Columbia University
School of Professional Studies



Leveraging BIM and CIM to Strengthen Digital Project Delivery for New York City: A Multi-Agency Readiness Assessment and Implementation Roadmap

Prepared for:
New York City Department of Design & Construction (DDC) Town+Gown NYC. Mayor's Office for Climate and Environmental Justice. DDC Project Controls Division.

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Introduction to NYC Team

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Executive Summary

New York City is at a pivotal moment in modernizing its capital delivery system. Executive Order 23/2022 (EO 23) and the Circular Design and Construction Guidelines establish clear expectations for reducing embodied carbon, improving materials transparency, and strengthening lifecycle information management across capital projects.

This report examines BIM and CIM adoption across New York City's capital construction ecosystem through two distinct but interdependent delivery streams, both of which must advance for EO 23 to be implemented effectively.

Team 1 – DDC

Assessed DDC's readiness to expand BIM and CIM. Evaluated across capital planning, asset management, and design and construction operations, and developed a roadmap and change management strategy addressing process re-engineering, training, culture, and adoption risks. The assessment also examined impacts on covered agencies under EO23 that operate and maintain DDC-managed projects.

Team 2 – Covered Agencies

Assessed the BIM and CIM readiness and maturity of covered agencies under EO23. (DCAS, DOT, DSNY, DEP, and Parks). Team 2 identified agency-specific pathways and impediments, and proposed change management strategies informed by agency interviews and insights from the private sector.

Drawing on Insights From:

- 6 interviews with DDC Infra/Public Buildings.
- 5 interviews with the covered agencies.
- 2 interviews with the private sector.
- Document analysis and qualitative comparative assessment.

The research identified common challenges cutting across both streams. Interviewees from DDC and the covered agencies expressed support for BIM and CIM, recognizing their potential value, yet faced structural and organizational constraints that limit adoption at scale.

Five Themes Emerged Consistently Across DDC & Covered Agencies, within their respective contexts:

- High willingness, limited capacity: Staff are motivated to adopt BIM/CIM but constrained by hiring freezes, budget pressures, bandwidth limitations, and aging IT infrastructure.
- BIM/CIM treated as optional rather than foundational. EO23 is perceived as a suggestion not as policy. Therefore leadership teams do not view the implementation of BIM/CIM as encouraged by EO23 to be integral to their project delivery.
- Breaks in the information lifecycle: Digital models generated during design frequently degrade into static formats by the time projects reach construction and operations.
- Fragmented systems and standards: Agencies rely on disparate tools and data practices, leading to rework, version-control issues, and inconsistent handoffs.
- Risk aversion in a high-stakes public environment: Staff express concern that adopting unfamiliar tools may introduce errors, delays, or external scrutiny.

To address these barriers, we propose a set of practical, scalable strategies grounded in global best practices from the UK and Singapore, combined with the realities of NYC's public-sector culture:

1. Launch targeted pilot programs at each covered agency and leverage learnings from existing pilots at DDC.
2. Build a unified knowledge infrastructure.
3. Strengthen workforce capacity and learning pathways.
4. Establish governance that treats BIM as an information asset.

If implemented in phases, these strategies will allow NYC to:

- Deliver capital projects with greater efficiency, sustainability, and transparency.
- Streamline EO 23 carbon reporting.
- Improve coordination across agencies.
- Enhance lifecycle asset management.

To summarize, DDC and the covered agencies under EO23 are at a juncture of opportunity. With coordinated governance, practical pilots, workforce support, and modernized procurement, NYC can move from fragmented digital practices toward a unified model-based system that improves project outcomes and strengthens long-term public value.



Project Background, Problem Statement and Objectives

1.Background

New York City's capital construction ecosystem operates through a distributed governance model in which agencies play multiple, overlapping roles as project sponsors, managing entities, and long-term operators of public assets. Understanding how Building Information Modeling (BIM) and Civic Information Modeling (CIM) function within this ecosystem requires distinguishing between two related but operationally distinct contexts in which capital projects are planned, delivered, and maintained.

The first context concerns the New York City Department of Design and Construction (DDC) in its role as a managing agency. DDC serves as the City's central delivery entity for capital construction, managing design and construction projects on behalf of a wide range of sponsor agencies. These sponsor agencies include departments designated as covered agencies under Executive Order 23/2022 (EO 23) (namely the Department of Citywide Administrative Services (DCAS), Department of Transportation (DOT), Department of Sanitation (DSNY), Department of Environmental Protection (DEP), and Department of Parks and Recreation (Parks) as well as other City entities not subject to EO 23). In this role, DDC is responsible for coordinating consultants, overseeing construction delivery, and increasingly, setting expectations around digital workflows.

Within this delivery context, DDC has implemented use of Building Information Modeling (BIM) on many projects and has progressively integrated digital tools across the project lifecycle, particularly within its Infrastructure and Public Buildings divisions. Civil Information Modeling (CIM) is also used on select infrastructure projects. As a result of its centralized role and repeated exposure across agencies, asset types, and project scales, DDC has developed comparatively greater institutional familiarity with BIM-enabled delivery on projects it manages, though the degree to which BIM outputs are consistently structured for downstream use varies by project and sponsor.

The second context concerns EO 23-covered agencies in their role as managing agencies for their own capital projects. In these cases, agencies such as DCAS, DOT, DSNY, DEP, and Parks act simultaneously as both project sponsor and delivery manager, with responsibility for procurement, consultant oversight, information management, and handover practices residing entirely within the agency. While many of these agencies primarily focus on operating facilities, infrastructure, and public services (rather than maintaining large internal design and construction organizations), they nonetheless manage capital projects that must meet EO 23 requirements and support long-term operational needs.

Before this engagement, there was a limited consolidated understanding of the BIM/CIM maturity and readiness of covered agencies when operating in this independent-delivery role. Interview findings suggest that capacity, experience, and tooling vary significantly across agencies and across project types. In some cases, covered agencies rely heavily on external consultants for model development, while focusing internally on how information is received, interpreted, and used for asset management, maintenance, and sustainability reporting. As a result, BIM and CIM are often encountered as handover artefacts rather than as integrated delivery and operational tools.

Overlaying both contexts is Executive Order 23, promulgated by the Mayor's Office of Climate and Environmental Justice (MOCEJ), which mandates reductions in embodied carbon for applicable capital projects and introduces new requirements related to Environmental Product Declarations (EPDs), lifecycle assessments (LCAs), and low-carbon material selection. While EO 23 does not explicitly mandate BIM, it does require agencies, regardless of delivery model, to organize, verify, and report materials and carbon data in a structured and auditable manner. In practice, this places increasing pressure on both managing agencies and sponsor agencies to improve information management practices across the project lifecycle.



1.Background cont'd

As the literature on digital transformation and sustainable construction indicates, embedding carbon assessment and reporting into capital projects is significantly more feasible when structured digital models and consistent product data are available. Alsofiani (2024) emphasizes that BIM-enabled workflows can play a critical enabling role in integrating sustainability analysis into routine design and delivery processes, positioning BIM and CIM as important, though not exclusive, mechanisms for supporting EO 23 compliance.

Accordingly, this report examines BIM/CIM adoption across New York City's capital construction ecosystem through two explicitly defined analytical streams:

(1) DDC's internal maturity and practices in its role as a managing agency delivering projects for sponsor agencies; and
(2) the readiness and capacity of EO 23 covered agencies to adopt BIM/CIM on projects they manage independently.

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By treating these streams as distinct but interdependent, the report avoids conflating delivery roles while identifying challenges and opportunities that cut across the ecosystem. Drawing on interviews, document analysis, and organizational assessment, the report identifies barriers to knowledge-sharing, inconsistencies in standards and workflows, and gaps in workforce capability and governance.

Based on these findings, it proposes practical, scalable recommendations designed to strengthen coordination, improve digital maturity, and support more consistent and sustainable capital project delivery across both delivery models.



