

THEORIZING THE INTERNAL SOCIAL SUSTAINABILITY OF SANITATION ORGANIZATIONS

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Theorizing the Internal Social Sustainability of Sanitation Organizations

Jessica Kaminsky³ & Dr. Amy Javernick-Will⁴

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ABSTRACT

Onsite household sanitation technologies such as septic tanks or latrines serve a large percentage of the world's population. Unfortunately, they experience high failure rates after construction, with resulting environmental and public health consequences. Previous work has suggested that these failures are often a result of our inability to navigate the technology-society nexus. In other words, they represent problems of social sustainability. In order to address this urgent problem, we build theory regarding the social sustainability of infrastructure systems by leveraging established organizational theory. To do this, we collect household level interview data in four communities in rural Bangladesh. Virtually all households in this research population have constructed onsite sanitation systems, typically using their own resources. However, almost half of these systems have since fallen into disrepair, mirroring the high socially based failure rates cited globally from similar systems. Using cross case qualitative analysis and legitimacy theory, we explored what differentiates those households that continue to use and maintain sanitation systems (those with socially sustainable systems) from those that do not (those with socially unsustainable systems). We found that households in the unsustainable group have adopted toilets ceremonially, with construction decoupled from the actual practice of maintaining and using the sanitation system. Understanding infrastructure abandonment as a form of organizational decoupling gives us a new way to analyze and try to solve the problem of post-construction infrastructure abandonment. Specifically, effectiveness concerns (whether or not desired infrastructure services are

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actually achieved) and competing rational myths (beliefs regarding how and why things ought to be done) drive decoupling and lead to abandoned sanitation. In order to recouple sanitation structure and practice for continued use and maintenance of onsite systems, designs should consider both effectiveness and competing rational myths. For example, by requiring odor management technology for all improved sanitation infrastructure we improve infrastructure effectiveness (by delivering odor management) and also address the commonly held rational myth of miasma (odors causing illness). Therefore we suggest that, as we revise the almost expired Millennium Development Goals, technologies without odor management should be removed from our definition of improved sanitation due to negative contributions to social sustainability. Further, we observe that concern with status (likely stemming from Community Led Total Sanitation development methods) appears at a similar and high rate in both the socially sustainable and socially unsustainable household groups; it does not differentiate the two. Finally, technical support is needed to address effectiveness concerns, share knowledge, and help households move away from ceremonial sanitation adoption and towards locally desired benefits such as improved convenience, odor management, and public health protection.

INTRODUCTION

Bangladesh is the world's 7th most populous country (World Bank 2011). Once a British colony, it is now a parliamentary republic with an elected national assembly. It is also an extremely poor country, with over 40% of the population living on less than the international poverty line of \$1.25USD/day . In the year 2000, Bangladesh was one of the many countries targeted for improved sanitation infrastructure through the Millennium Development Goals (MDG) (UN 2000). Specifically, at the year 2000 baseline, just 39% of Bangladeshis had access to improved sanitation. By 2011, access to improved sanitation had greatly increased to almost 63% (UNDEP 2011). While these figures represent real progress towards the provision of basic infrastructure services to all people, they also represent the work that is left to be done. Firstly, nearly 40% of Bangladeshis are still without access to improved sanitation. More ominously, this figure may not represent the full magnitude of the challenge. Recent work has begun to question the definitions used to define improved sanitation. For example, definitions of improved onsite sanitation systems only measure the construction of new systems and do not require that constructed systems are in use. Unfortunately, global evidence suggests that many constructed systems have extremely high abandonment rates (CSIR 2007; Rodgers et al. 2007; WSP 2007) with related public and environmental health impacts.

The households selected for this research have adopted sanitation, by which we mean that they have built sanitation systems, almost always with their own means. However, about half of them (42%) are currently unmaintained and broken. This research asks *what differentiates those households that continue to use and maintain sanitation systems from those that do not?* As onsite technologies work well in controlled conditions, we locate both the problem of infrastructure abandonment and its solution at the technology-society nexus; in other words, as a problem of social sustainability.

POINTS OF DEPARTURE

Our research theorizes sanitation infrastructure as an organization and analyzes it with legitimacy theory. To provide the necessary theoretical background to answer our research question and explain why we took this approach, we begin by making a theoretical case for analyzing infrastructure systems as organizations. Next we review the literature regarding social sustainability in infrastructure. Finally, we describe the construct of legitimacy from organizational theory, which we use to analyze the dataset in this research.

INFRASTRUCTURE AS ORGANIZATION

The key theoretical contribution driving our analysis is expanding organizational theory to explicitly include infrastructure systems, similar to previous work that has analyzed construction projects using insights from organizational theory (for example, see Javernick-Will and Levitt 2009; Mahalingam and Levitt 2007; Sillars and Kangari 2004). Corresponding to organizational theory (Scott 1998), we note that in order to function, sanitation technologies require collectivities of people with common goals and an interest in the survival of the system, an environmental context, structured work responsibilities, and standards for defining and enforcing against deviant behavior. For convenience, we introduce the term *sanitation organization* to refer to the system we just described. We make this theoretical argument by considering what a sanitation system is and what it is supposed to do (De Laet and Mol 2000). We might, for example, define sanitation infrastructure by the physical, above ground components (such as a seat, a privacy enclosure, or a roof to protect from the weather). After all, this is what people use every day; this is likely what the average person would describe or show us when asked what sanitation is. In contrast, we might define sanitation by the components below ground which actually hold waste, such as rings of concrete and a slab that serves both as part of the below ground enclosure and also the above ground user interface. After all, a toilet unconnected to a receptacle and ultimately treatment might be better called a seat. Of course, these materials by themselves are also not sanitation; they

