

Article

The Complex Relationship between Capacity and Infrastructure Project Delivery: The Case of the Indian National Urban Renewal Mission

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Abstract: Capacity development (CD) interventions are becoming a vital component of development projects. However, there is a lack of information about the relationships between capacity and project delivery. This paper presents the results of a study of how CD was applied to one of India's largest urban infrastructure programs. While the Indian government considered a lack of capacity to be the main problem in project delivery, there is little evidence that explains the relationships between capacity and project delivery. This study analyzes the content of 58 interviews with project engineers, managers, and administrators about the hurdles they experienced at each stage of project delivery and seeks to understand these hurdles through the lens of CD. The study identifies the influence of capacity factors on project delivery and the converse influence of project performance and outcomes on CD. Ultimately, this study reveals the complex two-way interactions between capacity and project delivery.

Keywords: capacity development; Indian urban sector; urban infrastructure development; project performance; project hurdles; urban development policy

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1. Introduction

Infrastructure development provides opportunities for broad-based economic growth and improved quality of life [1]. Many countries in the Global South identify infrastructure development as a precondition to economic growth and a solution to many urban and rural problems. The focus of Sustainable Development Goal (SDG) 9, to “Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation,” has focused global attention on the creation of “quality, reliable, sustainable and resilient infrastructure” (SDG 9, Target 9.1). Further, SDG 11 highlights the need for cities and human settlements to be “inclusive, safe, resilient and sustainable,” and targets issues such as affordable housing, public transportation, air quality, green and public spaces, waste management, and the capacity for planning as critical areas for improvement. However, infrastructure development has become “an increasingly complex and diverse process” [2] (p. 19) that involves various stakeholders, multiple stages, and interdisciplinary issues such as planning, engineering, and financing. Thus, the capacity of individuals and organizations to cope with this complexity is critical to project success and achieving SDG 9 and 11. A lack of human and institutional capacity can place severe constraints on the ability of countries to deliver infrastructure projects and maintain desired outcomes. Meanwhile, approaches to improve the capacity for planning and project development in the Global South are often fragmented, without a comprehensive understanding of how capacity interconnects with project performance and outcomes. This study investigates the relationship between capacity and project delivery and seeks to understand infrastructure development through the lens of capacity development (CD).

India typically promotes infrastructure development at the national level. When there is an urgent national issue, the Government of India (GOI) creates a mission that focuses on centralized actions in a specific sector for a certain time period. The Jawaharlal Nehru National Urban Renewal Mission (JNNURM) was initiated in December 2005, as one of the GOI missions to cope with the urban infrastructure gap that was recognized as a major impediment to India's economic growth and rapid urbanization. The program provided substantial central financial assistance to cities for urban infrastructure development for a duration of seven years. Water supply and sanitation, road networks, urban transportation, solid waste management, and old town redevelopment are examples of the types of projects supported by the JNNURM.

According to the mid-term appraisal of India's 11th Five-Year Plan [3], the JNNURM has been achieving its goals effectively, but a lack of individual and organizational capacity has been undermining the program. Thus, the GOI initiated various CD interventions under the JNNURM to address this concern, which included a Rapid Training Program, Peer Experience and Reflective Learning, Regional Capacity Building Hubs, etc. The rationale behind this approach was "the more capacity, the better the performance, the more results" [4] (p. 86). However, few studies have been conducted on the JNNURM to understand the actual relationships between capacity and project delivery. This study of the JNNURM program aims to understand the interactions between capacity, project delivery, and urban infrastructure development, and answer the following research questions:

- What project delivery hurdles exist at different stages of a project in the Indian urban infrastructure sector?
- How are capacity factors at individual, organizational, and environmental levels related to the hurdles?
- How do project performance and outcomes affect capacity development at individual, organizational, and environmental levels?

Section 2 reviews the existing literature and Section 3 explains the research methodology. Section 4 contains the analysis results that identify project hurdles, the influence of capacity factors on the project hurdles, and the influences of project performance and outcomes on CD. In Section 5, the relationships between capacity and project delivery in urban infrastructure development are revisited.

2. Literature Review

2.1. Capacity as a Means of Development or as an End in Itself

The concept of CD is widely utilized by the development community, and "nearly every major national or transnational development assistance organization has published at least one policy paper" on the subject [5] (p. 562). The concept of capacity includes various *subjects*, such as individuals, people, organizations, institutions, and societies, and *purposes*, such as to create value, manage affairs, perform functions, solve problems, set and achieve objectives, and identify and pursue development goals. CD is also typically defined as a process that enhances capacity [4,6–9]. Among many definitions, this study adopts the OECD's [6] definition that defines capacity as "the ability of people, organizations and society as a whole to manage their affairs successfully" and CD as "the processes whereby people, organizations and society as a whole unleash, strengthen, create, adapt and maintain capacity over time."

