

MACRO ANALYSIS OF COMPUTING IN CONSTRUCTION EDUCATION IN EUROPE

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Abstract

This study presents the first comprehensive mapping of construction computing education in Europe, analysing 187 validated institutions across 35 countries. Using a three-tier verification methodology, we examine geographic distribution, program characteristics, and curriculum content. A sensitivity analysis estimates that current programs (~13,900 annual graduates) meet 6-49% of workforce demand depending on digitalization assumptions. Key findings include geographic concentration in Western Europe (40% in DACH and British Isles), predominance of master's programs (58.3%), and low ISO 19650 coverage (8.6%). These findings inform educational policy and workforce planning for EU construction digitalization.

Introduction

The construction sector is undergoing rapid digital transformation, driven by Building Information Modelling (BIM) mandates, sustainability requirements, and emerging technologies including digital twins, artificial intelligence, and robotics that showcase an internal transformation to tackle sector challenges. With increased external pressures, such as The European Union's Renovation Wave strategy targeting the renovation of 35 million buildings by 2030, or the revised Energy Performance of Buildings Directive (EPBD) which establishes increasingly stringent digitalization requirements, the sector is due a rather extensive upskilling of their workforce in digital competencies. These policy drivers create substantial demand for construction professionals equipped with advanced digital competencies. The European Construction Industry Federation estimates that more than two million additional workers will be needed in the sector by 2030, with digital skills identified as a critical gap (EFBWW, 2023).

BIM policies have been progressively introduced across European countries, beginning with the United Kingdom's in 2016, followed by Germany in 2021, Ireland in 2024, and additional countries including Spain, France, and Italy have implemented or are developing similar requirements as we speak. The adoption of ISO 19650 as the international standard for BIM information management further standardizes expectations for digital competency across the sector. Skills gaps and the inability

to attract appropriately trained talent remain among the leading barriers to technology adoption in construction (Kjellmark & Hjelseth, 2025).

These policy mandates and industry demands translate directly into pressure on higher education institutions to produce graduates with appropriate digital competencies. Universities and technical schools across Europe have responded by developing specialized programs in BIM, digital construction, and construction informatics of various natures (Abdirad & Dossick, 2016). However, this response has been uncoordinated, with institutions independently designing curricula based on local industry needs, available expertise, and national accreditation frameworks. Several systematic reviews have highlighted the lack of common academic guidelines across institutions, noting that effective BIM implementation requires coordinated curriculum modifications and teaching strategies (Besné et al., 2021; Witt & Kähkönen, 2019). This fragmentation is compounded by the absence of a shared competency reference: while the European Digital Competence Framework (DigComp 2.2) and the ESCO classification define digital skills at a generic level, neither provides construction-specific occupational profiles for digitally skilled roles (Vuorikari et al., 2022). Moreover, European workforce intelligence reports have consistently identified construction among the sectors with the widest digital skills gaps, yet without granular data on how educational supply maps to these shortfalls (Cedefop, 2023). It is not surprising that the resulting educational landscape is fragmented: some regions have developed extensive program portfolios while others remain underserved; curriculum content varies significantly in scope and depth; and alignment with international standards such as ISO 19650 is inconsistent. To date, no comprehensive mapping of this provision exists, limiting the ability of policymakers, institutions, and industry to assess whether current educational capacity matches workforce requirements.

This paper addresses three research questions: (1) What is the current landscape of construction computing education across Europe in terms of geographic distribution, program characteristics, and curriculum content? (2) What is the estimated annual graduate output from specialized construction computing programs? (3) How does current educational capacity compare to workforce demand under different digitalization scenarios?

Methodology

To secure a comprehensive provision of the current academic offer across Europe, a sequential process is followed to gather the quantitative evidence. The research methodology comprised four stages: (1) data collection using structured searches and large language model (LLM) assisted extraction, (2) multi-tier verification against primary sources and an interactive dashboard, (3) classification and coding of programs and topics, and (4) sensitivity analysis to estimate capacity gaps.

Data Collection

Data collection followed a systematic multi-stage approach combining manual searches with LLM assisted extraction. Programs are initially identified through mass structured web searches using keywords in English and local languages (BIM, digital construction, construction informatics, computational design combined with country names and institution types). The LLM outputs provide a base dataset that is posteriorly reviewed through the institutions websites to confirm existence and relevance, as well as a review of professional body listings (buildingSMART national chapters, national BIM councils).

