

Article

Towards a Standardized BIM Manager Profile: Comparative Review Across Economies with Varied Digital Construction Policies: A Case Study of the Polish BIM Labor Market

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Abstract

Building Information Modelling (BIM) has become a key driver of digital transformation in the construction sector, increasing the demand for professionals capable of managing BIM-enabled projects across their entire life cycle. However, despite the growing importance of the BIM Manager (BIMM), there is still no widely accepted competency framework applicable across different regulatory and market contexts. This study aims to identify the core competencies required of BIM Managers operating in countries with different digital construction policies and to evaluate the extent to which the Polish labour market and educational system align with international expectations. A qualitative comparative approach was adopted, combining a narrative literature review, an analysis of 48 job advertisements from 6 countries representing different BIM policy and implementation contexts, with 8 advertisements analysed per country, and an exploratory qualitative comparative study of selected Polish academic and professional educational programs. To complement the qualitative approach, an auxiliary text frequency analysis was conducted by extracting the most frequently occurring post-related vocabulary from the analysed job advertisements. The extracted terms were subsequently grouped into broader competency domains to support the interpretation of employer expectations. The results demonstrate that employer expectations are remarkably consistent and extend beyond technical BIM expertise to include leadership, communication, information management, and strategic decision-making competencies. The auxiliary text frequency analysis confirmed the consistency of the qualitative findings by demonstrating that the most frequently occurring competency-related terms could be meaningfully interpreted within four complementary categories: Technical BIM Competencies, Managerial & Operational Competencies, Information & Data Management Competencies, and Behavioral (Soft) Competencies. In addition, prospective Emerging Digital Competencies are discussed as a future-oriented conceptual extension reflecting the ongoing digital transformation of BIM practice. Although Poland represents an emerging BIM market without mandatory BIM implementation in public procurement, its labour market and educational offers largely reflect international competency expectations. The identified competency domains provide a foundation for developing a standardized BIM Manager profile and support future efforts toward harmonizing higher education, professional certification, and industry practice in digitally transforming construction markets.



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1. Introduction

The construction sector is undergoing a profound transformation through the integration of digital technologies that support built assets throughout their entire life cycle—from design and construction to operation. One of the most prominent innovations in this context is Building Information Modelling (BIM), a methodology that is widely adopted in many countries and is gaining increasing recognition in more and more countries. Although BIM implementation is expanding within enterprises, challenges persist, particularly regarding the shortage of qualified professionals capable of managing BIM processes holistically—not merely from a technical standpoint.

BIM, as defined by international practice, refers to a structured approach to building data modelling and lifecycle management. A central role in this environment is that of the BIM manager (BIMM), whose work is guided by standards such as ISO 19650 [1–6], which defines protocols for information management in a BIM context. A BIMM typically possesses qualifications related to investment and construction project management and assumes multidimensional responsibilities that go beyond technical coordination. These include implementing BIM strategies, leading teams, ensuring compliance with standards, supporting digital adaptation, engaging in strategic dialogue with leadership, organizing training, and overseeing the professional development of staff.

Unlike the BIM coordinator (BIMC), whose responsibilities are primarily technical, the BIMM plays a strategic role, aligning digital workflows with organizational goals. The BIMM also collaborates with information strategy personnel to select tools and processes tailored to specific project needs. For consistency, the term BIMM will be used throughout this article to denote the BIM manager's role.

This article aims to develop a competency framework for BIMMs. The topic is timely given the rapid pace of technological advancement in the construction sector and the growing popularity of BIM. The review focuses on both technical and soft skills, their presence in job postings, and the learning outcomes offered by educational programs for future BIM professionals. It also addresses labour market expectations and compares selected educational systems.

To reflect the diversity of policy environments influencing BIM adoption, countries were selected to represent three broad categories: (1) mandated BIM economies (e.g., the United Kingdom, United Arab Emirates, Germany, Italy), where BIM implementation is required by law or regulation; (2) digitally mature but non-mandated contexts (e.g., the United States of America), where BIM is widespread but not formally enforced at the country-level; and (3) a context characterized by developing BIM implementation without a general national BIM mandate (Poland), where BIM is gaining popularity but remains largely voluntary. The grouping was introduced as a contextual typology for comparative purposes rather than as a quantitative BIM maturity ranking. This analysis was based on job advertisements, academic literature, industry reports, and educational program content. A custom classification system was developed to organize competencies into several categories. This structure facilitates the identification of both skill gaps and desired attributes for effective BIM management.

The contribution of this study lies, first of all, in examining how recurring competency expectations compare across selected BIM policy environments and in confronting these international labour-market requirements with selected educational pathways available in

Poland. To complement the qualitative comparative analysis, an auxiliary text frequency approach was adopted to support the interpretation of competency-related terminology extracted from BIM Manager job advertisements. The extracted terminology was further organized into four complementary vocabulary clusters: Technical and BIM terms, Managerial & Operational terms, Information & Data Management terms, and Behavioural (Soft Skills) terms. Based on this comparison, the study seeks to contribute towards a standardized competency profile for the BIM Manager profession while also proposing Emerging Digital Competencies as a future-oriented extension for next-generation BIM Manager competency frameworks.

The study addresses the following research questions:

- RQ1. What competencies are most frequently required of BIM Managers across different BIM policy environments?
- RQ2. How does the competency profile expected on the Polish labour market compare with those observed in more mature BIM markets?
- RQ3. To what extent do selected educational offers in Poland address the competency requirements identified in the labour market analysis?
- RQ4. Can the recurring competency requirements identified in the analysed labour markets provide an initial basis for further development of a standardized BIM Manager competency profile?

2. Materials and Methods

2.1. Theoretical Background

2.1.1. Building Information Modelling

According to [7–11], Building Information Modelling (BIM) is a process and methodology involving the creation and management of a digital representation of the physical and functional characteristics of a building or construction facility. BIM models serve as shared data resources, supporting planning, construction, management, utilization, revitalization, and demolition activities [12], whereas information saved there includes building geometry, components, and materials, which can be adapted to generate computational models suitable for a broad range of computational simulations. The model is semantically rich, containing specific data, properties, spatial relationships, quantities, and other customized information about structures added by stakeholders [13–15].

BIM is designed to centralize all project information in a digital model, acting as a comprehensive database for managing all elements of infrastructure throughout its lifecycle, what underline different researchers [11,16,17]. It integrates all actors in a construction project, facilitating collaboration among designers, consultants, contractors, and other stakeholders [10,18–20].

BIM presents significant differences compared to traditional computer-aided design (CAD) systems. While CAD relies on external sources for information integration, BIM offers an internalized system where semantic and geometric data of construction elements are directly accessible from the digital model [21]. BIM models are object-oriented, integrated, and parametric, allowing for the definition of objects with relationships and associated metadata, which aids interoperability between domains in building design, construction, and management [22].

ISO 19650 standardizes and streamlines data and information management across all project stages, from design and construction to asset management, promoting collaboration and efficiency [23,24]. The document is derived from earlier standards and is recognized as a key reference for BIM information management [23].

The competencies required for effective BIM implementation span technical (software proficiency, data management, interoperability standards), managerial (BIM management,

information requirement policy integration), and collaborative domains (stakeholder collaboration, interdisciplinary approach, communication), as well as application-specific topics (sustainability, waste efficiency, lifecycle management). This classification reflects the multifaceted nature of BIM competencies, emphasizing the need for a holistic approach.

2.1.2. BIM Professions

The implementation of BIM requires a fundamental shift in the approach to the project delivery process. BIM enforces a more structured and transparent method of knowledge creation and management. For BIM to be successfully implemented, the appointment of so-called “change ambassadors” is essential. These are typically individuals who actively support the transformation, understand its underlying rationale, and recognize the benefits it offers [25]. In the context of BIM, this role is most often fulfilled by BIM managers, information managers, or BIM coordinators. These professionals possess appropriate expertise in the new project delivery paradigm and are responsible for disseminating the BIM vision, implementing the adoption roadmap, and communicating the benefits of BIM-based workflows [26]. Importantly, they must be aware of the challenges associated with organizational change and actively support the transformation process.

According to [27], the BIM manager (BIMM) is a professional who may operate in project offices, building enterprises, and construction contractors, bearing significant responsibility for the success of BIM implementation. During the transformation process, the BIMM is required to assume the role of a coach, focusing not only on technological aspects but also on organizational and human factors [25]. This includes helping team members perceive change as an opportunity for development, supporting them in overcoming personal barriers, and addressing resistance to innovation. The BIMM is responsible for leading the team and articulating a coherent BIM vision that encompasses the full scope of responsibilities associated with the role. To effectively manage resistance to change, the BIMM needs to engage in continuous and structured dialogue with top management regarding both technological objectives and the business rationale for BIM adoption [25].

