

BIM and State Reforms in Infrastructure Management (2015-2025): Historical Comparison of Policies, Standards and Narratives of Efficiency in Peru, Colombia, Chile and Brazil

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Abstract

Building Information Modeling (BIM)—defined as a set of policies, processes and technologies that operate in an integrated and collaborative manner—has emerged as a way to reduce costs, increase efficiency and quality and shorten the delivery times of infrastructure projects. Its purpose was to explore the scientific literature on the implementation of BIM methodology and government reforms in infrastructure management in Latin America—specifically Peru, Colombia, Chile and Brazil—between 2015 and 2025. The study employs a systematic literature review design, structured in accordance with the PRISMA 2020 guidelines. The search strategy was conducted in two databases: Scopus and DOAJ, using Refseek as the search engine. A total of 19 articles were included in the review, of which 31.57% (n=6) addressed issues related to BIM implementation and infrastructure management in Brazil. In conclusion, it is important to note that despite the global significance of this methodology, its adoption in Latin America has been quite slow. Its evolution over the past decade has been addressed only partially, as few countries in the region have shown interest in implementing it. Therefore, public institutions in Latin America must continue to adapt regulations and standards for BIM implementation in order to achieve maximum efficiency in infrastructure management. In light of this, it is recommended that, to ensure effective implementation, it is necessary to strengthen knowledge, address interoperability issues and overcome cultural resistance. Similarly, public policies should be reviewed and adapted to the current needs of the infrastructure sector.

Keywords: BIM Methodology, Infrastructure, Management, State Reforms.

Introduction

Efficiency in infrastructure management is recognized globally as an institutional necessity, which involves the ability to ensure maximum social benefit for citizens by utilizing available resources (1). Generally, public sector efficiency is determined by the relationship between investment in resources or inputs and the services delivered (2). In this regard, high efficiency can be achieved to the extent that social and economic benefits are maximized while minimizing the use of public funds. Therefore, eliminating unnecessary expenditures ensures better service delivery (3). Consequently, the government, through its institutions, has taken on the responsibility of addressing citizens’ needs, such as the development and maintenance of infrastructure, roads and housing, among others. In this regard, planning and regulation in the execution of

infrastructure projects have recently been a fundamental pillar of public sector efficiency, with ongoing management in the development of new projects (4, 5). Likewise, regulations and methodologies have been designed and implemented for the management and control of information related to the planning, financing, oversight and compliance with the execution of infrastructure projects (6). The implementation of standardized work methodologies such as building information modeling (BIM) paves the way for the optimization of project management (7). Historically, the BIM methodology originated in the 20th century, in the United States in the 1970s, through the research of architect and professor Charles Eastman, who initially proposed the Building Description System (BDS). This model allowed for detailed representations of the structure with

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geometric attributes, representing the first actual version of an intelligent model (8). Currently and since 2017, BIM has been governed by a standard in the United States known as the National BIM Standard (NBIMS.US). This standard regulates the design, execution and supervision of construction projects with the aim of achieving cost-effective and sustainable solutions (9–11). Once implemented, the BIM methodology provides a series of social benefits that contribute to achieving significant changes that benefit citizens. In light of the above, there are studies focused on improving the implementation of BIM in the public construction sector, specifically in Ethiopia. The study confirmed that, due to a lack of technological infrastructure, limited government support and a lack of research and training at universities, the implementation of BIM is, to some extent, forced (12). Another study focuses on public-sector organizations through a case study in Italy, based on a sustainable design process. The authors presented a structured process model with a prioritized selection for BIM implementation, which includes a practical roadmap and a role matrix that drives the structural reorganization of the entities responsible for its implementation (13). In the Americas, a study was conducted on the development and technological advancement of BIM methodology based on patent citations in the United States of America (USA). The main finding was that the integration of BIM with emerging technologies such as the Internet of Things (IoT), big data and artificial intelligence (AI) is a significant trend in the USA (14). Finally, some studies indicate that while BIM has been used and adopted more widely in developed countries, its level of advancement in developing countries is still in an early stage of maturity. This is primarily associated with budgetary constraints and the prevalence of unskilled labor in these nations (15).

Given the nature of this study and the importance of BIM methodology—which has been adopted in North America, Europe and Asia—a research gap emerges regarding the progress made in Latin American countries in terms of government guidelines for BIM implementation. Consequently, this article is based on the following research question: What has been the historical evolution of infrastructure management and the implementation of BIM in terms of policies, standards

and narratives of efficiency in Peru, Colombia, Chile and Brazil? The objective is to explore the academic literature on the implementation of BIM and government reforms in infrastructure management from 2015 to 2025.

Key Features of the BIM Methodology

Today, given the global demands to preserve and protect the environment and promote comprehensive social well-being, the BIM methodology is aligned with the 2030 Agenda. It is aimed to a systematic search for sustainability, efficiency and quality in the construction, reconstruction and maintenance of infrastructure (16). Therefore, it is imperative to comprehensively and progressively implement the guidelines included in the various dimensions of this methodology for the development of public projects, with a view to achieving efficient infrastructure management (17).