While the definitions of CD by different international organizations are similar [10], divergent perceptions of capacity exist, which have led to different CD approaches. One of the most divergent perceptions is whether researchers should consider capacity as a means of development or as an end in itself. Honadle [11] (p. 577) notes that "definitions of capacity vary in the extent to which they specify the activities that should be performed versus the results that are sought." The former perception that considers capacity as a means of development is applicable to many CD frameworks, which focus on the question of capacity for what end. This approach uses CD "as a strategic instrument" to advance

solutions for other development projects [9] (p. 10). Under this approach, organizations have often been regarded as pieces of techno-rational machinery that need to be ‘fixed’ or further developed through the CD process [4]. In general, the perception of capacity as a means to development prevails in the instructional frameworks of major organizations, which leads to a result-focused, linear progression of thinking. In contrast, the latter approach sees improved capacity as the end result. Thus, capacity can be evaluated independently. In this approach to CD, development is ultimately about developing the capabilities of people “by focusing on the freedoms generated by conventional outcomes rather than just on the outcomes themselves” [12] (p. 17). Thus, developed capacity could be the goal of any development activity. Vallejo and When’s [13] study argues that evaluating CD under prevailing mechanisms is not adequate to capture this impact. To investigate the relationship between capacity and project delivery, this study takes the position that they are not located in a linear progression, but rather in a spiral process where they influence and reinforce one another. Thus, in addition to a one-directional relationship, this study focuses on the two-way interactions between capacity and project delivery.

2.2. Urban Infrastructure Project Delivery

Infrastructure projects face many challenges that are well documented in the project management literature. While early studies had a narrow focus that missed critical front-end and institutional elements, the focus has broadened significantly in recent studies [14]. Two of the most common infrastructure project delivery factors are time and cost overruns, which have been explored in a number of different ways [15–17]. Even though the factors of time and cost overruns in infrastructure projects have been studied extensively, few studies focus on capacity as a main factor of time and cost overruns. Those studies that consider capacity in the context of infrastructure project delivery tend to consider only one aspect of capacity such as organizational development or knowledge management [18,19].

In the field of development studies, capacity issues are addressed in relation to a specific object or context [20]. While researchers and practitioners approach CD in various ways [6–9], they lack a comprehensive operationalization framework and do not consider the relational perspective of capacity [21]. Unlike these studies, this research uses capacity factors at multiple levels—the enabling environment, organization/network, and individual/project—and applies the concept of CD to urban studies.

3. Research Methodology

This study draws data from case studies of 12 cities in five states in India—Gujarat, Maharashtra, Karnataka, West Bengal, and Uttar Pradesh—that were part of the JNNURM program. Data for the case studies were collected through interviews and documents. A total of 71 semi-structured, face-to-face interviews were conducted over 10 weeks from September to November 2013. For the interview protocol for the case studies, see [10]. The interview participants consisted of 84 engineers, managers, and administrators who were involved in the JNNURM projects from 40 different organizations. The participants were divided into five groups: chief and project officers in local government, chief and project officers in state-level public corporations, supervisors working in supervising agencies and state governments, project management consultants and contractors in the private sector, and experts and trainers in state-level training institutes. Out of 71 interviews, 13 interviews were excluded due to the low quality of the interview content. To complement interview data, secondary data were collected from documents such as city development plans (CDPs), detailed project reports (DPRs), and quarterly progress reports (QPRs).

The semi-structured interviews focused on project delivery, capacity evaluation, and CD suggestions to verify the capacity gaps identified in the existing JNNURM literature and to investigate the relationship between capacity factors and project delivery. Within each subject area, questions were designed to understand a respondent’s level of

knowledge, experience, and opinion. Follow-up questions were asked as necessary to obtain the targeted information. While the interviews were semi-structured, the respondents were also encouraged to tell their stories.

Before the data analysis began, a CD framework for the JNNURM was developed that contained several capacity factors [10]. The selection of the capacity factors was informed by the general dimensions of capacity in the CD literature, including the capacity factors identified from the GOI's documents and JNNURM-related literature, the CD strategy developed by the GOI, and the factors identified from 20 expert interviews in the preliminary field research during October 2012. Since the hierarchical classification of capacity aligns with most existing frameworks, this study classified the capacity factors as follows:

- Enabling Environment: Governance and Institutional Structure, Politics, Human Resource Supply;
- Organizational Level: Devolution, Organization Development, Communication and Partnership, Financial Condition; and
- Individual Level: Skills and Knowledge, Attitude and Ownership.

To analyze the data, this case study mainly utilized theoretical coding for explanation building [22]. The explanation building approach focuses on analyzing the case study data to build an explanation (or understanding) of the factors under study. To explain the relationship between the constructs of the case study, the codes related to project delivery were grouped and connected with the relevant capacity factors. Themes of the theoretical coding that “systemically links all categories and subcategories with the central category that has explanatory relevance” [23] were developed based on the capacity factors, and the codes were analyzed based on the themes. NVivo 10, a software package for qualitative data analysis, was used to code and analyze the data.

