte 2014).

Thematically, the academic research on SC in India has analyzed barriers and challenges to implementing smart city initiatives; contextualized technological possibilities and embarked upon policy-level critical analyses such as those on the overall SC mission, issues of citizen participation and the hollowing of local governance. Rana et. al. (2018)’s discussion of key barriers of SC from a review of existing literature and views of experts can be categorized under the first theme, where they find that governance, is a key concern in developing a SC network. As an example of studies of the second category, Kummitha and Crutzen (2019)’s qualitative enquiry revealed that normative institutions played a constraining role on citizen-led initiatives although regulatory institutions supported them. On the issue of citizen participation in smart city initiatives, academic literature has been fairly critical and emphasized the need to go beyond the obvious means of achieving participation. Consultation in the smart city mission of Dholera, a smart city project in the state of Gujarat, for instance, has been studied as state-mediated ‘deliberative democratic’ encounters (Datta 2015). Concerns arising from corporate envisioning of SC quite evident from the plethora of technological implementations by vendors seem to result in cities speaking the “language of corporate firms” (Datta 2015; Khan et al. 2018; Kummitha 2018).

## Technological Frames of Reference

Framing theory considers how groups of people construct, articulate and share meanings concerning the nature of so-called ‘reality’. A frame, or set of meanings, is transmitted (or activated) when it resonates, or gains salience, with the ways in which a particular group of people understand the world (Wiesman 2011). Orlikowski and Gash’s (1994) technological frames of reference (TFR) theory has been a seminal theory of framing (Davidson and Pai 2004) in IS literature. As an accepted approach for examining the assumptions and knowledge about technology that people have, it has been used for understanding how individuals and groups differ in their understanding of technology and the implications of such divergences. TFR is “the core set of assumptions, expectations, and knowledge of technology collectively held by a group or community” (Orlikowski and Gash, 1994 p. 199). TFR not only concerns how people perceive technology, but also how they understand “the specific conditions, applications and consequences of that technology in particular contexts” (p.178). Orlikowski and Gash also identified three frame domains of TFR: 1) the nature of technology (people’s images of the technology and their understandings of its capabilities and functionality), 2) technology strategy (people’s views of why their organization acquired and implemented a technology), and 3) technology in use (people’s understanding of how their organization will use a technology day to day and the conditions or consequences associated with its use) (p. 183-184). Although these three technological frame domains are seen as being widely applicable, they have been supplemented by additional frame domains; such as the IT capabilities, business value of IT, and IT-enabled work practices (Davidson 2002); technology implementation and contextual insights (Young, et al., 2016).

Different groups of stakeholders may share TFRs or contest them. In the latter case, this may lead to political contests between frame meanings (Young et al., 2016) and in the former, develop congruent frames which become the norm through a process of self-reinforcement (Mazmanian 2013). Young et al. (2016) argue that contestation of frames can be both within a group of stakeholders (inconsistencies) and across groups (incongruencies), the latter being more common in inter-organizational information systems where stakeholders are likely to be a broader range of people and organizations interested, affected or in a position to influence the information systems development and use (Pouloudi and Whitley 1997). Such incongruencies in frames are likely to manifest in patterns of divergent enactments (Davidson and Pai 2004), reflecting resistance and skepticism, resulting in poor appropriation of information technology. Stabilization and consensual closure of incongruent frames are often difficult to achieve, especially when diverse stakeholder groups are involved (Mcloughlin et al. 2000) since they are more likely to bracket cues based on their varied professional and organizational identities (Elbanna and Linderoth 2015). However, ‘institutional entrepreneurs’ or ‘configurational intrepreneurs’ act as change interventionists in challenging existing belief systems (Elbanna and Linderoth 2015; Mcloughlin et al. 2000) and aid reconciliation of incongruent frames through a process of organizing vision (Davidson and Pai 2004); boundary spanning (Cranefield and Pries-heje 2019) and perspective making (Boland and Tenkasi 1995).

# Methodology

Our choice of research methodology is shaped by the rationale underlying our research questions. One, stakeholders of a particular technology-led initiative are specific to a context and their perceptions are often intensely embedded in the context in which they function. Second, in a smart city initiative, often a collection of integrated, threaded urban development-focused technology-enabled projects that are designed for a unique space, the boundaries between the technology-enabled phenomenon and the socio-cultural context are explicit. Third, an examination of the perspectives of diverse stakeholders and the mechanisms used to reconcile the incongruences if any, should be able to capture the narrative richness in their interactions. This research study therefore demanded in-depth investigation of a contemporary phenomenon within its rich real-life context. This need is best fulfilled by an interpretative approach (Myers 2017) which aims to develop an understanding of the context and the process by which the IT-enabled initiative intensely affects and is in turn influenced by the context (Walsham 1995).

