



Alignment of Architecture Education in Universitas Sebelas Maret With The Needs of The Construction Industry: A Case Study of PT Hutama Karya (Persero)

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ABSTRACT

BACKGROUND & CONTEXT

The construction industry is evolving rapidly through new technologies, modern methods, and sustainability standards, requiring architecture graduates skilled in design, technical coordination, and professional practice. Studies consistently show a gap between architectural education curricula and real industry needs, and in Indonesia this remains a significant challenge. This gap is examined through a case study of the Architecture Study Program at Universitas Sebelas Maret and PT Hutama Karya (Persero), a major state-owned construction enterprise.

PURPOSE OR GOAL

This study examines the suitability between architectural education and construction industry needs, focusing on design innovation, modern construction technology, and graduates' readiness for managerial roles and multidisciplinary teamwork, to identify which competencies are underrepresented in the curriculum.

APPROACH OR METHODOLOGY

A descriptive qualitative case study design was used, involving semi-structured interviews with industry practitioners, an intern, and curriculum-responsible lecturers, alongside curriculum documents and graduate tracer study profiles. Data were analyzed using Braun and Clarke's (2006) six-phase thematic analysis.

OUTCOMES

Five themes emerged: limited cross-disciplinary collaboration, technical competency gaps (particularly BIM), limited industry exposure, uneven course relevance, and institutional constraints. Most industry-required skills, including BIM, digital coordination, and project management, were largely absent or underdeveloped in the curriculum.

CONCLUSIONS

Architectural education at Universitas Sebelas Maret requires stronger integration with construction industry practice, consistent with prior research on practice-based learning and industry collaboration. Strengthening university-industry partnerships and developing an adaptive curriculum are essential to closing this gap.

KEYWORDS

Architecture education, construction industry, adaptive curriculum.

Introduction

The construction industry needs skilled professionals to keep up with modern workplace technologies, policies, and practices. In this regard, architecture degrees from higher education institutions are expected to be proactive and ready to face emerging challenges. Unfortunately, many studies reveal a gap between the skills of architecture graduates and the expectations set by the construction industry (Wagner, 2008; Dall'Alba & Barnacle, 2007).

Tyler's Curriculum Theory (1949) emphasizes the alignment between educational objectives, learning experiences, and assessment as essential to achieving effective learning outcomes. In the context of architectural education, this theory suggests that when the academic curriculum misaligns with industry demands, graduates may lack the competencies necessary for professional success. In addition, this approach emphasizes other aspects, such as soft skills development, technical knowledge, and practical experience, as crucial to employability after graduation. The theory asserts that higher education needs to integrate industry practices, such as internships and collaborative projects, to bridge the gap between theory and practice.

To further strengthen the theoretical foundation of this study, we also draw upon Biggs' theory of constructive alignment (1999), which advocates that curriculum design should ensure coherence among intended learning outcomes, teaching and learning activities, and assessment strategies. In this view, curriculum development must consider not only content but also how students learn and demonstrate their knowledge.

Furthermore, we incorporate Yorke's employability framework (2006), which defines employability as a set of achievements—skills, understandings, and personal attributes—that make graduates more likely to gain employment and succeed in their chosen occupations. These frameworks serve to highlight the importance of aligning architectural education with the evolving competencies expected in the construction industry.

The architecture study program at Sebelas Maret University has a vision to produce competent architecture graduates who meet current and future needs and can compete globally. One is a provider/worker in the construction industry services. Students are prepared through a curriculum responsive to changes in the development of the times in the era of disruption and industrial revolution 4.0 and Society 5.0.

PT Hutama Karya (Persero) is one of the state-owned enterprises in the construction sector that participates in having a significant role in infrastructure development in Indonesia and provides a big picture related to competencies in the world of education, such as interdisciplinary education of work teams, digital construction applications, BIM technology, as well as regulations and standards in the national construction sector.

This article is prepared to address this problem by assessing the extent to which architectural education at Sebelas Maret University is harmoniously integrated into the construction industry. The research uses a descriptive qualitative method with a case study method, which aims to deeply understand the alignment between architectural education and the needs of the construction industry, especially at PT Hutama Karya (Persero) as well as extracting information from curriculum documents and conducting interviews with the construction industry related to the skills of graduates needed and the conditions of graduates working in the construction industry services. Furthermore, this study supports efforts to improve graduates' employability globally, particularly by supporting the digital transition and sustainability of the construction sector, which is an essential focus of the sustainable development agenda. By highlighting interdisciplinary skills, the adoption of digital technologies such as BIM, and the importance of soft skills in project leadership, this research is relevant to international efforts to build the capacity of sustainable construction human resources.

Recommendations from this research include strategies for university-industry collaboration, greater incorporation of practice-based learning, and a curriculum adaptable to construction needs. With those steps, architecture graduates are expected to be better prepared to contribute to global construction projects.

Method

This study uses a descriptive qualitative approach through a single case study design, focusing on PT Hutama Karya (Persero) and the architecture study program at Sebelas Maret University. Purposive sampling was used to recruit participants who had direct experience in curriculum development or construction practices.