This study encountered the general challenge facing case study research relating to the lack of rigor [22]. To address this challenge, data were collected using multiple methods, such as interviewing a range of professionals and reviewing supporting documents. To triangulate the main findings, the results from the case studies were complemented by another research method—qualitative comparative analysis (QCA)—and the QCA results [24] enhanced the generalizability of the case study findings [10].

4. Results and Discussion

4.1. Hurdles in JNNURM Project Delivery

This section introduces the JNNURM project timeframe and discusses the project delivery hurdles according to the planning and design, implementation, and operation and maintenance phases of a project.

4.1.1. Program Timeframe

The JNNURM's inherent characteristic of being a ‘mission’—a results-oriented, time-limited program—was identified as one of the main project delivery hurdles. The JNNURM projects had seven years from the initial establishment of a CDP—a prerequisite for project approvals and fund releases—through to project implementation and completion. Seventeen respondents shared the opinion that the limited time was the root cause of time and cost overruns. Since it typically took a few years to establish the CDP and DPR and to undergo the bureaucratic procedures for project sanctions, this left insufficient time for the project implementation itself.

Another characteristic of the JNNURM was a competitive atmosphere. When the GOI called for proposals (DPRs), the time pressure to prepare the proposals forced the participating agencies to focus on the sanctioning of their proposals and to submit proposals that were not well reviewed. Furthermore, in order to be sanctioned, some proposals tended not to articulate anticipated challenges. Regardless of their feasibility, the proposals assumed conditions that would be advantageous for project implementation and

were far from the realities on the ground. Time and cost overruns were considered to be unavoidable due to the gaps between the plans and reality. Hence, the JNNURM's time limits and sanction-oriented project landscape can be directly associated with project time and cost overruns.

4.1.2. Planning and Design

The short timeframe and competition for project sanctions increased dependence on external consultants and exacerbated disconnections between the plans and the local context. The authorized agencies hired private consultants in many cases to prepare the CDP and DPR, with the local government playing only a minor role. Some respondents emphasized prevailing practices in DPR preparation: the same consultant would be hired by different municipal corporations to prepare their DPRs, which tended to produce similar DPRs in different cities due to the absence of surveys at the grassroots level and field studies.

The gaps between the plans and ground realities created diverse problems for the implementing organizations. Land acquisition was the most frequently cited problem (31 respondents). Generally, the availability of land is critical in large-scale infrastructure projects. In many of the JNNURM projects, however, there was not sufficient time during project planning to secure land, or even to confirm the availability of the land. Therefore, the project proposals did not include accurate information about the land, and problems involving the land arose in the project implementation stage. For example, a respondent in Uttar Pradesh admitted that they had not checked the land availability during project planning, and he highlighted that this situation happened in many other states as well.

Furthermore, land acquisition was reported as creating conflicts, with many conflicts ending with a lawsuit (33 respondents). When a lawsuit is filed, the part of a project related to the lawsuit has to halt because of the possibility of a design change, causing a delay. The lawsuits were also described as causing cost increases due to land compensation. The unrealistic plans prepared by the consultants were also described as not reflecting the opinions of locals. The lack of consensus on the projects that created conflicts between the stakeholders sometimes resulted in lawsuits.

Interview respondents also reported cases where plans were not well developed due to a lack of data. Older urban areas in India usually have complex underground utilities and were often developed individually without a comprehensive plan. Many respondents indicated that because of insufficient data, it was difficult to map the existing utility lines and to include them in their plans.

Certain project activities required permission from certain authorities, and the slow procedure for intergovernmental approvals was another critical problem in the Indian urban sector. It was common for an authority in charge of other public facilities to delay approval for the implementing agency's activities in its jurisdiction, and 33 respondents stated that delayed permission was the main reason for a project delay.

For reasons such as impractical designs, local opposition, and lawsuits, some implementing agencies needed to change their project designs and estimates and to go through complicated bureaucratic procedures to obtain additional approvals. Getting approval for a revised DPR took a few months or years, and in some cases, the GOI did not permit a revision. In summary, unrealistic plans due to a disconnect with the local context and a lack of data created a diverse range of problems for project implementation, leading to delays and cost overruns.

4.1.3. Implementation

Most of the JNNURM projects that experienced problems at the project planning stages also experienced problems during the project implementation stage, such as improper contract management, on-site physical constraints, and financial constraints. Sixteen respondents mentioned the tendering process as a problem. Many implementing agencies were dependent on consultants and unfamiliar with the tendering requirements

for project implementation. Some implementing agencies called for tenders without meeting certain conditions for bidding in the program. In such cases, the GOI would ask for a re-tender because of the unsatisfied conditions, and repeating the process led to project delays.

The JNNURM was a nation-wide program, and many projects were initiated across the country at the same time. Some projects in the JNNURM were different in size and modality from previous urban projects. Even though there were many contractors in India, the supply of qualified contractors for the JNNURM projects was less than the demand. In some cases, there were not enough bidders who met the minimum qualifications, and the implementing agencies had to repeat the tendering process until they had the required number of qualified bidders (16 respondents).