***Nov 2016***

Bbsr in top 20 World SC Cities Awards

***June 2015:*** Smart Cities Guidelines issued

***Jan 2016***

Government announces Round 1; Bbsr ranks No. 1

***Aug 2016***

Bhubaneswarone Portal launched

***Jan 2018***

CRUT formed

***Oct 2016***

Contracts for PGMC awarded to IBI

***March 2018***

Adaptive Traffic Signal Control Solution at 50 junctions

***Sept 2018***

PBS Vendor backs out; New Tender for PBS Released

***July 2015:***

Deadline for nominations from the state governments

***April 1, 2016***

BSCL commences business as SPV

***Sept 2016***

Government announces Round 2 SCs

***April 2017***

Bbsr wins Pierre L'Enfant planning award from American Planning Association

***July 2018***

ICOMC Inaugurated

***July 2018***

Heavy rains flood Bbsr city

***Mar 2017***

Ranchi pulls out of Asian Athletics; Bbsr chosen; 90 days to prepare

*\* Timeline not to scale*

*\* Complied by Authors*

***Nov 2018***

MoBus and MoCycle – PBS Launched

***Dec 2018***

Men’s Hockey World Cup held at Bbsr

***July 2017***

Bbsr successfully hosts Asian Athletic Championships

***Sep 2017***

Honeywell chosen as MSI for the Pan-City Solutions

***Oct 2018***

Odyssey City Card launched

Figure 1: Timeline of Significant Events in Bhubaneswar Smart City

## Bhubaneswar: The City in Focus

We chose to study Bhubaneswar (Bbsr), the capital of Odisha state, in south-east India, as a single case study of India’s SC mission implementation. A profile of the city is presented in the Appendix 2. Bhubaneswar’s urban administrative structure is representative of most medium sized cities in India, while its urban evolution and socio-economic milieu sets it apart. The city received a high ranking in the original SC challenge in 2015 while in subsequent awards given by MoHUA, it seems to have hardly found a place. On the contrary, the city won accolades from American Planning Association under the *Pierre L'Enfant International Planning Award* (APA 2017). The Bhubaneswar Smart City (BSC) team used a combination of citizen consultation voting process and the city administration’s assessment to decide both the locale for Area-Based Development (ABD) and priority of pan-city solutions. In pan-city solutions, urban mobility had the highest number of votes from the citizens during the stakeholder acceptability survey (GoI 2015). Our analysis of secondary data on the progress of urban development and technology-enabled pan-city solutions projects in various SC seemed to indicate that the BSC team had indeed made considerable progress, especially in extensive planning, since having received the SC mission funding despite the numerous constraints. This evolution of the BSC project since 2016 (Figure 1) piqued our academic interest.

## Transit, Traffic and Urban Mobility

We choose transit, traffic and urban mobility as the focus in the context of the larger BSC initiative based on three observations. First, there is a need for growing cities to be aware of the importance of the “road” as more than just a connecting link between one point to another. As one of our key respondents phrased it

“One department thinks of roads as more like veins which have only one purpose of transporting blood from one part to another. It is as nothing existed in between. There are people living on both sides. A city’s roads need to be planners’ solution, a humanitarian solution, a citizen’s solution… street space, how well that is organized for everyone..” - NA4

Figure 2: Stakeholders and Projects of Bhubaneswar Smart City

**Bhubaneswar Municipal Corporation**

**MoBus**

**MoCycle**

**ABD;**

**Traffic Control**

**Social Equity;**

**Street Vendors**

**Socially Smart**

**Child Friendly**

**Gender Sensitive**

**Traffic Control**

**City Surveillance**

**Socially Smart**

**ABD**

**Odyssey Card**

**Socially Smart**

**ABD**

**ABD**

**Affordable Housing**

**Urban Core**

***Stakeholders included in this study***

**Bhubaneswar Development Authority & Urban Knowledge Centre**

*Partial list of BSC projects*

Second, by investing in improving transit, traffic and urban mobility, cities can aim to achieve sustainable economic growth while reducing economic burden for private individuals and public agencies (EIU 2017).

Further, inequitable public transport can contribute to marginalization of economically weaker groups in cities (Grengs 2002; Qamhaieh and Chakravarty 2017). Third, technology innovations are commonly used to enhance efficiency in transit and traffic. Use of IT-based solutions in enhancing mobility, transit and reducing traffic congestions in the urban context has been seen to yield significant benefits to the three key aspects of livability, sustainability and inclusive economic development (Dixon et al. 2019).

Bhubaneswar is perceived as a rapidly growing city in terms of increasing population and growing vehicular density while attempting to address congestion issues. Overcrowded roads have led to increasing environmental pollution, longer commutes, decreasing reliability of public transport and far lower rider-experience. BSC team also identified road lane blockages, heterogeneous vehicle composition and lack of awareness of traffic rules, poor driving habits as being major challenges in urban mobility (GoI 2015). As a response to this issue, they chose *transit-oriented development and* *urban mobility* as one of the components of ABD and *intelligent traffic management, smart parking* and *transit operations* as part of the Pan-City Solutions. Our current study therefore focuses on these initiatives (Figure 2). A key aspect of BSC’s urban mobility plan has also been to make it more inclusive – child friendly and gender sensitive.