must be purchased, transported, and properly assembled and installed in order to be more than plastic, wood, and concrete. Similarly, the sanitation system needs people to use it and fix it when it breaks. In some instances, sanitation systems are supposed to increase incomes and nutrition by producing fertilizer for sale or to apply directly to subsistence crops. In other models sanitation is intended as a business to provide a livelihood for sanitation entrepreneurs, or even as a good that provides convenience, safety from assault, or improved marriage prospects for one's children. We might also define the sanitation system and its work by noting that it ought to provide not only income or a place to relieve oneself but also good health, and that it cannot do so without an appropriate environmental context, installation, maintenance and operation. It also cannot improve health unless not just single households, but entire (geographic) communities adopt the technology. In other words, sanitation technology must gather households, businesses and communities to work together. Beyond the local community, infrastructure may serve a nation building purpose, supporting national policies, drawing resources from multinational organizations, and eliminating social divides between people with and without access to infrastructure services such as sanitation. The various work that infrastructure systems do can only be achieved with the organized participation of people.

SUSTAINABILITY IN INFRASTRUCTURE

Our research deals with a particular part of social sustainability that is concerned with internal organizational participants, excluding both external stakeholders and social justice concerns. We are interested in the community that is a daily part of the sanitation organization through use and maintenance, which we call internal social sustainability. Without this type of social sustainability, infrastructure is abandoned and its benefits are not achieved. In recent years, social sustainability has become an issue of increasing interest to construction researchers (Levitt 2007), who understand past construction research in terms of economic and environmental sustainability and call for further expansion into social sustainability. More recently yet, scholars have built frameworks for incorporating

social processes into construction projects (Valdes-Vasquez and Klotz 2013 a; Valdes - Vasquez and Klotz 2013 b), identified indicators (Kaminsky and Javernick-Will 2013a; Shen et al. 2011), and applied frameworks important for the sustainability of infrastructure (Fischer and Amekudzi 2011). In addition, research has described perceived or real market advantages for firms concerned with sustainability (Beheiry et al. 2006; Lu et al. 2013) and interactions between infrastructural and social recovery after disasters (Jordan and Javernick-Will 2013). On a high level, we define social sustainability as supporting fundamental human capabilities such as life; bodily health; bodily integrity; senses, imagination, and thought; emotions; practical reasons; affiliation; relation to other species; play; and control over one's environment (Nussbaum 2011). Generally this is the human development approach followed by the United Nations and championed by Sen (2009, 1999). However, this theory has little to say about how to design and construct infrastructure in support of this goal. This paper addresses part of this gap by building theory specific to the internal social sustainability of infrastructure using the theoretical construct of legitimacy, which emerged as important during initial data analysis.

LEGITIMACY

Legitimacy “is a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions” (Suchman 1995 p. 574). More recently, Deephouse and Suchman (2008) further define legitimacy by noting that it is *dichotomous* (an organization is either legitimate or not, rather than more or less legitimate in comparison to another), that it is *non-rival* (one organization gaining legitimacy does not negatively affect another), that it is *homogenizing* (it produces conforming organizations according to whatever attributes or practices are seen as the most legitimate), and finally, that it is *political* (linked to authority, and may produce a right to act in a given arena). Legitimacy has been linked to the issue of organizational continuity that concerns us here (whether or not people continue to participate in sanitation organizations). For example, studies show that legitimacy helps organizations gain access to

resources (Hall 1992; Suchman 1995), which are necessary for organizational survival. Similarly, in a study of 143 hospitals over 46 years, Ruef and Scott (1998) showed that both managerial and technical legitimacy influenced hospital survival, albeit in a manner dependent on the relevant institutional environment. In contrast, organizations that violate stakeholder expectations lose legitimacy and become vulnerable to challenge (Stjernberg and Philips 1993). Since these foundations, the publication of two key works in 1995 (Scott 1995; Suchman 1995) encouraged the growth of legitimacy scholarship. More recent work differentiates between internal and external legitimacy (Drori and Honig 2013; Kostova and Zaheer 1999), how organizations can gain legitimacy (Golant and Sillince 2007; Lounsbury and Glynn 2001; Suddaby and Greenwood 2005), or lose it in a time of crisis (Sine et al. 2007). In construction research, legitimacy has been used in research examining conflict or cooperation on job sites (Anvuur and Kumaraswamy 2012; Leung et al. 2013).

We follow in this rich theoretical tradition and organize legitimacy into three categories taken from the literature (Scott 1995; Suchman 1995): pragmatic legitimacy (self interested calculations of an organization's most immediate audience), moral legitimacy, (positive normative evaluation of an organization and its activities), and cognitive legitimacy (organizational role in constituents' sense of cognitive coherence). For example, a pragmatic aspect of having access to a toilet is convenience, while a moral aspect is the protection of public health and a cognitive aspect is understanding the connection between germs and health.

RESEARCH QUESTION

In this paper we argue that, to explain the high rate of failed onsite sanitation systems, we need research at the technology-society nexus that analyzes infrastructure systems as organizations. Given the high observed rate of onsite sanitation systems that are abandoned or otherwise go unmaintained,

we leverage organizational theory to answer the question *what differentiates those households that continue to use and maintain sanitation systems from those that do not?*

As will become apparent through our subsequent results and discussion, in this research we discovered that internal organizational participants (households) possessing unmaintained or unused infrastructure adopted sanitation ceremonially, and that this explains low rates of operation and maintenance (O&M).