2.Problem Statement

The New York City Department of Design and Construction (DDC) is leading a citywide effort to modernize capital project delivery by expanding the use of Building Information Modeling (BIM) and Civic Information Modeling (CIM). This transformation is central to advancing the City's commitments under Executive Order 23/2022 and the Circular Design and Construction Guidelines, which call for sustainable, transparent, and efficient project delivery across all public agencies. Yet despite DDC's leadership and early progress, BIM/CIM adoption across the municipal construction ecosystem remains inconsistent, fragmented, and limited in its impact.

Stakeholder interviews highlight persistent systemic barriers: uneven digital maturity across agencies such as DSNY, DCAS, and DOT; limited workforce readiness and training; insufficient IT infrastructure and licensing; unclear governance around data ownership and maintenance responsibilities; and a lack of consistent funding or policy enforcement mechanisms. These gaps prevent BIM/CIM from moving beyond design into construction, handover, operations, and lifecycle asset management. As a result, DDC's ability to serve as a unifying force for digital transformation across the City is constrained.

Team 1's task is to understand where DDC is and plans to go with expansion of BIM and CIM--assess the readiness of DDC to move forward with its planned expanded use of BIM and CIM and provide a roadmap and change management strategy that addresses workflow changes, process re-engineering, novels way of thinking, training, work culture risks, and adoption bottlenecks, which includes DDC's advanced capital planning, asset management, design and construction operations and practices.

Team 2's task is to assess the readiness and maturity of the other covered agencies regarding their use of BIM and CIM under the MOCEH guidance document pursuant to EO 23/2022, and to develop a change management strategy for those agencies based on interviews with their representatives. Assess readiness/maturity across covered NYC construction agencies and existing pathways and identify potential impediments, which will likely vary across agencies

Both Teams will compare public agency BIM/CIM use and readiness with private industry practices through rapid research and interviews with private professionals in construction project management and construction contracting.

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Together, these two workstreams address the organizational, cultural, and technical barriers that currently limit NYC's ability to fully leverage BIM/CIM. By aligning governance, workforce readiness, standards, and data infrastructure, the City can modernize its construction ecosystem, improve efficiency and transparency, and establish a replicable benchmark for digital transformation in the public sector.



2.1 Contextual Framing

The implementation of BIM and CIM under Executive Order 23 is best understood **not as a technology deployment, but as an organizational transformation and knowledge-management challenge.** Research on digital transformation consistently shows that lasting change occurs when organizations redesign governance structures, workflows, skills, and incentives, rather than simply introducing new tools into existing routines (Alsofiani, 2024). Across the agencies studied, the core issue is not whether BIM works, but whether current systems allow digital information to flow reliably across the lifecycle of a project, from early design, through construction, and into long-term operations and carbon reporting.

From a knowledge-management perspective, BIM/CIM serves as an infrastructure for transforming tacit knowledge (held by designers, engineers, inspectors, and operators) into explicit, structured, and shareable digital artifacts. This aligns with Nonaka & Takeuchi's (1995) knowledge-creation model, in which organizations continuously move knowledge between tacit and explicit forms in a spiral of innovation. Yet interviews reveal that this spiral repeatedly breaks at the project handover stage. Digital models are generated during design, but they are frequently converted back into static PDFs or 2D drawings once facilities enter operations. As a result, the City often pays for digital richness without capturing its full long-term value.

These interruptions reflect deeper organizational and cultural challenges common to large-scale transformation. Kotter (1995) emphasizes that change succeeds only when leaders build urgency, form coalitions, generate early wins, and reinforce new behaviors over time. Many agencies remain early in this journey. EO 23 signals a new direction, but the supporting scaffolding, governance clarity, shared standards, training pathways, incentives, and cross-agency alignment are still emerging. Edmondson's (1999) notion of psychological safety is equally relevant: staff are more willing to adopt new digital practices when they feel safe experimenting and learning, yet many interviewees described environments where fear of mistakes still inhibits experimentation with BIM tools.

In parallel, Succar's BIM Maturity Model (2010) highlights the uneven digital landscape across which Executive Order 23 must operate. City agencies are not starting from the same level of BIM/CIM maturity. Some agencies, such as DEP, exhibit more integrated digital workflows in design and coordination, while others, including DSNY and Parks, remain at pilot or foundational stages. DDC itself, despite being the City's primary builder, contains multiple units and divisions operating at different maturity levels, ranging from advanced model-based practices to traditional CAD-based workflows. This variation underscores that any citywide digital strategy must accommodate multiple starting points rather than assume uniform readiness.

As the agency responsible for delivering capital projects on behalf of most City agencies, DDC sits at the center of this heterogeneous ecosystem. Digital information produced by DDC must be usable by sponsoring agencies for operations and asset management, while operational requirements and data standards from those agencies must be reflected back into DDC's project models. When maturity gaps exist on either side, information continuity breaks down, reducing the long-term value of BIM/CIM and increasing coordination friction across the lifecycle.

Taken together, these conditions indicate that **BIM/CIM implementation under EO 23 is inherently a system-level challenge.** Progress depends not only on improvements within individual organizations, but on the alignment of capabilities, standards, and practices across the interconnected network of agencies involved in New York City's capital delivery system.



Methodology Approach and Data Sources

3. Methodology Approach

Our overall research design is a qualitative comparative case study. Once we had been onboarded during our initial conversation with the DDC in September, we reviewed the materials they provided, including the BIM Guidelines (New York City Department of Design and Construction, 2012) and the Design Consultant Guide (New York City Department of Design and Construction, 2012b). These documents helped us familiarize ourselves with the terminology, technologies, and policy frameworks underpinning BIM and CIM in the public sector. We supplemented this understanding with EO 23/22 and international reports on BIM/CIM practices in the United Kingdom and Singapore. Weekly meetings with the Sponsor helped accelerate sensemaking and keep our inquiry aligned with DDC's expectations.

This report is grounded in an interpretivist and critical realist stance. We treat digital transformation and EO 23 implementation as socio-technical processes shaped by real infrastructures, policies, and resource constraints, yet deeply dependent on how people interpret them, how knowledge circulates, and how organizational cultures respond to risk and change.

When we entered this project, it became clear that understanding BIM at DDC and across agencies was not only about the software. It required uncovering the knowledge ecosystem that surrounds it. Interviews became a way to surface tacit knowledge of the unwritten habits, shortcuts, and "this is how we've always done it" wisdom that rarely appears in manuals. In contrast, the formal documents, standards, and training guides offered the explicit side of that story. Bringing these perspectives together allowed us to examine not only what BIM is in theory, but what BIM means in day-to-day practice for the people who encounter it.

As we moved deeper into the fieldwork, we began tracing how BIM-related knowledge flows across and within the covered agencies. Sometimes these flows were smooth and organic; other times they were fragmented, with teams reinventing solutions already known elsewhere. By mapping where questions are answered, where they stall, and how guidance is shared or interpreted, we identified moments when BIM knowledge flourished and others where it encountered barriers. These "breakpoints" revealed not just gaps but cultural and structural events, signposts of how assumptions, missing context, or unclear documentation shape the narrative around BIM.

Finally, our inquiry looked toward the future: *What would it take for BIM knowledge to flow more freely across the covered agencies?* This shifted our role from observers to sensemakers. We searched for early successes and small openings, peer-learning loops, informal champions, accessible examples of BIM done well, that could be amplified to build momentum. Our methodology thus became more than a data collection exercise. It evolved into a way of listening to how the organization tells its BIM story and imagining how that story might shift if tacit and explicit knowledge were brought together in a more intentional, structured, and shared manner.



3.1 Goal

With the specifics of the task at hand outlined, we set off to conduct a series of live interviews and literature reviews. The goal of the interviews was to:

- Evaluate the current state of BIM and CIM use across the DDC and the covered agencies.
- Unveil impediments to digital transformation.
- Assess the DDC and each covered agency's maturity in using these digital tools for the use case.

We drafted 30 questions and refined them to the 10 most pertinent, being mindful that we would have only an hour per interview.

3.2 Hypotheses

Two hypotheses were formulated based on our conversations with the Sponsor.

- Both internal and external factors impede the broader adoption of BIM and CIM in the DDC and covered agencies.
- The challenge is as much about people as it is technology.