The lack of qualified contractors was closely related to the experience and level of expertise of local contractors (nine respondents). Before the JNNURM, implementing agencies in the urban sector cooperated with local contractors. However, the local contractors were not capable of executing the JNNURM projects, which were large-scale infrastructure systems in various sectors. One respondent in Gujarat explained the situation as follows: “The [local] contractors, who were working for [City X], ... may fill the tender, [but] when you evaluate them, you [discover] that there is only one [eligible] contractor among three or four.” Even if the bidders were qualified and met the criteria for selection, there were cases where the bidders were not able to execute the project. If the actual capability of the contractor who was awarded a tender was not sufficient to implement a certain technology or address complaints relating to logistics, the contract needed to be terminated during project implementation.

Another problem encountered in tendering was the lack of local knowledge (12 respondents). Due to a lack of experienced local contractors, the implementing agencies needed to hire outside contractors who were specialized in a certain sector. The outside contractors were not familiar with the local context and had not formed local networks. The contractors needed time to establish local networks to obtain local materials and labor. Since the contractors needed to move their employees and bring labor and materials from their base region, the costs increased. Furthermore, as discussed above, many plans were not implementable, and the gaps between the plans and reality on the ground created many obstacles that could not be managed properly by incapable contractors. Similar to the lack of capable contractors, 12 respondents stated that there were insufficient construction materials and the quality of laborers was not good enough, which also contributed to project delays.

In addition, 26 respondents indicated that the financial structure related to project funds led to project delays and cost increases. After project sanctioning, the tendering system that selected the lowest quote created a financial problem. Four respondents explained that, when a tender was selected based on the lowest quote, cost overruns became unavoidable. The government rates were more likely to be lower than market rates. In the reported cases, both the bidder and implementing agency knew the estimated project cost was not feasible, but the tendering system allowed the bidder with the lowest quote to be awarded the tender. In this situation, the respondents argued the cost overruns were simply due to the difference between the market and government rates. The GOI's unrealistic rate schedule created a more complicated structure for the project funds. In the case of cost overruns, the implementing agency could not pay the extra costs to the contractor without the GOI's approval. Without payment, the contractors suspended projects, which delayed project implementation.

Another problem with any revisions to the cost estimate was the issue of who would bear the extra cost. When the revised estimates were approved, since the GOI typically did not cover cost overruns, state and local governments needed to bear the extra costs. In some cases, local governments were not able to pay the increased cost to the contractors, and projects were suspended or delayed until a resolution was found. Hence, the logistics related to the release of funds were closely connected to project delays (16 respondents).

Another reason for delays in releasing funds was related to the reform agendas. As a prerequisite for receiving funds from the GOI, state and local governments were required to implement mandatory and optional reforms such as increases in cost recovery and function transfers. The reforms were intended to empower local governments by transferring functions, funds, and functionaries from state governments, so most of the reforms needed to be adopted by state governments. However, there are cases where local governments implemented their mandatory reforms, but the state-level reforms were not adopted. In these cases, although the implementing agencies completed a certain part of the project implementation with the settled funds, the GOI did not provide the next installment for a project because of the unsatisfactory status of the reforms. One respondent in West Bengal emphasized: “[The] release of funds is also linked with the reform. Most of the local [governments] are not in a position to implement the reforms as described by the Government of India. So we are worried whether the fund[s] will be given or not.”

In summary, the most critical reason for the time and cost overruns was the vicious circle between project delays and cost increases. The project delays caused costs to escalate as time passed, and the price escalations required additional time for approvals from the central government level, a lengthy and complicated procedure that caused the project to be delayed further.

4.1.4. Operation and Maintenance

The factors leading to time and cost overruns in project implementation also influenced the operation and maintenance (O+M) stages of a project. In a number of cases where state governments led the program, local governments did not participate in project planning and implementation and were then made responsible for the O+M of a project. In these cases, the local governments were reluctant to take on the O+M responsibility. Since local governments were not involved in other stages of a project, they typically did not have enough staff who were equipped with the necessary knowledge and information about a project at the time of the project handover. Without extra staffing, the O+M of a project was an additional burden for existing local government staff (eight respondents). In addition to the lack of staff, the cost of the O+M was another reason behind the reluctance to take over a project. Sixteen respondents mentioned insufficient cost recovery via user fees. Due to a political decision by state governments, local governments were not allowed to collect user fees for urban services, and this became another conflict surrounding the handover of projects. One respondent explained this conflict: “Municipalities are afraid [that] if they take up the project ... in [the] future ... the state government [may not] have any money for them, [and] the entire burden will automatically come to them.” Without specific actions for cost recovery, the operation of a project could become a burden on local governments.

Figure 1 shows the complexity of the hurdles. The figure indicates how a problem at a certain stage of a project could become the cause of a problem at a later stage of the project.