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| --- | --- | --- | --- | --- |
| Table 1: Sources of Primary and Secondary Data | | | | |
| ***Primary Data (Interviews)*** | |  | ***Secondary Data*** | |
| ***Code***  ***Used*** | ***Role - Associated Agency***  ***(Duration in Minutes)*** |  | ***Code used*** | ***Description of the Source***  ***(Approximate Length in Pages)*** |
| CM1 | Key Person - Central Mission (75) |  | SD1 | BSC Proposal and Annexure (200) |
| CM 2 to 4 | Consultants - Central Mission (180) |  | SD2 | Extracts from other city proposals (2000) |
| NA 1 to 2 | Tech Leads - Nodal Agency (110) |  | SD3 | News reports on Smart Cities in India (1114) |
| NA3 | Project Lead - Nodal Agency (40) |  | SD4 | News reports on Bhubaneswar (72) |
| NA4 | Key Person - Nodal Agency (50) |  | SD5 | BSC Documents in public domain (1881) |
| NA5 | Domain Expert - Nodal Agency (30) |  | SD6 | Government Notifications (200) |
| PA 1 to 3 | Consultants - Partner Agency (235) |  | SD7 | Answers to Parliament questions (1000) |
| PA4 | Key Person - Partner Agency (75) |  | SD8 | Transcripts of YouTube interviews (9) |
| ST 1 to 4 | Domain Experts – Stakeholder (200) |  | SD9 | BSC social media pages (NA) |

## Data Sources

Sources of data (Table 1) for this study included both primary (dominantly face-to-face and telephonic interviews) and secondary (dominantly published data sources). Our choice of respondents drew from Pouloudi and Whitley’s (1997) principles for identifying stakeholders. We use the term stakeholder to refer to people, groups or institutions who are interested in the BSC’s projects, likely to affect it or are likely to be affected by it. Agencies were thus identified as stakeholders based on the role they played in the planning and implementation of various projects and their interrelationships with BSC team, the nodal agency (Chibber 2002). Figure 2 represents the stakeholders and the BSC projects they are associated with. Partner agencies are private vendors contracted based on open tendering processes to execute the different projects. We engaged in a process of reconnaissance through multiple visits to the SC mission in the central government and the BSC team. We extended our list of interviewees through snowballing. A total of 17 respondents were interviewed over a 7-month period. We use generic roles to identify our interviewees in order to ensure anonymity. Given that urban mobility projects were still in nascent or pilot stages, we did not include citizens amongst our interview respondents but focused on the provider perspective.

## Analysis

With mental maps of our research questions, the background literature and documented sources of incongruences in IT-enabled change especially in large scale initiatives, we analyzed around 7000 pages of textual data. We combined Orlikowski and Gash’s (1994) and Young et al.’s (2016) frame domains to code the text and analyze patterns in the data. To this we added technology governance (people’s understanding about who makes the technology decisions, what are the processes followed) and inter-stakeholder interaction (people’s understanding about coordination and communication between different external and internal agencies involved in the technology implementation) given the uniqueness of the smart city initiative as a technology project. The longitudinal nature and diversity of technological projects required us to use four broad layers of information technology architecture including - infrastructure, applications, data, and analytics/decisions support, along with two general categories - overall smart city mission; knowledge and capacity building adding to six cross-codes. Our initial list thus contained 42 broad codes.

We used text analysis software NVivo© to organize our large dataset and to facilitate the text coding process. However, we did not use NVivo’s automated coding options but coded the text manually. We also added new codes wherever data warranted them. Our approach is analogous to a combination of inductive and deductive approach to data analysis not uncommon in information systems research (Lewis et al. 2011). One author coded the text along with the help of a qualified research assistant familiar with the context and trained in text coding using NVivo. Random quotes were chosen to be discussed amongst the authors to check the validity of the coding process. Disagreements were addressed through discussion and reinterpretation. Wherever possible, unambiguous definitions of codes were developed consensually. Once the data was coded, our subsequent analysis was composed of two stages. First, thematic conceptual matrices were created to help organize the data through a process of clustering and factoring (Miles and Huberman 1994). This helped identify the congruent frames and incongruencies. Second, we developed potential explanations for the reconciliation of inconsistencies observed in the data. In doing so, we had to iterate through the coded text, reanalyze the data and abstract the shift in frames through the associated manifestations while attempting to tease out explanatory mechanisms for such reconciliations. For instance, we asked of the data: how have collective popular perceptions of particular groups affected individuals of another group? How have the actions of a particular stakeholder been interpreted by another? What do stakeholders seem to make of the underlying power dynamics? Through such interrogations, we compared the reported progress of the projects and the reframing of perceptions.

# Findings

Our findings indicate that evolution of the Bhubaneswar smart city project has been dotted with inconsistencies and incongruencies in stakeholder perspectives. We examine below three key manifestations of such mismatch. In the subsequent section, we present mechanisms that team Bhubaneswar seems to have appropriated in reconciling these frame incongruencies.