The questions were tailored to eliminate leading prompts and prevent closed-ended answers, encouraging detailed responses from the interviewees. Questions were also tailored to differing reality of the interviewees, which provided DDC with one set of interview questions and the covered agencies with another contextual set.

3.3 Interviewees In Focus

The Department of Design and Construction ratified the interview questions and provided contact information for interviewees from their organisation and from each of the five covered agencies. Our final two interviewees were from the private sector.

- DDC Infrastructure
- DDC Public Buildings
- Department of Citywide Administrative Services
- Department of Transportation (DOT)
- Department of Sanitation (DNSY)
- Department of Environmental Protection (DEP)
- Parks
- Columbia Construction
- Architect Lead



3.4 Frameworks

This report draws on a set of complementary organizational, technological, and knowledge-management frameworks to analyze BIM/CIM readiness across DDC and the covered agencies. Together, these frameworks provide a structured lens for understanding why digital transformations in the public sector succeed or fail, and what is required to implement BIM/CIM at scale within a complex, multi-agency environment.

1) Kotter's Eight-Step Change Model (1995)

Purpose: To diagnose readiness for organizational transformation and design strategies for cultural adoption.



The framework is especially suited to bureaucratic environments where change is slow and often inhibited by structural inertia.

2) ADKAR Model For Individual Adoption

Purpose: To understand how individuals (not just institutions) progress through change.



ADKAR (Awareness, Desire, Knowledge, Ability, Reinforcement) provides a way to structure interventions that address:

- low awareness of BIM/CIM benefits,
- varying motivation to adopt new tools,
- gaps in knowledge and ability,
- and the reinforcement needed to prevent regression to 2D workflows.

This model is critical in a resource-limited public sector where staff cannot be compelled or financially incentivized into adoption.

3) Nonaka & Takeuchi's Knowledge-Creation (SECI) Model (1995)

Purpose: Explain how organizations convert tacit knowledge (held by individuals) into explicit, shared knowledge that can scale across teams.

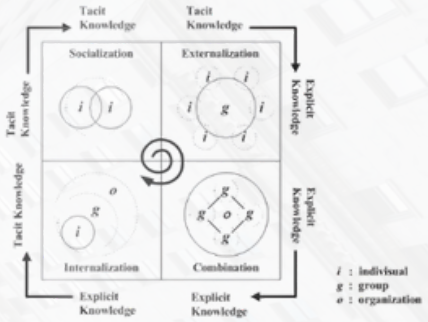


Figure 1. Knowledge Creation as the Self-Transcending Process

Source : Nonaka and Konno (1998) , p.43

BIM/CIM is fundamentally about managing knowledge. The SECI model illuminates why:

- BIM models break down at handover (tacit → explicit conversion failure),
- Agencies struggle to develop repeatable digital workflows, and
- Knowledge capture and diffusion mechanisms (playbooks, workflows, templates) are essential to avoid siloing expertise.
- This framework underscores the need for internal capability-building, not just new software.

This framework underscores the need for internal capability-building, not just new software.

3.5 Limitations

Our research is primarily qualitative and exploratory, and though we used varied sources, the findings presented may not be statistically generalisable, unlike those from a large-scale quantitative approach, such as an organisational-wide survey with a measurable P-value. Nevertheless, the qualitative value of the interviews and the breadth of representatives yielded key findings across culture, technology, and policy, and how they relate to BIM/CIM readiness.

Additionally, our position as graduate researchers working closely with a sponsoring agency may have influenced which questions were emphasized and how strongly interviewees felt able to criticize existing structures. We address this by explicitly acknowledging sponsor-related constraints and foregrounding convergent patterns across agencies and sectors rather than isolated comments.





Interview Findings

4.Interview Analysis

Our interviews with the **DDC, DCAS, DOT, DSNY, DEP,** and **Parks** detailed varying use cases for the tools. However, the most pressing revelation from our conversations was the hurdles that confirmed the hypothesis we set out. We identified both internal and external pain points as expressed by the interviewees. Though the different covered agencies have divergent structures, purposes, and areas of focus, recurring mentions across the interviews highlighted common pitfalls.

These recurring patterns suggest that barriers to BIM adoption are not agency-specific anomalies, but systemic features of the current public-sector project delivery environment. The analysis that follows therefore emphasizes common dynamics across agencies rather than treating each interview as a standalone case.

Analytical Framing of The Interview Findings

This section synthesizes interview findings across DDC and EO23-covered agencies to identify cross-cutting organizational and institutional patterns shaping BIM and CIM readiness. Rather than treating covered agency responses as isolated cases, we focus on recurring dynamics that appear consistently across different mandates, asset types, and professional roles.

Consistent with research on digital transformation in complex organizations, BIM readiness is treated here not as a technical condition, but as an organizational capability shaped by workflows, governance structures, culture, and learning mechanisms (Vial, 2019). This framing is important because it shifts attention away from individual motivation or tool availability and toward the deeper systems that enable or constrain sustained adoption.

Assessment Methodology For BIM Maturity and Readiness

To translate qualitative interview insights into a coherent cross-agency picture, we conducted a structured BIM maturity and readiness assessment across DDC and the EO23-covered agencies. Our intent was not to rank agencies competitively, but to establish a shared interpretive framework for understanding where organizations currently stand and why readiness varies.

Drawing on prior research that conceptualizes BIM as a socio-technical system rather than a standalone tool (Succar, 2009), interview questions were organized around six dimensions that repeatedly surfaced as enablers or constraints in practice:

1. Digital workflows and tools
2. People and skills
3. Governance and procurement
4. Culture and psychological safety
5. Knowledge continuity across the project lifecycle
6. Champions and learning networks

At the end of each interview, participants were asked to provide a self-assessment score from 0 to 10 indicating how ready they felt their agency was to expand BIM use beyond isolated pilots. These scores were not treated as objective measurements.

Interpreting BIM Readiness: Definition of Maturity Levels:

As the DDC and covered agencies selected their own numeric scores, it was necessary to translate these values into a shared maturity language. Drawing on established BIM maturity models (Succar, 2009) and international public-sector practice like the ones in the UK and Singapore, as mentioned before, we grouped the 0–10 scale into five readiness levels:

- 0–2: No awareness or activity

BIM is largely absent from routine work, with minimal internal capability or infrastructure.

- 2–4: Very low readiness – curious but not equipped

Interest exists, but training, tools, and time are limited. BIM use is sporadic and consultant-driven.

- 4–6: Structured but limited readiness – pilots and building blocks

Agencies have initiated pilots or partial standards, but BIM use depends heavily on individuals rather than institutional routines.

- 6–8: Advanced readiness – BIM beginning to scale

BIM is used routinely across multiple projects, supported by clearer roles, leadership commitment, and emerging standards.

- 8–10: Fully embedded / digital-by-default

BIM is the standard mode of working across the project lifecycle, consistent with mature national programs such as those in the UK and Singapore.

This scale provides a shared interpretive anchor for comparing agencies with different missions, asset portfolios, and institutional constraints.

Figure 1 on page 18 illustrates the distribution of self-assessed BIM readiness across DDC and EO23-covered agencies, interpreted using the maturity scale defined above. The figure shows that most agencies cluster in the mid-range of readiness, indicating early structure and pilot activity but limited scalability.



