Crimson Publishers
Wings to the Research

Review Article

Geomatics for Building Information Modelling

Murat Yakar*

Department of Geomatics Engineering, Mersin University, Turkey

ISSN: 2639-0574



***Corresponding author:** Murat Yakar, Department of Geomatics Engineering, Mersin University, Mersin, Turkey

Submission: October 09, 2026
Published: November 10, 2026

Volume 7 - Issue 3

How to cite this article: Murat Yakar*. Geomatics for Building Information Modelling. Adv Civil Eng Tech. 7(3). ACET.000662.2026.
DOI: 10.31031/ACET.2026.07.000662

Copyright@ Murat Yakar, This article is distributed under the terms of the Creative Commons Attribution 4.0 International License, which permits unrestricted use and redistribution provided that the original author and source are credited.

Abstract

Building information modelling (BIM) for existing assets requires a traceable connection between observations, interpreted objects and engineering decisions. This focused narrative review examines terrestrial laser scanning, mobile mapping and photogrammetry through that connection. A reference-level reassessment of the submitted 43-item bibliography retained 23 relevant sources and added four further publications. The resulting 27-source corpus is purposive rather than exhaustive. A study-level evidence matrix distinguishes geometric documentation from demonstrated BIM conversion and separates primary applications from reviews. The synthesis supports a decision-led framework comprising requirements definition, controlled acquisition, object interpretation and independent acceptance checks. Its use is demonstrated through a hypothetical refurbishment clearance assessment, including explicit uncertainty allowances, a failed initial decision and targeted resurvey. The example illustrates the framework; it is not field validation. Across the selected evidence, dense sampling and visual continuity are insufficient to establish usable BIM information. Registration quality, independent dimensional checks, semantic completeness and exchange integrity require separate tests. Remaining limitations include a small, historically weighted corpus, uneven access to detailed validation protocols and the absence of comparative experiments. Future evaluation should test complete survey-to-delivery workflows against shared engineering tasks rather than rank sensors from incompatible accuracy reports.

Keywords: Building information modelling; Reality capture; Scan-to-BIM; Laser scanning; Photogrammetry; Uncertainty; Model validation

Introduction

Existing buildings frequently lack complete and current design records. Refurbishment and maintenance decisions therefore depend on observations of the asset as it exists. Geomatics supplies spatial control, surface measurements and quality assessment; BIM organizes objects, attributes and relationships for subsequent use. The central difficulty is preserving the connection between these two forms of information as observations are simplified and interpreted.

A point cloud records sampled surfaces. It does not directly establish material composition, load-bearing function, ownership or maintenance responsibility. Likewise, a visually complete model may contain surfaces inferred across occlusions. A defensible workflow must distinguish measured geometry, documented attributes and expert interpretation and retain the evidence needed to revisit each decision.

This review asks which observations are appropriate for a stated building task, how those observations become BIM objects, and what checks establish whether the delivered information is fit for that task. Its contribution is a focused evidence synthesis and an operational decision framework with a worked example. It does not introduce a new sensor, reconstruction algorithm or experimentally validated performance ranking.

Review Method and Evidence Boundaries

Scope and eligibility

The review uses purposive source selection. The starting set was the 43 references in the submitted manuscript, which had been assembled from four pre-existing bibliographies.

Those bibliographies were not reproducible database searches and are no longer described as such. The present revision reassessed each listed reference against the specific questions of building measurement, conversion to BIM and acceptance of the resulting information. No citation-count threshold or author-profile membership rule was used. A targeted supplementary selection of 15 publications co-authored by Yakar was included to document relevant regional work; this is an author-focused selection and introduces an explicit concentration limitation.

Sources were retained when they directly addressed building or infrastructure capture, Scan-to-BIM, HBIM, or application-specific data quality and had an identifiable publisher or institutional record sufficient for the bounded claim made here. General terrain applications, cadastral applications, sensor algorithms without a demonstrated building-information link, and documentation examples without a specific role in the revised discussion were omitted from this focused synthesis. Omission does not imply that an excluded publication is scientifically unsound. Appendix A records the disposition of all 43 original entries.