For each identified institution, the following data points were extracted: institution name, country, city, geographic coordinates, program names and URLs, language of instruction, delivery mode, duration, annual tuition cost (EUR), estimated graduates per year, and curriculum topics. LLM-assisted extraction was employed to accelerate initial data capture from institution websites and program documentation, with all extracted data subsequently verified against primary sources in the verification stage.

The LLM-assisted extraction used Claude Sonnet 4.5 via structured prompts requesting, for each institutional webpage, the extraction of institution name, programme title, URL, language of instruction, delivery mode, duration, tuition fees, and listed module topics. For non-English webpages, the LLM processed content in the source language with extraction fields specified in English, leveraging its multilingual capabilities; no separate machine translation step was applied. During L2 verification, approximately 60% of LLM-extracted records required correction, with errors concentrated in tuition fee fields (inconsistent currency formatting and missing fees) and graduate estimates (confused with total enrolment figures). The LLM therefore served as a productivity accelerator for initial data capture rather than a definitive extraction tool, with all final dataset values confirmed through manual verification.

Verification Framework

A three-tier verification framework was developed to assess data reliability, supported by an interactive dashboard that enabled systematic review and validation of institution records. Level 1 (L1) confirms program existence through accessible URLs and institution website confirmation. Level 2 (L2) validates core data including curriculum content verified against program

documentation/specification, costs confirmed from official sources, and topics coded from syllabus or module descriptors. Level 3 (L3) additionally confirms all previous data, as well as graduate numbers, through direct institutional contact, accreditation reports, or official statistics.

The interactive dashboard served as the primary verification tool, displaying institution records with all associated data fields and enabling reviewers to flag inconsistencies, update verification levels, and track validation progress across the dataset. This systematic approach ensured consistent application of verification criteria across all institutions.

This analysis includes only institutions meeting L2 or L3 verification (n=187), of which 16 achieved L3 verification including confirmed graduate numbers. Eight L1-only institutions were excluded due to insufficient data reliability – this is due to the geopolitical situation in Eastern Europe (Russia, Ukraine, and Belarus institutions are therefore not included in this analysis for now).

Classification

Programs were classified according to ISCED levels: Bachelor studies (ISCED 6, including BEng, BA, and Foundation degrees), Master studies (ISCED 7, including MSc, MEng, MA, Mastère Spécialisé), Doctoral studies (ISCED 8), and Continuing Professional Development (CPD). Integrated programs such as the French Diplôme d'Ingénieur, which span both undergraduate and graduate levels across five years, were counted in both Bachelor's and Master's categories to accurately reflect their educational scope.

Curriculum topics were coded using a controlled vocabulary of 39 terms developed through iterative coding, consolidation of synonymous terms, and validation against ISO 19650 and buildingSMART terminology. The list of terms can be seen in Table 1.

Table 1: List of computational topics used as curriculum drivers.

Topics	
3D Modelling & Scanning	AI & Machine Learning
Architecture	BIM
BIM Software	CAD/CAM
Collaborative Workflows	Construction Engineering
Construction Informatics	Construction Management
Data Management	Digital Construction
Digital Design	Digital Fabrication
Digital Twins	Energy Performance
Facility & Asset Management	GIS & BIM Integration
Heritage BIM	ISO 19650

Infrastructure BIM	Infrastructure Engineering
Innovation & Entrepreneurship	IoT
Lean & Integrated Delivery	Parametric & Generative Design
Prefabrication & Modular Construction	Procurement & Contracts
Programming	Project Management
Risk & Safety Management	Robotics & Automation
Smart Cities & Buildings	Structural Engineering
Sustainability	Timber Construction
Virtual or Augmented Reality	nD BIM
openBIM & IFC	

During the posterior analysis, for specific geographical features, countries were grouped into ten regions based on geographic proximity and construction market characteristics: DACH, British Isles, Iberia, France, Nordic, Italy, Central Europe, Balkans, Benelux, and Baltic. The countries represented on each region and the number of institutions per region are listed in Table 2. A total of 187 institutions from 35 countries are represented in this study.