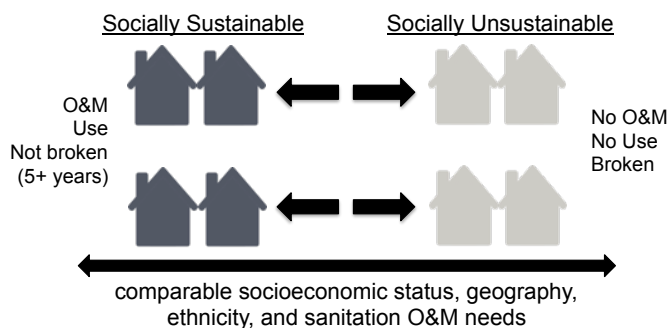
METHOD

In this section, we begin by explaining the research design. Next we describe the data collection process and how these data were prepared for analysis. Finally, we describe procedures that were used to ensure research reliability and validity.

RESEARCH DESIGN

For this project, we perform a qualitative cross-case analysis of interview data comparing groups of sustainable and unsustainable household cases. Individual households represent an embedded unit of analysis (“a unit lesser than the main unit of analysis, from which case study data are also collected (e.g. household data within a neighborhood case, individual employee data within an organization case, or project data within a program case)” (Yin 2009 p. 238)) situated within both the communities they are geographically located and also within the group of either sustainable or unsustainable households they belong to according to the operational definitions provided below. Figure 1 shows this breakdown.

Figure 1: Research Design



The model of infrastructure development we investigate here lacks government or other externally provided infrastructure services for sanitation. The cases investigated in this research also lack external provision of sanitation services, and thus, the government or other providers are absent from our cases. The interview method of data collection was selected due to its ability to develop rich data even in the context of developing communities, where infrastructure data is often limited or nonexistent. Following Yin (2009), case study methods were selected as the research question dealt with contemporary events, did not require control of behavioral events, and sought to understand why the observed phenomenon was occurring. The cross case comparison allows us to discern differences between groups of households that have or have not achieved socially sustainable sanitation. Finally, qualitative methods allow the collection of rich, contextual data appropriate to our exploratory research question. Findings are replicated across four case study communities.

DATA COLLECTION

Data collection took place in households located in four rural and economically disadvantaged communities in early 2013. The communities are located in the Barisal district of Bangladesh, and both have self-reported and researcher estimated annual household incomes between \$300-600 USD. The most common occupations were farmers, fisherman, homemakers, or day laborers. Households have an average of 5.5 people living in them, ranging from 1 to 16 people and the average annual per capita income in these communities is approximately \$80USD. All communities reported that they ended the practice of open defecation in the past 5-10 years.

Communities were selected based on the knowledge of local sanitation officers in the Bangladeshi government and various local non-governmental organizations (NGO) in order to be similar in terms of geography, ethnicity, religion, and socioeconomic status. To qualify for participation in this research, households in each community were required to have installed toilets using onsite non-sewered

technologies. The majority use ring slab pit latrine designs used only by the family living in the nearby household. This means that any needed repairs or maintenance costs were comparable across the sample of households. While there were a few instances of relatives with separate houses sharing a toilet, none could be defined as public or community toilets. For this project, we operationalized socially sustainable sanitation as onsite sanitation that was not broken on the day of the visit and where residents reported performing maintenance after initial construction. In some cases, although maintenance had not been performed, the system was unbroken on the day of the visit. If these systems had been in operation for more than five years, they were classified as unsustainable. Alternatively, if the system had not yet been in operation for more than five years, it was removed from the analysis as a case with an indeterminate sustainability outcome, as it is possible that these systems have not yet required maintenance such as emptying the pit. It is worthy of note that many community members used local businesses that would empty latrine pits for a fee. Six household cases distributed between three of the four communities were removed from our analysis due to this criterion. This resulted in 84 households being classified as sustainable, and 62 households being classified as unsustainable. A trained bilingual research assistant who is local to Bangladesh collected the data. Interviews were conducted in the Bengali language common to Bangladesh.

Each household in the selected communities was approached and asked to participate in the project. Every household that agreed to participate was interviewed. Communities were visited up to five times over a week each in order to reach every possible household. In total, 154/162 (95%) households consented to participate. In two cases, the audio recorder failed and the interview data were lost, resulting in analysis of 152 households. To elicit detailed, contextual responses, questions were semi-structured but open ended. For example, interviews asked respondents “Why did you want a toilet?” “What is a toilet good for?” and “Are toilets worth the trouble? Why or why not?” The audio of each interview was recorded using a cell phone, which is less unusual and intrusive in the research setting

than a dedicated audio recorder. After the interviews were complete, the audio was transferred to a computer for concurrent transcription and translation to English.

DATA ANALYSIS

After data collection was complete, the translated transcriptions were imported to the NVivo 10 software package (QSR International Pty Ltd. 2012) for formal qualitative coding (Miles and Huberman 1994; Saldaña 2009). The translated transcriptions produced approximately 585 pages of text for analysis. Each sentence of the transcriptions was analyzed and assigned to a qualitative code, or archetype. For validity and reliability, we developed a coding dictionary iteratively that matched archetypes of statements to legitimacy and status constructs. After the initial coding of the transcripts, the dictionary was reviewed amongst a panel of academics for feedback and input. After minor changes, the entire dataset was recoded to ensure consistency with the dictionary. When applying codes, we attended to the content (rather than just the presence) of responses to judge if each item supported or detracted from legitimacy. For example, one respondent described unpleasant odors emanating from their sanitation system: *“It spreads a bad smell when the wind blows”*. We coded this statement to pragmatic legitimacy as it deals with a direct personal effect of participation in the sanitation organization. This particular coding instance is expected to detract from legitimacy as a ‘bad’ odor was specified. The archetype—odor management—was added to our coding dictionary so that any subsequent instances of this archetype could be consistently coded. This process resulted in 1912 coding references across the entire dataset. No construct was referenced at a significantly different rate from the aggregate ($p \leq 0.025$) in any community.