Once implemented, the BIM methodology offers a series of social benefits that help bring about significant changes that benefit citizens. Its structure is divided into nine specific dimensions, which are described below: D1—idea and concept to be addressed; D2—design and related documentation; D3—information model; D4—project sequence and schedule. D5 cost estimation; D6 sustainability and energy efficiency; D7 covers facilities management; and D8 data security integration. Finally, D9 environmentally friendly development (18).

A truly significant aspect is that, through standardized execution, more humane, efficient and sustainable buildings can be constructed to transform cities into safe, healthy, comfortable and smart places (19). In the economic context, the structure of this methodology is based on the digitized management of information and communication. This ensures that citizens benefit from fewer errors and lower costs in the design of construction projects, as well as the use of eco-friendly materials that align with the green philosophy. Thus, its applications can contribute to better planning and management of buildings, minimizing the negative impact of certain natural and man-made events (20).

Methodology

This study is based on the qualitative paradigm and an interpretive approach, with a design centered on a systematic review of the literature.

Methodologically structured in accordance with the PRISMA 2020 guidelines (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) (21), to guarantee transparency in the search for and selection of information. Similarly, it is complemented by a historical-logical analysis, combining analytical-synthetic and inductive-deductive methods (22), in which, based on a dialectical relationship, induction allows us to observe specific historical facts and deduction to abstract universal logical laws. In this regard, we will use these data to assess the implementation of BIM and infrastructure management in Latin America between 2015 and 2025.

High-impact academic publications included in journals indexed in the databases were taken into consideration: Scopus, as a database of abstracts and citations of peer-reviewed works that indexes

journals regardless of access type and DOAJ, because in practice it functions as an academic database, but is technically defined as an online directory or index that indexes and provides access to high-quality, peer-reviewed, open-access academic journals (23). RefSeek was also considered an academic search engine. Special attention was given to documents highlighting the application of BIM methodology and its relationship to infrastructure management and institutional efficiency in the public sector in Latin America during the period from 2015 to 2025. To assist in the search for related documents, the Google Scholar search engine was used to locate relevant information in documents such as master's and/or doctoral theses. Table 1 presents the information in a structured format.

Table 1: Selection Criteria

Selection Criteria	Inclusion	Exclusion
Publication Period	2015-2025	Before 2015
Language	English or Spanish	Different from English or Spanish
Level of study	This includes indexed academic articles, academic articles, book chapters and published master's or doctoral thesis reports.	Monographs, editorial articles and papers presented at international conferences or symposia
Keywords of the study	BIM methodology, institutional efficiency, public sector, Latin America	That contain keywords other than those included
Type of digital access	Open access	Restricted Access

Search queries were designed using the keywords "institutional efficiency," "BIM methodology," "infrastructure management," "HBIM method-

logy," "public sector," and "public administration," along with the Boolean operators "AND" and "OR." The search queries are shown in Table 2.

Table 2: Search Equations

Database	Operational equation
Scopus	TITLE-ADS-KEY((BIM OR "building information model*" OR "building information modell*" OR "building information management") AND ("infrastructure management" OR "public infrastructure" OR "infrastructure project*" OR infrastructure development" OR infrastructure planning" OR "infrastructure governance" OR "construction project management" OR "public construction") AND (policy* OR regulation* OR legislation OR standard* OR framework* OR guideline* OR mandate* OR "regulatory framework*" OR "technical standard*" OR "institutional change" OR "public management" OR reform* OR governance OR policies OR standards OR governance OR "state reform" OR "government reform" OR "institutional reform") AND (Peru OR Colombian OR Chilean OR Brazil OR Brazilian)) AND PUBYEAR AFT 2014 AND PUBYEAR BEF 2026 AND DOCTYPE (ar OR re OR cp)
DOAJ	("Buildinh Information Modeling" OR "Building Information Modelling" OR BIM) AND ("infrastructure management" OR "infrastructure projects" OR "public infrastructure") AND ("state reform" OR "government reform" OR "public sector reform" OR "institutional reform") AND Policy OR policies OR Standards OR regulation OR governance OR efficiency) AND (Peru OR Colombia OR Chile OR Brazil) AND ("Building Information Modeling" OR "infrastructure management" OR "infrastructure projects" OR "public infrastructure") AND ("state reform" OR "government reform" OR "public sector reform" OR "institutional reform") AND (policy OR policies OR standards OR regulation OR governance OR efficiency) AND (Peru OR Colombia OR Chile OR Brazil)
Refseek	("Building Information Modeling" OR "Building Information Modelling" OR BIM) AND ("infrastructure management" OR "infrastructure projects" OR "public infrastructure") AND (Policy OR policies OR Standards OR regulation OR governance OR efficiency) AND (Peru OR Colombia OR Chile OR Brazil) AND

("Construction Information Modeling" OR "infrastructure management" OR "infrastructure projects" OR "public infrastructure") AND (policy OR policies OR standards OR regulation OR governance OR efficiency) AND (Peru OR Colombia OR Chile OR Brazil)

The search process was divided into four specific stages: identification, screening, selection and inclusion. In the first phase, a total of 691 documents were identified, of which 122 came from Scopus, 208 from DOAJ, 177 from Refseek and 184 from Google Scholar. The selection criteria shown in Table 2 were used to narrow the scope of the in-depth systematic review of the articles deemed relevant (24).