Table 2: List of regions represented in this study with its associated countries and number of institutions per region.

Region	Countries	Institutions
DACH	Germany, Austria, Switzerland	46
British Isles	UK, Ireland	29
Iberia	Spain, Portugal	25
France	France	23
Nordic	Sweden, Norway, Denmark, Finland, Iceland	12
Italy	Italy	10
Central Europe	Poland, Czech Republic, Slovakia, Hungary, Slovenia	11
Balkans	Greece, Turkey, Serbia, Croatia, Cyprus, Bulgaria, Romania, Bosnia & Herzegovina, North Macedonia, Albania	19
Benelux	Netherlands, Belgium, Luxembourg	8
Baltics	Lithuania, Estonia, Lithuania	4

Sensibility Analysis

The capacity gap analysis employs a parametric model adapted from workforce demand estimation approaches used in labour economics (Willems & De Grip, 1993; BLS, 2024). Annual demand for digitally skilled construction professionals is estimated as:

$$D = W \times P \times (r + g)$$

Where (W) represents total construction workforce, (P) is the digital skills penetration rate (proportion of workforce requiring specialized digital competencies), (r) is the replacement rate (proportion leaving annually due to retirement, career change, or attrition), and (g) is the growth rate (annual increase in digital roles).

The model structure reflects standard workforce planning practice, where total demand comprises both replacement of existing workers and expansion to meet growing requirements. Four scenarios were constructed by varying P across plausible ranges (0.03 to 0.12) and g (0.02 to 0.10), while holding r constant at 0.05 based on typical construction sector turnover rates. The lower bound for P (0.03) reflects the current proportion of explicitly BIM-designated roles in European construction job markets as reported by Cedefop (2024), while the upper bound (0.12) aligns with the EU Pact for Skills construction blueprint target and digital specialist penetration rates observed in more digitised sectors such as manufacturing (Eurostat DESI, 2024). Growth rate bounds ($g = 0.02-0.10$) span observed annual increases in digital construction job postings across major European markets between 2020 and 2024. Workforce data were drawn from the European Construction Observatory 2024 Skills Report, using the combined construction sector definition (NACE F + M.71) totalling approximately 18 million workers across analysed countries.

To account for institutions not captured in this mapping exercise, an institutional coverage factor (C) of 0.75-0.80 was applied to estimate total European graduate output: $S_{total} = S_{map}/C$. This estimate is a conservative number derived from observed search saturation: during the final two search iterations, fewer than 6% of queries yielded previously unidentified institutions, suggesting diminishing returns approaching dataset completeness. Unmapped institutions in smaller countries, newer programs, and non-English language offerings may contribute additional graduate output. Under this adjustment, estimated total European supply ranges from 16,062 ($C = 0.8$) to 17,133 ($C = 0.75$) graduates annually.

Results

Geographic Distribution

The dataset comprises 187 institutions across 35 countries. Germany leads with 32 institutions, followed by the United Kingdom (26), France (23), Spain (20), and Italy (10). Regional aggregation reveals concentration in Western Europe, with DACH countries (Germany, Austria, Switzerland) accounting for 46 institutions (24.6%) and British Isles (UK, Ireland) contributing 29

institutions (15.5%). Eastern and Southern European regions show lower provision density, with the Baltic states contributing to with only 4 institutions (2.1%).

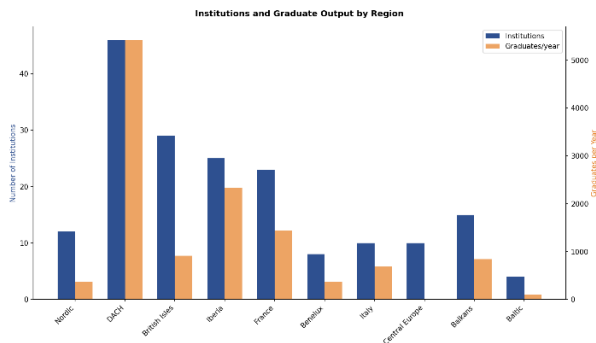


Figure 1: Bar chart of the geographic distribution of institutions and graduates (per year) per region.