Source identification and traceability

Verification was conducted on 3 November 2026 through exact-title web searches and publisher or institutional records. The nine core seed sources correspond to original references 1, 2, 3, 5, 6, 7, 15 and 21. Three additional sources were located through targeted title searches addressing existing-building BIM, automatic reconstruction and HBIM: Volk et al. [1], Tang et al. [2] and Murphy et al. [3]. Their addition addresses conceptual gaps rather than representing an exhaustive search update. Table 1 gives the 12-source core inventory, its origin and the level of evidence used. Fourteen further original references were reinstated for bounded building-documentation applications, and a wearable mosque-modelling study was added. These 15 supplementary sources are listed as [13-27] and their individual roles are recorded in Table 2. DOI identifiers in the reference list provide stable retrieval routes.

Table 1: Final evidence inventory and traceable source origins.

Ref.	Source and Origin	Evidence Inspected and Role
[4]	Arayici 2008; original 1	Institutional abstract and metadata; existing-building case context
[5]	Wang and Kim 2019; original 2	Institutional abstract and metadata; construction review
[6]	Rashdi et al. 2022; original 3	Publisher article; Scan-to-BIM review
[7]	Valero et al. 2022; original 5	Journal summary and metadata; acquisition guidance
[8]	Almukhtar et al. 2021; original 6	Publisher article; building TLS proof of concept
[9]	Bhatla et al. 2012; original 7	Publisher abstract; dimensional comparison
[10]	Thomson et al. 2013; original 15	ISPRS abstract and metadata; indoor mobile capture
[11]	Murtiyoso and Grussenmeyer 2017; original 21	Publisher abstract and metadata; UAV comparison
[12]	Martínez-Carricondo et al. 2021; original 37	Publisher article; UAV-to-HBIM case
[1]	Volk et al. 2014; added	Publisher abstract and institutional record; lifecycle gaps
[2]	Tang et al. 2010; added	Publisher abstract and institutional record; reconstruction tasks
[3]	Murphy et al. 2009; added	Publisher abstract and metadata; HBIM method

Table 2: Study-level comparison of selected primary applications.

Study	Observation and Output	Validation Evidence and Bounded Inference
Almukhtar et al. [8]	TLS of Headington Hill Building; exterior and interior point-cloud workflow	Station layout and processing are described. Supports acquisition and software planning; does not establish independently validated, semantically complete BIM.
Bhatla et al. [9]	Handheld photographs of a bridge; wall comparison with laser scanning	Dimensions compared with drawing-derived as-built information; wall datasets compared. Results caution against generalizing the tested photogrammetric workflow to precision tasks.
Thomson et al. [10]	Indoor mobile laser scanning for building geometry and modelling	Fit-for-purpose assessment described in the abstract. Supports consideration of indoor mobility; inspected summary does not establish a transferable independent accuracy threshold.
Murtiyoso and Grussenmeyer [11]	Two close-range UAV heritage cases; dense reconstruction	Comparison with laser scanning and assessment of triangulation and matching. Supports checking image-network performance; does not itself demonstrate operational BIM.
Martínez-Carricondo et al. [12]	UAV point cloud and historical information converted to HBIM at Isabel II dam	Geometric checking in an As-Built/Revit workflow. Demonstrates explicit BIM conversion; internal model-to-cloud agreement alone is not independent absolute verification.
Murphy et al. [3]	Laser and image surveys linked to historic parametric objects	Method describes mapping BIM objects onto survey surfaces. Supports interpretation-based HBIM; abstract does not establish universal dimensional acceptance limits.

Copyright © Murat Yakar

This process gives an auditable final selection of 27 publications, but it does not establish search sensitivity or field-wide completeness. No database export, deduplicated search-result archive or PRISMA flow is claimed. Published reviews supply context and are not treated as independent replications of the primary cases that they may themselves cite. Where only a publisher abstract or institutional summary was inspected, extraction was restricted to that record; missing experimental details were not reconstructed.

Extraction and concentration assessment

Extraction recorded source type, acquisition method, application, explicit BIM linkage, validation evidence available in the inspected record, and the inference permitted by that evidence. Table 2 compares selected primary applications. Reported accuracy values were not pooled because reference observations, object scales and acceptance tasks differ. The proposed acceptance rules and illustrative numerical example are identified separately from published findings.