Next, the data were filtered to identify potential duplicate entries across two or more databases,

based on a quick review of the document's title and abstract. In this first phase, 240 records were discarded, resulting in a subtotal of 451 documents for screening, of which 212 were excluded on language grounds. This left a total of 239 records available for retrieval. No retrievable records were found; however, 220 documents were excluded based on the selection criteria. Consequently, 19 articles were included in the in-depth review, as shown in Figure 1.

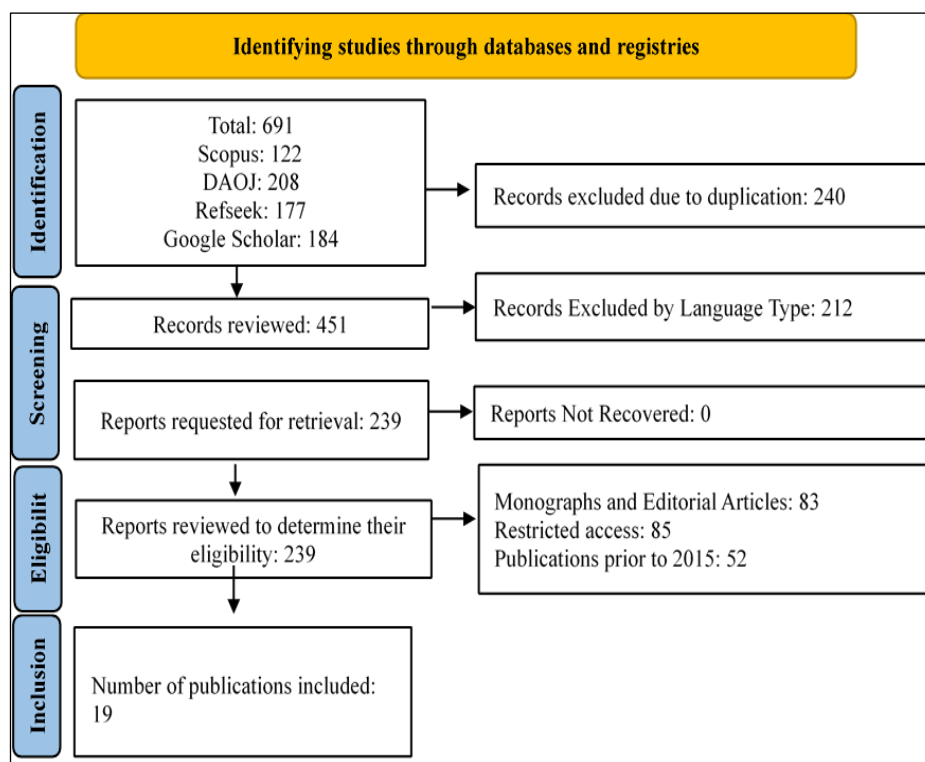


Figure 1: Flowchart PRISMA 2020

Finally, the 19 articles were submitted to a methodological quality assessment process based on the consensus of two reviewers, who independently determined this procedure using the selected studies. Critical evaluation tools were applied; the checklist was a modified version of the suggestions by past researcher (25, 26). The questions (Q) were scored on a three-point scale, where 1 point corresponds to "Yes," 0 points to "No," and 0.5 points to "Partially." Any research project can receive a score between 0 and 7 points. A higher overall score on the research indicates that the student is better able to answer the research questions. A higher general score on the

research indicates that the student is better able to answer the research questions: Q1: clear definition of objectives, Q2: research design to achieve the objectives, Q3: proper design of research methods and tools, Q4: correct information about the research model, Q5: proper application of the information-gathering method, Q6: correct explanation of the study's context and Q7: supporting the results with references from the literature.

Table 3 shows that all 19 studies met the quality assessment criteria, indicating their acceptability and suitability for the proposed analysis. The quality level was set at an acceptable range above

80 percent, which in this case falls between 86 percent and 100 percent. The following characteristics were coded: a) author(s) and year

of publication; b) study objective; c) research method; d) database; e) journal; and f) findings.