## Definition and Strategy

The novelty and newness of smart city as an initiative have evoked a variety of responses from the stakeholders. The mission, in its guidelines, states that “there is no universally accepted definition of a smart city” (GoI 2016) recognizing that each city should be free to define what they want their city to be. Respondents appreciated the flexibility given by the smart city mission in allowing them to do so

“What central smart city mission gave was a framework ..this is how you can improve your city for that we can help you with funding and by giving some guidance with expert opinions. Apart from that everything was on the city to make it happen. It’s the city’s ownership to take it forward” - PA1

However, in defining what smart city meant to them, many leaders articulated the overall purpose and strategy of the mission quite differently. While one leader emphasized citizen participation and ownership in order to successfully make a city smart:

.. should focus on smart governance, improved living conditions and more livelihood opportunities to match the growing urban population...**Active participation** of citizens is indispensable. If citizens are callous and do not take **ownership** in governance, no city can be smart. - SD8

While another focused on efficiency in urban administration and governance:

A smart city is built with the objective of **doing more with less**, using technology...our objective is to have **more efficient systems** in governance, in the delivery of public services, in the management of city infrastructure and management of citizens’ day to day life. - SD8

The role of technology in the SC mission has also been perceived in myriad ways, some broad and others far more precise in their expectations from the technology-enablement of the city infrastructure and services. Perspectives observed in the opinions expressed in popular press (*SD8*):

We would like to infuse a lot of technology in **governance** not for the sake of technology but for the sake of transparency, efficiency, bringing down the time for giving services to the people.

We have to look at the social and infrastructure elements besides a **simpler** implementation of information technology systems to create a Smart City

Smart city means **inclusion** of people from all economic strata and hence IT applications must work as tools to achieve a better **citizen service mechanism**.

Interestingly, transit and transport occupied a dominant place in the discussion on what it meant to make Bhubaneswar smart. A senior leader remarked

Smart cities are not just about technologies, it is about a **smarter way of life**, a more sustainable way of life... Ease of life. The city is a maze out there. Why should I be so hassled to just go from one place to another place, why I should be scared of travelling in my own city. Technology should **enable me to enjoy travelling** in my city. - NA4

While the multitude of meanings attributed to smart city may by itself be of less consequence, such variety of perspectives impacts the prioritization of projects and therefore their execution. Such incongruencies demand negotiation, notwithstanding the challenge in negotiating with peers in other stakeholder groups:

...we try to be polite with them. But they just cannot visualize. They would argue with us that if you do this (technology solution) traffic problems will happen. Senior bureaucracy needs to change its orientation. First thing, nobody believes in logical reasoning. They thought the solution was to create more ..., they don’t realize that would make it messier. I am glad we did not let that happen - Anon.

Along with the equivocality in the definitional aspects of the projects and the role of technology solutions, the context in which the initiative is being implemented gives rise to additional divergence in perspectives.

## Contextual Divides

A microcosm, Bhubaneswar is replete with the numerous contextual divides that characterize typical Indian cities. It is a medium sized city with an urbanized, yet rural image; with a rich cultural heritage, conservative in its social milieu yet attempts to portray a contemporary façade. The city has rapidly developed urban infrastructure wherever possible, yet numerous pockets where basic public amenities are yet unavailable exist (Kar 2016). The government’s decision to re-design, redevelop and re-densify (GoI 2015) the ABD location while leaving aside the rest of the city for future action has, therefore attracted harsh criticisms:

Of the one million population who call the city their home, only 46,000 or less than 5 per cent will benefit with 24x7 water, electricity, internet connectivity, policed security, walkable streets, public transport connectivity, green areas, treated sewerage and other improved urban necessities the 'smart district' promises to provide...**Digital-age apartheid** has arrived….Developing a smart area instead of the larger city **intensifies inequality**.. (Jena 2016)

The complexity and the paradoxes of Smart Bhubaneswar has only been intensified by the makeovers over the last decade or so, since the increasing presence of educational institutions and technology companies. One respondent, who had been visiting the city regularly for over 7 years now commented:

...before the smart city thing happened, if I were going to tell anyone that I’m going to Bhubaneshwar, they’re like what’s there in Bhubaneshwar….I don’t know if you visited the city 5 years ago. It **was very** **different**…there were no Ubers, no OLAs, nothing was there, I used to love coming here, I was living in Delhi then, flights used to be empty, I could come with no one sitting next to me.... - PA4

Anecdotal comparisons with other cities highlight deep contrast in the context that the city presents to consultants, service providers and vendors who are here on BSC assignments. Their deep interaction with the city especially with the urban administrators and law enforcement agencies has left them thinking:

as a society this city has been very happy with its as-is. We wake up, we go to office at 11, we are back at home in the afternoon for a siesta...you don’t mess up with us. We will go on the wrong side of the road…That is ok... When we are putting technology to fine the violators, and send them instant e-challans, it is **taking time for people** to accept this. Not everyone...but quite a few - PA1