The reviewer identified shared-author concentration in 26 of the original 43 references. The expanded revision includes 15 Yakar-coauthored publications among 27 references (55.6%). The remaining 12 publications provide an external conceptual and comparative core. The supplementary sources were selected for their relevance to building capture, control or condition documentation, but the author-focused selection does not eliminate sampling bias. Repeated contributions from the same research network are not independent replications. No field-wide frequency, pooled accuracy or sensor superiority is inferred from their number.

Study-level Synthesis

The selected evidence spans three distinct outputs: documentation of observed geometry, reconstruction of building objects, and management of building information. Arayici [1] provides an early case-based route from laser observations to existing-building models. Wang and Kim [2] organise construction uses across reconstruction and geometric inspection. Rashdi et al. [3] connect capture, processing and exchange. These sources establish the workflow context; they do not demonstrate that every reality-capture application delivers complete operational BIM.

Table 2 exposes a practical divide: obtaining usable geometry and producing an accepted information model are different achievements. A documentation study may establish coverage or matching performance without testing object identities, attributes or exchange. Conversely, a demonstrated HBIM conversion can still require additional independent checks before it supports a critical engineering dimension. The framework below responds by assigning a separate acceptance question to each stage.

The broader existing-building review by Volk et al. [10] identifies conversion effort, updating and uncertainty as continuing obstacles. Tang et al. [11] distinguish geometry, object categories and relationships during reconstruction. Together these distinctions justify evaluating the delivered model across several dimensions rather than interpreting a single point-cloud statistic as overall quality.

Geomatics Acquisition and Spatial Control

Terrestrial laser scanning

TLS provides sampled surfaces from stationary viewpoints. Acquisition planning must consider occlusion, incidence angle, accessible positions and overlap. Raising point density cannot recover an unobserved surface. Survey planning guidance [4] supports linking capture and preprocessing to the downstream use. The building proof of concept [5] illustrates the dependence of capture and processing on station arrangement and software handling.

Registration residuals describe agreement under the chosen alignment model. They do not independently establish absolute position or the dimensions of reconstructed objects. Repeated bays and approximately planar surfaces can weaken alignment constraints. A project should therefore reserve distributed check features and critical dimensions that were not used to fit the registration. Reference uncertainty and feature-identification uncertainty must accompany the resulting discrepancies.

TLS documentation of Ağzıkara Han [13] and software analysis of Farabi Mosque [14] provide building-specific examples of point-cloud acquisition and processing. The heritage TLS overview [15] places these activities in a broader documentation context. These sources support the need to retain survey and processing evidence; they are not treated as demonstrations of semantically complete, independently accepted BIM.

Mobile and wearable mapping

Mobile mapping can capture connected indoor spaces without repeated static setups. The indoor study [7] provides a relevant building-scale context. Its findings should not be extended automatically to every handheld or wearable configuration. Trajectory drift, repetitive geometry, moving objects and transitions between indoor and outdoor environments require project-specific assessment.

Closed and cross-linked routes can improve constraints, but loop closure is not an independent acceptance test. Withheld checks should cover route extremities, changes in level and critical interfaces. Where a component requires a tighter tolerance than the mobile dataset demonstrably supports, targeted static scanning or conventional dimensional measurement should supplement it.

Wearable mapping has been applied to a steel structure [16], Cambazli Church [17] and Mufti Abdullah Siddik Mosque [27]. These cases extend the application context from industrial building geometry to heritage interiors. Their inclusion does not establish suitability for precision assembly. In particular, a reconstruction of current condition cannot by itself establish earthquake-induced change without a comparable pre-event baseline.

Copyright © Murat Yakar

UAV and terrestrial photogrammetry

UAV photographs can provide roof and upper-façade views, while ground photographs support close surface detail. The heritage comparison [8] examines triangulation and dense matching against laser data. The handheld-camera study [6] shows why the performance of one reconstruction workflow cannot be inferred from visual plausibility or low equipment cost. Neither paper supports a universal ranking of current sensors.