Furthermore, the BIM manager should focus on the regular monitoring and support of individuals involved in developing new BIM-based procedures and standards. Creating an environment that encourages open discussion about the benefits, challenges, and uncertainties associated with newly implemented technologies is equally important. The BIMM should also support the definition of individual career paths for team members and identify appropriate training and professional development opportunities aligned with these paths. Resistance often stems from a lack of understanding or misinterpretation of change; therefore, the presence of a BIMM within the team is crucial. Continuous education, support for professional growth, and the standardization of procedures—ensuring clarity and usability—are necessary to foster engagement and encourage early participation in the BIM process [25].

Additionally, the BIM manager is responsible for assessing the feasibility and appropriateness of BIM application in a given construction project. The BIMM collaborates with stakeholders responsible for shaping the information strategy of both the organization and the investment project. Based on organizational capabilities and project-specific requirements, the BIMM selects suitable processes, procedures, and digital tools to support investment objectives. The role also involves preparing documentation related to BIM implementation, relying on advanced knowledge of BIM methodologies and the practical application of BIM standards in projects. The BIM manager is expected to remain informed about emerging trends in BIM technologies and to identify new areas of potential application [25].

In addition to the BIM manager, two other BIM-related roles are typically present within organizations, such as BIM modelers and BIM coordinators—most often operated on the designer's or contractor's side. Alongside various other BIM-related roles, these three are considered the most critical for successful delivery of a BIM-based project [28]. The BIM modeler is responsible for developing digital building models and carrying out detailed modeling tasks using specialized applications dedicated for BIM. As such, this role is primarily technical and typically positioned within the design office structure. In contrast, the roles of BIM coordinator and BIM manager may initially appear similar; however, they differ significantly in scope and responsibility. This warrants a closer examination of the distinctions between these two positions. First of all, the positions are not interchangeable; they represent distinct functions within BIM-enabled project management. The primary difference lies in the scope of responsibility. The BIMC is responsible for coordinating BIM activities and design workflow processes. This role operates across three main domains. Within native BIM software environments, the BIM coordinator oversees model staging, design variant management in accordance with organizational standards, import and export to IFC formats, and collaborative work on central models. Within the project's Common Data Environment (CDE), the BIMC is authorized to manage data and changes, invite users to the project, and assign access rights. In the area of interdisciplinary coordination, the BIM coordinator is responsible for identifying, reporting, and managing clashes between disciplines [25].

Moreover, the BIMC supports the BIM manager in tasks related to progress reporting, risk register maintenance, and task delegation. This role requires the ability to use 3D models and embedded information to detect design errors and interdisciplinary conflicts. In practice, BIM coordinators are most often positioned within the organizational structure of contractors. Compared to the BIM manager, the BIMC has a more limited scope of responsibilities, focusing primarily on the operational management of technical aspects of BIM models. By contrast, the BIM manager fulfills a more strategic and managerial function, overseeing the implementation of the entire BIM system and ensuring compliance with relevant standards [25,27,28].

2.1.3. Competence vs. Competency and Professional Competencies

The term 'competence' in the dictionary definition is literally the ability to do something well [29]. It can also refer to an organism's capacity to interact effectively with its environment [30]. On the other hand, 'competency' is an important skill that is needed to do a job [31]. It relates to an individual's ability to perform a specific task or deliver a measurable outcome [32]. Similarly, according to other sources, 'competencies' are commonly defined as the integration of knowledge, skills, attitudes, and personal characteristics that enable effective performance of tasks or duties within a professional context [33–37]. They serve as guidelines for professionals to operate safely and effectively in their respective disciplines and are considered the smallest unit for measuring performance [34,37]. However, 'professional competencies' refer specifically to the knowledge, skills, and abilities required to perform tasks successfully as part of one's professional role [35,38–41]. These competencies often include intellectual abilities, domain-specific strategies, motivational aspects, values, and beliefs [35,42,43]. Competency components typically include conceptual (theoretical) knowledge, procedural (applied) knowledge, also known as skills, and personal attributes. Professional competencies, in turn, are understood as complex, multi-dimensional constructs that integrate technical expertise, behavioural characteristics, and attitudinal factors applied within work environments. Figure 1 presents a generic model of the identified semantic issues along with their corresponding conceptual elements.

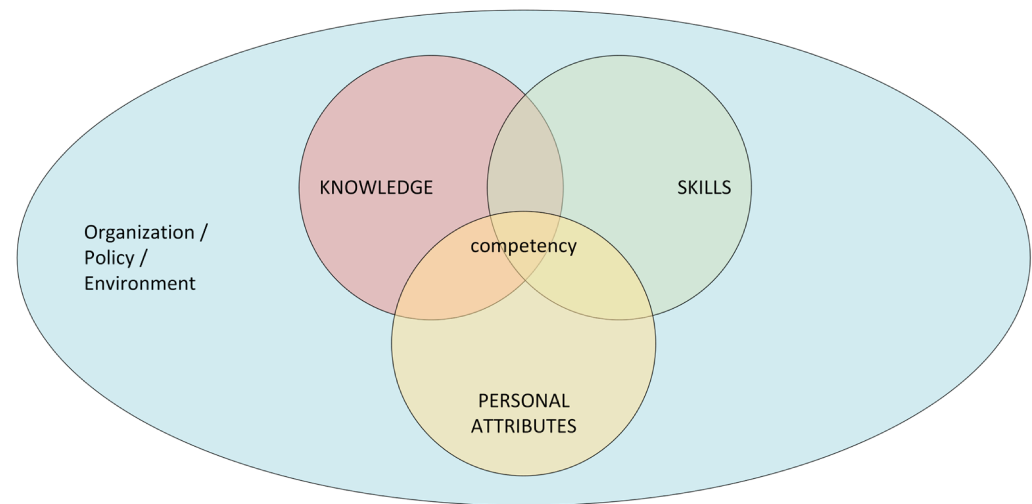


Figure 1. Semantic overlap model of competency.

A contemporary construction market demands a comprehensive set of BIM-related competencies, encompassing conceptual knowledge, practical digital skills, collaboration, project management, and continuous professional development. Addressing skills gaps, overcoming resistance to change, and integrating BIM with broader construction and digital competencies are essential for effective BIM adoption and sustained industry advancement [32,44–47].

In the literature, using a three-tiered model of competencies is proposed [32]. The first level—core competencies—reflects the individual characteristics that enable a person to perform measurable actions or achieve quantifiable outcomes. This level encompasses four main competency sets:

- Fundamental traits, understood as innate personal attributes that cannot be acquired through education or training;
- Situational factors, which include characteristics linked to nationality, language, or other contextual variables that may affect the delivery of a service or product;
- Qualifications and licenses, encompassing personal attributes such as academic degrees, scientific publications, professional accreditations, trade certificates, or licenses;
- Historical indicators, referring to employment history, project experience, previously held roles, and professional positions [32].

The second level involves domain-specific competencies, which pertain to individuals' professional abilities, the resources they use to carry out complex tasks, and the methods applied to deliver outcomes under demanding conditions. This level comprises eight competency sets, grouped as follows:

- Four primary sets: managerial, functional, technical, and support-related skills, representing the main categories of professional expertise;
- Four secondary sets: administrative, operational, implementation-related, and research and development (R&D) competencies, which emerge from the intersection of primary sets [32].

The third level, referred to as execution-level competencies, represents a person's ability to apply specific tools and techniques to perform defined tasks or achieve measurable results.

In practice, these three levels of competencies are not isolated but rather complementary and interdependent. Performing a given role typically requires a combination of competencies from all three levels. A conceptual idea of the three-tiered model of competencies is presented in Figure 2.