Quite contrary to such experiences, when called upon to volunteer for the BSC mission, the city exceeded the expectations of the team:

at one point when we called for volunteers, within three days we had 200 volunteer applications. We were expecting 20-30, and thought they would need some convincing and then they would come, but 200 people who sent us applications, some called and some wrote to us. That is like running a corporate campaign, with 200 people….that kind of a thing was something which we were totally surprised with, **citizens willing to participate** and doing something over here - PA4

The technology facet of pan-city solutions, especially those related to urban mobility merely added to the incongruencies in the contextual frames. A key person in the planning team agreed that in the initial stages, given the city’s demographic profile, they had identified technology as a risk factor rather than an enabler:

When Bhubaneswar won the smart city challenge, we saw a lot of change, and technology became almost second nature to people. We had initially identified that as a risk for us, the acceptance of technology by people... we were aware that smart means technology as an enabler, but we were also fearful of the digital divide because **this city was not that urban**. - PA4

On the contrary, another respondent seemed to attribute a smaller contribution from technology to the extant contextual complexity that arose from the city’s cultural fabric:

It’s not just cultural, even if we didn’t have the technology, tech was just another layer which was complicating things for us… Even if we don’t put technology, we would have similar problems. - PA3

Such fears hardly seem unfounded when the team encounters push-back from stakeholders as responses to field pilots of hand-held traffic violation ticket devices. One stakeholder of a BSC project commented:

It is easy for the vendor to come and give these ‘toys’. But if there is no connectivity then how do we challan (traffic ticket) the offender? It takes 1 minute to write out a paper challan. But in this machine, we have to press many icons and then swipe the card. It takes minimum 5 minutes for one challan. In peak time, we cannot spend so much time doing this. They have to come up with something better. We have already told them. Let us see. - ST3

While such diffidence indicated doubt in the efficacy of the project, it also exposed the inter-organizational distance between the stakeholders, especially the nodal agency, BSCL and its many peer departments.

## Nodal-Agency: Role, Position and Temporality

The SC mission has been envisaged as a mission mode project, i.e. an initiative with specific goals, milestones and unambiguous outcomes. As one respondent aptly put it

even before this came in, there were multiple other interventions which were in each track. But the SC thing **helped us channelize the effort** to a particular mission mode... What we want is to take the cities which are at a particular level right now to an extent where its developing faster and utilizing the technology that is available now. - PA1

“Bhubaneswar Smart Cities Limited” (BSCL), was designed as a Special Purpose Vehicle (SPV), a state bureaucratic form, a nodal agency which can plan, implement, operate and monitor different projects. Nodal agencies are coordinating organizational forms which “act as clearing houses for information, as hubs for policy design, as in-formal lobbies to push ministries toward maintaining the long-term goals …, and as mediators in inter-ministry disputes” (Chibber, 2002). The SPV form allows it to expedite the process of development by drawing the attention of state agencies to focal projects and resolving intra-state, inter-agency conflicts that emerge in state bureaucracies. However, such a structural form is also likely to undermine the existing governance structures especially the empowered urban local bodies and impede their already lagging capacity building initiatives (Praharaj et al. 2018).

One incident highlights this challenge. An underpass planned to be constructed in a city junction by the works department before the BSC mission was initiated, was stalled by urban development authority since:

the development authority did not think the current design is appropriate for the smart city projects planned for the city. Hence, it chose to intervene (SD4, Feb 18, 2016)

BSCL, the SPV and its role as the nodal agency is perceived quite differently by various stakeholders. One respondent characterized BSCL as the agency which

keeping technology as the backbone, (BSCL looks at) what will actually **make our city more livable**, in terms of environment and sustainability and in terms of equity - NA4

Technologists within BSCL on the other hand, have a more infrastructure-provider oriented description:

I think of it as - BSCL is the communication link. It will only be the communication network that BSCL owns. Because all the smart traffic and transit elements are installed across the city, they will have to be connected. **That is what BSCL does**. - NA2

Equivocality in its institutional identity is also visible in the temporality of the SPV perceived by different stakeholders. For instance, two respondents remarked:

BSCL is here for 5 years, it could go on, but initially it has been designed with a 5 year timeline. - PA4

BSCL, is implementing all these projects. Once we stabilize them, then **we handover** to the concerned departments so that they can actually operate all those things. - NA1

On the contrary, one interviewee saw it as a continuing agency

BSCL as an organization wants to be self-dependent and has to go for **further 10 or 15 years** it’s not that central government funding ceases and the department also comes to an end… the thought process is how we make sure that this process is live and kicking like 5 years or 10 years down the line. - PA1

# Discussion

As the nodal agency, BSCL along with different partners have, through the duration of the project, evolved mechanisms of reconciliation aimed at overcoming the divergence in understanding, perspectives and expectations mentioned above, with the explicit objective of moving forward the various projects under the BSC mission. While the impact and efficacy of these mechanisms can only be validated through time, their manifestations can be observed in the everyday enactments (Elbanna and Linderoth 2015).