Capture should provide convergent views, stable calibration and suitable image scale. Reflective glazing, uniform walls, repetitive texture and changing illumination may impair reconstruction. Independent checkpoints and critical dimensions should test the final geometry. Texture may help locate a condition observation, but a photograph alone does not establish the cause of deterioration or concealed material properties.

The UAV heritage overview [18] and the İsmail Fakirullah Tomb case [20] extend the discussion to monument-scale aerial documentation. The ground-control distribution study [19] concerns the spatial support for reconstruction. Here it motivates documenting control geometry; it does not replace independent checkpoints or imply that one control layout is optimal for every building.

Georeferencing and integration

A local engineering coordinate system can be appropriate when it is documented and, where required, related to an external reference frame. The deliverable should specify units, origin, orientation, vertical reference and transformation parameters. A floor elevation must not be treated as an orthometric height without an explicit relationship. Large-coordinate handling and unit changes should be tested in the receiving application.

Close-range photogrammetry of the Döğer caravanserais [21], Roman-period assets in Silifke-Mersin [23] and Eşrefoğlu Mosque [24] illustrates complementary documentation targets. The mosque study includes aerial photographs for roof modelling. These are relevant acquisition examples, whereas the BIM object definitions, source links and acceptance rules proposed below remain additional modelling requirements.

From Observations to Accepted Objects

Interpretation and representation

The framework in Figure 1 starts with the intended decision. An object record should then retain its source observations, interpretation status and required properties. A fitted wall plane may suit room inventory but suppress an inclination relevant to structural assessment. The chosen representation must preserve the features needed for the task, while the underlying observations remain accessible.

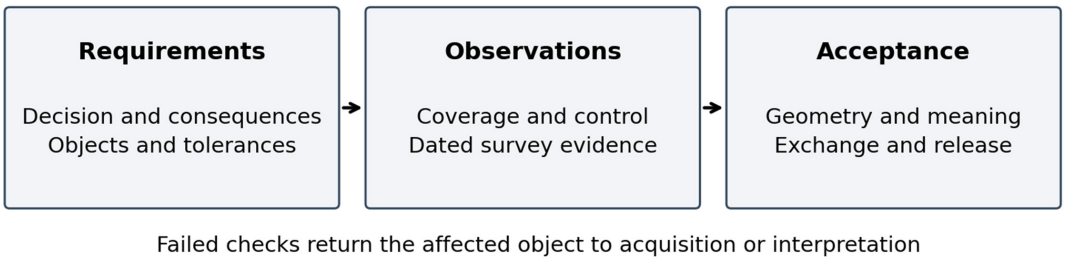


Figure 1: Decision-led measurement-to-information framework. Each stage has a distinct evidence requirement. Original conceptual diagram.

Geometry, class and relationships require separate checking, consistent with the reconstruction tasks described in [11]. A labelled point cluster is not necessarily a complete BIM object. Openings, object connections, room boundaries and required attributes must also be assessed. Unsupported material or structural properties should remain unknown or explicitly provisional rather than being filled with plausible defaults.

Independent geometric checks

For n withheld checkpoints, three-dimensional discrepancy can be summarized by Equation 1. Differences compare the same physical feature in the evaluated data and the independent reference. Horizontal and vertical components should also be reported. A check reference is not error-free; its uncertainty limits the interpretation of the discrepancy.

$$RMSE_{3D} = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(\Delta x_i^2 + \Delta y_i^2 + \Delta z_i^2)} \qquad (1)$$

Surface fit answers another question. Report signed bias, dispersion, an upper percentile of absolute residuals and the fraction within the task tolerance. A near-zero mean can conceal opposing errors. Spatial residual maps and checks on withheld dimensions can identify problems that a single aggregate value misses. Surface-to-model agreement using the modelling input is an internal fit check and must be labelled accordingly.

Coverage semantics and exchange

Coverage denominators must be explicit. The fraction of observed target surface is different from the fraction of required objects modelled or required attributes completed. Interpolated

Copyright © Murat Yakar

geometry should not count as observed coverage. Table 3 specifies evidence types rather than universal numerical thresholds (Figure 2).

Table 3: Proposed acceptance evidence for a project-defined use.