Data collection involved semi-structured interviews with project managers or human resources personnel from the company, an intern at PT Hutama Karya (Persero), and lecturers responsible for curriculum management. All participants provided written consent, and their identities have been anonymized to ensure confidentiality.

The interview protocol included open-ended questions about the technical or managerial skills expected of new architecture graduates and which areas of the curriculum were most or least relevant to industry needs.

In addition to interview transcripts, secondary data such as curriculum documents, syllabi, and graduate profiles were also collected and reviewed. Graduate profiles were obtained from tracer study results completed by alumni.

Data were analyzed using manual thematic analysis, following the six-phase process proposed by Braun and Clarke (2006): (1) familiarization with the data, (2) initial coding, (3) theme search, (4) theme review, (5) theme definition and naming, and (6) report writing.

Although we did not use formal triangulation methods, data validation was conducted by matching themes that emerged from different participant groups (e.g., industry, faculty, and study programs) and supporting them with document analysis. This strategy ensured credibility and helped achieve data saturation.

Results and Discussion

Data analysis yielded five main themes, organized through a thematic process. This process began with a thorough reading of interview transcripts and curriculum documents. Researchers then marked initial codes such as “never worked across disciplines,” “did not know BIM,” and “internship was only observation.” These codes were then grouped and filtered into themes that represent recurring patterns from various data sources.

1. Lack of Cross-Disciplinary Collaboration Experience

The industry considers the ability to work in multidisciplinary teams (architects, civil engineers, project managers) to be very important for large-scale construction projects. However, students' experience in cross-disciplinary collaboration remains limited, as it has not been explicitly incorporated into the learning structure.

2. Technical Competency Gap

Although the architecture curriculum already includes courses such as Building Technology, Building Structures, and Working Drawings, construction companies such as PT Hutama Karya expect graduates to better understand the technical and managerial aspects of construction projects. For example, Building Information Modeling (BIM) is still not a key competency in most study programmes.

3. Limited Exposure to Industry

Alumni reported that the industry internship period is generally too short and does not fully reflect the real challenges in the field. This leaves graduates less prepared to handle the complexity of national-scale construction projects such as those handled by PT Hutama Karya.

4. Suitability of Specific Courses

Some courses considered highly relevant by industry practitioners include Site Design Studio, Project Management, and Working Drawings. However, the effectiveness of these courses depends heavily on the teaching methods and the project contexts used as case studies.

5. Educational Institutions

The lecturer's interview showed an awareness of the need for curriculum alignment, but facing the structural constraints in its implementation, such as limited teaching resources, time, and faculty policies, is a challenge.

These themes also form the basis for the compilation of Table 1 and Table 2. In Table 1, the assessment of graduates' competency levels is based on the frequency and consistency of findings from interviews and confirmation with learning documents. For example, BIM competency was categorized as "low" because all respondents stated they had never been formally taught and were unable to operate the software. Similarly, for project management and digital coordination competencies, which emerged from codes such as "does not know project software" and "no digital training."

Meanwhile, Table 2 is compiled based on matching the interview results with the curriculum content. If a competency is considered necessary by the industry but is not found or has not been reinforced in the curriculum, it is categorized as "not yet included" or "not yet optimal." For example, the topic of construction regulations has not yet appeared in the core syllabus, while lean construction is not yet part of management or planning courses. This process demonstrates how thematic findings from field data are organized into structured categories in a table.

Table 1: Courses in the Architecture Program at Universitas Sebelas Maret that are relevant to the Construction Industry

No	Course	Credit	Category	Relevance to the Construction Industry	Short Description
1	Architectural Communication Engineering Drawing 2	3	Must	Moderate	Two-dimensional and three-dimensional modeling, through the presentation/visualization of architectural working drawings using computer graphics media. Essential for conveying ideas to multidisciplinary teams.
2	Architecture Studio 4	5	Core/ Studio	High	Single function mid-rise building project by integrating structure and utilities
3	Architecture Studio 5	5	Core/ Studio	High	Multi-function high-rise building project by integrating structure and utilities

4	Architecture Studio 6	5	Core/ Studio	High	Designing built environments or facilities with special emphasis and themes in the form of areas, large-scale architecture, complex functions, building technology
5	Building Technology	3	Must	High	Understanding the use of types of fabricated building materials, composite materials, and material innovations along with the properties and behavior of materials on building structures and construction
6	Building Structure Engineering	3	Must	High	Understanding and skills in building structural engineering
7	Building Utility	2	Must	High	Applying and integrating building utility computing systems and environmental utilities
8	Landscape Design Studio	3	Core/ Studio	High	Understanding and skills in landscape and site engineering in planning
9	Industrial Internship/ Practical Work	2	Practice	High	Hands-on experience on real projects

