Human resources for BIM jobs in the AEC industry in Vietnam: an investigation on job positions and requirements

The-Quan Nguyen¹,², Nguyet-Anh Dau-Thi² and Thuy-Ninh Dao¹,³

¹Faculty of Construction Economics and Management, National University of Civil Engineering, 55 Giai Phong Road, Hai Ba Trung District, Hanoi, Vietnam
²Institute of Investment and Construction Management, National University of Civil Engineering, 55 Giai Phong Road, Hai Ba Trung District, Hanoi, Vietnam
³Ph.D. Candidate, Department of Civil Engineering, National Taiwan University, No. 1, Sec. 4, Roosevelt Rd., Taipei, 10617 Taiwan

Email: quanmt@nuce.edu.vn

Abstract. The paper presents research results from 90 BIM jobs vacancies for the AEC industry in Vietnam which were advertised on popular recruitment channels. The results show that BIM jobs in the South are more popular than in the North and the Central. BIM-related job positions are different from company to company, but this study groups those positions into three basic positions according to the international best practice approach: BIM Manager, BIM Coordinator, BIM Modeler. For BIM Modelers, their main job is to develop 3D models, deploy design documents, and coordinate with stakeholders to perform the work. BIM Coordinator's on-demand job is to coordinate models across disciplines, check conflict and report, control models, support project management. The main task of a BIM Manager is to manage and develop BIM uses, to ensure the information to be communicated among the parties in the projects, and train BIM human resources in the company. There are many requirements for these positions, among them are the two basic requirements of “experience” and “software” (organisations may use different software for the BIM uses they apply). The article also emphasizes the need to have more involvement of professional associations, state management agencies, etc. to standardize job positions, then later they can award BIM licenses to the proper human resources appropriately.

1. Introduction

Building Information Modelling (BIM) has been widely introduced globally and it is claimed to be adopted in Vietnam since the last decade. The uses of BIM in the AEC industry (architecture, engineering and construction industry) have brought lots of benefits to the stakeholders of the construction projects [1] and have been claimed to enhance the productivity in the construction industry [2], and Vietnam may not be an exception. In order to implement BIM widely and effectively, the AEC industry needs to be provided with sufficient and qualified BIM human resources. In addition to attract the BIM specialists graduated from overseas, the local training centres in Vietnam must also take part in educating and training this type of human resources. However, the uses of BIM require multiple disciplines, a set of software and there are different BIM levels that each organisation may want to target; this fact leads to a great diverse in the requirements for this type of human resources.
Selected countries have officially categorised BIM jobs by issuing guidelines for BIM implementation, or training syllabus in which the BIM titles are clearly stated. Of course, roles and responsibilities of each position are different, but some titles have many common designated functions, i.e. BIM Managers and VDC Managers as in the classification of Lee and Borman [3].

There is a variety of BIM-related job titles that have been used in different countries. The study of Miyoung Uhm et al. [4] shows 35 types of BIM job titles. These are then divided into eight job categories by analyzing the relationship between job titles, namely BIM project manager, BIM director, BIM coordinator, BIM senior architect, BIM manager, BIM designer, BIM MEP coordinator, and BIM technician. Joseph's study classifies BIM job positions to 7 categories: BIM manager, BIM Modeler, BIM analyst, BIM software developer, BIM modeling specialist, BIM facilitator, BIM consultant, BIM researcher [5]. In another approach, the United Kingdom CIC BIM Standard Protocol records the responsibilities of the BIM Manager, the BIM Coordinator, and the BIM Modeler [6], while other documents may refer to BIM job captain, BIM coordinator, BIM technician etc. [5] or BIM managers, BIM coordinators, and virtual design and coordination (VDC) managers [3]. More titles such as BIM Trainer, Director of BIM Technologies, BIM Consultant, Manager of BIM Marketing, BIM Software Applications Support Engineer have also been used in companies in North American countries, as Barison and Santos have summarized [7]. Mathews [8] also present a myriad of BIM titles in which there are some distinct positions.

BIM job titles are classified according to the theory analysis, task analysis, roles, and requirements for each position. This article adopts three indispensable positions in a BIM project: BIM Manager, BIM Coordinator, BIM Modeler (Modeling Technician BIM) from the UK AEC BIM Protocol [6], which are widely adopted by many countries, like Malaysia. The responsibilities of the BIM Manager, the BIM Coordinator, and the BIM Modeler are illustrated in Table 1.