Dimension	Evidence Required	Release Condition
Position and dimensions	Withheld points and critical dimensions; reference uncertainty	Specified limits met in the relevant locations
Surface coverage	Observed area divided by required target area; occlusion map	Critical interfaces observed or explicitly excluded
Object information	Required objects, attributes, relationships and reviewed exceptions	Required information complete; unsupported attributes flagged
Exchange	Reimported units, coordinates, dimensions, IDs and properties	Receiving application preserves required information
Temporal validity	Observation dates, revision reasons and update responsibilities	Model state suitable for the decision date

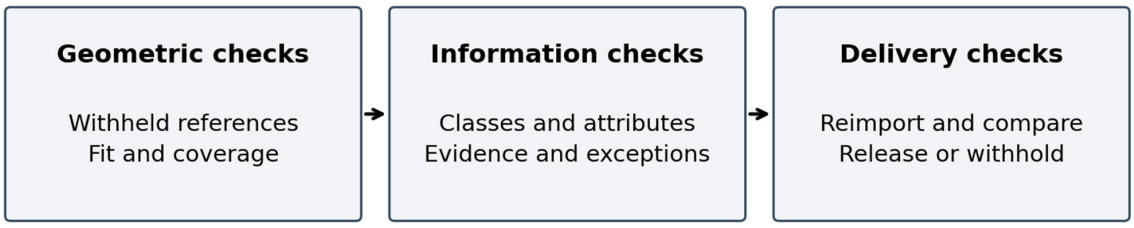


Figure 2: Separate acceptance questions for geometry, information and delivery. Passing one category does not establish the others. Original conceptual diagram.

Worked Demonstration of the Framework

Task and assumed evidence

This example is hypothetical. All dimensions, counts, uncertainties and acceptance limits in this section are analyst-selected inputs, not measurements from a published case or from the author. The task is to decide whether an existing opening can accommodate equipment with a required clear width of 1000mm. The example considers width only; height, turning space, handling allowances, structural suitability and safety authorization would require separate checks.

The project specifies a maximum 3D checkpoint RMSE of 10mm, complete observation of both jambs at the limiting height, and preservation of object identity, width and observation date after exchange. A conservative clearance rule additionally requires the lower 95% width bound to meet the required width. These are illustrative project rules, not standardized limits.

Initial assessment and failed release

Assume a mobile capture produces an opening width of 1008mm. Eight withheld checkpoints give a 3D RMSE of 8mm, so the global position criterion passes. The occlusion record, however, shows that one jamb at the limiting height was inferred. Width acceptance must therefore be withheld even before the numerical clearance calculation.

For illustration, suppose each jamb coordinate has a standard uncertainty of 4mm along the width direction, the two coordinates are independent, and the jambs are otherwise correctly identified. Equation 2 gives a width standard uncertainty of 5.66mm. A normal approximation gives a lower 95% bound of 996.9mm, below the required 1000mm. The width decision therefore also fails under this assumed uncertainty model. This calculation cannot account for the unobserved jamb and does not legitimize its inference.

$$u(w) = \sqrt{u(x_L)^2 + u(x_R)^2 - 2\,cov(x_L, x_R)} \qquad (2)$$

$$w_{lower} = w - 1.96\,u(w) = 1008 - 1.96 \times 5.66 = 996.9\,mm$$

Targeted resurvey and conditional acceptance

The framework directs a targeted measurement of both jambs rather than acceptance of the visually continuous model. Assume a new independent dimensional survey measures 1012mm with combined standard uncertainty 2mm. The revised lower bound is 1012 – 1.96 × 2 = 1008.1mm. Under the illustrative width criterion, the clearance now passes. If errors are correlated or non-normal, the covariance or coverage model must be revised before using this calculation.

Table 4 demonstrates why a passing registration or checkpoint statistic cannot determine the engineering decision alone. The revised object record retains the initial inference, the resurvey evidence, the corrected width and the reason for revision. The example demonstrates an auditable decision path; it provides no empirical estimate of resurvey frequency, cost reduction or framework effectiveness.

Copyright © Murat Yakar

Table 4: Hypothetical decision record before and after targeted resurvey.