Program Characteristics

A total of 372 programs were identified across 187 institutions. Master's-level programs dominate at 232 (58.3%), followed by bachelor's programs at 97 (22.6%), Doctoral programs at 55 (14.8%), and CPD offerings at 16 (4.3%). Twenty-six integrated programs (primarily French Diplôme d'Ingénieur and Double Degrees) are counted in both Bachelor's and Master's categories. Figure 2 represents the distribution of the current offer of programs that integrate construction informatics. Note that CPD offer is the lowest and may be due to bias in the data collection process or an undervalued approach to construction informatics education.

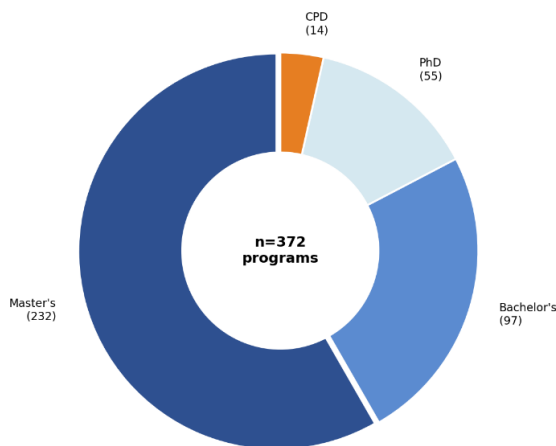


Figure 2: Pie chart of the program type distribution.

English is the most common language of instruction (96 programs), reflecting internationalization strategies particularly at master's level. German (44), French (26), and Spanish (19) serve primarily domestic markets. The predominance of Master's-level programs positions construction computing as a specialization layer atop foundational engineering or architecture education.

The overwhelming majority of construction computing programs in Europe are delivered through traditional presential (on campus) instruction, with 158 institutions (84.5%) operating exclusively in this mode. A further 11 institutions (5.9%) offer hybrid presential/online options,

providing some flexibility while maintaining campus-based teaching as the primary delivery mechanism. Fully online provision remains limited, with only 5 institutions (2.7%) offering all programs entirely online, and an additional 5 operating in blended formats that combine synchronous and asynchronous elements. This distribution reflects the hands-on nature of construction computing education, where access to specialist software, hardware laboratories, and collaborative project work traditionally necessitates physical presence. However, the limited online provision may also represent a missed opportunity to reach working professionals seeking to upskill without career interruption, particularly in regions underserved by presential programs.

Full-time study dominates the European construction computing education landscape, with 114 institutions (61.0%) offering only full-time programs. A further 32 institutions (17.1%) provide both full-time and part-time pathways, while 13 (7.0%) cater exclusively to part-time students. Notably, apprenticeship models feature prominently in certain national contexts, with 12 institutions (6.4%) offering apprenticeship-only routes and 8 (4.3%) combining full-time study with apprenticeship options—these are concentrated primarily in France and Germany where dual education systems are well established. The predominance of full-time provision presents a potential barrier to workforce reskilling, as construction professionals seeking digital competencies must often choose between continued employment and formal education. The relatively limited part-time and flexible study options suggest that CPD pathways and micro-credentials may need to play a larger role in addressing the digital skills gap among the existing construction workforces.

Curriculum Content

BIM appears in 87.7% of institutions, confirming its status as the foundational topic. Digital Construction (43.9%), Construction Management (42.8%), and Sustainability (37.4%) follow. Emerging technologies show moderate coverage across programs: Digital Twins (21.4%), Parametric and Generative Design (20.3%), and AI/Machine Learning (14.4%).

Notably, explicit coverage of ISO 19650 standards appears in only 8.6% of institutions, despite its status as the international standard for BIM information management. Similarly, openBIM and IFC coverage stands at 8.6%. This suggests curriculum development has not kept pace with standardization efforts.

Regional specializations are evident. Nordic institutions emphasize Sustainability (67% versus 37% overall) and Digital Twins (58% versus 21%). DACH institutions show strength in Digital Fabrication (17%) and Robotics (11%). British institutions lead in Lean and Integrated Delivery (31%) and ISO 19650 coverage (17%). Iberian institutions focus on Infrastructure BIM (56%) and BIM Software tools (48%). Italian institutions specialize in Heritage BIM (40%) and Parametric Design (60%). This regionalisation can be evidenced in the heatmap provided in Figure 3.