VALIDITY AND RELIABILITY

Validity and reliability checks are intended to improve the quality of research results. Both qualitative and quantitative research designs have developed a variety of standard procedures that, when used

properly, help ensure 1) that researchers are carefully defining both what they are measuring and how they are measuring it (construct validity), 2) that the results appropriately represent the data set (internal validity), 3) that the results represent the larger research population the results are claimed to generalize to (external validity), and finally 4) that another researcher, using the same tools, would find the same results (reliability). This study addressed these concerns by using constructs from existing literature, performing intercoder reliability checks (97% agreement across four interviews), performing multiple coding iterations, and by developing a coding dictionary and research database.

RESULTS

In this section, we show that effectiveness (or the attainment of infrastructure services from built infrastructure) is not driving construction. Next we provide evidence that households adopt sanitation infrastructure due to various concerns with legitimacy, which do not vary between the groups of households with and without sustainable sanitation infrastructure. To aid this discussion, Table 1 shows the results of the qualitative coding described above.

TABLE 1. Coding References

| Theoretical Constructs* | | Selected from Coding Dictionary** | Count of References*** | % of References | Count of Households | % of Households |
|-------------------------|-------------------|------------------------------------|------------------------|-----------------|---------------------|-----------------|
| Pragmatic | Exchange | Cleanliness | 702 | 37% | 144 | 99% |
| | | Personal Hygiene | | | | |
| | | Odor Management | | | | |
| | | Insects or Livestock Contamination | | | | |
| | | Convenience | | | | |
| | Influence | Labor | 179 | 9% | 128 | 88% |
| | | Financial Contribution | | | | |
| Dispositional | None | 0 | 0% | 0 | 0% | |
| Moral | Consequential | Public Health | 270 | 14% | 111 | 76% |
| | | Pollution | | | | |
| | Procedural | Modernity | 75 | 4% | 51 | 35% |
| | | Knowledge | | | | |
| | | Neat and Clean Life | | | | |
| | Structural | The Right Way | 76 | 4% | 63 | 43% |
| | Personal | Internal to Community | 80 | 4% | 58 | 40% |
| External to Community | | | | | | |
| Cognitive | Comprehensibility | Health & Sanitation Causality | 180 | 9% | 98 | 67% |
| | Taken for Granted | That's The Way It's Done | 34 | 2% | 31 | 21% |
| Total | | | 1596 | 100% | 146 | 100% |

*Suchman 1995

**Selected for brevity. These represent the items most frequently coded to each construct.

***Households may reference constructs more than once.

INEFFECTIVE INFRASTRUCTURE

To begin, we describe the household's experience of sanitation infrastructure, and whether or not it is producing desired outcomes. In 88% of cases, households made financial or labor contributions in order to get a sanitation system. While NGO and government officers have had a presence in the community, it is not the case that they provided a sanitation system to each household. Individual households took the initiative to change, and we should note that these changes are not insignificant to the households. Based on household reported data, the cost to purchase the slab and rings and transport them to the

village is the equivalent of about \$9USD, with additional labor to dig the pit, additional cost and labor to build an enclosure, and possibly an additional cost for a seat and a container to hold water for flushing. We estimated annual household income to range from \$300-\$600USD. The cost for just the rings, slab, and transport is thus over 15% of monthly earnings at the top of our income range, and is more than a quarter of monthly earnings at the lower end.

Households report the cost to have a plumber empty the pit is about \$2USD, or almost a full day's wages, making them reasonably expensive technologies. Alternatively, new rings are purchased or the existing rings are pulled out of the full latrine in order to place them in a new pit. Still, the former is expensive (more than 3 days' wages) and the latter involves the hazards of direct contact with waste that has not been treated in any way and is certainly a distasteful task. Beyond the work of moving the toilet, several households had stories of people falling into full latrines: *"The slab was poor in quality. My son fell down into the hole because the slab broke. It looked like taking a bath."* Similarly, while 79% of households mentioned odor management (*"[With a toilet] there will be no bad smell"*) some of this number also complained about the smell from the latrines: *"They have a poor toilet. The bad smell could be smelled from the house."* As will be discussed below, when bad odors are connected with health impacts (*"If you have a headache, build my toilet yourself!"*) households may doubt that even fully functional latrines can actually improve health outcomes. Similarly, they may use one that is not technically able to provide treatment through inappropriate design or construction: *"We don't clean the pit. This is an island. During the rainy season we let the waste flow through the water."* As actually constructed, the toilets in the communities selected for this research are not efficient. They are expensive, involve repeated dirty work, do not improve health, and often produce unpleasant odors. They are, in a word, ineffective.

LEGITIMATE OUTCOMES & PROCESS

The next step of our analysis was to separate the statements we mapped to legitimacy constructs into items that dealt with the outcomes of sanitation and items that dealt with the process of sanitation (how sanitation ought to be done). This was done to simplify presentation of results and also because the typology used as our analytic tool makes this distinction in its definitions, though it does not organize them this way. Within each of these categories we discuss different sources of legitimation, following the description given by Suchman (1995) with the addition of two constructs that emerged during the analysis (inertia legitimacy and status).