Criterion	Initial dataset	Revised evidence
Global checkpoint RMSE ≤ 10mm	8mm; passes	Existing global check retained; local dimension checked separately
Both limiting jambs observed	One inferred; fails	Both directly observed; passes
Lower width bound ≥ 1000mm	996.9mm; fails	1008.1mm; passes
Required properties survive exchange	Observation date absent; fails	ID, width and date checked after reimport; passes
Decision	Withhold width-based release	Accept width criterion only; other access requirements remain separate

Information Exchange and Lifecycle Use

BIM and GIS interfaces

Building objects and their geographic context require compatible coordinates, identifiers and meanings. An exchange package should include the coordinate transformation, required property definitions, source references and observation dates. Open exchange is discussed in the Scan-to-BIM review [3]; the specific reimport tests proposed here are operational checks rather than a claim of compliance with a particular standard version.

A successful file import does not establish integrity. The recipient should compare selected coordinates and dimensions, object counts, identifiers and mandatory fields. Measured boundaries should also be distinguished from design boundaries and legally registered boundaries. Surface capture alone cannot confer legal authority on a visible feature.

Heritage refurbishment and construction

The Isabel II dam study [9] explicitly combines UAV geometry and historical information in HBIM. The earlier HBIM method [12] links survey surfaces with parametric interpretation. These examples support preserving both evidence and interpreted objects. They do not establish that concealed construction details can be inferred reliably from exterior geometry alone.

For refurbishment, the principal deliverables may be verified openings and interfaces rather than a uniformly detailed whole-building model. For construction verification, the measured state and approved design should remain separate so deviations can be reviewed against the applicable task tolerance. For heritage conservation, detailed meshes or imagery may preserve irregular surfaces that a simplified parametric object cannot express. Linked representations allow these different uses without treating every surface detail as an operational BIM requirement.

The discussion of modern heritage documentation technologies [22] provides a wider conservation context. The Sarışıh Inn study [25] addresses UAV-based recording of masonry deterioration, while the Mardin Mansion study [26] combines observational assessment with TLS for facade material problems. These cases motivate linking condition annotations to dated observations. An observed surface defect and an inferred deterioration mechanism must remain distinguishable; neither study is used here to claim automated diagnosis of concealed material behaviour.

Updating and operational records

A dated as-built model represents an observed state. Operational use additionally requires defined update triggers, responsible parties and persistent identities. Updating difficulties identified in [10] motivate explicit distinction between a physical change, correction of a modelling error and revision of design intent. Each has a different evidential basis and should receive a different revision reason.

Figure 3 describes a proposed traceability structure. Repeat observations should be compared under stable reference conditions, with uncertainty and covariance considered where data share control. A series of scans alone does not establish an operational digital twin: the link to maintained objects, update responsibilities and decisions must also function.

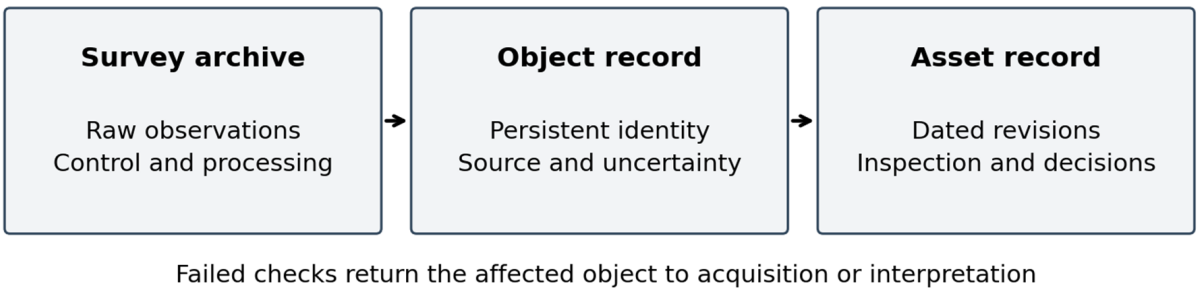


Figure 3: Traceability from survey archive to asset updates. Observation dates and record-edit dates are distinct. Original conceptual diagram.