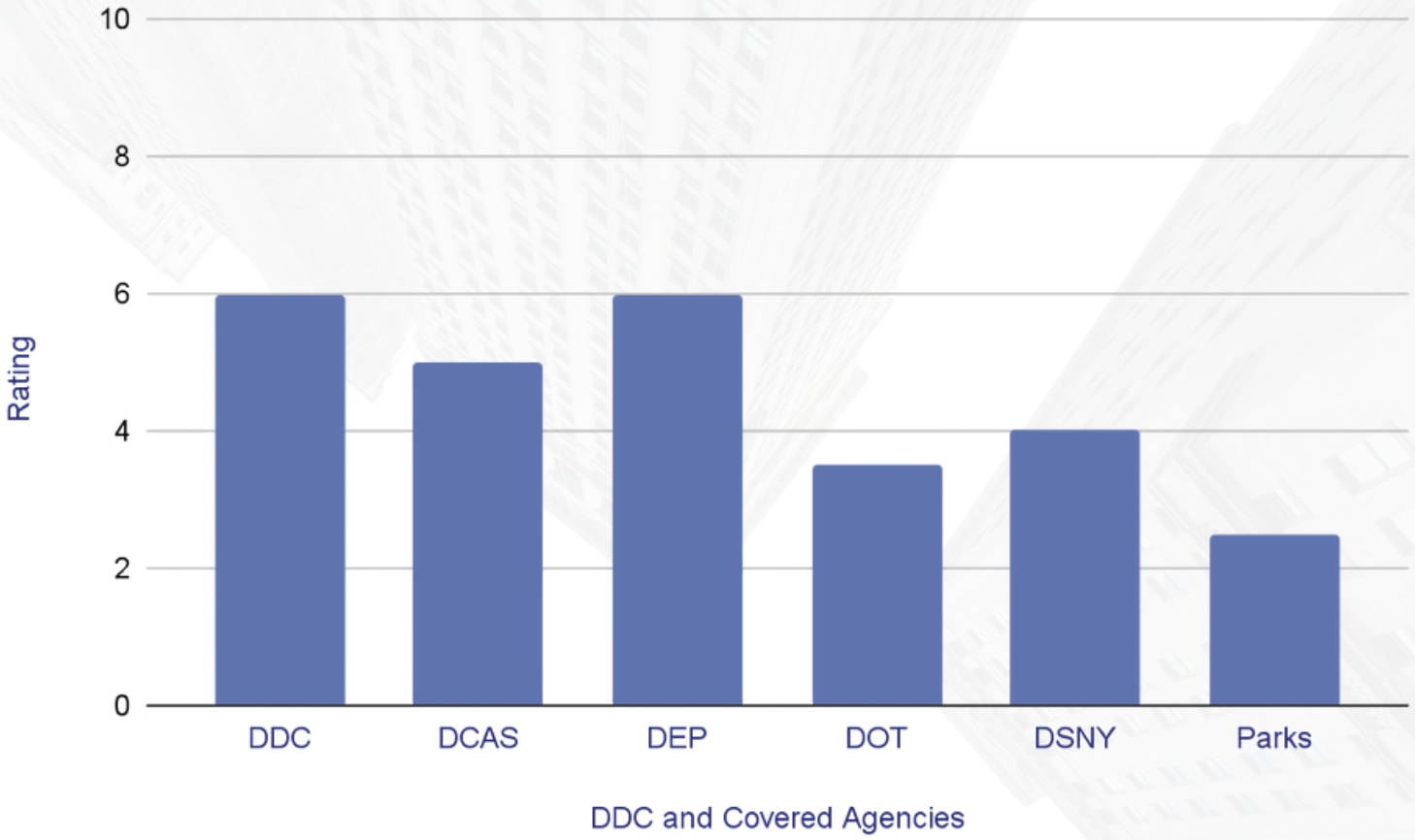
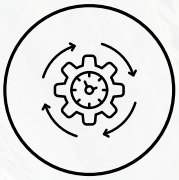


Fig.1 Readiness Level

DEP and DDC appear at the upper end of this range, reflecting more routine use of BIM in specific contexts, while covered agencies such as **Parks and DOT** remain at earlier stages. Although DEP and DDC report similar readiness scores, interview evidence suggests that they are not at the same stage of maturity. DDC's BIM use is more institutionalized and embedded in established workflows, indicating a transition from pilot activity toward broader, more consistent application across projects.

On the other hand, DEP, which is more advanced than other agencies, still exhibits uneven adoption across certain phases of the BIM lifecycle, suggesting that targeted pilots may remain necessary to extend capability into less mature areas. Notably, the figure does not depict a simple divide between leaders and laggards. Instead, it reveals a system characterized by uneven but broadly constrained readiness, which informs the thematic analysis that follows.

4.1 Common Themes Across Interviews



Willingness Among Interviewees To Adopt Tools, Limited by Capacity.

While the majority of interviewees from DDC and the covered agencies were well-versed in BIM and CIM, interviews made clear that this expertise is not broadly distributed. In several agencies, staff with BIM/CIM training remain the exception rather than the norm.

Except for DEP, where it was evident that BIM tools are widely used across the organisation, other covered agencies had fragmented deployment of BIM and CIM.

In our interview with Parks representatives, they rated their maturity level at just above a 2, whereas the average score was 4.5, with DEP topping out at 6. Limitations largely stemmed from budget cuts, hiring freezes, bureaucracy, and outdated IT systems.



BIM & CIM Are Viewed As Beneficial, But Not Critical To Operations.

Aside from DEP, which has widespread integration, the other covered agencies recognise the strengths of BIM and CIM but are lukewarm about whether they are integral to their operations. Though BIM improved coordination, clash detection, and project delivery when used, leadership in agencies facing budget cuts found it cumbersome to prioritize new methods when they believed current methods worked well.

"I've tried to garner support for more BIM/CIM projects, but with everything going on right now, it's just not top of mind for the organization at this time."



Executive Order 23 Is Perceived as a Suggestion Rather Than a Policy.

In one of our conversations, the following comment was made: ***"Executive Order 23 is not a law; as a result, it doesn't necessarily mandate the use of these tools. If we don't use them, we're not going to get sued."*** The sentiment expressed here was standard across different covered agencies when asked about the impact of EO 23. Another interviewee mentioned that it does not make a ***"strong case for why organisations need to do things differently."*** As a result, EO 23 is not seen as a catalyst for broader adoption of BIM and CIM. A lack of legal imperatives means those in leadership positions don't have to adhere to them, especially in an industry where change is slow to come.



Fear of Errors & Risk In a High-Stakes Environment.

When pressed on why the DDC and covered agencies were slow to adopt, 63% of the representatives interviewed directly mentioned the nature of the industry. They noted that Public Construction is slow by design because mistakes can cost taxpayers a princely sum. Additionally, they added that if a new tool is used and the results are lacklustre, the consequences could result in structural faults that lead to physical damage. Therefore, teams that are accustomed to older frameworks and methods stick to them to avoid mistakes.

4.1 Themes Across Interviews



Dichotomy Between Recruits & legacy staff.

During our conversations, several mentions were made of differences in learning incentives between newer staff members and those with long tenure at the agencies. People who join are more likely to be acquainted with BIM and CIM because of their exposure to these tools through their education, and therefore are better placed to use them

In contrast, people who joined the industry before BIM and CIM may not have the same level of exposure. They have been at their respective agencies for years, if not since the DDC's inception in the 90s, and do not see a need to change their approach. Secondly, unlike the private sector, which can use financial incentives to get people to acquiesce, the public sector faces financial constraints that nullify that approach.



4.2 Internal and External Challenges

Internal Challenges Identified From Interviews

- Staffing shortages and hiring freezes - 4/6 covered agencies reported difficulties recruiting skilled BIM professionals.
- Skill gaps and training limitations - Of the staff who are willing to learn, their efforts are hampered by a lack of time to develop and by a limited number of structured training programs.
- Legacy workflows and outdated IT systems: Two of the agencies interviewed still rely heavily on PDFs and 2D drawings, even though they sporadically implement BIM/CIM tools.
- Cultural dichotomy-Newer members are well versed in BIM and CIM, while some staff members who have been there for a while are reluctant to change how they work.

External Challenges Identified From Interviews:

- Budget constraints -4/6 covered agencies mentioned budget constraints as a significant limiting factor. This affects what initiatives are prioritized, and as it stands, launching organizational-wide BIM/CIM initiatives is viewed as a nice-to-have, not an essential change.
- Policy Ambiguity around EO 23 -Organizations are unsure of how to adapt and why they need to adjust these sustainability requirements into their operations, especially without financial backing to do so.
- Pragmatic Industry -The construction industry moves cautiously by design to prevent missteps. Any widespread adoption of new tools requires credible proof-of-concept examples, and even then, implementation will have to be phased.
- Dependency on third-party consultants -Without dedicated in-house teams, covered agencies receive complicated models but cannot scale them internally or maintain them. Knowledge gaps form between the few trained and the many untrained, creating silos.