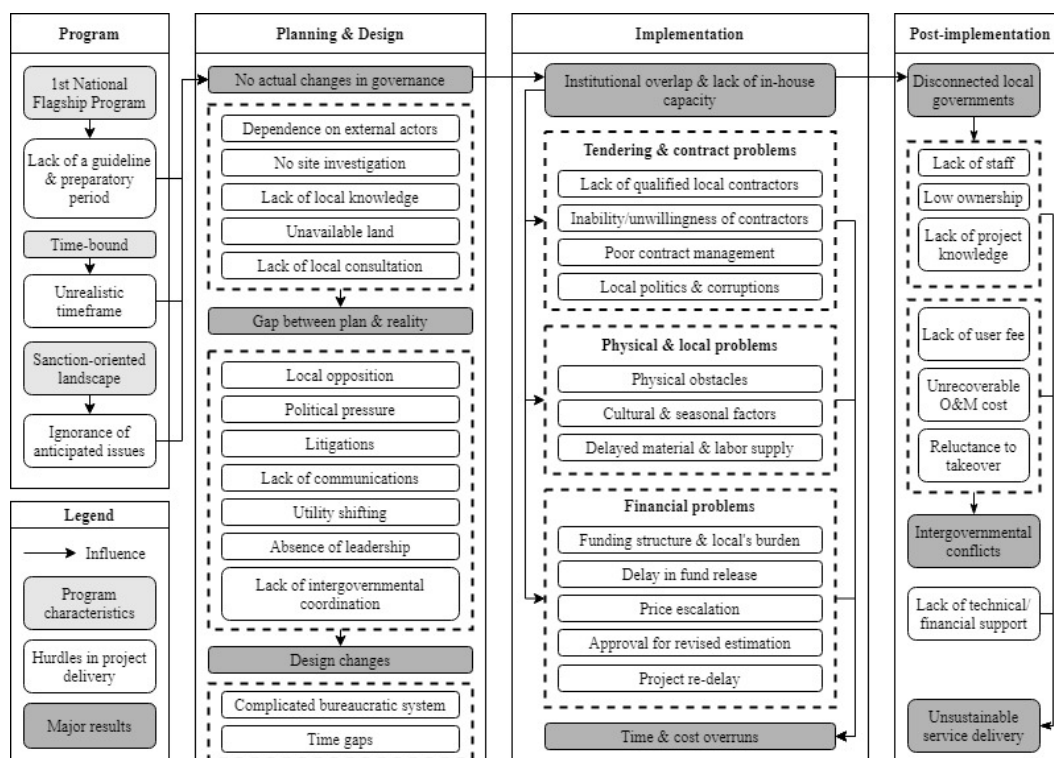


Figure 1. Hurdles in the JNNURM project delivery.

4.2. Influence of Capacity Factors on JNNURM Project Delivery

In India's urban sector, most project participants did not consider a lack of capacity as a direct cause of project hurdles. In van Loon et al.'s [21] study, the CD approach is emphasized as a systemic way to understanding outcomes. Through the lens of CD, this section analyses the project hurdles emphasized by respondents and their responses to the second research question.

4.2.1. Enabling Environment

CD is usually executed in diverse local contexts, where contextual factors need to be carefully considered in the design of interventions [4]. Many respondents mentioned various contextual factors that create the enabling environment for a project. Because the JNNURM was a time-limited program that went through a short preparatory period, the projects were assigned to participating agencies based on the existing functions of agencies. The main authorities for project implementation varied depending on the states, which had different degrees of devolution. As a mandatory reform, devolution was pursued in all states, but the time-bound and results-focused characteristics of the program strengthened the existing institutional structure and established the roles of participating institutions based on the existing institutional structure.

Governance, one of the capacity factors at the enabling environmental level, influenced project delivery. In JNNURM projects, there were institutional overlaps that made it difficult to clarify responsibilities during project delivery. Fragmented institutional structures hindered coordination between institutions and were responsible for time and cost overruns. One respondent provided the following example: "There is no single entity for urban mobility ... which allows [a] certain integration and cohesion of all the activities in that sector. ... This is one of the reasons why such a big project, despite all the money and the political strength, couldn't reach [its goal]."

Moreover, institutional overlap hampered the integrity and continuity of work related to different stages of a project. When local governments did not participate in project implementation, they were likely to become reluctant to take over the responsibility for

the O+M because their levels of knowledge and ownership related to the project were low (nine respondents). The complicated bureaucratic procedures were originally developed to ensure accountability in project governance. There were many rules and regulations that participating agencies were required to follow, and in some cases, the rules and regulations were not relevant to the context around the project. As a capacity factor at the enabling environment level, the complex procedures combined with a lack of accountability were closely related to the reasons for time and cost overruns (16 respondents).

Politics is another frequently emphasized contextual factor in the literature, and there can be an unseen, complex interplay between politics and CD [4]. In the case of India's urban sector, some respondents considered political cooperation between the levels of government to be a fundamental component of project delivery.