Copyright © Murat Yakar

Discussion and Research Priorities

What the synthesis supports

Across the bounded evidence in Tables 1 and 2, acquisition, interpretation and acceptance address different failure modes. The practical implication is to specify required information before choosing the instrument and to retain unresolved objects as provisional. Sensor combinations are justified when they close an identified coverage or information gap, with checks retained for the combined product.

The framework extends this separation into a decision record: requirement, evidence, uncertainty, test result and action. The worked example shows how those fields can prevent premature acceptance when a global positional check passes but a critical local feature is missing. Its contribution is procedural clarity, rather than a demonstrated improvement over alternative workflow.

Limits of inference

The final corpus is small, purposive and weighted toward established workflows and regional heritage applications. Fifteen of its 27 publications share the manuscript author, and several share additional collaborators. This concentration remains a material limitation despite the external core. The review is not a comprehensive account of contemporary automated reconstruction, wearable systems or operational digital twins. Source counts must not be read as independent confirmations of effectiveness.

Detailed protocols were not accessible for every source, as Table 1 records. Consequently, no study-quality score or pooled accuracy estimate is provided. The omission of sources with indirect relevance narrows unsupported claims but cannot substitute for a prospectively designed systematic review. The framework and its thresholds require empirical validation; the hypothetical example must not be cited as an experimental result.

Testable research priorities

A useful comparative study would apply alternative capture strategies to the same building tasks, reserve independent control and report the effort required to reach accepted delivery. Evaluation should include missed critical surfaces, dimensional errors, incorrect object relationships, manual corrections and information lost during exchange. Shared tasks would make the results more comparable than sensor labels alone.

Longitudinal testing should assess whether object identities, source links and uncertainty survive repeated revisions. Automation should be evaluated on the accepted model and the unresolved exceptions it exposes. An algorithm that identifies unsupported geometry can improve review even when it cannot reconstruct that geometry reliably. Evidence of efficiency should include interpretation, verification and resurvey effort, not acquisition duration alone.

Conclusion

Geomatics contributes to BIM through controlled observations, explicit spatial references and defensible quality checks. A usable information model also requires interpretation, source traceability and validation of the delivered objects. The focused synthesis shows why geometric documentation must be distinguished from demonstrated BIM conversion and why model-to-cloud agreement cannot replace independent verification.

The proposed framework links a stated engineering decision to acquisition, interpretation, acceptance and revision. Its hypothetical clearance example illustrates that passing a global accuracy check does not resolve missing local evidence or uncertainty in a critical dimension. The framework offers an auditable method for organizing these checks, while comparative experiments and longitudinal studies remain necessary to establish its practical effectiveness.

Data Availability

The 27-source inventory is reported in Table 1. The manuscript contains exactly three original conceptual figures, numbered 1–3, and four tables, numbered 1–4. All numerical values in Section 6 and Table 4 are hypothetical and are supplied in full for reproducibility of the arithmetic.

Declaration of AI-assisted Preparation

Generative AI assisted with restructuring, English-language editing, source organization and preparation of the conceptual figures and hypothetical worked example. The author remains responsible for checking the scientific interpretation, bibliographic records and final manuscript before submission.

References

1. Volk R, Stengel J, Schultmann F (2014) Building Information Modeling (BIM) for existing buildings-Literature review and future needs. Automation in Construction 38: 109-127.
2. Tang P, Huber D, Akinci B, Lipman R, Lytle A (2010) Automatic reconstruction of as-built building information models from laser-scanned point clouds: A review of related techniques. Automation in Construction 19(7): 829-843.
3. Murphy M, McGovern E, Pavia S (2009) Historic building information modelling (HBIM). Structural Survey 27(4): 311-327.
4. Arayici Y (2008) Towards building information modelling for existing structures. Structural Survey 26(3): 210-222.
5. Wang Q, Kim MK (2019) Applications of 3D point cloud data in the construction industry: A fifteen-year review from 2004 to 2018. Advanced Engineering Informatics 39: 306-319.
6. Rashdi R, Martínez-Sánchez J, Arias P, Qiu Z (2022) Scanning technologies to building information modelling: A review. Infrastructures 7(4): 49.
7. Valero E, Bosché F, Bueno M (2022) Laser scanning for BIM. Journal of Information Technology in Construction 27: 486-495.
8. Almukhtar A, Saeed ZO, Abanda H, Tah JHM (2021) Reality capture of buildings using 3D laser scanners. Civil Eng 2(1): 214-235.
9. Bhatla A, Choe SY, Fierro O, Leite F (2012) Evaluation of accuracy of as-built 3D modeling from photos taken by handheld digital cameras. Automation in Construction 28: 116-127.
10. Thomson C, Apostolopoulos G, Backes D, Boehm J (2013) Mobile laser scanning for indoor modelling. ISPRS Annals of the Photogrammetry, Remote Sensing and Spatial Information Sciences 2(5)/W2: 289-293.
11. Murtiyoso A, Grussenmeyer P (2017) Documentation of heritage buildings using close-range UAV images: dense matching issues,