4.3 Covered Agency Overview

Agency	Cultural Attitude Toward Digital Tools	Internal Challenges	External Challenges	Overall Readiness (0–10)
DDC	BIM positive attitude, with several interviewees familiar with the tools already	Some people in leadership need to be convinced of the quantifiable value of adopting these tools	The construction industry is highly risk-averse and change adoption is slow and bureaucratic.	7
DEP	Positive, engineering-forward, innovation-friendly. Staff are highly open to BIM and see it as essential.	limited hiring capacity for BIM roles; uneven training.	Operations teams are still analog; limited hiring capacity for BIM roles; uneven training.	6
DSNY	Willing, culturally open, but resource-constrained.	Old facilities; small capital budget; limited staff bandwidth.	Aging infrastructure; consultant-driven BIM.	4
DOT	Generally positive toward technology but psychologically strained by staffing cuts; sees BIM/CIM as useful but not mandated.	Knowledge loss from attrition; low morale; few training resources.	Hiring freezes; lack of EO23 clarity; limited leadership mandate.	3.5
DCAS	Open but lacks strong leadership push; culture is administrative and compliance-focused.	Lack of leadership alignment in digital vision; limited internal technical capacity.	Budget constraints; perceived risk of BIM errors; no mandate clarity.	5
Parks	Curious but cautious; sees BIM as valuable in the future but not immediately necessary.	Staff are willing to learn, but workplace culture is overly pragmatic and slow to change. The main hurdle is people, not capital.	Need for citywide alignment to make BIM use mandatory in processes and project delivery.	2.5

4.4 Theoretical Approach to Problem Solving

BIM/CIM adoption across NYC's public construction ecosystem faces a complex mix of institutional, cultural, and structural barriers. Interviews revealed deep-seated risk aversion, uneven digital literacy, time scarcity, outdated procurement norms, inconsistent data standards, and tools that do not meet the complexity of modern projects. These challenges are not unique to New York; they reflect the same barriers encountered in early BIM adoption efforts in the UK, Singapore, and major public infrastructure programs worldwide.

Global leaders successfully addressed these barriers through phased, capability-building approaches, strong change coalitions, procurement reform, standardized data environments, and cultural strategies that normalized experimentation and learning. The following integrated strategies synthesize those best practices with the realities observed across DOT, DCAS, DSNY, DEP, Parks, and DDC.

- **A) Start Small to Reduce Risk & Build Confidence (Pilot-First Strategy)**

Fear of failure and job insecurity were recurring themes across agencies. Staff often hesitated to use BIM/CIM on live projects, lacking time, training, or assurance that mistakes would be acceptable.

Deploy small, low-risk pilots (using past or non-critical projects) mirroring the UK and Singapore's early BIM programs, which used "learning pilots" before mandates took effect. These pilots:

- Allow experimentation without schedule pressure.
- Generate early wins that build psychological safety.
- Demonstrate tangible value to create momentum where EO23 currently lacks perceived urgency.
- Counteract resistance among long-tenured staff who worry about job displacement.
- Public-sector transformation research consistently shows that incremental, evidence-driven approaches outperform large-scale rollouts in complex bureaucracies.

- **B) Build and Empower Change Leaders & Mixed Teams**

Kotter's (1995) model emphasizes that successful change requires a credible guiding coalition. Interviews confirmed that agencies already have small pockets of digital fluency, often younger employees or individuals with private-sector BIM experience. These people are natural change leaders, capable of:

1. Leading pilot programs.
2. Coaching peers.
3. Demonstrating practical use cases.
4. Acting as bridges between leadership and frontline teams.

Pairing change leaders with mixed teams (supervisors, motivated learners, shadow trainees) follows the distributed leadership models used in the UK and Singapore.
This approach also reduces the knowledge-vacuum risk where staff attrition leaves critical skills siloed or lost entirely.

- **C) Anchor Digital Adoption in Real Agency Problems, Not Abstract Technology**

One of the strongest insights from interviews was that BIM/CIM adoption stalls when presented as a generic "digital upgrade." Staff embrace BIM when it solves real problems they experience daily:

DDC: reducing coordination failures between design disciplines, minimizing late-stage change orders, and improving the quality and consistency of digital handover packages.
DSNY: eliminating delays from poor existing conditions data.
DEP: improving handover packages for operations.
DOT: accelerating coordination between roadway, traffic, and structural units.
Parks: visualizing small projects for public engagement.
DCAS: improving asset tagging and energy reporting.

This problem-driven approach aligns with innovation research (Vial, 2019) and with Singapore's BIM Roadmap, which tied digital tools directly to pain points in permitting and facilities management.

When BIM addresses operational pain points (not theoretical ambitions) adoption becomes intrinsically valued rather than compliance-driven.

4.4 Theoretical Approach to Problem Solving

- **D) Integrate Training Into Real Work, Not Stand-Alone Sessions**

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When BIM addresses operational pain points (not theoretical ambitions) adoption becomes intrinsically valued rather than compliance-driven.

- **E) Integrate Training Into Real Work, Not Stand-Alone Sessions**

Traditional training models fail because staff lack time, learning feels abstract, and leadership rarely reinforces application.
Embedding training within pilot execution replicates the experiential learning models used in the UK's BIM Task Group. This method:

1. Ensures immediate application.
2. Shortens learning loops.
3. Supports retention.
4. Makes training directly relevant to daily workflows.
5. Reduces dependence on external consultants.

Shadowing by change leaders also provides real-time troubleshooting and prevents early technical mistakes from becoming discouraging failures.

- **F) Establish Psychological Safety as a Foundational Condition For Learning**

Edmondson (1999) shows that innovation flourishes only when individuals feel safe to experiment and ask questions. Interviews revealed that some employees fear appearing incompetent or inefficient when using unfamiliar tools.
To counter this, leadership must explicitly communicate that:

1. Experimentation is expected.
2. Mistakes are acceptable.
3. Learning is the primary goal of pilots.
4. Evaluation is based on process, not perfection.

Global precedents support this approach. The UK's early BIM trials adopted a "safe-fail" mandate for all pilot teams, while Singapore's IDD program emphasized non-punitive learning environments as a core principle.

- **G) Create Systems For Knowledge Capture & Diffusion**

Without explicit knowledge capture, BIM/CIM becomes confined to isolated experts; precisely the problem DSNY and DOT described. Pilots must produce reusable materials, including:

1. Workflow documentation.
2. "How-to" guides built from actual project steps.
3. Short internal playbooks,
4. Process screenshots or GIFs.
5. Recorded reflections from participants,
6. Departmental brown-bag learning sessions.
7.

This directly parallels Nonaka & Takeuchi's SECI Model, ensuring that tacit knowledge becomes explicit and transferable across agencies.

The UK institutionalized this through national BIM Playbooks; Singapore formalized it through guided templates embedded into its Corenet submission system.

4.4 Theoretical Approach to Problem Solving

- **H) Address Systemic Structural Barriers Through Industry-Aligned Best Practices**

Procurement Reform to incentivize digital capability: The public sector's lowest-bid contracting actively discourages BIM investment. By contrast:

  - UK (2016): Mandated BIM Level 2 for all government works; BIM capacity became a qualification criterion.
  - Singapore: Required digital proficiency to bid on public jobs.

Until New York's public sector moves toward "best-value" procurement or ties digital capability to pre-qualification, contractors will continue to treat BIM as a cost rather than a competitive advantage.

Standardized Data Exchange and a Common Data Environment (CDE): Fragmented data exchange, CAD, PDFs, consultant servers, produces rework and misalignment. International best practice demonstrates the solution:

  - UK ISO 19650 / PAS 1192: National data standards + CDE requirement.
  - Singapore Corenet X: Unified digital submission environment across agencies.

DDC needs equivalent shared data schemas, classification systems, and a CDE to achieve model-based workflows across DDC and the covered agencies.