Table 3: Results of the Quality Evaluation of Each Item

Research	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Total	Percentage (%)
1	1	1	1	1	1	1	1	7	100
2	1	0.5	1	1	0.5	1	1	6	86
3	1	1	1	1	1	1	1	7	100
4	1	1	1	1	1	1	1	7	100
5	1	1	1	1	1	1	1	7	100
6	1	1	1	1	0.5	1	1	6.5	93
7	1	1	0.5	1	1	0.5	1	6	86
8	1	1	1	1	1	1	1	7	100
9	1	0.5	1	0.5	1	1	1	6	86
10	1	1	1	1	1	1	1	7	100
11	1	1	0	1	1	1	1	6	86
12	1	1	1	1	1	1	1	7	100
13	1	1	1	1	1	1	1	7	100
14	1	1	1	1	1	1	1	7	100
15	1	1	1	1	1	1	1	7	100
16	1	1	1	1	1	1	1	7	100
17	1	1	1	1	1	1	1	7	100
18	1	1	0.5	1	1	1	1	6.5	93
19	1	1	1	1	1	1	1	7	100

Note: Q= Question.

The assessment revealed that approximately 63% of the included studies received a quality score of 100%, 11% received a score of 93% and the remainder received a score of 86%. Once the quality level was established within a range of 86% to 100%, the data were coded for the presentation of the results.

Results and Discussion

During the systematic review, techniques for analyzing and synthesizing information were applied, carefully extracting the relevant elements from each publication to associate them with each previously established objective. In the analysis and synthesis of the information reviewed in each of the 19 included documents, it was found that, of the 9 member countries of the BIM-RGL, open-access studies have been published in 7 of the organization's member countries. The findings are detailed below in the order of the research objectives.

The number of academic publications identified in an initial search was 507; after applying the PRISMA method, this number was reduced to 19. It should be noted that 85 documents with restricted access were identified; these could not be included in this review and as a result, relevant information may have been lost. However, were able to review

14 articles that were indexed in Scopus, which may provide further support for these results.

During the first three years of the specified period—that is, 2015, 2016 and 2017—no information on published articles was collected. However, in 2018, three articles were published, two of which were indexed in Scopus and the third in DAOJ. In 2019, only one publication was recorded, which was retrieved from the DAOJ database; whereas in 2020, only two articles met the selection criteria, one indexed in Scopus and the other in DAOJ.

In 2021, a total of three articles were published, all of which were indexed in Scopus. In 2022, two documents were included: an article indexed in Scopus and a master's thesis found through Google Scholar. As for 2023, two articles were recorded in Scopus and one in the Refseek database. In 2024, there are three articles in the Scopus database and one in DOAJ. Finally, 2025 has a single article, which is also listed in the Scopus database.

Characteristic Aspects of Publications Related to Notable Contributions to BIM Implementation and Infrastructure Management in Latin America Between 2015 And 2025

Each reviewed document contains elements related to BIM implementation and the way in

which infrastructure management has been conducted for its development. Table 4 lists the most notable contributions related to the subject of the study in descending order, based on study, database and the country where the study was conducted.

Table 4: Results of the In-depth Review of Notable Contributions

Objective	Methodology	Database	Country of the study	Contribution	References
To analyze trends in BIM adoption in Chile from 2013 to 2016.	Quantitative paradigm, descriptive-correlational approach and longitudinal design.	Scopus (Q2)	Chile	In Chile, by the mid-2000s, the government was promoting the implementation of BIM through the so-called PlanBIM (2015). However, there was still no BIM standard in place, as the Chilean Standard NCH 1156 (2018) had not yet taken effect. This allowed each company or organization to apply its own pseudo-standards. However, a regulatory draft is currently under consideration that would require the implementation of BIM starting in 2020, including a working standard for the construction and infrastructure sector.	(27)
To analyze the importance of the Colombian government's initiative, leadership and regulation in the implementation of BIM in infrastructure projects	Qualitative paradigm. Descriptive approach. Design based on a literature review	DOAJ	Colombia	Infrastructure projects are contracted by the government, although the government does not develop them. It is responsible for contracting a third party to perform the work. For this reason, it is promoting the initiative to implement BIM in Colombia by proposing a government roadmap for this purpose. In addition, collaborative strategies were established to bring together all members of the construction sector around the stated goal. A BIM commission is being established to develop standards, guidelines,	(28)

To analyze the potential of the BIM model for the supervision of public works contracts in Brazil.	Qualitative paradigm. Exploratory-descriptive approach. Design based on a normative and literature review	Scopus (Q3)	Brazil	specifications and protocols. In addition to the progressive generation of BIM contracts. As a basis, Brazil has a legal framework established in Article 37 of the Federal Constitution, Law No. 8,666 (1993)—the Public Bidding Law—and Law No. 12,462 (2011) on the Differentiated Public Procurement Regime. However, given the limitations in construction supervision, the BIM methodology makes it possible to structure inspection plans based on the BRS ISO 21500:2012 standard and identify the most common irregularities in public construction projects. The effectiveness of construction planning is reviewed using 4D and 5D BIM models and simulators. The contributions of BIM to the prevention of nonconformities in construction projects were identified.	(29)
To present an approach for implementing Building Information Modeling (BIM) in public projects in Peru.	Qualitative paradigm. Interpretive approach. Propositional design based on a literature review	DOAJ	Peru	Public projects in Peru are managed through the National System for Multi-Year Programming and Investment Management—Invierte Perú. Through this system, government contracts are awarded in accordance with the Government Procurement Act (Law No. 30225). However, BIM has been used in special projects by the Ministry of the Interior, the Ministry of Justice, the Ministry of Housing, Construction and Sanitation and the Ministry of Economy and Finance, which has spurred the implementation of a BIM Plan through a roadmap. In any case, implementation is planned during the design	(30)