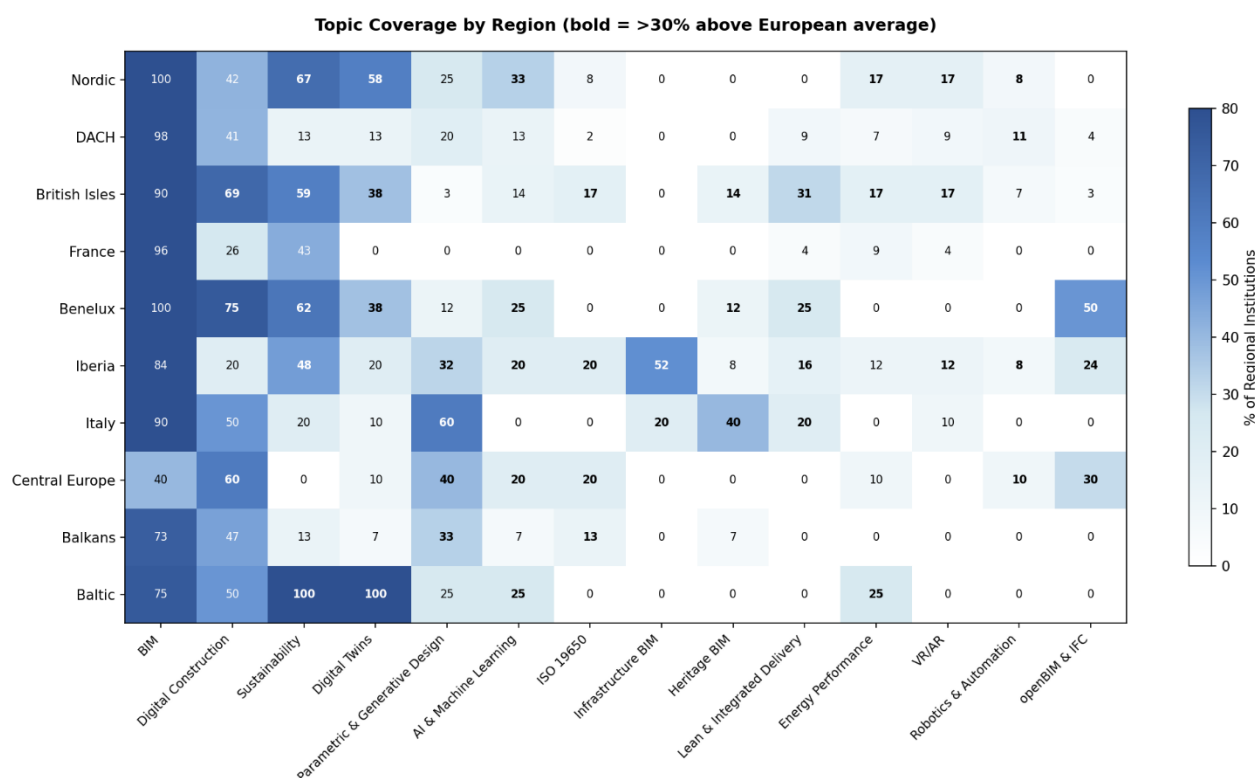


Figure 3: Heatmap of the topic coverage in academic programs across European regions.

Cost Analysis

Tuition costs for construction computing programs vary substantially across European regions, reflecting different national approaches to higher education funding (see Figure 4).

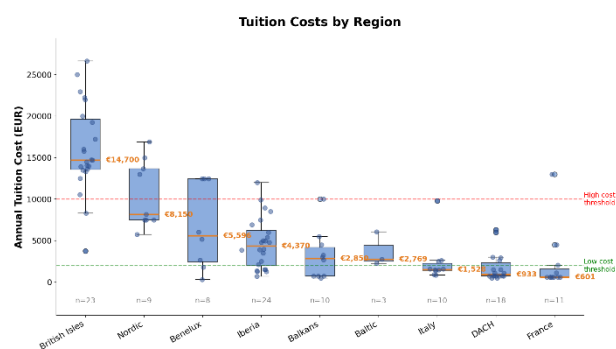


Figure 4: Box plot of the distribution of yearly cost of construction computing education per region.