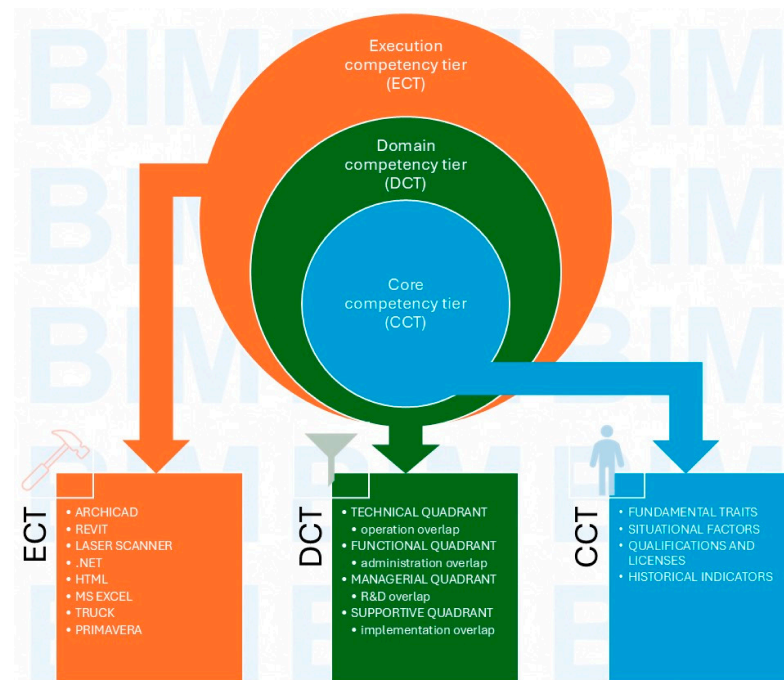


Figure 2. Three-tiered model of competencies applicable for BIM [32].

It may be concluded that a thorough and structured assessment of competencies serves as a valuable tool for strategic management—both at the level of the enterprise and within the investment project itself. In predictive project environments, competency assessment plays a critical role. Moreover, clearly structured competency models facilitate the development of assessment frameworks and educational curricula based on learning outcomes. Such outcomes help define not only what an individual knows, but also what they are capable of doing in practice [32].

For purposes of the present study, a competency of a BIM Manager is understood as a job-related requirement explicitly expressed in an advertisement or educational outcome and referring to the knowledge, skills, qualifications, experience, behavioral attributes, or decision-making capabilities expected to perform the BIM Manager role effectively.

2.1.4. BIM-Related Country-Specific Policies

BIM is increasingly embedded in public procurement processes, driven by regulatory mandates in many countries all over the world.

For instance, the European Union has explicitly encouraged, specified, or mandated the use of BIM for publicly funded construction and building projects, as stated in two directives of the European Parliament and of the Council. Literally, it is said that for public works contracts and design contests, Member States may require the use of specific electronic tools, such as building information modelling tools or similar [48,49]. As a consequence of such legal directions, many EU members have already implemented BIM in public procurement.

However, this process faces multiple challenges, including organizational resistance, technical barriers, high costs, data management complexities, and difficulties in stakeholder collaboration [50]. Overcoming these difficulties requires integrated approaches that combine technological innovation with organizational learning, standardized processes, and supportive policies. Frequently, market maturity is a major barrier to BIM adoption [51].

In the United Kingdom, a BIM-driven country, Level 2 BIM adoption has been mandated for government-procured projects since 2016 [23]. Germany has implemented a mandate for BIM in specific sectors of its economy, particularly for public infrastructure

projects [52]. In Italy, BIM became mandatory for public projects above €100 million starting in 2019 [53]. In the United States of America (USA), BIM mandates are present at the level of specific federal agencies [54]. The United Arab Emirates (UAE), in turn, is identified as a jurisdiction that has mandated Building Information Modelling (BIM) for public works [55].

In contrast, despite several years of discussion and strategic initiatives, Poland has not introduced a formal mandate requiring the use of BIM in public procurement procedures. The existing public procurement and construction regulations are not yet fully aligned with mandatory BIM implementation. Although significant progress has been made in the digitalization of the construction process in recent years, these reforms primarily concern administrative digitization rather than model-based project delivery. Current digital solutions include, for example, the possibility of submitting building design documentation in digital form when applying for a building permit, as well as maintaining the construction logbook and building facility documentation in electronic formats. However, these measures do not constitute a systematic BIM requirement. The Polish case is particularly noteworthy, as Poland is one of the largest European Union member states, characterized by a high volume of public investments and numerous national infrastructure programs. Nevertheless, BIM adoption remains largely driven by private-sector initiatives and only isolated public projects, including selected flagship developments such as Port Polska, where BIM has been implemented on a project-specific basis rather than as a result of regulatory obligation.

Based on the reviewed regulatory and market conditions, three distinct national specificities in relation to BIM adoption can be identified (Figure 3). The first group comprises officially mandated BIM economies (e.g., the United Kingdom, Germany, Italy, and the United Arab Emirates), where BIM implementation is required by law or formal regulation, particularly in public procurement. The second group includes digitally mature but non-mandated contexts (e.g., the United States of America), where BIM is widely adopted in practice and supported by institutional frameworks, yet not enforced through nationwide legislative mandates, mainly due to the specificity of public administration in the country. The third group consists of contexts characterized by developing BIM implementation without general national BIM mandates (e.g., Poland), where BIM adoption is gradually increasing but remains largely voluntary and is not yet embedded within a coherent regulatory framework. From a broader analytical perspective, these three categories may be interpreted as forming two contrasting areas in terms of readiness for BIM-based project delivery. The first and second groups together represent countries that are structurally prepared for BIM implementation—either through formal mandates or through high levels of market-driven digital maturity—whereas the third group reflects countries still undergoing institutional and regulatory reform, and therefore not yet fully prepared for systematic BIM integration at the national level.

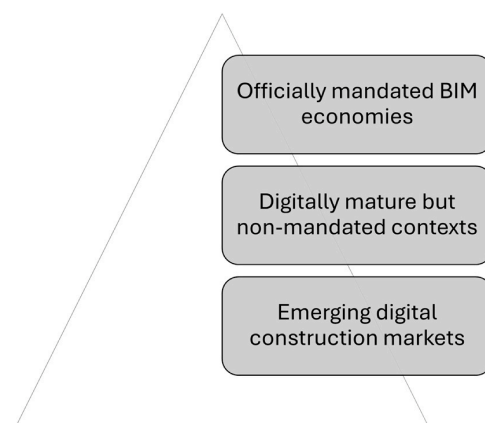


Figure 3. Conceptual pyramid of BIM implementation contexts across national economies.

2.2. Methodological Background

2.2.1. Research Gap

Despite the increasing relevance of BIM and a rising demand for qualified specialists such as BIMMs, there is a significant lack of empirical research focused on their professional competencies. Current literature on the topic is limited, often general in nature, and does not provide systematic analyses based on job market data, recruitment processes, or the profiles of individuals currently employed in BIMM roles. There are no widely accepted standards or reference frameworks for evaluating BIMM competencies, which creates difficulties for both education providers and employers in defining qualification criteria. Furthermore, the level of professional preparedness among BIMMs remains inconsistent due to limited access to specialized training and certification programs. However, there is a recognized need for a comprehensive approach to identify, classify, and maintain an inventory of generic BIM competencies required for modelling, collaboration, and integration activities across project lifecycles, industry sectors, disciplines, and specialties.

Previous recruitment-based studies have examined BIM-related job roles and, in particular, the long-term distinctiveness and possible convergence of BIM Manager, BIM Coordinator, and Project Manager positions. The present study addresses a different problem. Rather than questioning the persistence of the BIM Manager role, it examines the competency expectations associated with a role that is currently present in the labour market and actively recruited by employers. The focus is therefore placed on identifying and structuring the knowledge, skills, qualifications, and professional attributes expected from BIM Managers across selected national contexts, with Poland examined as a case study. This exploratory analysis is intended as an initial step toward future research on competency assessment, recruitment support, and the development of clearer professional profiles for BIM Managers. Current research highlights that while some competencies have been identified, a complete and systematic inventory applicable to all relevant contexts is still lacking, which limits the ability to assess and develop BIM capabilities industry-wide [32,56]. It addresses the gap by delivering a structured review of expected competencies, based on a literature review, job postings, and educational offerings, aiming to inform competency development and to constitute a potential basis for future standardization.

2.2.2. Description of Multidimensional Model

In response to the identified research gap, this study undertakes a qualitative analysis of the competency expectations associated with the role of BIMM. The adopted research methodology comprised three main stages: a review of scholarly and professional literature, an analysis of job advertisements, and an examination of selected educational programs, both academic and non-academic, based on a case study of Poland. These complementary sources were used for different analytical purposes: the literature provided the theoretical background, job advertisements formed the primary basis for the cross-country comparison of employer expectations, and selected Polish educational programs were examined as a case study of competency development pathways.

The first stage involved a narrative literature review conducted using open-access academic databases, including the common repository ScienceDirect. Publications from the past fifteen years were considered, using keywords including: “BIM,” “BIM competencies,” “BIM specialists,” “BIM manager,” “BIM in the construction industry,” and “BIM leadership.” The purpose of this stage was to establish the theoretical background and identify existing approaches to BIM-related competency classification rather than to provide an exhaustive systematic synthesis of all publications in the field.