Copyright © Murat Yakar

comparison and case studies. The Photogrammetric Record 32(159): 206-229.

12. Martínez-Carricondo P, Carvajal-Ramírez F, Yero-Paneque L, Agüera-Vega F (2021) Combination of HBIM and UAV photogrammetry for modelling and documentation of forgotten heritage. Case study: Isabel II dam in Níjar (Almería, Spain). Heritage Science 9: 95.

13. Kanun E, Metin A, Yakar M (2021) Obtaining 3D point cloud of Agzikara khan using terrestrial laser scanning method. Turkish Lidar Journal 3(2): 58-64.

14. Nazari SW, Akarsu V, Yakar M (2023) Analysis of 3D laser scanning data of Farabi Mosque using various software. Advanced Lidar 3(1): 22-34.

15. Yakar M, Yılmaz HM (2025) The use of terrestrial laser scanning technology in the documentation of cultural heritage. Cultural Heritage and Science 6(2): 138-148.

16. Karabacak A, Yakar M (2025) Steel structure measurement with wearable mobile lidar. Geomatics 11(1): 129-138.

17. Karabacak A, Yakar M (2022) Applications of wearable mobile lidar and 3d modeling of Cambazli church. Turkey Lidar Journal 4(2): 37-52.

18. Yakar M, Yılmaz HM (2025) The use of unmanned aerial vehicles in cultural heritage documentation. International Journal of Engineering and Geosciences 11(2): 496-509.

19. Yakar M, Yılmaz HM (2025) Ground control point distribution in the production of location data using unmanned aerial vehicles. Geomatics 11(1): 88-96.

20. Pulat F, Yakar M (2026) High-Precision 3D documentation of cultural heritage using UAV photogrammetry: The tomb of Ismail Fakirullah. Geomatics 11(2): 232-242.

21. Yakar M, Uysal M, Toprak AS, Polat N (2013) 3D modeling of historical doger caravansaries by digital photogrammetry. The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences XL-5(W2): 695-698.

22. Yakar M, Yılmaz HM (2025) The role of modern technologies in documenting cultural heritage. Cultural Heritage Studies 6(2): 94-110.

23. Yakar M, Yılmaz HM, Yıldız F, Zeybek M, Şentürk H, et al. (2010) 3D Modeling and Animation of Roman-Era Artifacts in the Silifke-Mersin Region. Journal of Geodesy and Geoinformation 2010(101).

24. Mohammed O, Yakar M (2016) Modeling of places of worship using terrestrial photogrammetric methods. Selcuk University Journal of Engineering Sciences 15(2): 85-95.

25. Karataş L, Alptekin A, Karabacak A, Yakar M (2022) Detection and documentation of stone material deterioration in historical masonry buildings using UAV photogrammetry: A case study of Mersin Sarisih Inn. Mersin Photogrammetry Journal 4(2): 53-61.

26. Karataş L, Alptekin A, Yakar M (2023) Investigating the material deteriorations on the facades of stone structures by terrestrial laser scanning method: Case study of Mardin mansion. AKU J Sci Eng 23(3): 700-711.

27. Karabacak A, Yakar M (2023) 3D modeling of mufti Abdullah Siddik Mosque using wearable mobile lidar. Advanced LiDAR 3(1): 1-9.

Copyright © Murat Yakar