Table 2: The Requirements of Competencies That the Construction Industry Needs

No	Required Competencies	Description	Competency status of architecture graduates
1	BIM (Building Information Modeling)	Proficient in digital modeling of projects (BIM 3D, 4D, 5D, 6D) and general BIM information management (BIM as a method, not just as a tool)	Low
2	Cross-disciplinary collaboration	Able to work together with planning teams, contractors, vendors, and owners	Moderate
3	Technical knowledge of structure & MEP	Understand structural, mechanical, electrical, plumbing systems and construction methods	Moderate
4	CDE Usage & Digital Coordination	Able to manage models and documents in Common Data Environment (CDE)	Low
5	Survey digital	Understanding data collection and survey data processing with various digital survey tools that can be used as needed.	Low
6	Lean Construction	Understand lean principles in planning, execution, and collaboration with the supply chain	Low
7	Data Analytics & Dashboard	Able to process project data using Power BI, Excel, or internal dashboards	Low

8	Project Management	Understand the aspects that need to be managed in a project and about project leadership. not only useful for construction projects but can also be used in general starting from planning, business and others.	Low
9	Construction Management	Understand the principles of construction implementation from preparation, implementation, to completion of work.	Low
9.1	Risk Management	Understand risk management, from identification to mitigation, so that it can be used in the world of work anywhere.	Low
9.2	Project Time Management	Effective in preparing schedules, baselines, and implementation control (Primavera/MS Project etc.)	Low
9.3	Project Cost Management	Efficient in project cost planning and management	Moderate
10	Sustainability & green construction	understanding carbon footprint calculations in the building life cycle, green materials, green building certification	Low
11	Legal, Contracts and Regulations	Understanding FIDIC, LKPP regulations, contractual risk analysis	Low
12	Occupational Safety and Health (K3)	K3 certification, SMK3 implementation, hazard identification	Low

Table 3 presents a development of the results of the thematic analysis, using a comparative approach that compares the competencies expected by industry with those taught in higher education. The information in this table is compiled based on confirmation from interviews with PT Hutama Karya professionals and alumni, as well as from matching the curriculum documents.

Table 3: The Requirements of Competencies That the Construction Industry Needs

No	Competention	Taught on Campus	Required by industry	Notes
1	BIM (Building Information Modeling)	No	Yes	Need curriculum integration
2	Cross-disciplinary collaboration	not optimal	Yes	Need for reinforcement
3	Technical knowledge of structure & MEP	Inadequate	Yes	Need for reinforcement
4	CDE Usage & Digital Coordination	No	Yes	Need curriculum integration
5	Survey digital	Inadequate	Yes	Need for reinforcement
6	Lean Construction	No	Yes	Need curriculum integration
7	Data Analytics & Dashboard	No	Yes	Need curriculum integration
8	Project Management	No	Yes	Need curriculum integration
9	Construction Management	No	Yes	Need curriculum integration
9.1	Risk Management	No	Yes	Need curriculum integration
9.2	Project Time Management	No	Yes	Need curriculum integration
9.3	Project Cost Management	No	Yes	Need curriculum integration
10	Sustainability & green construction	Yes	Yes	Need for reinforcement
11	Legal, Contracts and Regulations	No	Yes	Need curriculum integration

12	Occupational Safety and Health (K3)	No	Yes	Need curriculum integration
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Conclusion and Recommendation

This research identifies a gap between the competencies of Sebelas Maret University architecture graduates and the needs of the construction industry, particularly in technical, managerial, collaborative, and digital technology areas. PT Hutama Karya, one of the major players in the national construction industry, seeks graduates who are not only creative in design but also adaptable to the dynamics of large construction projects.

Although architecture education plays a significant role in producing professionals for the development sector, it is essential to recognize that not all the needs of the construction industry can be met by architecture graduates. The construction industry is a multidisciplinary ecosystem encompassing project management, civil engineering, construction technology, occupational health and safety, and legal and financial matters. Architecture graduates are generally focused on the design, space planning, and aesthetic aspects of the built environment, so they may struggle to master more in-depth technical and managerial aspects.

In the context of construction, architects are not the only actors; they are part of a team that includes engineers, construction managers, quantity surveyors, and other technical personnel. Thus, aligning architecture education with industry needs does not mean that architecture graduates must master all technical aspects of construction, but rather that they must be prepared to work collaboratively within an interdisciplinary work system.

1. Industry Practice-Based Curriculum Integration

Architecture study programs must integrate more practice-based courses, such as construction technology, project management, and building performance simulation. Collaboration with construction companies, such as PT Hutama Karya, can produce a co-created curriculum that addresses the field's real needs.

2. Mandatory and Certified Internship Program

A more structured, mandatory internship program is needed, linked to real projects undertaken by industry partners. Internship certification from partner companies can be part of the assessment of graduate learning outcomes.

3. Interdisciplinary Skills Training and Digital Technology

Architecture students need to be equipped with basic interdisciplinary skills, such as reading civil engineering drawings, understanding the construction implementation process, and operating software such as BIM (Building Information Modeling), which is now standard in the construction industry.

4. Strengthening Soft Skills and Project Leadership

Architectural education should include training in professional communication, negotiation, project leadership, and time management skills that are highly valued in the construction world but often overlooked in architecture curricula that focus too much on design.

5. Tracer Study and Continuous Assessment of Graduates

Educational institutions need to conduct tracer studies periodically to assess how graduates can adapt to the world of work. The results can be used to continuously update the curriculum and teaching methods.

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