The British Isles exhibit the highest median costs at €14,700 annually, with considerable variation ranging from approximately €7,000 to over €30,000 depending on institution and residency status. Nordic countries follow at €8,150 median, though this figure is skewed by high fees for non-EU/EEA students; domestic students in Norway, Sweden, and Denmark typically pay no tuition at public institutions. In contrast, DACH countries (Germany, Austria, Switzerland) demonstrate the lowest median costs at €933, benefiting from predominantly public university systems with nominal administrative

fees and a predominance of part-time studies for active workers. France shows a bimodal distribution with low-cost public university programs alongside higher-fee Grandes Écoles. Southern European regions—Iberia (€4,370 median) and Italy (€1,528 median)—offer relatively affordable pathways to construction computing qualifications. This cost variation has implications for workforce development: while high-cost regions may produce fewer but potentially better-resourced graduates, low-cost regions could theoretically scale provision more rapidly to meet digital skills demands, though this would require corresponding investment in teaching capacity and infrastructure.

Graduate Capacity and Demand Gap

Graduate estimates from all 187 institutions show a total annual output from mapped institutions at approximately 13,900 graduates. Germany produces the largest volume (4,000), followed by Spain (2,048), France (1,435), Switzerland (975), and the United Kingdom (970).

When normalized against construction workforce size, smaller countries with strong programs show high output ratios: Switzerland produces 21.7 graduates per 10,000 construction workers, Greece 20.6, and Luxembourg 20.0. Larger markets show lower ratios despite higher absolute output: United Kingdom (3.9), France (6.0), and Italy (3.6).

The sensitivity analysis reveals substantial variation in estimated capacity gaps. Table 3 presents coverage percentages across scenarios and coverage assumptions. Under conservative assumptions ($P=0.03$, only dedicated BIM specialists), mapped programs meet 37% of

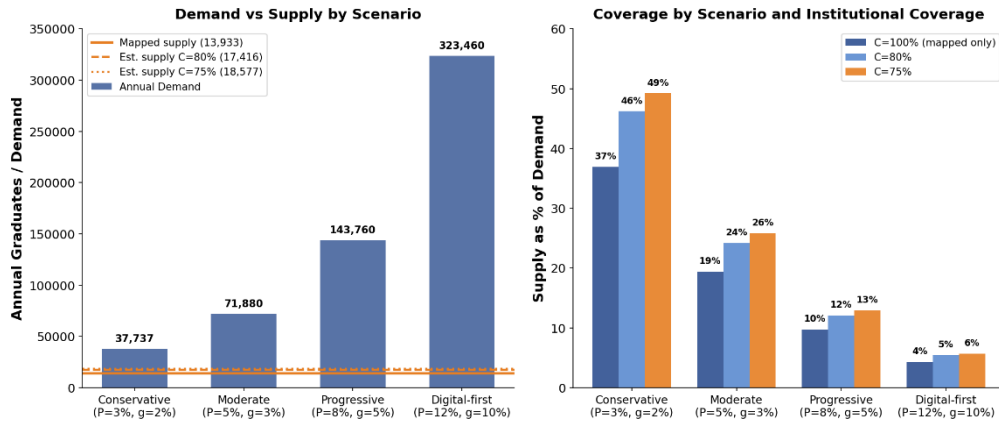


Figure 5: Sensitivity analysis showing demand versus supply by scenario and coverage percentages by institutional coverage assumption.

estimated annual demand; adjusting for institutional coverage ($C=0.75-0.80$) improves this to 46-49%. Under moderate assumptions ($P=0.05$, specialists plus power users), coverage drops to 19-26%. Progressive assumptions aligned with EU Renovation Wave ambitions ($P=0.08$) yield 10-13% coverage, while digital-first scenarios ($P=0.12$) suggest only 4-6% coverage even with optimistic supply adjustments.

Table 3: Capacity coverage by scenario and institutional coverage assumption.