- **I) Tools That Match Project Complexity**

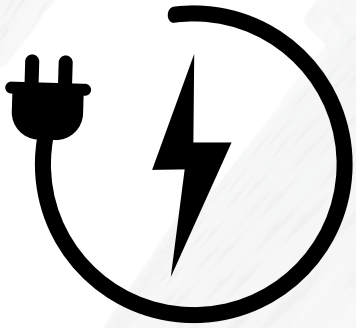
Current reliance on PDFs and unstable software is incompatible with DDC's increasingly dense infrastructure projects. Global precedents show that complex urban programs require federated models, multi-disciplinary coordination platforms, and model-centric planning, not document-centric workarounds.





Solution & Recommendations

5. Solution and Recommendations



Willingness Among Interviewees To adopt Tools Is limited By Capacity.

What DDC & the covered agencies need next is not just more tools. It requires a knowledge ecosystem that allows BIM/CIM to actually flow through the organization, from design to construction to operations.

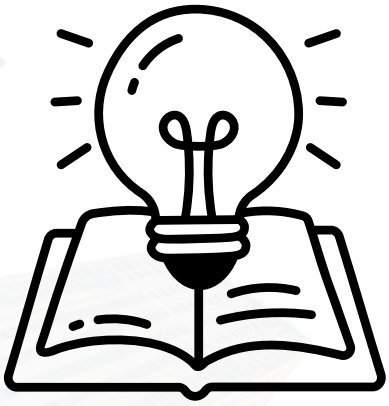
Here are our strategic recommendations, grounded in the knowledge framework and directly responding to the impact patterns we observed.

5.1 Build a Unified Knowledge Infrastructure

What We Learned:

Based on our interview with DDC teams, explicit knowledge, such as drawings, models, documents, is scattered across OneDrive, Box, PDFs, emails, and consultant servers. There is no single source of truth, which blocks BIM from moving through the lifecycle.

This turns explicit knowledge into a shared organizational memory instead of scattered files.



What We Recommend For DDC & Covered Agencies:

- Build a Common Data Environment (CDE) that all agencies must use for BIM/CIM.
- Standardize file naming, versioning, metadata, and classification.
- Require model-based handoffs in procurement contracts.
- Codify knowledge infrastructure around the specific tools that each covered agency uses. For example, DOT uses a combination of both CIM tools and BIM, whereas DCAS primarily uses BIM.

5.2 Strengthen the Workforce as Knowledge Carriers:

What We learned:

People accept BIM; they lack context, training, and confidence. Tacit knowledge remains local, passed through proximity rather than through systems. Helps tacit knowledge surface, circulate, and be reinforced rather than staying locked in individuals.



What We Recommend For DDC & Covered Agencies:

- Create a BIM Learning Pathway that explicitly outlines why these tools are relevant to the stakeholders at the organization and the agencies.
- Formalize roles like BIM Manager, Data Steward, and Model Auditor inside each agency.
- Provide non-punitive sandbox or pilot spaces to reduce fear of mistakes.

5.3 Improve Knowledge Flow Across the Lifecycle:

What We learned:

BIM breaks down at the same predictable points: design, construction, operations, and maintenance. Each group works in its own silo and tools do not connect. This restores the end-to-end knowledge pipeline, so BIM is not lost at the handover.

What We Recommend For DDC:

- Create clear handoff protocols between phases.
- Require consultants and contractors to deliver construction-ready and operations-ready models.

What we recommend For Covered Agencies:

- Ensure DCAS, DSNY, DOT, and the others receive models they can actually use.
- Align tools and data formats across covered agencies.



5.4 Upgrade Procurement to Support Knowledge Flow:



What We Learned:

The lowest-bid procurement model stops vendors from investing in BIM or delivering quality models. This kills knowledge quality at the source. Ensures external partners become contributors to knowledge, not blockers.

What We Recommend For DDC:

- Move toward qualification-based selection with digital maturity requirements.
- Require BIM deliverables at defined Level Of Development for every project phase.
- Build incentive structures for maintaining model fidelity through construction.
- Benchmark UK and Singapore procurement reforms as templates.

What We Recommend For Covered Agencies:

- Require BIM and CIM deliverables–where applicable for each of the covered agencies' various projects.



5.5 Establish Governance That Treats BIM as Knowledge, Not Just Technology:



What We Learned:
No one is fully accountable for model accuracy, handoff, maintenance, or updates.
Ambiguity kills adoption. Governance creates institutional knowledge stability, preventing drift and inconsistency.

What We Recommend For DDC:

- Create a BIM Governance Board. Source talent internally to bypass funding shortfalls in regards to onboarding new talent.
- Assign clear owners: who builds, who checks, who maintains, and who updates the model.
- Make governance light but firm guiding, not micromanaging.

What We Recommend For Covered Agencies:

- Establish BIM and CIM governance boards at each of the covered agencies to facilitate 'Best Practice' framework.

5.6 Launch (or Leverage Existing) Targeted Pilot Projects to show value:

What We Learned:

People believe what they see. Early wins accelerate adoption more than any mandate. Pilots turn knowledge into practice, and practice into organizational reinforcement. For the covered agencies, this presents an opportunity to launch targeted pilot programs.

DDC has already launched BIM and CIM pilot projects; however, their impact has remained localized. Lessons learned have not been identified or systematically captured; success criteria are unclear, and performance data were not consistently used to inform budget decisions, standards development, or broader rollout.



What We Recommend For DDC:

- Define clear success criteria for pilots, tied to delivery outcomes such as reduced field clashes, fewer RFIs and change orders, faster approvals, improved handover quality, and more complete EO 23 materials and carbon reporting.
- Standardize pilot tracking and evaluation, using a small, consistent set of indicators across projects to allow comparison and evidence-based decision-making.
- Institutionalize learning capture, requiring short post-pilot reviews that document effective practices, challenges, and implications for standards, templates, and guidance.
- Use pilot evidence to drive scaling decisions, informing updates to BIM execution plans, delivery requirements, and internal training priorities.





What We recommend For Covered Agencies:

- Select small, low-risk pilot projects (including retrospective modeling of completed projects where appropriate) to allow staff to learn without schedule or delivery risk.
- Focus pilots on agency-specific needs, such as asset data for operations, maintenance planning, or EO 23 reporting, rather than generic BIM functionality.
- Treat pilots as training pathways, using them to identify early adopters, develop internal champions, and build communities of practice.





Implementation

6 Implementation Approach

This combined implementation plan integrates Team 1's organizational change strategy and Team 2's pilot-based capability-building approach to support BIM/CIM adoption across DDC and the broader NYC construction ecosystem. We recommend that the transformation advance on two interconnected fronts:

1. **DDC's internal BIM/CIM maturity (governance, culture, processes, workforce)**
2. **The readiness and digital capacity of other covered agencies (DSNY, DCAS, DOT, Parks, DEP,)**

Both fronts must move forward together for BIM/CIM to become New York City's shared single source of truth.

DDC Internal BIM/CIM Maturity Implementation Plan

DDC's BIM and CIM capability has developed through project-level requirements, pilots, and individual expertise. The next stage of maturity is not about introducing new tools, but about consolidating and institutionalizing existing practices so that digital delivery becomes consistent, scalable, and reliable across DDC-managed projects. The phased path below reflects how that transition can occur in a controlled and realistic way.

A) Short Term (0–12 months): Stabilize and Align

In the short term, the focus should be on reducing variability and establishing organizational alignment around BIM and CIM. DDC should clarify enterprise ownership of BIM/CIM and treat digital delivery as a managed capability rather than a project-by-project choice. Existing pilots should be formalized as learning mechanisms, with clearer success criteria and structured review so that lessons learned are retained and reused.

Culturally, leadership should reinforce that BIM and CIM are supported ways of working and that pilots are safe environments for experimentation. This is critical to reducing risk aversion and encouraging broader engagement. From a process perspective, lightweight standardization (particularly around execution planning, handover expectations, and validation) should be introduced to ensure that digital outputs are usable beyond design.

Workforce efforts in this phase should concentrate on identifying and empowering existing BIM/CIM practitioners as internal change leaders, while pairing them with motivated learners to reduce single-point dependency and begin spreading capability.

What Does This Look Like?