Describe the advantages of implementing BIM automation in the Latin American and Peruvian construction industries.	A bibliographic review	DOAJ		and construction phases to detect potential errors. BIM automation plays a decisive role in transforming information management in the Latin American construction industry, although its adoption remains uneven and is influenced by institutional, educational and technological factors. Special conditions are required for BIM automation to evolve from a technical tool into an information governance system; these include: the standardization of an interoperable digital infrastructure, coordinated public policies and specialized training.	(31)
To present a basic BIM framework that ensures successful adoption by federal public organizations in Brazil.	Qualitative paradigm. Analytical-inductive approach. Design based on a literature review and the Design Science Research (DSR) method	Scopus (Q2)	Brazil	The adoption of BIM methodology in Brazil must consider, as a whole, all aspects related to project development procedures, model development procedures and public governance policies. All of this is intended to ensure greater economic efficiency. The successful implementation of BIM in Brazil is focused on the joint management of these three components. Use of the BIM model is highlighted within the BIM Implementation Plan and the Project Implementation Plan.	(32)
Provide context for the main features of the BIM methodology	Qualitative paradigm. Reflective-interpretive approach. Design based on a narrative, descriptive-comparative literature review	Scopus (Q4)	Brazil-Chile	In 2018, the Brazilian federal government established the committee to support the implementation of BIM. Its purpose was to define comprehensive promotional strategies for its entry into the public sector, in accordance with specific rules and guidelines. In Chile, since 2011, the Ministry of Public Works has required the use	(33)

Create a prioritized list of the main risks associated with the implementation of the BIM method in public agencies in Brazil	Quantitative paradigm. Exploratory approach. Method based on systematic mapping and case studies.	Scopus (Q1)	Brazil	of BIM in hospital construction projects. As of this date, the process of implementing the BIM methodology has begun. This has been promoted through decrees and mandatory measures to ensure its implementation. However, the sector's efficiency is below expectations. Public administration faces three main risks to effective implementation, which are: lack of knowledge and experience, interoperability issues and cultural resistance. This calls for a review of public policies and their adaptation to current needs in the infrastructure sector.	(34)
To assess the status of BIM implementation in Peru	Qualitative paradigm. Descriptive-evaluative approach. Design based on a literature review	Refseek	Peru	BIM methodology has been progressively implemented in Peru in the management of bidding processes for civil infrastructure projects. This is based on Supreme Decree No. 289-2019 (EF) for public entities. The first agency was the Ministry of Economy and Finance, followed by the Ministry of Housing, Construction and Sanitation. In addition, the advantages and disadvantages of implementing BIM in Peru were discussed, noting that its adoption has progressed to the point of managing bidding processes for civil infrastructure projects.	(35)
To investigate the main barriers to BIM implementation at a construction company in Brazil.	Qualitative paradigm. Exploratory approach. Design based on a case study with a literature review	Scopus (Q1)	Brazil	BIM proved to be more efficient during the design phase, but less effective during the construction phase. Therefore, it is clear that effective implementation requires the integration of structured management methods and tools. However, BIM facilitates information management and fosters a collaborative	(36)

To explore how the construction sector contributes to minimizing environmental impact through reuse and recycling, using BIM methodology, biomaterials, 3D modeling and digitization in a Mexican case study	Quantitative paradigm. Approach. Analytical-comparative approach. Design: Case study	Scopus (Q1)	Mexico	environment among design and construction teams, as demonstrated by the case study analyzed in Brazil's construction industry. The BIM methodology is currently being implemented in Mexico. The use of biomaterials was simulated in two case studies (Jalisco and Querétaro). Thus, it was demonstrated that they help reduce energy consumption and CO2 emissions. In addition, the use of biomaterials offers advantages over concrete.	(37)
Describe the proposed circular economy model for Santiago de Cali, which focuses primarily on the analysis and efficient use of construction materials, with particular emphasis on ecosystem restoration and the circular flow of rock materials.	Qualitative research and case study	Scopus/Google Scholar	Colombia	BIM facilitates interdisciplinary and simultaneous work and enables the management of building information throughout the various stages of the project. In addition, it can support the implementation of the circular economy model by integrating information on architecture, engineering, construction, materials and building components. This integration ensures that information is available throughout the various stages of the project's life cycle.	(38)
Assess the status of BIM implementation in the Dominican Republic.	Qualitative paradigm. Interpretive approach. Case study design	Scopus (Q1)	Dominican Republic	This research provides an important foundation for developing strategies and guidelines for the implementation of BIM in the Dominican Republic. Provee al Estado y al sector las debilidades y oportunidades para que este y el sector construcción trabajen de forma conjunta en este objetivo.	(39)
Identify various strategies used around the world in the implementation of the BIM method so that they can be	Qualitative paradigm. Interpretive-comparative approach. Propositional design	Scopus (Q4)	Mexico	In Mexico, a National BIM Implementation Strategy has been proposed, which promotes better planning and helps reduce overtime and cost overruns. In addition, it promotes the	(40)