As a contextual factor, the low availability of qualified contractors and human resources became a reason for the time and cost overruns. The large-scale urban projects in the JNNURM increased the demand for contractors with relevant skills and experience. Similar to the local governments, which did not function in certain urban sectors before the JNNURM, local contractors that collaborated with local governments did not have experience in large-scale project execution. The quality and quantity of qualified human resources and capable contractors was one component of the enabling environment that had a critical influence on project delivery. The following comment captures the challenge faced by the private sector: "Overnight, you cannot create experts in the country ... This was the biggest problem when JNNURM came in. ... So, it is not [just a matter of] capacity building for government engineers. ... We also need to create a set of people in this country to take up challenges."

4.2.2. Organizational Level

An organization's ability to obtain and integrate resources, build inter-organizational linking, and manage information can be critical to its performance [25]. In the JNNURM projects, one of the most critical factors for the creation of organizational capabilities was the devolution that the JNNURM pursued as one of its main objectives. The JNNURM basically aimed to achieve two contradictory objectives, namely, empowering local governments and implementing urban infrastructure projects quickly, and this contradiction led to many capacity challenges. The requirement to achieve the reform agenda as a prerequisite for fund installation is a good example of this contradiction.

In some states, contrary to the original objective, devolution was achieved only nominally to meet the requirements for fund release. One respondent in Uttar Pradesh indicated that the devolution was achieved in documents only: "They [local governments] are public representatives, [but they are] not given responsibility. ... Power is not given to them. It is in documents, but in practice, it is not there." In the JNNURM case, many local governments did not have a responsibility for project planning and design, so they were not involved in the planning and design process. Most DPRs for the JNNURM projects were formulated solely by external consultants, which created a problem where the DPRs failed to adequately understand the local context. In addition, the JNNURM was a time-limited program driven by the GOI, so the participating organizations did not need to restructure their organization for JNNURM project implementation. While a few organizations established a dedicated unit for the projects, most organizations distributed project-related work to departments that were already established or hired contractual employees using the designated JNNURM budget. This organizational structure was closely related to the fragmented management of the projects. The fragmented organizational structure proved to be a hindrance to inter-organizational communication and public relations, which had a significant impact on project delivery.

The lack of dedicated project staff or units in local government was one of the most frequently mentioned (24 respondents) reasons why local governments were excluded from the process of project planning and implementation. To fill staffing gaps at the local

government level, hiring contractual employees through the GOI's financial support was only a temporary solution to facilitate project delivery.

The financial viability of an organization was also a critical factor for project delivery. Although the local government's share was decided based on its financial condition, cost increases that exceeded the allocated budget led to a conflict between different levels of government. The financial conditions of local governments became more critical at the O+M stage. Since the JNNURM focused more on the creation of infrastructure systems, the financial health of local governments had a significant influence on the quality of infrastructure system services after project completion. In many cases, the coverage and rates of the user fees were not sufficient for the local governments to generate sufficient funds to operate the system, increasing the unwillingness of local governments to take over project outcomes.

4.2.3. Individual Level

Capacity factors at the individual level can change depending on the environmental and organizational capacity, and have a significant influence on projects from the planning stage through to the O+M stage. For changes in capacity at the individual level, the JNNURM included many CD activities such as the Rapid Training Program. However, since capacity at the individual level cannot be developed in a short time, the lack of existing skills, knowledge, and experience was found to be an impediment to project delivery. Respondents rarely regarded the lack of skills and knowledge as the main reason for time and cost overruns, but this lack of capacity was related to the local governments' reliance on external consultants. At the project planning stage, local governments were excluded from the process due to their lack of capacity, but excluding local governments from the process meant many plans were unrealistic.

In some states, inadequate skills and knowledge in local governments became a reason for the state government to postpone the transfer of functions. In these states, the state government was the main decision-maker for JNNURM projects. This situation created a structure with multiple implementing agencies that allocated JNNURM projects to mostly public corporations under the state government. This structure also created institutional overlaps, which led to other project hurdles, such as discord among government agencies and disconnections between the stages of a project cycle, which in turn had a negative influence on project delivery. The lack of skills, knowledge, and experience affected environmental and organizational capacity factors such as governance and organizational development interventions. The capacity factors at other levels also had significant influences on other capacity factors at the individual level, such as individual attitudes and ownership. For example, an institutional structure that provided limited roles for local governments dampened their willingness to engage in the project.

The previous sections explore how the capacity factors at different levels interacted with each other and shaped 'capacity' as a collective term. These factors were closely connected with project hurdles and constrained the project delivery in various ways. At the environment level, the ambivalent setup between empowerment of local governments and rapid implementation of projects can be regarded as the fundamental reason for the identified project hurdles. The limited time frame for the JNNURM projects did not provide the involved organizations or individuals with a learning environment for CD. The exclusion of local governments from project participation determined the entire landscape around project delivery and affected the project performance and outcomes. The influence of capacity factors on project delivery is summarized in Table 1.

Table 1. The influence of capacity factors on JNNURM project delivery.