## Simplifying the Vision

The vision for a smart Bhubaneswar as a liveable, sustainable and inclusive city to which its citizen can connect to, that is efficient in governance and delivery of public services was a means of creating a foundational frame of reference. The average resident of the city has thus far seen Bhubaneswar as a city with a “*chalta hain*” (Hindi - roughly translates to ‘anything goes’) attitude (Sahu 2018). But when the state recommended the city to the SC Mission; the city authorities were seen taking keen interest in soliciting public opinion for preferred projects; and subsequently when the city won the SC challenge, there seems to have been a strong external motivator to see things differently.

Bhubaneshwar residents took (the challenge) to heart, they have been **wanting an identity** ...when we told them what this whole competition is all about, that this is our chance to defeat the other cities, it became like an IPL (Indian Premier League) pretty much. Bhubaneswar doesn’t have a cricket team anyway, so this was the opportunity to show them that we are going to do it. - PA4

There were consistent efforts to simplify the shared vision and to reaffirm the vision through every interaction between the city and its residents. The city simplified the grand vision of a technology-enabled inclusive, liveable and sustainable city to simply ‘My city’. In the early stages of the SC proposal preparation, the city initiated a contest for vision statements and titled it “My City, My Dream” (SD4, October, 11, 2015). A citizen grievance redressal app named “MCMP” (My City, My Pride) was operational around the same time as well. One leader articulated it as:

First is vision- whether the city and the citizens are ready to be connected with the municipal council and government; whether they are able to think through what they want in the future, that’s the beginning point. If we are able to **envision together**, we will be able to implement together. - SD8

A simplified and inclusive vision allows stakeholders to lighten the burden of interpretation, thus facilitating the change process (Davidson 2006). Creating legitimacy for such simplified vision involves challenging existing shared belief systems (Mcloughlin et al. 2000), the stakeholders’ mental models and the institutional arrangements that surround them (Elbanna and Linderoth 2015).

For the urban administration team which had lost its connect to the real urban issues and solutions, this presented an opportunity to revert to the basics of the city as being transit-oriented. A consultant remarked:

People who have been working as urban technologists for 30 years...we are telling them something that they used to know...and we tell them that it is better to do it this ‘new’ way...somewhere they also realize that they were taught all this in ‘urban school’ but given everyday practical realities, they have forgotten all this along the way - PA3

Yet, the simplicity of the vision which aided BSC during the early stages seems to have been insufficient in aiding its translation into action, leaving many key projects still in the pipeline awaiting execution support from the concerned stakeholder department. One of the respondents put it aptly

when you are setting out a vision you have to be ambitious. (But) the reality is not like that. When we look at some of the large projects that we had thought of, which could be catalysts to transform things, (they) have taken a lot more time, and will take a lot more time because they are related to issues that **go beyond words and vision elements and good intentions**. - PA4

But for every small force that pushes things away from the course, there seem to have been concerted conscious efforts to effect course correction mechanisms.

We **need to prove ourselves; we need to deliver**. Imagine running a city which is fully manual with constant leadership changes. You already have people who have 30 years of experience deputed from urban agencies. They have just changed their title from Works department executive engineer to smart city general manager - will that change his mindset. - PA3

While the ambiguities in the concept and process of BSC’s mission gave rise to distinct cognitive representations (Zuzul, forthcoming), these were often reconciled by bounding their respective roles in the larger mission to achievable immediate objectives. One respondent specified their role as follows:

...so gradually the municipal corporation has matured and whatever standard operating procedures they had, we are right now re-engineering them, adding some element into it and then putting it into the technology. See this is their process only so **we are just giving them the technology** to ensure that it is a seamless thing and there are no gaps. - NA2

The role of technology in aiding such simplification of vision to one which brings the city “together” administratively was also articulated:

When we told them that the ICOMC (Intelligent City Operations and Management Centre) is the only way we can have **an integrated way of looking at the city**, we are not as a society used to communicating…..it does not matter whether I am a bureaucrat or an urban engineer. I don’t talk to my peers in other departments. The only way of making them do it is to bring them together under one roof and demonstrate the utility of an integrated city perspective. - PA3

## Boundary Spanning

The issue of boundaries between departments engaged in operationalizing the vision of Bhubaneswar as a smart city were often blurred resulting in questions being raised about the nodal role that BSCL played. In its smart city proposal, the city states as one of its weaknesses

a large number of agencies are working in Bhubaneswar resulting in jurisdictional ambiguities. Presently, five departments are developing and maintaining road infrastructure. (GoI 2015)

Such jurisdictional ambiguities are likely to give rise to friction and tensions between different entities exposing the need to consciously build cross-boundary relationships. In forging symbiotic relationships with its stakeholders, overcoming conflicting or contestations of institutional logics not uncommon in government bureaucracies (Busch et al. 2018), an institutional framework evolved for the BSC. Two mechanisms characterize such an overarching institutional framework. First, a cross-leadership mechanism that allows BSCL staff to operate seamlessly with other urban departments, by having the BSCL Managing Director (MD) as part of leadership teams of stakeholder agencies; and along with it a means of maximizing coordination by interlocking directorship with other state agencies (Tsui-Auch 2004) where heads of stakeholder agencies are members of BSCL leadership team. One respondent stated:

..what (one person) has been able to do over the last 4-5 years, has changed the mindset of people from top to bottom. People above him also, they have started **talking the same language**. – PA3

Most respondents interviewed emphatically mentioned the MD’s cross-leadership as being the reason for ease of execution of many projects, facilitating inter-departmental coordination and enabling a mindset change through a process of reframing, effectively acting as an entrepreneurial change agent spanning institutional boundaries (Cranefield and Pries-heje 2019):

...and then this whole shift happened, you had one person who was the vice chairman of the Urban Development Authority, who was also commissioner of the municipal corporation, also heading the transport authority, and the SPV … A lot of hats to wear. But, I see it as a plus, decisions are being taken by one person. There are **connections between different things**. - PA4

Further, the interlocking leadership in the SPV itself, aided the process of boundary spanning helping overcome the scalability barriers:

The committee has authorities from all departments, not only from planning but also everyone else, from CEO of the SPV, the managing director, senior IAS officers, HRD secretary, finance secretary, home secretary, police commissioners .. so many people were part of the committee.... - PA1

Designing the SPV as a nodal agency and empowering it to make decisions that relate to multiple urban development aspects through the interlocking leadership team

This has made deployment and execution easy and very high because everything routed from the upper end so we don’t go to the different departments and talk, so we lay out a proposal, we send it across, we ask the relevant people who can do it and then it is accordingly **driven by those people who really want it to be done**. - NA2

A second institutional framework mechanism included the formation of a Bhubaneswar Urban Knowledge Centre (BUKC) as a knowledge, capability and resource center for all aspects related to planning and coordination between the city agencies.

..came up with BUKC, it is a sort of a technical **one stop resource center** for all city agencies... whatever questions and concepts that they want to get clear, BUKC is the one explaining it, because…the capacity is just still not there (in existing departments) - PA4

The boundary spanning role of BUKC is also evident in its structural positioning. BUKC is a unit of the urban development authority thus foregrounding its role as the primary planner and designer for all aspects relating to the smart city initiative:

See...BUKC is a part of the development authority, and development authority is long term. BSCL is for 5 years. But we plan to continue BUKC, as we just want to keep evolving as a city. The development authority is where BUKC is going to be and it serves BSCL, and all the agencies as well…BUKC is not in the smart city office, as it is the development authority which does all the planning and designing. So BUKC should be in urban core. – PA4

## Perspective Taking and Perspective Making

In ensuring the progress of an inter-organizational technology initiative, an assessment of the embedded power dynamics aimed at understanding each stakeholder’s strategic position and the potential impact - positive and negative of the system to be implemented, may aid in design of interventions that can overcome potential barriers (Boonstra and de Vries 2008). Stakeholders influence each other in the process of negotiating IT-enabled change and reinterpret their stances through the evolution of the project (Mcloughlin et al. 2000). This involves a process of mutual *perspective taking* symbolizing exchange of knowledge and integration of perspectives from across organizations, coupled with *perspective making,* a process ofstrengthening internal knowledge within the group or organization through construction of narratives (Boland and Tenkasi 1995). Such knowledge sharing mechanisms may also aid the process of bracketing internal sociomaterial constitution with equivalent contextual sociomaterial conditions lying outside the institutional boundary (Avgerou, forthcoming). BSC team traversed many extra yards to seek opinions and expectations of the city’s residents and other stakeholders in the run up to the challenge:

(one of the key leaders) had made extra efforts to make the process of SC proposal preparation **more** **inclusive**…involving citizens, urban leaders, participating government agencies, even NGOs working in urban related issues…so that has made people feel they are doing it for the city - PA3

Subsequently, during the operationalization and implementation of the different projects, the dominant role, and justifiably so, was played by the development authority and municipal corporation, i.e. the urban core (Figure 2). Yet, in an attempt to sustain the momentum of intensive planning and deliberate coordination, BUKC was created, as an “extension of the development authority” (SD4, August 11, 2018):

Here we saw BUKC as an actual knowledge center that we are trying to create versus a typical program management consultancy. The intent makes a difference…the intent from the beginning was that we have to build the capacities of everyone as well, it is not just delivering regular reports. - PA4

Design - both urban as well as technology, was also being used as a means of *making* perspectives and strengthening knowledge within the urban core. BUKC’s role as a policy, planning and research agency along with identifying ways to leverage tools and technologies to make the city administration efficient and effective aided this process of re-design.

Our teams were at it for 4,5,6 months. Everyday. We cannot achieve behavioral change without that kind of persistence. It is not just that I build the infrastructure and leave it. But I have to make you aware of it. And I have to make sure that the new practice continues. - PA3

The process of *making* perspectives involved aiding stakeholders in bracketing cues afresh. Institutional entrepreneurs catalyze stakeholders’ breaking away from existing mental models helping them absorb new perspectives and new ways of working with technology (Elbanna and Linderoth 2015).