In practice, this means clarifying ownership and expectations. For example, DDC should formally designate a small enterprise BIM/CIM leadership function (whether an individual or a small steering group) that can later evolve into the BIM Governance Board, with responsibility for setting minimum digital expectations across DDC-managed projects. This does not require a new policy, but it does require a clear signal that BIM/CIM deliverables are not optional add-ons.

DDC should also better leverage the pilots it already runs. A concrete step would be to require that every BIM or CIM pilot include a short close-out review that answers a few specific questions and carefully documents these responses: What was modeled? How was the model actually used? Where did it save time or reduce rework? What information was lost at handover? These reviews should be captured centrally and reused, rather than remaining with individual project teams.

From a delivery standpoint, DDC should introduce a simplified, standardized BIM Execution Plan template that focuses on how information will be handed over, rather than just on how models are created. Even a two- or three-page "thin BEP" would reduce variability and clarify expectations for consultants.

On the workforce side, DDC should identify staff who are already using BIM/CIM effectively and formally recognize them as internal reference points. A practical example would be pairing one experienced BIM user with one or two project managers on an active project, allowing learning to happen in context rather than through separate training sessions.

Outcome

DDC achieves consistency, captures learning from existing pilots, and establishes a stable foundation for scaling. Fewer ad hoc BIM decisions, clearer expectations at project kickoff, and pilot projects that actually generate reusable lessons.

6 Implementation Approach

B) Medium Term (12–36 months): Scale and Embed

Once alignment is achieved, DDC can shift from stabilization to scale. In this phase, BIM and CIM should become the default delivery approach for most DDC-managed projects, with requirements calibrated by project complexity rather than left to discretion. Governance structures should use evidence from pilots to refine standards, adjust consultant expectations, and justify targeted investments.

Culturally, BIM-first delivery should be normalized through routine use in project kickoffs, design reviews, and coordination activities. Processes should evolve so that BIM supports not only design coordination but also construction sequencing, handover, and EO 23-related reporting. This may include introducing a shared digital workspace to improve version control and cross-team visibility.

Workforce development in this phase should expand beyond specialists to include project managers, inspectors, and supervisory staff, embedding digital competence into everyday roles rather than isolating it within technical teams.

What Does This Look Like?

A concrete step here would be to update standard project initiation and consultant onboarding processes so that BIM/CIM expectations are discussed alongside schedule, budget, and risk, rather than later as a technical detail. BIM requirements can vary by project complexity, but they should be explicit and predictable.

DDC should also begin consolidating digital workspaces. For example, instead of each consultant hosting models on separate platforms, DDC could require that BIM deliverables for selected projects be maintained in a shared, DDC-approved environment with basic version control and access rules. This does not require a citywide CDE immediately, but it does move away from the current fragmented storage modus operandi.

Process-wise, DDC should ensure that BIM is used consistently for coordination and decision-making, not just production. A practical example would be requiring that certain design review or coordination meetings reference the model directly, rather than relying solely on 2D PDFs.
Workforce development in this phase should broaden beyond specialists. For example, project managers and inspectors should receive targeted, role-specific exposure (learning how to review models, extract information, and flag issues) without needing to become modelers themselves.

Outcome:
BIM and CIM are embedded into standard delivery processes and are no longer dependent on individual champions or exceptional projects. Most DDC projects follow a familiar digital rhythm, staff expect to work with models, and BIM supports real decisions during delivery rather than living on the side.



6 Implementation Approach

C) Long Term (36+ months): Institutionalize and Optimize

In the long term, BIM and CIM should function as permanent organizational infrastructure. Digital delivery expectations should be fully embedded into DDC policy, contracts, and hiring practices, ensuring continuity regardless of leadership or staffing changes. A formal structure (i.e. a governance board and/or center of excellence) can maintain standards, monitor performance, and evaluate emerging technologies.

Culturally, DDC should treat BIM and CIM as the norm for project delivery, while continuing to encourage improvement and innovation. Processes should position BIM/CIM as the single source of truth throughout the project lifecycle, with continuous refinement informed by performance data and user feedback. Workforce strategies should focus on sustaining capability through talent pipelines, advanced training, and knowledge transfer.

What does this look like?

Concretely, DDC would embed BIM/CIM expectations into standard contract language and role descriptions so that digital delivery is assumed rather than negotiated. Hiring and professional development pathways would reflect this, ensuring that new staff arrive with baseline digital literacy.

By now, DDC should also have formalized permanent functions, such as a BIM/CIM Governance Board, and a center of excellence or equivalent, that maintains standards, reviews performance, and evaluates emerging practices such as digital twins, GIS integration, or automated model checking. This function would not run projects, but would ensure consistency and continuous improvement.

From a process perspective, DDC should use BIM/CIM as the authoritative source of information across the project lifecycle, with clear rules about what data must be maintained and how it supports downstream uses like asset management or EO 23 reporting.

Finally, DDC should regularly review its digital delivery approach against global best practice, adjusting standards and workflows as tools and expectations evolve.

Outcome:

DDC operates as a digitally mature agency, capable of consistently delivering high-quality, data-driven capital projects and supporting broader City sustainability and transparency goals. BIM and CIM are no longer discussed as innovations; they are simply how DDC delivers projects, supports sponsor agencies, and meets sustainability and transparency objectives.



6.1 Pilot Proposal Structure for Covered Agencies

Each pilot program should be;

Small In Scope.

Training teams can be tasked with recreating a previously completed project using BIM and CIM tools to minimise the risk of delays or disruptions to ongoing projects.

Led By Change Leaders.

Change leaders are the people in these organisations who are already trained in BIM and CIM and eager to see their use cases scaled. Most of the interviewees we spoke to are excellent change leaders because they have a direct incentive to see these tools implemented.

Supported By Motivated Learners.

From the interviews, it was clear that some staff members are open to learning and would like to be trained. These are the early adopters that the agencies should be identifying. They can be found internally through targeted surveys and interviews with staff members who want to upskill with BIM and CIM.

Structured With Feedback Loops.

Change leaders should provide routine feedback to trainees to evaluate their performance and offer insights. Once the trainees have learned, they can be used to shadow new trainees to scale the use case.

Connected To An Agency-Specific Challenge.

Different teams within the covered agencies, use different tools, even within the respective BIM and CIM umbrella. Therefore, the chosen pilot projects should be bespoke to each agency, each with specific KPIs to measure efficiency.



A) Identify & Empower Change Leaders.

These are individuals who already understand BIM and CIM tools and workflows. The interviewees we spoke to were all advocates of these tools. They are familiar with them, understand their value, and would be happy to see them further implemented; therefore, they make excellent prospects to lead this transformation from the ground up.

Their role is to:

1. Lead the pilot
2. Train staff
3. Model new behaviours
4. Serve as contact points for supervisors and the higher-ups at the agencies.

B) Select Motivated trainees.

As stated previously, the public sector is unable to throw money at the problem as the private sector can. Employees cannot be given lofty bonuses for learning these tools. The best bet is to find eager learners through agency-wide surveys and interviews. Identify those who are driven to understand and leverage their enthusiasm to build a team of early adopters. Even though financial incentives are limited, agencies can communicate the value of professional development and the promotional pathways that may open when trainees learn these tools.

C) Implement A Shadow Support Model.

If possible, partner trainees with Change Leaders who shadow their work during the first project. Shadowing the trainees helps with;

1. Tool troubleshooting
2. Workflow questions
3. Real-time problem solving
4. Avoiding early technical mistakes
5. Ensuring deliverable quality

6.1 Pilot Proposal Structure for Covered Agencies

D) Contextualize The Pilot Projects

Each team and agency varies in the deliverables it provides. The pilots should be based on challenges specific to an agency, rather than a generic BIM or CIM tutorial that may not be contextually relevant. This is not to dismiss the value of LinkedIn Learning modules or other online training modules in establishing the basics of the tools; Change Leaders should make the challenge relevant to their organization.

One way to do this is to frame a deliverable around a past project that has already been completed. The objective for trainees is to reproduce those outcomes or improve on them using digital tools. This creates a low-risk scenario in which live projects are not negatively affected, and the project's outcomes can be weighed against what has already been achieved to benchmark the efficiency of the digital tools.