PRAGMATIC OUTCOMES

One source of pragmatic legitimacy is the expected value of organizational participation. It deals with direct, pragmatic benefits. For our case, these are the direct benefits, or services, that users expect to receive if they participate in the sanitation organization. Some of the services that were referenced often in our data were cleanliness, hygiene, odor management, aesthetics, separating insects or livestock from waste, and convenience. Virtually every household in both the sustainable and unsustainable groups referenced this type of legitimacy (99% vs. 98%). The data suggests that all households understand the potential infrastructure services that they might receive if they were to participate in a sanitation organization, and that this is not sufficient for socially sustainable sanitation.

One household in each group did not reference pragmatic legitimacy. As these households appear to be outliers, we discuss them individually. The sustainable household that did not reference this type of legitimacy built their own toilet (another type of pragmatic legitimacy) because they believe that a toilet is the modern thing to do (moral legitimacy) and because they are ashamed to do otherwise (status). They mentioned that they primarily built a toilet in fear of violent reprisal if they did not (*"The government ordered to burn the tree toilets. Then we built a toilet."*). The unsustainable household that did not reference this type of pragmatic legitimacy also built their own toilet (pragmatic legitimacy),

although it has since broken and goes unrepaired. They spoke to a visiting NGO about their toilet (moral legitimacy) and understand there is a connection to environmental harm (moral legitimacy). However, the force of inertia went against sustainable sanitation adoption: *“I am too old to do that...We can’t [change].”*

MORAL OUTCOMES

One source of moral legitimacy is socially valued accomplishments. In other words, organizational outputs are judged as morally worthwhile or not. In our data, the outputs of sanitation organizations that emerged from the data during coding are public health and environmental health. In every instance these were seen as morally positive. The former dealt primarily with preventing disease epidemics (*“If I practice open defecation there will be diseases”*), and the latter with water or air pollution (*“If people practice open defecation the air and water will be polluted”*). Overall, this type of moral legitimacy was referenced more often in the sustainable household group (80% vs. 71%). This pattern also held true in each of the four communities as well as across the aggregated groups of sustainable vs. unsustainable households.

STATUS OUTCOMES

In addition to legitimacy, status was mentioned in 84% of household cases as an outcome of sanitation technology (privacy, prestige, shame: *“If my relatives come to visit me and I don’t have a toilet, it will raise a negative impression about me”*). It too was present at approximately the same rate in the household groups with sustainable and unsustainable sanitation (86% vs, 82%). Status theory is developed in existing organizational literature and is known to impact organizational survival; it is also known to be analytically distinct from legitimacy in that it is hierarchical, rival, segregating, and political (Deephouse and Suchman 2008). Formally, status is a hierarchical ordering; it is “socially constructed, intersubjectively agreed-upon and accepted ordering or ranking” (Washington and Zajac 2005 p. 284). While we do not pursue it analytically in this work, taking note of the status construct leads us to an

important finding regarding violence in infrastructure uptake. Our analysis links to the Community Led Total Sanitation methods that have been used extensively in Bangladesh (Hanchett et al. 2011; Kar and Chambers 2008). These methods aggressively attempt to inspire shame that triggers communities to adopt sanitation technologies for every household on their own initiative. The analysis here shows that while these methods may indeed be able to coerce initial construction, they do not cause sustainable use in many cases and come with other negative consequences. Fear of violence was mentioned in 15 households in our dataset as a motivator for building a toilet. Of these 15, nine have achieved sustainable sanitation and six have not. This rate is not higher than that achieved in the larger research population. Other respondents attributed widespread sanitation uptake to this violence, suggesting that this factor may have gone underreported: *“Everyone in this community had a tree toilet. I myself broke some of them with the local government people. I provoked others to burn tree toilets. We did it to keep our environment clean.”* Households do indeed report building toilets to avoid violence. However, even when these toilets continue to be used, the lack of maintenance and appropriate design and construction mean that they are likely a net loss for public health in terms of both increased violence and of concentrated, collocated fecal waste.

PRAGMATIC PROCESS

A source of pragmatic legitimacy is an organization being responsive to constituents’ larger interests through some form of control enacted by the constituent. To operationalize this for our sanitation organization, we coded all instances of financial or labor based participation; that is, at some point in the infrastructure lifespan, the household either built or maintained a toilet themselves or paid someone else to do it for them. This indicates a certain level of control over the system, and aligns with considerable discourse in the development community regarding the need for household participation in development and the improved outcomes that are (sometimes) claimed to result from it (Cooke and Kothari 2001; Khwaja 2004; Roma and Jeffrey 2010). This type of legitimacy is the only theoretical

construct in our dataset that was referenced at a statistically significant different rate between our two groups ($p < 0.01$). 100% of sustainable households referenced it compared to just 71% of unsustainable households. However, we should note that this is an artifact of our definitions; we operationalized sustainability in part by requiring homeowner maintenance.

MORAL PROCESS

A source of moral legitimacy is socially valued techniques and procedures. For example, the majority of readers of this article might prefer a science-based hospital with an 80% survival rate to a shaman with a 100% survival rate if medical care were needed. Belief in the process and how it relates to valued outcomes (e.g., that the provided medical care is actually causing survival) is important. Some of the valued organizing principles of society that emerged from our data were Modernity, Knowledge, and leading a Neat and Clean Life. In our dataset, 35% of both the sustainable and the unsustainable groups referenced this type of legitimacy. Unsustainable households referenced this construct more often in two of the communities; in the other two the sustainable household group referenced it more often. The subcontracts varied, with Modernity referenced by approximately 30% of each group (*"It is the era of modern civilization"*), Knowledge referenced more often (11% vs. 6%) in the sustainable group (*"There are two causes [of poor sanitation]. It's because of illiteracy and poverty"*), and A Neat and Clean Life referenced more often (1% vs. 10%) in the unsustainable group (*"If we want to lead a neat and clean life we need a toilet"*).