# Conclusion

In a newspaper opinion piece, senior journalist Srimoy Kar wrote

...the real test lies in its ability to transform itself into an able and efficient implementer, ensuring fast-paced, time-bound and holistic execution of plans. The biggest challenge, however, would be posed by the citizenry .. characterized by a sheer lack of civic sense and scant respect for law. Making the "unsmart people" smart should be an equal task as development of smart infrastructure. (Kar 2016)

In comprehending the divergent perspectives of different stakeholders of a smart city project in the city of Bhubaneswar, we draw upon the theoretical lens of “technological frames of reference”. We discuss three dominant frames – (a) the smart city’s overall strategy, (b) the contextual divides that exist in urban geographies in a developing country like India, and (c) the role, position and temporality of the nodal agency. The incongruencies in the frames so projected by different stakeholders are, over time and through iterative interactions across stakeholders, being reconciled. We also present three such reconciliation mechanisms, Interactions between the three mechanisms are evident, further underlining the contextual realities where the entrepreneurs’ boundary spanning efforts in taking and making perspectives have manifested in the simplification of the vision for the smart city. While the three mechanisms presented here are neither mutually exclusive nor the sole measures of reconciliation of framing incongruencies, their dominance in the early stages of smart city evolution are unambiguous.

We acknowledge three limitations of this study - generalizability, representativeness of the sample and inadequate involvement of citizens as data sources. The decision to choose a single case study arose from the need to focus on the contextual interactions between stakeholders. The limitations in generalizability from such single case-study research can, albeit to some extent, be overcome through the use comparative contextual case studies. We hope to do so in our future research work, where we expect to compare other Indian cities in similar stages of smart cities implementation. Limitations in data, such as representativeness of stakeholders, recall bias of respondents, not uncommon in short-term framing case studies (Davidson and Pai 2004) were, wherever possible, minimized through data triangulation, but can be eliminated through long-term action research. Finally, citizens, as end-users of the city’s spaces and services demand more focused attention as consumers of the offerings of a smart city. We hope to accord that attention to the citizen’s perspectives in our subsequent study.

Our study contributes to academic literature in two ways. One, it draws the attention of information systems researchers to the potential insights that the use of theoretical lenses such as sense-making, framing (Orlikowski and Gash 1994; Young et al. 2016) and reconciliation of frames can provide in a large-scale IT-enabled change context (Davidson 2006). Davidson and Pai (2004) had issued an earnest call to do so (pg. 148). Second, a contemporary socio-technical context such as that of a city-wide urban redevelopment initiative - a smart city project, where diverse individual and institutional stakeholders with their respective agendas come to play (Pouloudi and Whitley 1997) presents a unique setting observe how frames develop, interact and are reconciled along with the ensuing enactments. Doing so may help practitioners deliberately design mechanisms that can aid inversion and reconciliation of incongruent counter-productive frames while reinforcing heterogeneous but congruent frames (Mazmanian 2013).

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# Appendices

## Appendix 1: A Brief Background of the Smart Cities Mission in India

Ministry of Housing and Urban Affairs, Government of India introduced the Smart Cities (SC) Mission as a centrally funded initiative in June 2015. MoHUA chose to use a two-stage competition method to select 100 Indian cities for development into SC. The first stage of the competition was intra-state recommendations, followed by a nation-wide city challenge. The shortlisted cities prepared a detailed proposal laying out their plan for retrofitting, redevelopment in 500-acres of the city where an Area-Based Development (ABD) will be implemented. In addition to ABD, pan-city technology-driven smart solutions were proposed to make the city’s infrastructure and services more citizen-friendly and efficient. Cities could seek help from professional consultants and external agencies. Cities were also expected to ensure participation from various urban planning and administrative departments and most importantly, the city’s residents. The proposals were evaluated by a panel of experts constituted by MoHUA. Over 5 rounds, a total of 99 cities were announced. Each city was then required to form a Special Purpose Vehicle (SPV), legally a limited liability company where the urban local bodies (such as the municipal corporation) and the state government held shares, in order to implement the smart city projects.

## Appendix 2: Bhubaneswar - A Brief City Profile

Bhubaneswar is a 135 sq. kms. (roughly 1/4th the size of Mumbai, 1/6th the size of New York and 1/12th the size of London) has a population of around 1 million. Although the city began its planning as early as 1950s, it has hardly been able to catch up with the increasing needs of its rapidly growing population. As a once historically and culturally vibrant city, Bhubaneswar was often seen as attempting to bridge the socio-religious conflict between the old and the new towns, while presenting the possibility of rapid urbanization to a state otherwise dominated by rural spaces (Kalia 2006). The image of the city, in its past avatar, was that of a “sleepy” unhurried state capital with a much-to-be-desired public transport, bare minimum community spaces, hardly inclusive yet deeply rooted in a sense of tradition. However, the last two decades have seen the city move to becoming an educational hub while also attracting investments from the Indian IT-industry thus influencing the city’s social and cultural fabric (Das 2016).