E) Use 360-Degree Feedback Loops To Support Trainees

Establish Regular feedback sessions between:

- Trainees
- Change leaders
- Supervisors

The feedback cycles are designed to support the following;

- Continuous improvement
- Early identification of barriers
- Cultural reinforcement
- Transparent reporting

Lunch-and-learns have proven successful in the private sector. As the interviewee from Columbia University's construction arm mentioned, it is something the agencies can leverage to ensure best practices are shared.



6.3 Practical Application Example: DSNY

From the interviews, it was clear that each agency has unique pain points, which is why this report is not proposing a ubiquitous pilot. Instead, this example is meant to show how one covered agency may approach a pilot implementation.

DSNY's biggest blockers are:

- Fragmented information across drives, email, and paper archives
- Reliance on century-old drawings during emergencies
- Consultant-driven BIM with no internal continuity

This pilot targets information continuity, not full BIM maturity.

Phase 1: Pilot Definition & Readiness (Months 0–3)

Objectives

1. Define a low-risk, DSNY-specific pilot
2. Establish ownership, scope, and success criteria
3. Curate learning time and space

Key Activities
Select one completed facility project.
Define minimum viable BIM scope:
Appoint Change Leaders
Run internal surveys & interviews to identify motivated trainees

Outputs
Pilot charter
Success metrics (baseline)
Named pilot team
Leadership endorsement

Phase 2: Digitization & Skill Seeding (Months 3–6)

Objectives

1. Convert legacy knowledge into digital form
2. Begin experiential, task-based learning

Key Activities

- Scan paper and blueprint drawings
- Organize files into a single digital repository
- Begin shadow-based training:
  - trainees recreate documentation of the past project

Outputs

- Digitized drawing archive
- Centralized repository structure
- Initial trainee competency
- Early feedback from operations staff

Phase 3: Evaluation, Iteration & Replication Prep (Months 6–12)

Objectives

1. Decide whether the pilot delivers operational value
2. Prepare for limited scaling if justified

Key Activities

- Measure before/after KPIs:
  - time to locate information
  - staff confidence
  - rework reduction
- Refine workflows and standards
- Identify which components should not scale
- Document lessons learned

Outputs

- Pilot evaluation report
- Refined playbook
- Scale cost estimates
- Go / No-Go recommendation

6.3 Practical Application Example: DSNY

This RACI consolidates DSNY's pilot into six core activities, clarifying ownership while maintaining a low-risk, agency-led approach to digital adoption.

R = Responsible (executes the work)
A = Accountable (owns the outcome)
C = Consulted (provides input)
I = Informed (kept aware)

Pilot Activity	Change Leaders	Trainees	Supervisors
Define pilot scope & success criteria	**A/R**	I	C
Select completed facility project	**A/R**	I	I
Form pilot team & secure leadership support	**R**	C	**A**
Digitize legacy drawings & records	**A**	**R**	I
Recreate past project using BIM tools	C/**A**	**R**	I
Validate outcomes & decide on scale	**A/R**	I	C

6.4 Value Proposition of the Pilot Approach

Why pilot programs work

Pilot programs reduce risk and increase buy-in because they:

1. Require minimal budget
2. Avoid overwhelming agencies with a full-scale transformation
3. Provide concrete evidence of value before scaling
4. Allow agencies to learn by doing
5. Build internal champions who can train others
6. Respect agency differences in culture, readiness, and capacity

Limited resources, staffing constraints, and risk aversion currently impede New York City's public construction industry. The pilot model is the most feasible path to digital transformation.

Incentives & Motivation

Although agencies cannot rely on monetary incentives, they can motivate participants through:

- Opportunities for leadership visibility
- Contribution to a high-impact modernisation initiative
- Skill development and certifications
- Increased job satisfaction
- Promotion pathways
- Recognition from supervisors and project sponsors
- Clear mobility pathways
- The chance to work on innovative, resume-strengthening projects

Even if mobility is not immediately available to these employees right now, the awareness that it is a possibility in the future, even if it means venturing into the private sector, is a strong enough incentive to motivate them to train.



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6.5 ADKAR Framework for Pilot Approach

Stakeholder	Awareness	Desire	Knowledge	Ability	Reinforcement
DDC	Early IDs + regular checks enable clean handover and EO-23 evidence.	Fewer closeout fires; predictable acceptance.	Thin BIM execution plan (asset-ID plan and EO-23 evidence map); micro-training.	Run regular validations and a final completion check; escalate misses; require a pre-handover dry-run.	Gate sign-off tied to passes; recognize “clean handovers.”
Agency - DCAS	Understand that BIM is required for city-owned building assets, lifecycle management, energy benchmarking, and emissions reporting under MOCEJ mandates.	Motivation to reduce portfolio operating costs, improve energy efficiency, centralize building data, and enhance capital planning accuracy.	Needs structured training in BIM for facilities management and data handover requirements.	Pilot BIM on DCAS-managed buildings upgrades; build internal BIM teams; deploy centralized database.	Tailor KPIs to encourage BIM adoption. Have a staff certification program that ensures that BIM competence is a core value of the organisation’s strategy. Acknowledge early adapters and reward them accordingly.

6.5 ADKAR Framework for Pilot Approach

Stakeholder	Awareness	Desire	Knowledge	Ability	Reinforcement
Agency - DOT	Tailor KPIs to encourage BIM and CIM adoption. Have a staff certification program that ensures that BIM competence is a core value of the organisation's strategy. Acknowledge early adapters and reward them accordingly.	Motivated by reduction in project rework, better utility clash detection, improved public safety, faster permitting, and enhanced cross-agency data sharing.	Needs further training in CIM integration, 3D modeling and infrastructure digital twins.	Launch training on low-risk, minimum remarkable products where hands on experience and assistance can be provided by senior staff members to iron out deficiencies.	Mandate CIM deliverables in all capital road and bridge RFPs, standardize data formats.
Agency - DSNY	Understand that BIM/CIM supports facility modernization, route optimization, resilience planning, and emissions reduction reporting aligned with EO 23/2022.	Champion operational efficiency, optimized routes, and efficient workflows.	Requires training in BIM. Similar to previous recommendations.	Launch training on low-risk, minimum remarkable products where hands on experience and assistance can be provided by senior staff members to iron out deficiencies.	Tailor KPIs to encourage BIM adoption. Have a staff certification program that ensures that BIM competence is a core value of the organisation's strategy. Acknowledge early adapters and reward them accordingly.

6.5 ADKAR Framework for Pilot Approach

Stakeholder	Awareness	Desire	Knowledge	Ability	Reinforcement
Agency - DEP	DEP recognizes EO 23 goals on clean construction but awareness of BIM integration is uneven. Hold internal briefings linking EO 23 mandates to daily project work.	Interest exists in sustainability but motivation is compliance-driven. Tie goals to DEP's mission and introduce recognition for innovative teams.	Strong technical base but limited BIM know-how. Provide short, joint DEP–DDC training on tools and workflows.	Lacks tools, coordination, and data sharing. Pilot EO 23 projects using MOCEJ's Material Tracker and form a BIM task force.	Progress tracking depends on EO 23 reports. Embed KPIs and showcase carbon-reduction wins internally.
MOCEJ	EO-23 requires usable, verifiable evidence.	Lower compliance friction; credible reporting.	Policy to evidence data map; validator logic overview; thresholds.	Early feedback on acceptance criteria; align LCA triggers.	Guidance references delivery KPIs; quarterly clinic follow-ups.

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Change Log:

The visual palette of the final report was edited to match the layout of the final presentation

Transition pages were added in between the large sections to give the final report a more cohesive flow

The Covered Agency Figure on page 22 was edited to include the DDC as per the request of the sponsor during a preliminary report feedback session.

All the agencies under EO23 were referred to as 'covered agencies' as per the request of the sponsor during report feedback.

The Implementation framework from page 32-42 was differentiated from the original report to show how implementation plans vary for DDC and the covered agencies.

Additionally, the RACI table was re-imagined to focus specifically on DSNY as an example of how one of the covered agencies may implement a pilot program.