In the second stage, job advertisements for positions of BIMM were analysed. For each market, job postings from the past three years were retrieved from selected recruitment platforms. The keyword “BIM manager” was used to identify relevant listings.

The job-advertisement analysis was designed as an exploratory qualitative comparison rather than as a statistically representative survey of national labour markets. An equal number of eight BIM Manager advertisements (Appendix A) was analysed for each of the following six countries: the United Kingdom, Germany, Italy, the United Arab Emirates, the United States of America, and Poland, resulting in a balanced comparative sample of 48 advertisements. Job postings were identified using the term “BIM Manager” and were limited to advertisements providing sufficient information on the qualifications, knowledge, skills, or experience expected from candidates. The analysis therefore focuses on recurring competency requirements within the selected sample and does not seek to estimate their prevalence across the entire national labour market.

Based on this empirical material—encompassing both market demands and educational provisions—a multidimensional competency model tailored for BIM managers was constructed. The recurring competency requirements identified in the research material were organized into five analytical categories developed for the comparative analysis: education and formal qualifications (EFQ), technology and domain expertise (TDE), team coordination and leadership (TCL), communication and collaboration (CC), and analytics and decision-making (ADM). These categories provided a consistent structure for organizing employer requirements and comparing the analysed national contexts.

The competency requirements extracted from the advertisements were assigned to the five analytical categories on the basis of their substantive meaning and role within the BIM Manager profile. The classification involved manual researchers’ judgement; however, no formal inter-rater reliability procedure was performed as part of the original exploratory study.

Coding was based on the semantic meaning of the requirements stated in each advertisement rather than on the occurrence of individual keywords. For example, requirements concerning formal education, professional qualifications, or certification were assigned to EFQ, BIM software, standards, modelling, and domain-specific technical knowledge to TDE, team management, coordination, and leadership to TCL; communication, collaboration, and interpersonal requirements to CC; and analytical, problem-solving, strategic, or decision-making requirements to ADM. Where a requirement could potentially relate to more than one category, its primary meaning in the context of the advertisement was used for classification.

To identify the competencies required of BIM Managers (BIMMs), a review of selected job advertisements was conducted. The analysis covered countries representing different levels of economic development and digital maturity in the construction sector, corresponding to the three groups presented previously in Figure 3. For each country, eight BIM Manager job advertisements were selected for analysis. The identified competency requirements were classified into five categories: EFQ, TDE, TCL, CC, and ADM. Tables in the next chapter summarize the competencies most frequently required by employers. For this exploratory analysis, a competency was classified as dominant (in the sense of showing predominance in observed composition) when it appeared in at least half of the advertisements analysed for a given country (≥ 4 of 8 advertisements). The 50% threshold was transferred from other areas, including the majority voting rule [57], and adopted as a simple qualitative decision rule to distinguish recurrent employer requirements from those occurring only occasionally within the analysed sample. It should not be interpreted as a statistical threshold for the national labour market.

To complement the qualitative thematic analysis, an auxiliary text frequency check was used, based on the textual content extracted from all analysed BIM Manager job

advertisements. The combined corpus was pre-processed by removing common stop words, duplicate expressions, punctuation, and different grammatical forms referring to the same competency concept. Subsequently, the frequency of competency-related terms was calculated to identify the most frequently occurring expressions across all job advertisements. The extracted terminology was then interpreted within four broader vocabulary clusters: Technical and BIM terms, Managerial and Organizational terms, Information and Data Management terms, as well as Behavioural (Soft Skills) terms to provide additional quantitative support for the qualitative findings. This analysis served exclusively as a complementary layer and did not replace the expert-driven thematic classification adopted in this study.

The third component of the study involved an analysis of educational programs offered in Poland, and aimed at training future BIMMs. Both academic and professional offerings were included. Among the academic programs analysed were the postgraduate courses: “BIM Manager–Modern Management of Construction Projects” at WSB Merito University; “Project Management for BIM Managers with Elements of Business Psychology” at the Silesian University of Technology; and “BIM Manager” (formerly: “BIM–Modelling and Managing Information about Facilities, Infrastructure, and Construction Processes”) at the AGH University of Krakow. Additionally, a non-academic expert course offered by PROCAD was included as an example of short-term intensive training focused on operational BIM competencies. The four programs were selected as illustrative cases representing different forms of BIM Manager competency development in Poland: three postgraduate academic programs with different educational profiles and one short-term professional training course. The analysis was not intended as a comprehensive quantitative survey. The selection of specific cases was based on many years of experience and market research by the researchers. It is worth noting that qualitative analysis does not require the use of many cases and is sufficient when additional cases do not add anything new to the results, when data saturation is reached [58]. In this analysis, other training and postgraduate study offers were initially screened, and their content was a repetition of those selected for the main analysis.

An approach presented in this article offers a broader understanding of the BIMM role—not merely as a technical expert but as a strategic leader and integrator within the digital transformation process in construction. The resulting competency profile may serve as a foundation for future efforts to professionalize this emerging role, inform the design of certification schemes, support recruitment processes, and guide the development of structured educational pathways in the context of digital construction.

3. Results

3.1. Market Requirements for Abilities of BIMM

Industry perception of the BIM Manager role and employers’ expectations converge in the labor market, where recruitment advertisements serve as a practical manifestation of competency demand. Consequently, job postings provide a valuable source of empirical evidence for identifying the qualifications, technical expertise, and managerial capabilities currently expected from BIM Managers. The following analysis examines these market requirements across selected countries representing different BIM policy environments.

3.1.1. The United Kingdom

The first country analysed is the United Kingdom, where job offers for British market from the following companies were analysed: Eden Brown (London, UK), Aylin White (London, UK), Marks Sattin (London, UK), AECOM (headquarters in Dallas, TX, USA), Sisk (headquarters in Dublin, Ireland), Lendlease (headquarters in Sydney, Australia),

Penguin Recruitment Ltd. (Swansea, UK), and the recruitment agency FAT Recruitment (Portsmouth, UK) (respective codes: UK_01 to UK_08 [59]). A summary of the categorised qualifications of BIMM in the UK is presented in Table 1.

Table 1. Classification of qualifications into categories along with their description in the United Kingdom.

Qualifications (Categories)	Skills
EFQ	- Higher technical or related education. - Professional experience and MEP knowledge required.
TDE	- Knowledge of Autodesk Revit, Navisworks, and AutoCAD software. - Knowledge of BIM management throughout the project lifecycle. - Knowledge of BIM norms and standards, particularly ISO 19650.
TCL	Ability to manage BIM teams and projects.
CC	- Ability to collaborate with stakeholders. - Communication skills.
ADM	Not explicitly stated in the analysed advertisements

3.1.2. Germany

The second country is Germany, where the following companies recruiting for German market were reviewed: Deutsche Bahn (Berlin, Germany), IPIP SA (headquarters in Ploiești, Romania), W. Hundhausen Bauunternehmung GmbH (Siegen, Germany), Infineon Technologies (Neubiberg, Germany), GE Vernova (headquarters in Cambridge, MA, USA), DB Engineering & Consulting GmbH (Berlin, Germany), Drees & Sommer SE (Stuttgart, Germany) and FERHAU GmbH (Gummersbach, Germany) (respective codes: DE_01 to DE_08 [59]). A summary of the categorised qualifications of BIMM in Germany is presented in Table 2.

Table 2. Classification of qualifications into categories along with their description in Germany.

Qualifications (Categories)	Skills
EFQ	- Higher technical/construction or comparable education. - Several years of professional experience in BIM required.
TDE	- Good knowledge of BIM software, including Autodesk Revit, Navisworks, and Solibri. - Knowledge of data management and 3D models.
TCL	Experience in project management and multidisciplinary coordination.
CC	- Ability to communicate and collaborate with stakeholders. - Teamwork skills.
ADM	- Ability to think analytically and make decisions. - Proactivity and work organisation skills.

3.1.3. Italy

Another example is Italy. Offers from the following companies recruiting for Italian market were used: Michael Page (Milan, Italy), Studio Altieri S.p.A. a Socio Unico (Thiene, Italy), 3TI Progetti (Rome, Italy), HYDEA (Florence, Italy), Nou Group (Rome, Italy), Gruppo MODULO (Padua, Italy), Pininfarina S.p.A. (Cambiano, Italy) and BIP (Milan, Italy) (respective codes: IT_01 to IT_08 [59]). A summary of the categorised qualifications of BIMM in Italy is presented in Table 3.

Table 3. Classification of qualifications into categories along with their description in Italy.