Another source of moral legitimacy is the moral standing of an organizational type, such as sewer infrastructure vs. onsite infrastructure. 43% of households referenced this construct, with no significant difference between the sustainable and unsustainable groups. For sanitation, we might note that it is common for onsite technologies to be perceived as second class as compared to a sewer system (Kaminsky and Javernick-Will 2013b). In this research context, where sewer technologies are unknown or at least presently impossible for an individual household to achieve, open defecation is seen

as morally inferior to the use of a toilet: *“Open defecation is not good. It is better to have a toilet.”* It is worthy of note that what is seen as ‘good’ is the physical presence of a toilet; a functional toilet was not specified.

Yet another source of moral legitimacy is the charisma of an alter. While in past literature (Suchman 1995) this has been defined as dealing with individuals, for this project we included connections to both individuals and organizations. For example, respondents described linking connections to NGO or government agencies as important to sanitation adoption. Overall, about 40% of households in both the sustainable and unsustainable groups mentioned this type of moral legitimacy. In this dataset, there was also no significant difference between these groups in terms of if the altars were internal to the community (family or neighbors) or external (NGO, government, businesses, other communities). Most of the connections were external, however, with respondents reporting that neighbors generally minded their own business about sanitation matters: *“I don’t usually go to or talk to the other families about the toilet.”*

COGNITIVE PROCESS

One source of cognitive legitimacy is the availability of cultural models that furnish plausible explanations for both the existence and actions of an organization. For a sanitation organization, this would mean a model that explains why sanitation is important by defining sanitation and explaining the costs and benefits of having sanitation. In our data, we see that the majority of households in both groups reference a model of understanding for sanitation, albeit at a slightly higher rate for the sustainable household group (80% vs. 71%). The model given in every case was a connection between toilets and disease prevention. For example, *“If we practice open defecation there might be various diseases. That is why I built my toilet.”* However, this quote (and many like it) comes from a household with a broken system.

Another source of cognitive legitimacy is shared meaning such that alternative arrangements become unthinkable. This construct was identified by statements like *"I give more importance to the toilet than to the house. Even he who has no house, should have a toilet"*. This type of legitimacy appeared slightly more often in the unsustainable household group (24%) than in the sustainable household group (19%). While both groups said that a household must have a toilet, the unsustainable group lacks connections between the treatment the toilet is providing, how that treatment is provided, and the taken for granted motivation for (and subsequent construction of) a toilet.

In addition to cognitive legitimacy types that have been previously identified in the literature, a construct emerged from our data that we call inertia legitimacy (statements of habit like *"I am habituated to use a toilet from my childhood"*). Inertia is different than existing constructs because there is an inherent difference between not being able to think of an alternative arrangement (an existing cognitive legitimacy construct) and being used to one of many alternatives (for example, being habituated to using a toilet although one's neighbor does not, making the alternative a daily reality rather than an unthinkable occurrence). Inertia was referenced in a total of 17 household interviews, 10 of which were in unsustainable cases. In all sustainable households in this group, inertia was in support of sanitation technologies. Each of the sustainable households that mentioned inertia said something like *"I can't poop outside. I'm not habituated."* Alternatively, in the unsustainable households, the force of inertia is against sanitation technologies; in all but one case, respondents said they were *"helpless"* or had *"no ability"* to change. While inertia was observed in just 12% of cases, when it did appear it had a near universal match to the sustainability outcome once the direction of inertial force for social sustainability was identified, suggesting the need for further investigation. In addition, we suggest that the reason it appears relatively rarely is not because it is unimportant but because of the particular cases selected for this project. Inertia stems from habit and the costs of changing an existing practice. In our current research, we observe inertia legitimacy in the few cases where households have used

sanitation technologies for a long time. Alternatively, when inertia legitimacy is referenced in unsustainable household cases, it appears as a perceived inability to change to the new technology. As our cases have recently transitioned from one practice to another (open defecation to some form of toilet, sustainable or not) this too is infrequently observed. Future work should investigate this construct in different organizational settings where it may occur more frequently.

LEGITIMACY

To summarize, if sanitation organization membership and benefits are driven by the quest for legitimacy we might expect to see different types of legitimacy between the group that has achieved sustainable sanitation and the group that has not. In other words, we might think that households that are aware of the benefits of sanitation would possess sustainable systems. However, this is not what we observed in our data, as shown in Table 2.

TABLE 2. Legitimacy Coding

| Legitimacy Construct | Sustainable (n = 84) | | Unsustainable (n = 62) | |
|----------------------|----------------------|------------|------------------------|------------|
| | Households | Percentage | Households | Percentage |
| Pragmatic | 84 | 100% | 62 | 100% |
| Moral | 80 | 95% | 59 | 95% |
| Cognitive | 67 | 80% | 44 | 71% |

*p≤0.05

We found that the groups of households with sustainable and unsustainable sanitation systems do not differ significantly in the types of legitimacy that they reference. In fact, while for simplicity it is not presented here, they do not significantly differ in any of the sub-types of legitimacy defined by Suchman's typology (1995). They do not differ for either the process or the outcomes of sanitation infrastructure. They do not differ in terms of one group having an understanding of benefits that would lead to market demand (pragmatic legitimacy). They do not differ in terms of the personal connections they have to others (moral legitimacy) nor yet in the existence of cognitive models to explain the

importance of sanitation (cognitive legitimacy). Rather than being a null result, this finding leads us to understand the key issue at stake in these sanitation organizations: the construction of a toilet is alone sufficient to permit membership in the sanitation organization. By constructing a toilet, households gain legitimacy benefits even when, scientifically speaking, they do not gain the actual benefits corresponding to that legitimacy. Continued use and maintenance—possessing a functional toilet—is not required. This is a problem because unless all households have a functional toilet, none will achieve the desired collective benefit of improved health.