Scenario	P	g	Annual Demand	C		
				100%	80%	75%
Conservative	0.03	0.02	37,737	36.9%	46.2%	49.2%
Moderate	0.05	0.03	71,880	19.4%	24.2%	25.8%
Progressive	0.08	0.05	143,760	9.7%	12.1%	12.9%
Digital-first	0.12	0.10	323,460	4.3%	5.4%	5.7%

Notes: P = digital skills penetration rate; g = growth rate; $r = 0.05$ (replacement rate); $W = 17.97M$ workers. C = institutional coverage factor representing proportion of European programs captured in dataset.

Figure 5 illustrates these findings, showing annual demand under each scenario against mapped and estimated supply levels (left panel), and the resulting coverage percentages across coverage assumptions (right panel).

Discussion

Parameter Sensibility

To validate the results obtained, a parameter sensibility is performed by introducing variability and quantifying the impact on the demand. The details of the parameter sensitivity are summarized in Table 4.

Table 4: List of the parameter sensitivity ranked by impact.

Parameter	Range Tested	Impact on Demand	Total Swing
P	3% → 12%	-28,752 to +100,632	129,384
g	2% → 10%	-8,985 to +62,895	71,880
r	3% → 7%	-17,970 to +17,970	35,940
W	15M → 20M	-11,880 to +8,120	20,000

The tornado chart in Figure 6 shows how varying each model parameter individually affects annual demand, starting from a base case (moderate scenario) of 71,880 graduates of annual demand. Parameters are ranked by their impact on demand, with the most influential at the bottom.

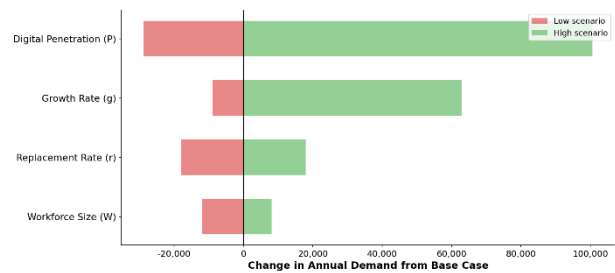


Figure 6: Sensitivity analysis on the impact of parameter variation on graduate demand.

The assumed proportion of the workforce requiring specialized digital skills has by far the largest impact. Varying P from 3% to 12% creates a swing of nearly 130,000 in annual demand, dwarfing all other parameters combined. Growth rate comes in second in impact. Assumptions about how quickly digital roles are expanding (2-10% annually) create a swing of ~72,000. Replacement and workforce size have limited impact. These parameters are relatively well-established from labour statistics and have narrower plausible ranges, limiting their influence on uncertainty. The critical unknown is not demographic (workforce size, turnover) but definitional: what proportion of construction workers

actually need specialized digital competencies? This question requires industry consensus to enable meaningful workforce planning.

Contributions to Academic Understanding

This study makes several contributions to the academic literature on construction computing education. First, it provides the first comprehensive, pan-European dataset of specialized construction computing programs, addressing a gap noted by previous systematic reviews which have highlighted the fragmented nature of curriculum documentation (Abdirad & Dossick, 2016; Besné et al., 2021). The dataset, comprising 187 verified institutions across 35 countries with standardized metadata on programs, topics, costs, and graduate capacity, offers researchers a foundation for comparative studies that was previously unavailable.

Second, the regional classification and topic coding framework enables systematic analysis of curriculum patterns. The identification of distinct regional specializations—Nordic emphasis on sustainability and digital twins, British focus on ISO 19650 and lean delivery, Iberian concentration on infrastructure BIM, Italian strength in heritage applications—provides empirical grounding for discussions of how local industry characteristics shape educational provision. Future research can build on this framework to examine whether regional specializations represent strategic differentiation or path-dependent responses to local market demands.

Third, the sensitivity analysis framework demonstrates a replicable methodology for estimating capacity gaps under uncertainty. Rather than presenting single-point estimates that imply false precision, the parametric approach makes explicit the assumptions underlying workforce demand calculations and allows stakeholders to assess implications under their preferred scenarios. The finding that definitional questions (what proportion of workers need digital skills?) matter far more than demographic parameters (workforce size, turnover rates) redirects attention toward the policy discussions that actually determine perceived shortages.

Fourth, the verification methodology offers a practical approach for maintaining data quality in large-scale educational mapping exercises. The three-tier framework (L1: existence confirmed; L2: curriculum verified; L3: graduate numbers confirmed) provides transparency about data reliability and can be adapted for similar studies in other regions or disciplines.