Qualifications (Categories)	Skills
EFQ	• Higher engineering, architectural, or related education. • Professional experience, most often at least 5 years required. • Very good proficiency in English. • BIM certification preferred.
TDE	• Very good knowledge of BIM software, most often Autodesk Revit and Navisworks. • Ability to implement and knowledge of Italian standards related to BIM and digital management of the informative processes.
TCL	• Experience in managing and coordinating BIM projects.
CC	• Communication skills. • Teamwork skills.
ADM	• Ability to approach problems analytically and make decisions based on analysed data.

3.1.4. The United Arab Emirates

The next country analysed is the United Arab Emirates, where BIMM positions can be found in companies recruiting for Emirati market such as: CONIN (Dubai, UAE), RMJM (Dubai, UAE), Egis (headquarters in Guyancourt, France), Surbana Jurong Private Limited (headquarters in Singapore, Singapore), Ssangyong Engineering & Construction Company LTD (headquarters in Seoul, South Korea), CNS Engineering Service (Dubai, UAE), SMEC (Australia/global network) and Creativ Leisure Turnkey Projects Contracting LLC (Dubai, UAE) (respective codes: AE_01 to AE_08 [59]). A summary of the categorised qualifications of BIMM in the UAE is presented in Table 4.

Table 4. Classification of qualifications into categories along with their description in the United Arab Emirates.

Qualifications (Categories)	Skills
EFQ	• Higher technical or related education. • Professional experience. • BIM certification required.
TDE	• Good knowledge of BIM software, particularly Autodesk Revit and Navisworks. • Knowledge of BIM processes and standards.
TCL	• Leadership skills and ability to manage projects and coordinate teams.
CC	• Ability to work effectively in an interdisciplinary team. • Communication skills.
ADM	• Analytical, problem-solving, and decision-making skills.

3.1.5. The United States of America

The non-European country is the USA. Offers were found from the following companies recruiting for American market: ONCORE Construction Consulting Group (North Potomac, MD, USA), Spees Design Build (Kent, WA, USA), Pulivarthi Group (Tega Cay, SC, USA), Romanyk Consulting Corp. (Plano, TX, USA), STV Group (New York, NY, USA), ArchKey LLC (St. Louis, MO, USA), United-BIM (East Hartford, CT, USA), and HDR (Omaha, NE, USA) (respective codes: US_01 to US_08 [59]). A summary of the categorised qualifications of BIMM in the USA is presented in Table 5.

Table 5. Classification of qualifications into categories along with their description in the United States of America.

Qualifications (Categories)	Skills
EFQ	- Higher technical or related education. - Professional experience required.
TDE	- Broad knowledge of tools, including Autodesk Revit, AutoCAD, and Navisworks. - Ability to perform 3D modelling and manage 3D models.
TCL	- Experience in project coordination and team management. - Ability to work in interdisciplinary teams.
CC	Excellent skills in effective communication and team collaboration.
ADM	- Innovative approach and ability to implement ideas. - Problem-solving skills.

3.1.6. Poland

To identify the requirements of the Polish labour market for the position of BIM Manager, a review of job advertisements was conducted. The analysis included job postings published by eight selected companies recruiting for Polish market: AECOM (headquarters in Dallas, TX, USA), Idom Engineering, Architecture and Consulting (headquarters in Bilbao, Spain), NizoDesign International (Warsaw, Poland), ELD Poland (Poznań, Poland), Amentum (headquarters in Chantilly, VA USA), PIG Architekci Sp. z o.o. (Warsaw, Poland), Randstad Polska Sp. z o.o. (Warsaw, Poland), and Dekpol Budownictwo Sp. z o.o. (Pinczyn, Poland) (respective codes: PL_01 to PL_08 [59]). A summary of the categorised qualifications of BIMM in Poland is presented in Table 6.

Table 6. Classification of qualifications into categories along with their description in Poland.

Qualifications (Categories)	Skills
EFQ	- Completed higher technical education in architecture, civil engineering, or a related field. - English language skills.
TDE	- Knowledge of BIM software, especially Autodesk Revit, Navisworks, and AutoCAD. - Knowledge of international BIM norms and standards, particularly ISO 19650. - Knowledge of BIM processes and ability to implement them. - Experience working in a BIM environment.
TCL	Management and coordination skills.
CC	- Ability to communicate and build relationships with all project stakeholders. - Teamwork skills.
ADM	Not explicitly stated in the analysed advertisements

3.2. Auxiliary Text Frequency Analysis of Competency Identification

To provide additional support for the qualitative findings, a text frequency analysis was conducted using the textual content extracted from the analyzed BIM Manager job advertisements. Unlike the thematic analysis, which relied on manual, qualitative interpretation, this complementary step aimed to quantitatively verify the consistency of the identified competency patterns through simple frequency-based text analysis.

The textual descriptions of job responsibilities, required qualifications, software proficiency, standards, certifications, and employer expectations obtained from all analyzed job advertisements were combined into a single corpus. Before the analysis, basic text preprocessing was performed by converting all text to lowercase, removing punctuation, numbers, duplicate expressions, and common stop words. Furthermore, different grammatical forms referring to the same concept (e.g., management, manager, and managerial) were grouped under their core semantic stems to improve consistency.

After preprocessing, the occurrence frequency of post-related vocabulary was calculated across the complete corpus. The twenty most frequently occurring terms were identified and subsequently interpreted by grouping semantically related expressions into broader competency domains. This complementary analysis was intended solely to strengthen the interpretation of the qualitative findings rather than replace the expert-driven thematic analysis adopted throughout this study.

Following this approach, the absolute frequencies of the identified terms were analyzed. This step was treated as a descriptive examination of terminology occurring in the text rather than as a direct measurement of competencies. Figure 4 presents the frequency of the terms occurring in the analysed BIM Manager job advertisements. The visualization indicates that technical terminology (Technical and BIM terms as well as Information and Data Management terms) is prominent in the analysed advertisements, while terms related to managerial activities and behavioural/soft skills also occur frequently. These results provide a descriptive overview of the vocabulary used in BIM Manager job advertisements, and complement the competency analysis presented in the preceding sections.

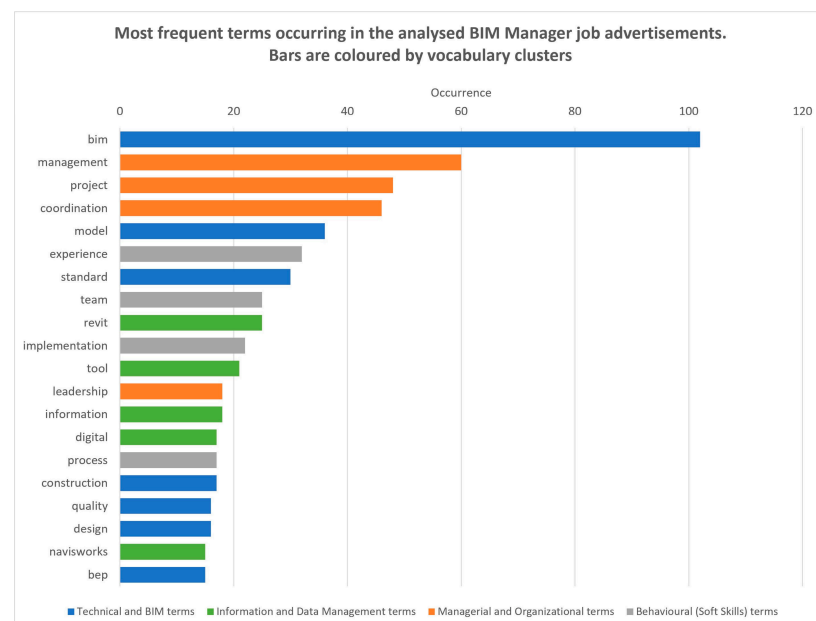


Figure 4. Most frequent terms occurring in the analysed BIM Manager job advertisements. Bars are coloured by vocabulary clusters.

3.3. Acquiring BIMM Competencies: A Case Study of Training and Educational Offers in Poland

The increasing demand for BIM professionals in Poland is reflected not only in job advertisements but also in the development of educational and training offers aimed at preparing specialists for BIM-related roles. In the Polish context, BIM Manager competencies can be acquired through both postgraduate academic programs and professional courses offered by private training providers. This section does not aim to present an exhaustive catalogue of all available educational paths. Instead, it focuses on selected programs that explicitly address competencies relevant to the BIM Manager role and can

therefore be treated as a narrative snapshot of how BIMM competencies are currently developed in Poland.