**Table 1. Responsibilities of the BIM Manager, BIM Coordinator, and BIM Modeler.**

| Role           | Strategic | Management | Production |
|----------------|-----------|------------|------------|
|                | Corporate| Research   | Process+Workflow| Standards| Implementation| Training| Execution Plan| Model Audit| Model Coordination| Content Creation| Modelling| Drawing| Production |
| BIM Manager    | Y         | Y          | Y          | Y         | Y          | Y        | N           | N          | N            | Y          | Y        | N      | N        |
| BIM Coordinator| N         | N          | N          | N         | Y          | Y        | Y          | Y          | Y            | N          | Y        | N      | N        |
| BIM Modeler    | N         | N          | N          | N         | N          | N        | N          | Y          | Y            | Y          | Y        | N      | N        |

Source: [6]

As one of the followers in terms of BIM adoption, Vietnamese architecture, engineering, and construction (AEC) industry have been looking for good practices from overseas countries to learn and apply. However, since the AEC industry in Vietnam refers to different sources from different countries, they may have adopted different approaches for BIM; this leads to the fact that they perceive differently the BIM-related issues, including BIM jobs and positions.

Based on information collected recently from the recruitment advertisements for BIM human resources, this paper aims to explore the actual BIM job titles in Vietnam and the requirements that have been set for the advertised positions. This helps to standardize the BIM job titles and the level of competencies and skill set needed for each title, for the clients to have a framework to refer to when they select consultants and contractors to deliver their BIM projects. This can also be a reference for the educators and trainers to develop their training curricula regarding professional BIM courses or BIM degree programs.

As one of the followers in terms of BIM adoption, Vietnamese architecture, engineering, and construction (AEC) industry have been looking for good practices from overseas countries to learn and apply. However, since the AEC industry in Vietnam refers to different sources from different countries, they may have adopted different approaches for BIM; this leads to the fact that they perceive differently the BIM-related issues, including BIM jobs and positions.

Based on information collected recently from the recruitment advertisements for BIM human resources, this paper aims to explore the actual BIM job titles in Vietnam and the requirements that have been set for the advertised positions. This helps to standardize the BIM job titles and the level of competencies and skill set needed for each title, for the clients to have a framework to refer to when they select consultants and contractors to deliver their BIM projects. This can also be a reference for the educators and trainers to develop their training curricula regarding professional BIM courses or BIM degree programs.
2. Materials and methods
This research adopted a 4-stage approach (Figure 1). In Stage 1, a literature review was conducted to detect different job positions related to BIM in the global AEC industry, then find out the popular approaches for categorize BIM job titles and related roles. In Stage 2, the research team scanned the most favored recruitment channels in Vietnam to record advertisements for BIM jobs vacancies. The job descriptions and requirements in the collected advertisements were analyzed in Stage 3 for a thorough understanding of the BIM jobs in Vietnam. Results are then compared to the global findings and recommendations were proposed in Stage 4.

In this research, advertisements for BIM job vacancies are collected from professional groups in social networks as Facebook, LinkedIn, construction online forums, and other reputable recruitment websites in Vietnam such as Indeed (https://vn.indeed.com), Vietnamworks, etc. The data collection process was carried out from October 2018 to August 2019, with 106 recruiting advertisements collected. After removing the duplicate recruitments and sketchy BIM job descriptions, 90 job postings remain for analysis (see Table 2).

Table 2: BIM job vacancies regarding job positions.

| No | BIM job positions | Frequency | Percentage |
|----|-------------------|-----------|------------|
| 1  | BIM Modeler      | 33        | 36.67%     |
| 2  | BIM Coordinator  | 37        | 41.11%     |
| 3  | BIM Manager      | 20        | 22.22%     |
|    | **Total**        | **90**    | **100%**   |

Incidentally, the number of BIM Modeler recruitments is approximately equal to BIM Coordinator. In a posting with both BIM Modeler and BIM Coordinator recruitment, the number of BIM Modeler required is always greater than that of the BIM Coordinators. The number of BIM Manager vacancies found in advertisements is relatively smaller than that of the two other BIM-related positions. During the progress of the data collection, more and more BIM Manager recruitments have been being posted, revealing the increase in the demand for this type of human resources. Among the cities in Vietnam, only Hanoi (North), Da Nang (Central) and Ho Chi Minh City (HCMC - South) are the locations for the BIM jobs posted. Figure 2 shows that the BIM market in the South of Vietnam is much busier than...
in the North and the Central. In particular, the number of BIM recruiting jobs advertised in the South is 4 times higher than Hanoi, and up to 19 times higher than Da Nang.

Figure 2. BIM job recruitments regarding locations of the posts.

Data collected were translated from Vietnamese into English to input into the NVivo software. Information generated from NVivo software will be analysed to describe the recent practice of BIM job descriptions and specifications in Vietnam.