DISCUSSION: CEREMONIAL ADOPTIONS & DECOUPLING

In our data, we observe that households build toilets and then subsequently do not use or maintain them. Households cite benefits of sanitation even when they are not actually experiencing them. Despite the many reported drivers and a financially proven motivation for change, 43% of households (62) were classified as unsustainable, generally because their toilet was broken on the day of the visit. Even if respondents felt strongly that they could not practice open defecation, many continued to use a broken or overflowing toilet: *“Like our toilet, we can’t build a new toilet that is why we are using our toilet. But we don’t poop outside.”* As such, we propose this as an example of decoupling, or ceremonial technology adoption, where formal structure (such as sanitation infrastructure) and actual practice (such as infrastructure use or maintenance) are not necessarily related.

In organizational research, decoupling has been observed in many settings dating back to Meyer and Rowan (1977). Meyer and Rowan suggest that structural changes are made in order to enhance legitimacy rather than because of efficiency: “ceremonial activity is significant in relation to categorical rules, not in its concrete effects...a sick worker must be treated by a doctor using accepted medical procedures; whether the worker is treated effectively is less important” (Meyer and Rowan 1977). We should note here that this use of efficiency more closely aligns to the meaning of effectiveness in the

engineering literature (Miller and Lessard 2001 p. 14); as we contribute to this body of knowledge we use its language henceforth. Similarly, from a ceremonial point of view, a household must have a toilet; whether or not the infrastructure can protect health as it is actually used is unimportant. The desired legitimacy benefits are achieved after the ceremonial structural change rather than being a function of achieved outcomes of the change that would also require change in practice.

The primary reason Meyer and Rowan give for decoupling is rational myths. As we live our lives, we develop various rational myths to explain institutional processes, techniques, tools, or structures. In other words, rational myths are how things ought to be done. Independent of their effectiveness, their omission is perceived as negligent or irrational. Even accepted and highly rationalized models are actually rationalized myths. They are a (useful and important) way of understanding that are nevertheless just models—reflective of reality but neither perfectly objective nor yet error free. As we do not have perfect information, we select tools depending on their perceived appropriateness, or legitimacy, for the task at hand. Similarly, households may construct a sanitation system ceremonially because they believe it is the legitimate thing to do, independent of any infrastructure services they may (or may not) achieve by doing so.

Relatively little empirical work has been done to investigate decoupling in organizations (Boxenbaum and Jonsson 2008). However, the work that has been done supports the occurrence of decoupling. For example, Brunsson and Olsen (1993) studied reform at Swedish Rail, finding that even a radical organizational reform had little impact on daily operations. Similarly, Kostova and Roth (2002) measured the ceremonial adoption of organizational practices due to legitimation pressures in multinational corporations. Similarly, socially unsustainable sanitation infrastructure occurs because households are able to gain the legitimacy of using sanitation infrastructure after just construction, without actually contributing to collective sanitation goals (like public health protection) by also maintaining the toilet.

There are various ways practitioners, academics, and infrastructure users can work to disrupt this problematic mechanism. For example, in many (more developed) communities this problem has been avoided by adhering to centralized, professionalized utility management. Similarly, in the contexts studied here, a shift towards the provision of infrastructure services (rather than just hardware) using treatment centralized at the scale of small communities may allow engineers to avoid the issues described here. This should be a focus of future international development goals. Unfortunately, at the present time this is an unrealistic goal for many rural developing communities. In the meantime, the more immediate goal must be to ensure that legitimacy is only awarded for a functional toilet. This may even require de-legitimizing non-functional toilets, although it is possible this strategy could instead cause households to abandon the structures built in ceremonial adoption. Further research is needed to determine how best to design educational outreach to ensure that households' infrastructure can provide collective benefits. Similarly, future work should investigate other types of infrastructure to see if decoupling is occurring where other infrastructure is experiencing high failure rates (for example, see WaterAID 2009).

Thinking about the social sustainability of sanitation in terms of decoupling and legitimacy theory gives us yet another way to try to solve the problem. Considering various cognitive models of understanding should change preferred designs with the goal of improving O&M rates. This understanding may help us modify designs so that sanitation infrastructure is perceived as more efficient, thereby driving effectiveness-based rather than ceremonial technology adoptions. For example, air pollution (moral legitimacy) was mentioned in 10% of household cases (*"The main problem is air pollution. Our toilet causes air pollution."*) and odor management (pragmatic legitimacy) was mentioned in 79%. This may suggest that there is a significant presence of belief in miasma theory in these households. Miasma theory suggests that poisonous vapors in the air from rotting organic matter cause diseases such as cholera. This view has been commonly held throughout history and indeed was one of the drivers for

the sanitary evolution of cities such as Paris and London (Jephson 1907). Certainly as a scientific community we must remain committed to the scientific models for sanitation that have greatly improved human health over the past century (BMJ 2007). However, by recognizing these various modes of understanding, we can develop designs that address both miasma and germ theories. In other words, sanitation technologies should be designed and constructed to provide a high level of treatment. There is no reason that these designs cannot also provide for the protection that would be specified by miasmatic theories. By providing odor management techniques such as a water seal or ventilated designs, we can both address these concerns and make the user experience more pleasant. Practically speaking, this suggests that we should bar the simple pit latrine design from the definition of improved sanitation due to its negative impacts on social sustainability, much as we would remove a design that did not actually separate people from waste on technical grounds.