Capacity Classification	Program	Planning and Design	Implementation	Operation and Maintenance
Enabling Environment	Governance and institutional structure: (in some cases) institutional overlaps due to lack of devolution and accountability and co-ordination problems	HR supply: lack of qualified/capable consultants Politics: lack of consensus	HR supply: lack of qualified/capable contractors Politics: delay in intergovernmental permission and local politics	Governance and institutional structure: decision-making by state governments (in some cases) and conflicts over user fee policy
Organization	Devolution of powers: (in some cases) nominal devolution that is not compatible with main objectives of the program	Organizational development: no planning unit, dependency on consultants Communication and partnership: low level of public awareness	Organizational development: fragmented management, contractual employees, and lack of staff Financial condition: financial viability	Organizational development: lack of staff (in some cases) and reluctance to take on responsibility Financial condition: no 100% cost recovery
Individual	Skills and knowledge: lack of skills and knowledge, (in some cases) no experience	Skills and knowledge: dependence on consultants Attitude and ownership: low level of ownership and conflicts over project plans	Skills and knowledge: inadequate contract management Attitude and ownership: no personal interest	Skills and knowledge: (in some cases) lack of knowledge about project implementation Attitude and ownership: low level of ownership and negative attitude toward responsibility

4.3. The Influences of Project Performance and Outcomes on Capacity Factors

The identified capacity factors have a significant influence on project delivery. Conversely, project performance and outcomes could influence CD. Baser and Morgan [4] indicate that improved results lead to more demand, more confidence, and more resources to invest in CD, and they create a rising spiral of improvements in capacity. In the case of India's urban sector, this spiraling influence did occur.

4.3.1. Enabling Environment

The JNNURM brought critical changes to the enabling environment, and one of these changes was a shift in perspectives. Three respondents emphasized that as the first flagship urban program in India, the JNNURM shifted the focus of the GOI to urban problems and started to mainstream this issue. Changes in urban governance can lead not only to changes in institutional capacity, but also to changes in the relationship between the public and private sectors [26]. The program aimed to make fundamental changes in urban governance to create an enabling environment in which organizational and individual capacities could be improved. In this regard, the JNNURM led to the empowerment of local governments dealing with the urban sector and general public and provided some resources to improve their capacity.

Twenty-seven respondents talked about how the JNNURM established project procedures and clarified the roles of participating agencies involved in the projects. "Through JNNURM, we got the funds [and] we got a system [that] all the government bodies [are] involved [in]." While different levels of government agencies were involved in the JNNURM projects, the program evolved to provide a better system for project delivery and clarified the role of different government agencies. The JNNURM changed the institutional structure for project delivery, and the project performance and outcomes facilitated the adoption of systems that enhanced the capacity of the agencies involved in the program.

In addition, local governments tried new types of projects in the JNNURM and expanded their networks to include national or international contractors. One respondent

commented that “There [were] so many areas ... [that] we went to the market to explore the possibilities.”

4.3.2. Organizational Level

The JNNURM influenced capacity at the organizational level in India’s urban sector. Devolution has been one of the key pillars of the JNNURM for empowering local governments, but it was not implemented as intended. In states where the state government has taken on the main functions in the urban sector, there were only nominal changes in institutional structures and processes. Specialized public corporations under the control of the state government took responsibility for certain activities. These state-level public corporations were hired for the JNNURM projects and were supervised by local governments. However, the actual role of the local government was limited to transferring project funds. In such cases, the project performance and outcomes did not influence the capacity.

In contrast to the above challenges, one of the most substantial benefits of the JNNURM was the financial support for most stages of the project delivery process. Five respondents stressed the financial benefits of the JNNURM for local governments as a new opportunity. One respondent in Maharashtra emphasized that they could initiate new types of urban projects due to the financial support. In fact, the JNNURM adopted tools for cost sharing and project financing that can theoretically enhance their financial condition. However, while various tools designed to improve financial conditions were developed at the organizational level, other capacity factors, such as politics at the environmental level and knowledge at the individual level, were not supportive of these tools. At the organizational level, the intended interventions for CD were focused on temporary assistance that made minor contributions to transforming an organization’s endogenous capacity.

4.3.3. Individual Level

Project performance and outcomes influenced capacity factors at the individual level. Twenty-one respondents suggested that involvement in projects advanced CD, and seven respondents specifically stated that capacity at the individual level was improved while they were participating in a project. Regarding project hurdles, some respondents indicated that the experience gained in a project was helpful for preparing subsequent projects. They discussed solutions for the potential hurdles at the stage of proposal preparation and could adopt the solutions before their follow-up projects were launched. In some cases, the capacity to predict and solve problems was improved through project participation. A respondent in West Bengal emphasized the importance of experience in connection with permission problems: “Due to lack of experience, we are now facing these kind[s] of problems. ... In (the) future, we will try to apply for central government departments’ [permission] before floating the tender.”

Respondents emphasized that local governments can acquire skills and knowledge when they participate in project implementation and collaborate with outside experts. However, the JNNURM had inherent characteristics that hindered learning and knowledge transfer. Without relevant organizational developments, such as increased staffing, many of the respondents were reluctant to take over a project, and project performance and outcomes had a negative influence on an individual’s attitude. While the JNNURM emphasized the CD of local governments, project performance without other CD interventions could conflict with the JNNURM’s CD objective.