3. Results and discussion

3.1. The required duties for BIM job positions

3.1.1. For BIM Modeler. In job postings, the title BIM Modeler is named differently, such as Revit Modeler, Construction Drawing Engineer, BIM designer etc. The main duties for this position in the 37 job recruitments posted include: developing 3D models, deploying design documents, and coordinating with the stakeholders to perform the work.

Table 3. The duties of BIM Modelers.

| Duties                                      | Frequency |
|---------------------------------------------|-----------|
| Reporting                                   | 2         |
| Controlling model quality                   | 4         |
| Controlling the schedule for model development | 3         |
| Developing 3D models                       | 34        |
| Clash detection                             | 4         |
| Developing project documents                | 3         |
| Concept development                         | 3         |
| Works inspection                            | 1         |
| Developing and transferring models          | 6         |
| Approving construction methods              | 1         |
| Coordinating stakeholders                   | 8         |
| Coordinating models                         | 2         |
| Family creation                             | 3         |
| 2D drawing design                           | 5         |
| Data integration and management             | 1         |
| Manipulation construction workload          | 4         |
| Deploying design documents                  | 11        |
| Exporting quantity                          | 2         |
The full list of duties required for BIM Modeler, under the form of employers' job requirements, and the frequency of each duty required for this position are encrypted by Nvivo software, then are shown in Table 3.

As the title implies, modelling is the primary responsibility of a BIM Modeler. In addition, some BIM recruitments also put down clash detection, quantity take-off, exporting quantity from the models. Besides, other posts proposed other duties such as controlling schedule and quality for model development, checking conflicts, developing families, coordinating models among different disciplines. Besides 3D modelling, Table 3 shows that deploying design documents is also another popular duty of a BIM Modeler. Though each organisation may consider some extra duties for the position, the most popular ones are rather similar to what of the standard position, as presented in Section 3.

3.1.2. For BIM Coordinator. Table 3 illustrates the demanding duties advertised by the employers to BIM Coordinators. The most popular duties required for this position include controlling models, clash detection and report, coordinating multidisciplinary models, developing and updating the templates, standards, BIM guides, ensuring the quality of submittals and internal processes, developing 3D models, ensuring communication among stakeholders, project information updating, controlling the project progress and report and quantity surveying. The full list of duties for BIM Coordinators as advertised in BIM job vacancies are presented in Table 4.

Table 4. The duties of BIM Coordinators.

| Duties                                      | Frequency |
|---------------------------------------------|-----------|
| Drawing updating                             | 3         |
| Project information updating                 | 13        |
| Setting up working environment and project standards | 10        |
| Ensuring the quality of submittals and internal processes | 16        |
| Ensuring communication among stakeholders    | 14        |
| Team member evaluation                      | 1         |
| Assessing and checking design                | 3         |
| Training BIM software for internal human resources | 2         |
| Developing 3D models                        | 16        |
| Supervising on construction sites           | 4         |
| Supporting the managers                     | 10        |
| Controlling models                          | 24        |
| Controlling the project progress and report  | 12        |
| Clash detection check and report            | 22        |
| Working with clients                        | 7         |
| Works and project inspection and acceptance  | 3         |
| BIM MEP department development              | 1         |
| Developing and maintaining BIM Protocol     | 4         |
| Coordinating multidisciplinary models       | 19        |
| Quantity surveying                          | 11        |
| Monitoring monthly meetings                 | 1         |
| Designing project items                     | 3         |
| Shopdrawing                                 | 5         |
| Developing component libraries              | 7         |
| Developing and updating the templates, standards, BIM guides | 18        |
It is noted that there are some duties required for BIM Coordinators but also appearing in the job descriptions for BIM Modelers. This proves the fact that there are some overlaps between the positions’ duties, not only in the United Kingdom as in their CIC Standard Protocol [6] but also in Vietnam.

3.1.3. For BIM Manager. BIM Managers are among the key members of BIM crew of any organization with BIM adoption. They are in charge of implementing BIM in the organization, applying and developing BIM uses for the organization and its projects. A BIM Manager’s duties also include ensuring the information flow among the organization’s project stakeholders and delivering training to the internal human resources. According to the CIC Protocol [6], there are some overlapped responsibilities between BIM Coordinators and BIM Managers, such as developing and executing the BIM Execution Plan, delivering in-house BIM training. The data collected from BIM job advertisements in Vietnam also supports this fact. Table 5 below shows the full list of the duties advertised for a BIM Manager. Among the duties that have been assigned for BIM Managers, the most popular duties include managing BIM implementation and BIM uses development, managing information exchange among project stakeholders, then delivering BIM training to internal members of staff and model coordination and clash detection, document management. That is to say, main duties of the BIM Managers in the perception of the Vietnamese organization are quite similar to that from the United Kingdom, as stated in the CIC Standard BIM Protocol [6].