The analysis covered three postgraduate academic programs and one commercial training course. The academic offers included the postgraduate program “BIM Manager–Modern Management of Construction Projects” delivered by WSB Merito University in selected cities [60,61], the program “Project Management for BIM Managers with Elements of Business Psychology” offered by the Silesian University of Technology [62], and the program “BIM Manager” (formerly: “BIM–Modeling and Managing Information about Facilities, Infrastructure and Construction Processes”) offered by AGH University of Krakow [63]. In addition, the BIM Manager expert course offered by PROCAD [64] was included as an example of non-academic professional training. These programs were selected because they combine technological, managerial, organizational, and procedural aspects of BIM education and therefore correspond to the multidimensional character of the BIMM role.

The reviewed programs show that BIMM education in Poland is not limited to the operation of BIM software. The WSB Merito program emphasizes BIM methodology, BIM standards, information management, implementation strategies, change management, Lean and Agile approaches, preparation of BIM-related documentation, and the use of project performance indicators. This indicates a strong orientation toward strategic BIM implementation in organizations representing different sides of the construction process, including clients, designers, and contractors. The program also addresses coordination, clash detection, open BIM standards, non-graphical data exchange, data analysis, and team management, which makes it directly relevant to several key competency areas identified in the job market analysis.

The Silesian University of Technology program places BIM within a broader project management and organizational psychology framework. Its curriculum includes BIM standards, BIM coordination, BIM management at the construction stage, BIM-based facility management, BIM implementation in organizations, and BIM as a working methodology. This offer is particularly relevant because it combines technical BIM knowledge with project management, risk management, team leadership, motivation, communication, and change management. Such a structure reflects the fact that the BIM Manager is expected not only to understand digital construction processes but also to manage teams, support organizational transformation, and coordinate interdisciplinary collaboration.

The AGH University program provides a more specialized approach to BIM education by distinguishing between the BIM Coordinator and BIM Manager educational paths, currently treated as separate study programs. Its curriculum includes technological and process standardization based on ISO and OpenBIM standards, interdisciplinary data coordination, information management across the asset life cycle, BIM implementation strategies, Lean BIM, legal aspects of BIM, and agile project management methods. The program also develops competencies related to the buildingSMART approach (including IFC and BCF formats), Common Data Environments, 4D modeling, infrastructure projects, and digital information exchange. In this respect, it addresses both operational and strategic dimensions of BIMM competencies, with particular emphasis on information management and the life-cycle perspective.

The commercial course offered by PROCAD differs from postgraduate academic programs in terms of duration and educational format. It is an intensive professional training course focused on BIM documentation, BIM implementation in organizations, BIM standards, ISO 19650, BIM roles, the organization of BIM teams, process standardization, BIM libraries, data exchange, and modern management methods such as Lean and Agile. Its practical orientation makes it a useful form of continuing professional development,

especially for engineers already active in the construction sector. However, the certificate awarded after completion should be interpreted primarily as confirmation of participation in specialist training rather than as an independent formal certification of professional competence, unless the acquired knowledge and skills are verified by an external accredited certification body.

To provide a more direct answer to what extent do selected educational offers in Poland address the competency requirements, the selected Polish educational and training programs were mapped against the five competency categories identified earlier (EFQ, TDE, TCL, CC, and ADM). The mapping (Table 7) is based exclusively on the program content described in the analyzed educational offers and indicates whether a given competency area is explicitly, partially, or not explicitly addressed.

Table 7. Mapping of Selected Polish Educational and Training Programs against BIM Manager Competency Categories.

Program	EFQ	TDE	TCL	CC	ADM
WSB Merito University *	Explicit	Explicit	Explicit	Explicit	Explicit
Silesian University of Technology *	Explicit	Explicit	Explicit	Explicit	Explicit
AGH University of Krakow *	Explicit	Explicit	Explicit	Explicit	Explicit
PROCAD BIM Manager course **	Partial	Explicit	Partial	Partial	Not explicit

* postgraduate studies, ** non-academic expert course; “Explicit” indicates that the competency category is directly addressed by the program content described in the reviewed material; “Partial” indicates that only selected elements of the category are addressed or that the relationship is indirect; “Not explicit” indicates that the reviewed program description does not provide sufficient evidence that the category is directly addressed; source: [62,64–66].

The mapping shows that the selected Polish educational and training programs address all five competency categories identified in the labor-market analysis, although their coverage and educational emphasis differ. EFQ is reflected through the formal educational character of the postgraduate programs and the credentials awarded upon completion, while TDE is explicitly addressed across all analyzed offers. The programs differ more noticeably in their treatment of TCL, CC, and ADM, reflecting distinct educational profiles. WSB Merito demonstrates a broad technological and implementation-oriented profile, including advanced digital technologies and organizational BIM implementation. The Silesian University of Technology places comparatively greater emphasis on project management, leadership, interpersonal communication, business psychology, and risk management. The AGH University program is more strongly oriented toward information management, BIM standardization, coordination, and digital information management throughout the asset life cycle. The PROCAD course provides a more condensed, practice-oriented pathway focused primarily on BIM implementation, standards, documentation, team organization, and modern management methods. Overall, the comparison indicates that the selected Polish educational offers address the multidimensional character of BIM Manager competencies through different and complementary educational profiles rather than through a uniform competency model.

The comparison of academic and commercial offers shows that BIMM competencies in Poland are developed through two complementary paths. Postgraduate programs provide a broader and more systematic educational framework, combining BIM technology, information management, legal aspects, project management, leadership, and organizational change. Commercial courses, in turn, offer shorter and more practice-oriented training focused on selected tools, documents, standards, and implementation procedures. Both types of education contribute to competency development, but neither should be regarded as sufficient on its own without practical experience in BIM-based construction projects.

Overall, the reviewed educational offers confirm that the BIM Manager profile is multidimensional. The role requires formal technical education, knowledge of BIM standards and digital tools, the ability to manage information and coordinate interdisciplinary teams, communication and leadership skills, as well as analytical and decision-making capabilities. This observation is consistent with the competency categories derived from the job advertisement analysis and supports the need to treat BIMM education as an integrated process combining technological, managerial, and interpersonal development. In the Polish context, the analyzed programs show visible progress in responding to labor market expectations, but they also reveal the need for further standardization of learning outcomes, certification rules, and competency assessment mechanisms for BIM Managers.

4. Discussion

The analysis of BIM Manager (BIMM) job advertisements revealed both common competency requirements and country-specific differences, providing a comprehensive picture of the profile sought by employers across international construction markets. Most job postings require candidates to hold a higher education degree in engineering or a related discipline, together with relevant professional experience. Technical proficiency in BIM software—particularly Autodesk Revit, Navisworks, and AutoCAD—was consistently identified as a core requirement. Knowledge of BIM processes and standards, especially ISO 19650 (or UNI ISO 19650 in Italy), was explicitly emphasized in the United Kingdom and Italy, whereas job advertisements from the United States of America and the United Arab Emirates placed greater emphasis on practical experience with BIM workflows rather than formal compliance with standards. British employers also frequently required familiarity with MEP (Mechanical, Electrical, and Plumbing) systems.

Beyond technical expertise, employers consistently expected candidates to demonstrate leadership, team management, communication, collaboration, and decision-making skills. These findings indicate that the BIM Manager role extends well beyond technical model coordination, requiring a combination of managerial and interpersonal competencies. While the fundamental expectations regarding BIM knowledge, software proficiency, and teamwork were largely consistent across all analysed countries, differences were observed in the required level of professional experience. Countries with more mature BIM ecosystems generally imposed higher experience requirements, whereas emerging BIM markets, such as Poland, tended to adopt less demanding criteria. Overall, the results demonstrate that the increasing adoption of BIM is reshaping competency expectations within the construction industry, reinforcing the need for BIM Managers who combine advanced technical expertise with strong leadership and organizational capabilities.

The findings demonstrate that the competency profile expected of BIM Managers in emerging BIM markets, exemplified by Poland, largely converges with that observed in countries where BIM implementation is more mature. This suggests that the BIM Manager role is no longer defined solely by technical expertise but increasingly requires a combination of leadership, communication, and strategic management skills, together with the capacity to continuously adapt to the rapid evolution of digital technologies in the construction sector.