Most project performance and outcomes provided opportunities to increase skills and knowledge at the individual level. However, the context and the existing capacity of the organization mainly determined the scope of project participation. When the existing capacity of an organization was considered insufficient to participate in the project, the organization did not have an opportunity to increase their capacity through project par-

participation. In addition, when the O+M of the project outcome was assigned to the organization without sufficient time for the organization to improve its capacity and performance, the insufficient time affected soft capacities such as attitude, and this could reduce capacity at the individual level. The influences of project performance and program outcomes on capacity factors are summarized in Table 2.

Table 2. The influence of project performance and outcomes on capacity development in JNNURM.

Project Phase	Enabling Environment	Organization	Individual
Program	Paradigm shift Changes in governance and institutional structure Administrative procedure reform	Facilitating devolution (nominal changes in some cases)	Focus on capacity development: various training tools adopted
Planning and Design	System building: planning process and requirements	Increasing dependence on consultants	Limited influence (knowledge transfer in some cases)
Implementation	Expansion of networks with private sector Opportunity for the private sector's capacity development	Financial support Organizational development (temporary changes in some cases)	Skills and knowledge through experience
Operation and Maintenance	Limited influence (continuing established roles)	Conflicts between institutions and financial burdens (in some cases)	Low ownership (evasion of responsibility in some cases)

5. Conclusions

The ability of the Global South to realize SDG 9 and 11 and develop sustainable and resilient infrastructure systems rests on the capacity of nations to implement complex and large-scale infrastructure projects. This study investigates the capacity factors that relate to the ability of 12 cities in India to advance urban infrastructure projects as part of a national mission. More specifically, it identifies the relationship between capacity factors and project delivery to determine whether a lack of capacity was the main reason for time and cost overruns with an urban infrastructure program in India. The underlying reason for time and cost overruns was found to be the limited timeframe for developing and implementing JNNURM projects. Most project interventions were results-oriented projects that were undertaken without considering the capacity of the organizations or individuals. In a number of projects, the participating agencies were not prepared to take on a project, but they were required to do so. Hence, these projects faced many challenges that resulted in a vicious circle of project delays and price escalation.

The capacity factors at various levels were closely related to the vicious circle of project delays and cost increases in project delivery, and the capacity factors were critical at every stage of project delivery. A lack of capacity at the individual level became a reason for capacity interventions at other levels, but no single factor alone determined the project delivery process. When combined with other capacity factors, each capacity created different conditions that facilitated or hindered project delivery. Similar to the influence of the capacity factors on project delivery, project performance, and outcomes influenced CD. Above all, project participation from the planning to the O+M stages had a positive influence on some capacity factors at the individual level such as skills and knowledge. However, taking over a project outcome without participating in the project had a negative influence on capacity at the individual level.

These findings demonstrate the two-way interactions between capacity and project delivery. A result at one stage could become a problem for other stages because of a complex interaction between individual, organizational, and contextual factors, forming a spiral structure between the project delivery process and capacity factors. Every component was related to the others, and it was difficult to separate a component from the others and analyze it in isolation. This demonstrates that the perspective of a traditional cause-effect relationship is not adequate for capturing the relationships between capacity and project

delivery. In this regard, the complex interactions between the components should be emphasized rather than a simple linear relationship between capacity and project delivery.

This study of India's urban sector provides an example of how capacity can serve as means to realize specific SDGs. With a narrow focus on CD for project improvement, the GOI approached capacity as a means for the JNNURM's objective to deliver the quick provision of infrastructure and recognized the lack of capacity at the local government level as a reason for the low performance. However, most interviewed local government officials disagreed with the GOI's perspective on their capacity; rather, they perceived that they were able to implement projects when they were given adequate resources and opportunities for project participation.

In line with the perspective of local government officials who recognized participation as an essential prerequisite to project success, many cases in India's urban sector were more likely to present the condition of a "low commitment, low capacity, low performance" equilibrium that is a classic trap of weakened systems" [4] (p. 28). The program pursued the empowerment of local governments as a formal objective, but the conditions in the programs were not supportive for this objective and led to low levels of commitment to the program. The fundamental reason for this trap may be that the GOI approached capacity as a means to advance the JNNURM, when an approach to develop capacity as a goal itself is needed.

Many developing countries are facing challenges related to the lack of infrastructure systems and services, and the urban infrastructure program in India provides a unique opportunity for exploring capacity and infrastructure development. This study showed that capacity and project delivery are not linearly correlated, but rather are interconnected with one another, and this highlights several important implications for urban infrastructure programs in other countries. Capacity interventions may not have the desired effects of CD without a comprehensive understanding of these interconnected relationships. In this regard, the approach to capacity as a means for project delivery should be accompanied by an approach to capacity as an end in itself, allowing sufficient time and supportive environments for CD to happen.

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