adapted for use in Mexico.				standardization of the overall information management policy throughout the life cycle of each project.	
To evaluate the feasibility and effectiveness of implementing BIM methodology to improve construction project management in companies in Peru.	Quantitative paradigm. Correlational approach. Cross-sectional design	Scopus (Q1)	Perú	Emerging issues in the management of BIM implementation in Peru were identified. The 3D, 4D and 5D models had shortcomings that made it difficult to visualize and understand the design phase, time coordination and strategic planning, as well as cost estimation and financial management. This highlights the need to transform construction management through innovation and greater efficiency. This will be achieved through effective training on the management and use of BIM methodology, aimed at professionals and staff working in the construction sector. The goal is to raise the level of knowledge and facilitate decision-making.	(41)
To present a comprehensive analysis of innovative strategies for waste management using Building Information Modeling (BIM): a case study of the Cathedral of Santa María de la Asunción in Jalisco, Mexico	Qualitative paradigm. Inductive-interpretive approach. Case study methods	Scopus	México	The innovative strategy proposes the gradual implementation of BIM between 2019 and 2026. It focuses primarily on modeling for the maintenance and/or reconstruction of historic buildings and their materials. It also proposes the integration of Revit software, which includes BIM modeling, to create predictive models—a feature that is highly beneficial in the restoration of historic structures and monuments.	(42)
Propose a management model using standardized contracts and BIM tools to optimize public-private	Qualitative paradigm. Analytical-documentary approach. Propositional design	Scopus (Q1)	Perú	A BIM information management model was proposed, based on standardized management models for New Engineering Contracts (NEC) and BIM tools, to optimize public-private	(43)

partnership (PPP) projects in Peru's road network.				partnership road infrastructure projects through emerging technologies and agile contractual frameworks. The NEC4 Option F contract management model, which includes best practices for contract management, is included. All of this is subject to the regulations set forth in Legislative Decree No. 1362, "Regulating the Promotion of Private Investment through Public-Private Partnerships and Investment Projects." Supreme Decree No. 240-2018-EF "Approving the Regulations for Legislative Decree No. 1362, which governs the Promotion of Private Investment through Public-Private Partnerships (PPP) and Investment Projects." contracts signed by the MTC.	
To provide a detailed and up-to-date review of the literature related to research areas in BIM methodology and its application in Colombia.	Qualitative paradigm. Analytical-interpretive approach. Design based on a literature review	DOAJ	Colombia	At the Latin American level, the most notable BIM initiatives by country are as follows: in Brazil, the BIM Management Committee (2018) (CG-BIM). In Chile, the BIM Standard for Public Projects (2019) and the BIM Implementation Matrix (2022). In Colombia, the 2020–2026 National BIM Strategy. In summary, the BIM standard provides a basis for decision-making through the exchange of structured information during the design phase via a Common Data Environment (CDE). Buildingsmart created an open, neutral standard for data exchange and interoperability across different disciplines.	(44)
Proposing Key Actions in Emergency Situations During the Post-	Qualitative paradigm. Interpretive approach. Propositional	Scopus (Q1)	Brazil	Proposing key actions in emergency situations during the post-recovery phase of asset recovery using the HBIM method: a	(45)

Recovery Phase of Heritage Sites Using the HBIM Method: A Case Study in Brazil	design with a case study	case study in Brazil. This refers to the restoration of Brazil's National Museum in 2018, after a fire broke out at the site. By applying a 3D virtual model of the National Museum of Brazil—which revealed the challenges encountered during the reconstruction process—it became clear that a protocol needed to be established, covering key areas for the application of HBIM in restoration efforts in the event of a fire. These key areas focus on a systematic approach that ensures informed decision-making, accurate damage assessment and precise reconstruction planning. In this way, HBIM is a BIM approach focused on the preservation of heritage structures and their restoration following unforeseen events and natural disasters.
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The information in Table 4 suggests that, despite the importance and significant contributions of BIM methodology worldwide, its implementation in Latin America is still proceeding at a slow pace. The evolution of this methodology over the past ten years has been addressed only partially, as at least eight countries in the region have expressed interest in implementing it. In addition to this, the documents—most of which have been indexed in the Scopus database—are clearly significant. However, the evidence seems to indicate that in Latin America, the issue has not generated the expected level of interest, suggesting that the efficiency of public institutions is still at a moderate stage of development. However, it is worth noting the attention given by a segment of the region's scientific community to addressing the topic at hand. In perspective, countries such as Brazil, Chile, Colombia and Peru are making progress in reviewing and adjusting policies, regulations and standards between 2018 and 2025, with the aim of improving the efficiency of the public sector.