Another strategy for avoiding ceremonial adoption and subsequent decoupling is knowledge outreach. We need education to help households understand how sanitation systems work and to understand that this process is an important component to achieving desired outcomes. In addition, we need to connect households to technically trained people so that households may outsource some of the needed knowledge work much as households in the more developed world do. By improving the performance of sanitation through technical knowledge, we may drive households further towards effectiveness-based adoption. An important challenge to this last recommendation is that it may not appear to be scalable; we are suggesting technical assistance for every household in the world. The inconvenient truth here is that all construction projects are necessarily unique. Each project must account for site-specific conditions (e.g. the presence of particular soils), generalizable scientific principles (e.g. percolation rates in those particular soils), and local beliefs and knowledge (e.g., miasma theory). Local and external knowledge must be blended to achieve sustainability.

CONCLUSION

“Definitely there is a problem [with open defecation]. Otherwise the government would not tell us to build toilets.”

In the cases described here, sanitation technology was adopted ceremonially. Our research unpacks seemingly simple statements similar to that above to try to build theory regarding the internal social sustainability of sanitation infrastructure. Households adopted sanitation technologies for many reasons. Some did so out of fear of violence (*“If we practice open defecation the government will burn...so we were bound to build our toilet no matter if we were starving or not, we had to build the toilet.”*) Others built it because they wanted to be part of the modern world (*“I want to move on with the times”*) or to protect public health (*“If we use a sanitary toilet it will cause no problems to the nearby families. Like...no disease”*). Over and over again, however, we see that households have ceremonially adopted toilets in a way that (from our scientific point of view) cannot actually deliver the outcomes they desire. Legitimizing isomorphic forces have caused virtually every household in these communities to build a toilet. What they have not achieved are the possible and locally desired benefits of sanitation technology such as the protection of human and environmental health, odor management, or improved safety.

In this paper, we theorized sanitation infrastructure as an organization. Using cross case qualitative analysis and legitimacy theory, we sought to understand what differentiates those households that continue to use and maintain sanitation systems (those with socially sustainable systems) from those that do not (those with socially unsustainable systems). In addition, we proposed inertia legitimacy, a new construct, and noted the importance of status. Finally, this research empirically demonstrates ceremonial technology adoption, or in other words the decoupling of structure and practice that drives socially unsustainable sanitation. It also suggests an interesting future research question. If

effectiveness concerns and competing rational myths are causing decoupling, can we eliminate it by addressing these issues through a combination of design modifications and educational outreach? This question is practically important as it has the potential to improve sanitation sustainability worldwide, thereby improving public and environmental health outcomes.

This question is also theoretically interesting, as it would give us new insight on the ways that organizations work. There is limited research to describe if decoupling can be maintained over time; however, Edelman (1992) presents evidence that suggests symbolically hired employees attempted to fulfill their mandate, suggesting that decoupling may break down over time. If decoupling breaks down, ceremonial sanitation adoptions may eventually lead to changed practices. Alternatively, it may mean that the ceremonial structural changes (the toilets themselves) may be abandoned to match the practice. If we are to achieve the former instead of the latter, there are ongoing requirements for technical support and for building knowledge of how technology can achieve socially desired outcomes rather than on the ceremonial adoption of sanitation technology itself.

As with any research, there are important limitations that must be acknowledged. Interview based data collection methods must acknowledge potential issues with free recall (Singleton and Straits 2004). Especially when dealing with a taboo topic like sanitation, we must consider that our data may be biased by respondents giving what they perceive to be socially desirable answers (Podsakoff et al. 2003). Indeed, in our analysis above we noted a contrast between the percentage of households that reported violence as a factor for adopting sanitation (10%) and quotes that suggest it was much more widespread. However, in this context we expect the major instance of giving socially desirable answers would be regarding the actual use of the sanitation system rather than construction or motivations regarding it. This potential issue was mitigated by the fact that the infrastructure was directly observable by the research team. Additionally, we do not intend to suggest by this paper that there are

not places where households are actually too poor to construct infrastructure, nor yet that there are not places where market demand for sanitation does not yet exist. However, in the communities selected for this research, these factors were not causing unsustainable sanitation practices. Instead, structure and practice were decoupled because of ceremonial technology adoption.

To summarize, this research:

- 1) Extended organizational theory to explicitly include infrastructure systems,
- 2) Built theory of the social sustainability of infrastructure, and
- 3) Developed decoupled, ceremonial infrastructure adoptions of toilets as a new explanation for socially unsustainable sanitation

Organizational theory helps us understand the forces driving socially unsustainable sanitation systems. We “say that the engineers will solve a specific problem or that the secretaries will perform certain tasks without knowing who these engineers or secretaries will be or exactly what they will do” (Meyer and Rowan 1977 p. 349). Similarly, households say that sanitation adoption will solve certain problems without knowing how or if this will happen. Unfortunately, in the case of technology, without appropriate means we cannot reach desired ends. Our work suggests that globally we will see increased number of households with systems that are not maintained as time passes. The challenge is to discover ways to recouple the structure and process of sanitation technologies. The encouraging side of this finding is that households are already aware of the legitimate benefits of sanitation, and have already ceremonially adopted toilets to help them achieve those benefits. What is needed now is a way to transform these magical talismans into functional technology.

More generally, we see our work as a contribution to the insights that organizational theory has and will continue to give construction researchers. Using organizational theory and evidence, we can build better infrastructure. For example, by adapting classic questions from organizational theory (Scott 2008) we

are better positioned to extend important and existing research streams that address the adaptation of our built environment in the context of globalization (Javernick-Will and Levitt 2010), to understand or enable the diffusion of innovative standards such as sustainability rating systems (Muench et al. 2010), or to achieve improved safety practices (Alsamadani et al. 2012).

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