Although the competency profile expected of Polish BIM Managers largely corresponds to that observed in countries with more mature BIM ecosystems, several important mismatches remain. The most evident difference concerns the institutional environment in which BIM competencies are developed and applied. In countries where BIM implementation is supported by national regulations or mandatory public procurement requirements, competency expectations are reinforced by standardized workflows, certification schemes, and well-established implementation practices. In Poland, by contrast, BIM adoption

continues to be driven primarily by market demand rather than regulatory obligations (which, currently in 2026, do not yet require BIM implementation in public procurement), resulting in fragmented implementation strategies and heterogeneous competency requirements across organizations. This institutional context is further reinforced by cultural and organizational barriers, including conservative approaches to project delivery, limited experience with collaborative digital workflows, and insufficient integration between academia, industry, and public administration. Consequently, educational institutions often respond to market needs independently, without a common national competency framework or standardized learning outcomes for BIM Managers. Nevertheless, the results of this study demonstrate that the Polish educational ecosystem is progressively adapting to international trends by integrating technical, managerial, and interpersonal competencies within BIM-related curricula. This creates an opportunity to further align national educational programs, professional certification systems, and public procurement policies with internationally recognized standards such as ISO 19650 and buildingSMART frameworks. Such alignment would contribute not only to the standardization of BIM Manager competencies but also to accelerating the digital transformation of the Polish construction sector and strengthening its international competitiveness.

New roles such as BIM managers or BIM coordinators require competencies that are still being defined. The integration of advanced technologies (e.g., AI, AR/VR, robotics) with BIM introduces additional competency requirements that are not yet fully understood or standardized. The literature calls for further research to clarify these emerging competencies and to develop frameworks for their assessment and development [44,45,67–69].

To address this gap in the literature and provide a structured pathway for integrating these rapidly evolving demands, a conceptual Future Digital Competency Framework for BIM Managers, illustrated in Figure 5, is proposed. The framework structures professional growth across five complementary categories: Technical BIM Competencies, Managerial & Operational Competencies, Information & Data Management Competencies, Behavioural (Soft) Competencies, and prospective Emerging Digital Competencies. The core novelty of the proposed framework lies in the explicit introduction of the fifth domain—Emerging Digital Competencies—which complements the four competency categories identified through the qualitative approach and supported by the supplementary text frequency analysis. This future-oriented domain encompasses capabilities such as AI literacy, digital twin awareness, cloud collaboration, cybersecurity awareness, data security and privacy, data analytics awareness, and automation & scripting awareness, reflecting the ongoing evolution of BIM practice. Especially, the increasing integration of Artificial Intelligence (AI) with BIM is reshaping construction processes by extending their analytical, predictive, and automation capabilities, while simultaneously increasing the need for professionals to develop competencies that enable them to work effectively in increasingly digital and data-driven environments [70,71]. Collectively, these domains suggest that the role of the BIM Manager is expected to evolve from technical model coordination toward digital leadership capable of supporting the digital transformation of the built environment [72].

Emerging Digital Competencies were not directly derived from the frequency analysis of the 48 job advertisements and should not be interpreted as current dominant market requirements. They are presented as a prospective extension of the competency discussion, reflecting the future-oriented component of the underlying study and indicating areas that may warrant examination as the BIM Manager role evolves. However, Table 8 details the occurrence frequencies of these next-generation digital capabilities across the analysed countries, which may be related to the symptoms of the mentioned changes.

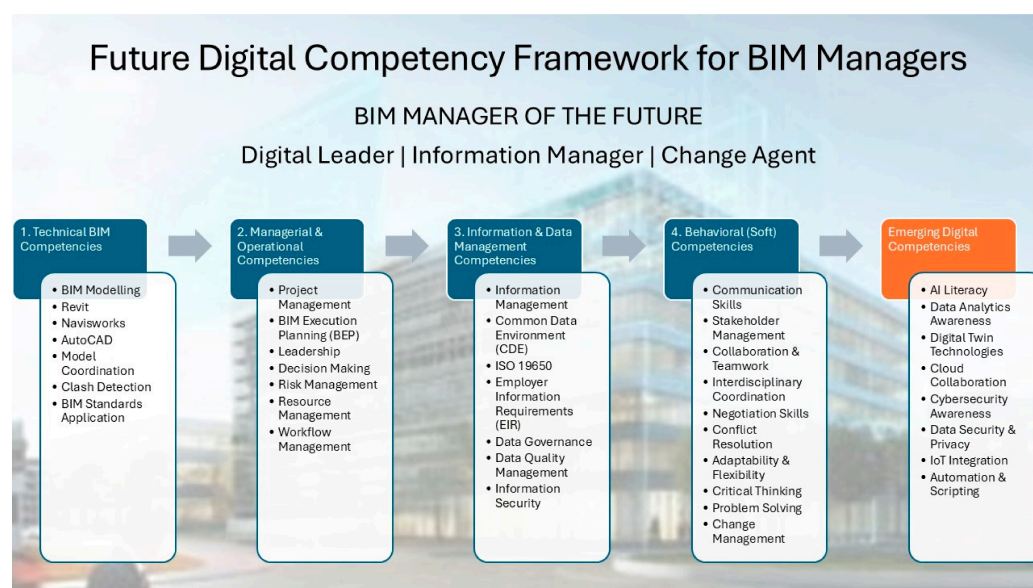


Figure 5. Suggested multi-dimensional Future Digital Competency Framework for BIM Managers, illustrating five complementary competency domains—Technical BIM, Managerial & Operational, Information & Data Management, Behavioural (Soft), and Emerging Digital Competencies—to support future digital transformation in the construction industry.

Table 8. Occurrence of Emerging Digital Competencies in BIM Manager Job Postings by Country.

Emerging Digital Competency	Total Frequency	Germany	Great Britain	Italy	Poland	United Arab Emirates	United States
AI Literacy	0	0	0	0	0	0	0
Data Analytics Awareness	1	0	0	0	0	1	0
Cloud Collaboration	4	2	0	0	0	0	2
Digital Twin Awareness	0	0	0	0	0	0	0
Cybersecurity Awareness	0	0	0	0	0	0	0
Data Security & Privacy	3	1	0	0	2	0	0
Automation & Scripting Awareness	7	0	1	1	3	0	2

The limited presence of emerging technology-related competencies indicates that these capabilities have not yet become standardized recruitment requirements, supporting their classification as emerging rather than established dimensions. The observed references to automation and cloud-based practices were primarily associated with specific tools, suggesting that technological adoption precedes the formal recognition of broader competency categories. Therefore, the inclusion of this domain provides a forward-looking perspective for the evolving BIM Manager competency framework. However, it is worth noting that in the literature, a relevant perspective on the future of the BIM Manager role was presented too [73], where one can find an attempt to assess the long-term market demand for BIM Managers as a distinct professional role. Some findings suggest that the BIM Manager

position may gradually become integrated with that of the Project Manager [73]. According to the study, the competencies expected from BIM Managers increasingly overlap with those required of Project Managers, with BIM-specific expertise remaining the primary distinguishing factor. Based on an analysis of 199 job advertisements collected from 14 recruitment websites across English-speaking markets, no substantial differences between the competency profiles of BIM Managers and BIM Coordinators were found [73], arguing that both roles largely align with the broader responsibilities of Project Managers. Consequently, the BIM Manager is viewed as a transitional rather than permanent role, emerging primarily from the current shortage of BIM expertise among construction professionals, particularly Project Managers. As BIM knowledge becomes more widespread and integrated into mainstream construction project management practice, the need for a dedicated BIM Manager position may gradually diminish [73]. The authors further emphasize that this transition will require the construction industry to adopt lifelong learning strategies to continuously develop BIM-related competencies. These findings provide an important basis for discussing the future evolution of the BIM Manager profession and complement the results of the present study, which similarly demonstrate that contemporary BIM Managers are expected to possess not only advanced technical knowledge but also broad managerial and leadership competencies.

In general, the findings provide clear answers to the research questions formulated in this study. First, irrespective of national BIM policy environments, employers consistently expect BIM Managers to combine technical expertise with leadership, communication, and analytical competencies, confirming the multidimensional nature of the profession (RQ1). Second, although Poland represents an emerging BIM market, the competency profile expected by employers largely aligns with those observed in more mature BIM ecosystems (RQ2). Third, the reviewed educational programs demonstrate that Polish higher education and professional training increasingly address these market requirements by integrating technical, managerial, and interpersonal competencies (RQ3). Finally, the recurring competency domains identified across literature, labour market analyses, and educational offerings provide an initial basis for proposing a standardized BIM Manager competency profile (RQ4).

5. Conclusions

This exploratory study identified recurring BIM Manager competency requirements across 48 job advertisements from six selected national contexts and examined these findings against selected educational and training offers in Poland. However, it does not establish a definitive or universally applicable international competency standard. Rather, the findings provide a comparative basis for further discussion and future validation of a more standardized BIM Manager competency profile.