Implications for Curriculum Development

The findings suggest several directions for curriculum development. The near-universal coverage of BIM (87.7%) indicates that foundational digital modelling skills are well-embedded in European construction education. However, the low coverage of ISO 19650 (8.6%) and openBIM/IFC standards (8.6%) points to a gap between technical tool proficiency and information management competency. As BIM mandates increasingly reference ISO 19650 compliance, institutions may need to strengthen coverage of standardised processes, common

data environments, and information delivery planning. Several non-exclusive explanations for this gap warrant investigation: ISO 19650 content may be embedded within general BIM modules without explicit labelling in programme descriptors, leading to systematic underreporting in web-sourced data; curriculum development cycles typically lag behind standardisation timelines, and ISO 19650's relatively recent transposition into many national frameworks may not yet be reflected in programme specifications; and institutions may perceive information management standards as practitioner-level knowledge better addressed through CPD than degree-level teaching. Distinguishing between these explanations would require qualitative curriculum document analysis or structured educator interviews, representing a priority for future research.

The predominance of Master's-level programs (58.3%) positions construction computing as a specialization layer atop foundational engineering or architecture education. While this model produces graduates with deep expertise, it may constrain the scaling of digital competencies across the broader workforce. The relatively limited CPD provision (4.3% of programs) represents a missed opportunity to upskill existing practitioners who cannot undertake full degree programs. Institutions and professional bodies might consider expanding short-course offerings, micro-credentials, and stackable qualifications that allow working professionals to acquire specific competencies incrementally.

Limitations

Several limitations should be noted. The dataset excludes vendor certifications (Autodesk, Bentley, Trimble), non-affiliated training programs or online programs (i.e., buildingSMART certificate), other informal training, and general IT/CS graduates who enter construction, representing significant but unmeasured supply channels. Graduate numbers are estimates for many institutions, with actual output potentially varying by $\pm 30\%$. The institutional coverage factor ($C=0.75\text{--}0.80$), while supported by search saturation patterns and partial national cross-referencing, could not be empirically calibrated for all 35 countries and may understate or overstate unmapped provision. There is additional bias in the data collection process as the authors do not represent nor know the whole picture of the educational offer in this topic, therefore adding uncertainty and regional bias to the data collection process. The parametric demand model abstracts complex labour market dynamics and should be interpreted as indicative rather than predictive. Finally, the dataset represents a snapshot; given the rapid evolution of construction technology, regular updates would be needed to maintain currency.

Future Research Directions

This study opens several avenues for future research. Longitudinal tracking of program evolution would reveal how curricula respond to changing industry demands and policy requirements. Graduate outcome studies could assess whether regional curriculum specializations translate into differentiated career pathways. Comparative

analysis with vendor certification data would illuminate the relative contributions of academic and industry-based training to workforce development. Finally, extension of the methodology to other regions—North America, Asia-Pacific, Middle East—would enable global comparisons of construction computing education provision and potential strategic best practice.

Conclusions

This study presents the first comprehensive mapping of construction computing education across Europe, identifying 187 validated institutions across 35 countries producing approximately 13,900 graduates annually (estimated 17,400-18,600 total when accounting for search uncertainty). Key findings include: (1) geographic concentration in Western Europe with 40% of institutions in DACH and British Isles regions; (2) predominance of Master's-level programs (58.3%) positioning construction computing as specialization; (3) near-universal BIM coverage (87.7%) but limited ISO 19650 standards coverage (8.6%); (4) strong regional curriculum specializations aligned with local industry characteristics; and (5) current programs meeting between 6% and 49% of estimated demand depending on digitalization and coverage assumptions.

Meeting EU construction digitalization ambitions will likely require both scaling of specialized programs and development of complementary pathways including CPD offerings, vendor certification recognition, and integration of digital competencies at bachelor's level. Policy clarity on role definitions and competency requirements is essential for evidence-based workforce planning.

The authors also hope that the map dashboard developed is of useful to future students to take informed decisions regarding their instruction in the digital construction domain. While we do not aim to transform the created platform into a marketplace, we hope that it serves as an easier method for students to understand the European educational offer in this field, enabling them to succeed in their desired professional ambitions.

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