### Table 5. The duties of BIM Managers.

| Duties                                                        | Frequency |
|---------------------------------------------------------------|-----------|
| Quantity take-off                                             | 1         |
| Controlling schedule                                          | 6         |
| Managing information exchange among project stakeholders      | 24        |
| Delivering BIM training to internal members of staff          | 14        |
| Developing BIM objectives                                     | 9         |
| Developing models                                             | 6         |
| Controlling team performance                                  | 5         |
| Controlling families and standards                             | 6         |
| Model checking                                                | 6         |
| Model coordination and clash detection                        | 13        |
| Coordinating BIM with subcontractors                          | 5         |
| Document management                                           | 12        |
| Subcontractors management                                     | 6         |
| Managing BIM implementation and BIM uses development          | 33        |
| Shopdrawing                                                   | 6         |
| Developing BIM application for project management             | 1         |

In these job vacancies advertisement, the overlapping duties are not only between BIM Managers and BIM Coordinators, but also between BIM Managers and BIM Modeler; this has not been articulated in any previous research or publications.

3.2. BIM jobs’ specifications in Vietnam

A typical job specification, together with job description, makes up the two major job analysis outcomes. It identifies the kind of person who are qualified to do well in the job [9]. Job specification may include education, experience, skills, preferred qualifications [9].

The job specifications of the collected BIM job vacancies focus on 3 main aspects: experience, software skills and other competencies. Figure 4, 5, 6 show the information generated from NVivo
software for the competencies, skills and qualification requirements for the BIM Modelers, BIM Coordinators and BIM Managers accordingly.

“Experience” and “software” are the keywords that have been mentioned the most in the job advertisements. The number of years for similar experience and level of software proficiency are required differently for different positions and by different recruiters. As in Figure 4, 5, BIM Modelers and BIM Coordinators are required to use Autodesk Revit, which is claimed as the most popular BIM authoring software in Vietnam; while BIM Managers are expected to be proficient in Autodesk Navisworks, a coordinating tool.

Regarding the work experience, the average duration required for a BIM Modeler is 2.1 year, while that for a BIM Coordinator is 3.1 year and for a BIM Manager is 3.4 year, which are rather high for a
new market regarding BIM like Vietnam. Other competencies required for BIM people include communication skills, teamworking skills, foreign language proficiency etc.; among which leadership and management skills are especially emphasized for the BIM Manager title. All of the three titles require at least a university degree; this fact reveals that in Vietnam, BIM people are considered as high-quality human resources.

4. Summary
The research results show that the AEC industry in Vietnam have started applying BIM and the organizations have been informed of the basic duties of the BIM people. However, the BIM titles are perceived differently by different employers, as well as the job descriptions for each BIM job position. As a result, apart from some common job requirements for each BIM position, the job specifications vary a lot from company to company. Therefore, there is a need for standardizing the BIM titles, as well as the basic requirements for each position. As the practice in Vietnam, the job standardization needs the involvement of not only the governmental agencies, but also professional associations in the AEC industry. The standards will support promoting BIM adoption widely and faster and facilitating quality management for the job performed by this type of BIM people. The standards also provide the basis for the clients in construction to assess and evaluate the contractors’ bidding documents regarding BIM people. What is more, the standards can serve as the reference for universities to develop their education programs to ensure the future accreditation for the programs.

5. References
[1] Bryde D, Broquetas M and Volm J M 2013 The project benefits of building information modelling (BIM) International journal of project management 31(7) 971-980
[2] Poirier E A, Staub-French S and Forgues D 2015 Measuring the impact of BIM on labor productivity in a small specialty contracting enterprise through action-research Automation in construction 58 74-84
[3] Lee G and Borrmann A 2020 BIM policy and management (Taylor & Francis)
[4] Uhm M, Lee G and Jeon B 2017 An analysis of BIM jobs and competencies based on the use of terms in the industry Automation in Construction 81 67-98
[5] Joseph J 2011 BIM titles and job descriptions: How do they fit in your organizational structure? (Autodesk University)
[6] Construction Industry Council 2018, Building Information Modeling (BIM) Protocol: Standard Protocol for use in projects using Building Information Models Construction Industry Council: London, Great Britain
[7] Barison M B and Santos E T 2011 The competencies of BIM specialists: a comparative analysis of the literature review and job ad descriptions, in Computing in Civil Engineering 2011 594-602.
[8] Mathews M 2015 Defining job titles and career paths in BIM, in CITA BIM Gathering 2015 Technological University Dublin: Dublin
[9] Lussier R N and Hendon J R 2017 Human resource management: Functions, applications, and skill development Sage publications

Acknowledgements
This research in funded by National University of Civil Engineering, Vietnam (NUCE) under grant number 223-2018/KHXD-TD.