The article addressed the lack of a structured competency framework for BIM Managers by integrating evidence from three complementary sources: scientific literature, international job advertisements, and selected educational programs in Poland. The findings demonstrate that the BIM Manager role is inherently multidimensional and extends far beyond technical expertise. Five core competency domains were identified—education and formal qualifications, technology and domain expertise, team coordination and leadership, communication and collaboration, and analytics and decision-making—which together constitute a comprehensive competency profile applicable across different national contexts. Despite potential differences in regulatory environments and implementation contexts, employer expectations proved remarkably consistent, particularly regarding the need to combine technical BIM knowledge with managerial and interpersonal capabilities.

5.1. Recommendations for Higher Education

Higher education institutions should continue moving beyond software-oriented BIM education toward integrated curricula that combine digital engineering, project management, organizational leadership, communication, and information management. Learning outcomes should be explicitly aligned with internationally recognized standards, including ISO 19650 and buildingSMART principles, while also incorporating emerging technologies such as artificial intelligence, digital twins, automation, and data-driven decision support. Stronger collaboration between universities and industry would further improve the relevance of educational programs and facilitate smoother transitions from academic training to professional practice.

5.2. Recommendations for Professional Bodies and Certification Authorities

Professional organizations such as chambers or associations as well as certification bodies should work toward establishing harmonized competency frameworks that clearly define the knowledge, skills, and experience required for BIM Managers. Current certification schemes vary considerably in scope and assessment methods, limiting their comparability across countries. A standardized competency framework would support professional mobility, facilitate objective competency assessment, and strengthen confidence among employers regarding certified BIM professionals. Such initiatives should also recognize continuing professional development as an essential component of maintaining BIM competencies throughout an individual's career.

5.3. Recommendations for Industry

Construction companies should recognize that successful BIM implementation depends not only on software proficiency but also on organizational readiness and leadership capabilities. Recruitment strategies should therefore place equal emphasis on technical expertise, strategic thinking, communication, change management, and interdisciplinary collaboration. Organizations should also invest in continuous professional development programs that enable employees to adapt to rapidly evolving digital technologies and increasingly integrated project delivery methods. Such investments are likely to enhance both organizational digital maturity and project performance.

5.4. Limitations and Future Research and Policy Implications

The findings should be interpreted in light of several limitations. The labour-market analysis was based on a relatively small exploratory sample of eight BIM Manager advertisements per country and was not intended to statistically represent entire national labour markets. Job advertisements provide only partial descriptions of employer expectations and may omit competencies assessed later in recruitment. Differences in advertisement length, terminology, language, employer type, and recruitment channel may also influence cross-country comparison. An additional limitation concerns reproducibility. The original coding involved researcher judgement without formal independent inter-rater verification, and the complete set of original online job-advertisement snapshots is no longer recoverable.

Moreover, the educational analysis was limited to selected Polish programs and should be interpreted as a case study rather than as a comprehensive assessment of Polish or international BIM education. Finally, the prospective Emerging Digital Competencies require independent validation before they can be treated as established components of the BIM Manager profile.

Future research should validate the proposed competency framework using quantitative methods involving larger international datasets and direct participation of BIM

professionals, employers, educators, and certification organizations. Comparative studies covering additional countries and different levels of BIM maturity would further strengthen the generalizability of the framework. From a policy perspective, the findings support the development of national competency standards aligned with international frameworks, together with stronger integration of BIM requirements into public procurement, higher education, and professional certification systems. Such initiatives would contribute not only to the standardization of BIM Manager competencies but also to accelerating the digital transformation of the construction sector. In this regard, the auxiliary text frequency analysis utilized in this study offers a practical and agile approach to identifying and updating the list of competencies. Ultimately, such methods may provide a practical mechanism for continuously refining BIM Manager competency frameworks, ensuring that they remain aligned with the evolving technological landscape of the construction industry.

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Conflicts of Interest: The authors declare no conflicts of interest.

Abbreviations

The following abbreviations are used in this manuscript:

ADM	Analytics and Decision-Making
BIM	Building Information Modelling
BIMC	BIM Coordinator
BIMM	BIM Manager
CC	Communication and Collaboration
CDE	Common Data Environment
EFQ	Education and Formal Qualifications
ISO	International Organization for Standardization
PAS	Publicly Available Specification
TCL	Team Coordination and Leadership
TDE	Technology and Domain Expertise

Appendix A

Appendix A.1

The table below (Table A1) contains sources of information about the labour market requirements for the BIMM position in the United Kingdom.

Table A1. Data about BIMM job offers from the United Kingdom.

ID Code	URL	Date Accessed
UK_01	https://tinyurl.com/e7xcyjmy	2 April 2025
UK_02	https://tinyurl.com/yz42yhyz	
UK_03	https://tinyurl.com/ysabynfr	
UK_04	https://tinyurl.com/ytb34smz	
UK_05	https://tinyurl.com/5xrm2ukj	
UK_06	https://tinyurl.com/3j6fx696	
UK_07	https://tinyurl.com/97d96k5r	
UK_08	https://tinyurl.com/3rdnm7n3	

Appendix A.2

The table below (Table A2) contains sources of information about the labour market requirements for the BIMM position in Germany.

Table A2. Data about BIMM job offers from Germany.

ID Code	URL	Date Accessed
DE_01	https://tinyurl.com/3c8ta66p	2 April 2025
DE_02	https://tinyurl.com/3fw2rncd	
DE_03	https://tinyurl.com/4t9j4s5h	
DE_04	https://tinyurl.com/muf76x75	
DE_05	https://tinyurl.com/3mmk5tbz	
DE_06	https://tinyurl.com/2r6p5acy	
DE_07	https://tinyurl.com/2d97nrxz	
DE_08	https://tinyurl.com/47zn63m9	

Appendix A.3

The table below (Table A3) contains sources of information about the labour market requirements for the BIMM position in Italy.

Table A3. Data about BIMM job offers from Italy.

ID Code	URL	Date Accessed
IT_01	https://tinyurl.com/y6byacvs	2 April 2025
IT_02	https://tinyurl.com/mrscsjcv	
IT_03	https://tinyurl.com/2n2kdv5p	
IT_04	https://tinyurl.com/5n7nzbma	
IT_05	https://tinyurl.com/3cr3yvvt	
IT_06	https://tinyurl.com/mw8ynam9	
IT_07	https://tinyurl.com/4ut2u3vp	
IT_08	https://tinyurl.com/49msrvtv	

Appendix A.4

The table below (Table A4) contains sources of information about the labour market requirements for the BIMM position in the United Arab Emirates.

Table A4. Data about BIMM job offers from the United Arab Emirates.

ID Code	URL	Date Accessed
AE_01	https://tinyurl.com/2u22ur2e	2 April 2025
AE_02	https://tinyurl.com/bddvmybb	
AE_03	https://tinyurl.com/3bn6ec89	
AE_04	https://tinyurl.com/3vzbu7hv	
AE_05	https://tinyurl.com/4ew2x3a7	
AE_06	https://tinyurl.com/3wx5bvus	
AE_07	https://tinyurl.com/yc2tvbmz	
AE_08	https://tinyurl.com/4ffvat46	

Appendix A.5

The table below (Table A5) contains sources of information about the labour market requirements for the BIMM position in the United States of America.

Table A5. Data about BIMM job offers from the United States of America.

ID Code	URL	Date Accessed
US_01	https://tinyurl.com/mr28m2nd	2 April 2025
US_02	https://tinyurl.com/yr5x7ytr	
US_03	https://tinyurl.com/y98btmhu	
US_04	https://tinyurl.com/yu9xvutz	
US_05	https://tinyurl.com/3u6d2r7m	
US_06	https://tinyurl.com/3apc68bm	
US_07	https://tinyurl.com/wva9evfc	
US_08	https://tinyurl.com/3cr529r4	

Appendix A.6

The table below (Table A6) contains sources of information about the labour market requirements for the BIMM position in Poland.

Table A6. Data about BIMM job offers from Poland.

ID Code	URL	Date Accessed
PL_01	https://tinyurl.com/262ewss9	2 April 2025
PL_02	https://tinyurl.com/2c5e2yqr	
PL_03	https://tinyurl.com/27hwue5e	
PL_04	https://tinyurl.com/2986v7qx	
PL_05	https://tinyurl.com/23j2psuc	
PL_06	https://tinyurl.com/296xxy7x	
PL_07	https://tinyurl.com/22hzgqdr	
PL_08	https://tinyurl.com/24gcbqe4	

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3. ISO 19650 (Part 3); Organization and Digitization of Information About Buildings and Civil Engineering Works, Including Building Information Modelling (BIM)—Information Management Using Building Information Modelling (Part 3). International Organization for Standardization: Geneva, Switzerland, 2020.
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