Chronological Evolution of Policies, Standards and Efficiency in Infrastructure Management Using the BIM Method in Peru, Colombia, Chile and Brazil Between 2015 and 2025

Between 2015 and 2018, Chile began this process with the implementation of the PlanBIM in 2015, followed by the implementation of the NCH 1156 standard in 2018. Meanwhile, in the absence of a standard, each company applied internal guidelines based on the principles of the BIM model. Meanwhile, in Colombia, a BIM commission has been established to draft relevant standards aimed at improving the efficiency of infrastructure management. For its part, Brazil has a BIM Support Committee and a corresponding legal framework based on constitutional provisions such as Law No. 8,666 (1993), also known as the Public Procurement Law and Law No. 12,462 (2011). In addition to inspection plans based on the ISO 21500:2012 standard, emphasis is placed on construction planning in the 4 and 5 dimensions (27-29, 33)

For the period from 2019 to 2022, Peru has the National System for Multiyear Planning and Investment Management – Invest Peru, which is based on the State Procurement Act (Law No. 30225). This entire process is part of an initiative that has driven the implementation of a BIM Plan through a roadmap. The implementation is addressed and considered during the design and construction phases to identify potential errors. There has also been an improvement in the management of bidding processes and civil infrastructure projects; to this end, Supreme Decree No. 289-2019 (EF) was issued, aimed primarily at public sector agencies. Brazil is promoting infrastructure management based on the BIM model through the implementation of both the BIM Implementation Plan and the Project Execution Plan, with a special focus on public governance. In addition, mandatory measures and decrees have been established to streamline and oversee this implementation. Finally, the Colombian government is focusing on improving the efficiency of the bidding process, planning and supervision of construction projects through a BIM strategy called ColombiaClass (30, 32–36, 38).

Similarly, between 2023 and 2025, shortcomings were identified in BIM implementation—specifically in the 3D, 4D and 5D dimensions—which paved the way for an effective training program aimed at professionals and staff involved in infrastructure management. In addition, the guide includes a management model for handling BIM information using standardized contracts and BIM tools for mixed-use projects. This is subject to the provisions of Legislative Decree No. 1362 and Supreme Decree No. 240-2018-EF (41, 43).

It is worth highlighting contributions and initiatives such as the case of Brazil, where the BIM Management Committee (2018) (CG-BIM) stands out (33). In Chile, the BIM Standard for Public Projects (2019) and the BIM Implementation Matrix (2022) (27,33); and in Colombia, the National BIM Strategy 2020–2026 (38). Finally, in Brazil, researchers assessed the need to develop a protocol covering key areas for the application of BIM in restoration work following a fire (45). In Mexico, this is reflected in the importance placed on the conservation and maintenance of architectural heritage (42).

Compare the progress made in government reforms related to infrastructure management for BIM implementation in Brazil, Chile, Colombia and Peru between 2015 and 2025

It appears that the efficiency of public institutions in Latin America is subjective, as the adoption of BIM methodology has historically been slow. According to a review of scientific publications from 2015 to 2025, among the countries that make up Latin America, studies related to this implementation have been conducted with significant attention in only eight of them. In this regard, Brazil tops this ranking with six articles that addressed the situation from a perspective focused on both technical and regulatory aspects, highlighting the progress, advantages, challenges and prospects. Based on these results, it can be inferred that the Brazilian government has been working to improve infrastructure management; this study highlights it as a pioneer in the pursuit of greater institutional efficiency (20, 32–34, 36, 45).

In second place was Peru with 4 publications, followed by Colombia and Mexico with 3 publications each. In the case of Peru, the reviewed documentation pertains to the optimization of public projects and the feasibility of BIM implementation. However, it was observed that the level of proficiency and knowledge in the country is somewhat limited, particularly in BIM dimensions D3, D4 and D5. This suggests that the efficiency of institutions in Peru, with regard to the use of BIM, is low (30, 35, 41, 43).

With regard to Colombia, the government's initiative to implement this methodology was highlighted, taking into account the progress already made by the private sector since 2018 (28). For its part, as a follow-up to this study, past study (44) conducted a thorough review of the available literature from 2019 to 2024, highlighting the increased application of this approach, particularly in transportation infrastructure. Despite this progress, there is still a need to establish an open channel of communication between the private sector (construction industry), universities and the government. Finally, the proposed Colombia Class classification system for public works projects is

part of a standardization strategy that encompasses the country's predominant construction methods and linguistic variations (38).

Finally, two separate studies were found in Chile. With regard to the findings on the progress of BIM implementation, these revealed the strongest historical trend, with relevant previous references on this topic in the region dating back to before 2015. Thus, the first steps toward BIM implementation were taken in 2011, when the Ministry of Public Works issued requirements for its use. This was specified for construction projects in the healthcare sector, such as hospital and healthcare facility infrastructure (33). It is important to note that, although it was found in 2018 that professionals in the construction sector had limited knowledge of BIM, the measures taken by the Chilean government to effectively address this (27).

The results indicate that the Latin American countries that have made significant efforts are Brazil, Colombia, Chile and Peru. On the one hand, this has involved a domestic initiative in each country, as well as international support under the auspices of BIM Standards (BIM-RGL), with the goal of improving the efficiency and quality of construction projects. This is an important step that is consistent with previous studies highlighted in the development of this study (19, 20).

Although the situation in each of these countries is different, due to their specific contexts, there is one common thread: the design and implementation of mechanisms based on BIM methodology. This is reflected in technological advancements, the involvement of government agencies through specific policies and the dissemination of knowledge about the benefits of BIM. Studies suggest that the efficiency of the government, as the governing body through its institutions, has promoted oversight, reduced overcost and improved the quality of projects. This is consistent with the findings reported in the studies cited as related cases in this study (13–16).

One negative aspect is that, while the region comprises a total of 20 countries, only 8 of them have made progress to a greater or lesser proportion, which indicates a lack of interest maybe by ignorance in this methodology. This is a cause for concern from a social perspective, as it fails to provide citizens with greater transparency,

more reliable projects and more sustainable management. Given this shortcoming, any failure or delay in its implementation contradicts the findings of the study related to the issues addressed in the case of Ethiopia, which could be interpreted as an inability to reap the specific benefits associated with the nine dimensions of this methodology (12).

Finally, it appears that in the majority of Latin American countries where BIM methodology has not been implemented, government agencies may lack procedures for evaluating and monitoring institutional efficiency. Therefore, the mere fact that the assessment of its ability to fulfill its functions, as well as the assessment of user satisfaction, is not standardized is a sign of institutional inefficiency. This contrasts with the observations presented in academic publications, such as eco-innovative requirements and the procedures available within the BIM methodology—aspects that must be addressed as soon as possible (1, 10–11)

Conclusion

As a final thought, it is worth noting that governments and state entities in Latin America must continue to review and adjust their policies, standards and strategies to successfully accelerate the implementation of BIM methodology. This will lead to better infrastructure management, a more people-centered approach to construction projects, safe maintenance and effective sustainability. The above is intended to achieve maximum efficiency in order to guarantee better benefits for citizens by implementing effective planning for building management with the greatest expected benefit. The above shows a significant knowledge gap, which is why future researchers need to be able to design applied empirical studies using observational, pre-experimental, or experimental designs. The purpose of this is to generate greater impulse and projection regarding the importance and contributions of BIM methodology in the institutional field in the public sector. Furthermore, this can be extended to correlational and comparative studies in order to determine the impact of BIM methodology on infrastructure management and the efficiency of public institutions in Latin America.

Practical Implications

This systematic review contributes to the existing literature by highlighting the impact of BIM on public administration from the perspective of sustainability and its implementation. It examined the progress, challenges and efforts made in Latin America, particularly in Brazil, Chile, Colombia, Peru and Mexico. However, globally, the BIM methodology is still in its early stages, as only a relatively significant percentage of countries in Europe have established mandatory regulations for its implementation.

The results of this study indicate that the implementation of BIM in the public sector is generally funded through vertical approaches; in other words, government guidelines that restrict the awarding of capital investment projects exclusively to companies that use BIM are intended to improve the performance of the construction sector. As for the staffing required to implement and use BIM for building management in the public sector, little information is available. Therefore, for future research, it is suggested that, first and foremost, the environmental, economic and social aspects involved in the implementation of BIM be considered. Finally, from a sustainability perspective, it is important to specify the mechanisms and means necessary to make the most of material and human resources when using BIM.

Limitations and Future Research

Since “BIM methodology” is a term of Anglo-Saxon origin, this study draws primarily on articles published mainly in English; Furthermore, documentation in Spanish is limited and in many cases, it is more than ten years old. On the other hand, there may be different approaches to interpreting the impact of Building Information Modeling (BIM) on public administration, aspects of its implementation and its sustainable approach. In this regard, for future research, it is suggested that studies be included in languages other than English and Spanish—such as French or Portuguese—that highlight the economic, environmental and social need for BIM implementation. At the same time, from a research perspective, specific cases on different continents must be planned, carried out and analyzed using different techniques.

Abbreviations

BRS: Brazilian Standards, CAPEX: Capital Expenditure, CG-BIM: Computer Graphics-Building Information Modeling, HBIM: Heritage Building Information Modeling, IDB: Inter-American Development Bank, ISO: International Organization for Standardization, NBIMS.US: National BIM Standard, NCH: Chileans Standards, Red BIM Gob Latam Network: Latin American Governments BIM Network.

Author Contributions

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Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this manuscript.

Data Availability

No primary data were generated or analyzed in this study. All sources used are cited within the manuscript.

Declaration of Artificial Intelligence (AI) Assistance

The authors confirm that no artificial intelligence (AI) tools were used for literature search, idea generation, development of the conceptual framework, data analysis, interpretation of findings, or writing of this manuscript. All scholarly content, arguments and theoretical contributions are the original work of the authors.

Ethics Approval

Since this study is a systematic review of previously published literature, it did not require approval from a Human or Animal Ethics Committee.

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