Key factors affecting the rent of office buildings: case study on Taipei 101

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Abstract. An exploration of the rent of office buildings in metropolises worldwide indicates that in response to the level of overall economic development, tenants often need to consider numerous factors when selecting the location of their offices, whereas landlords attempt to increase the rent of their buildings by using high-grade building materials to renovate the buildings and offering new facilities and property management services to meet the various needs of tenants. This study adopted the Delphic hierarchy process and analytic hierarchy process to explore office building rent in Taipei City by distributing a questionnaire to experts in the real estate field who possess practical experience in executing real estate projects. Specifically, the study investigated how office building rent is affected by factors such as geographical location and public facilities, thereby generating a reference for identifying related key factors. Analyzing the data collected from the questionnaire and the weighted indicator scores revealed that location in the main business district is the most crucial factor, followed by proximity to a Taipei Mass Rapid Transit station and the office building being a renowned landmark. By contrast, adequate property management is not a primary factor considered by the experts.

1. Introduction
After a country or region achieves notable economic development goals, the development focus tends to shift toward constructing unique buildings as landmarks. Therefore, office buildings have become a crucial indicator of the extent of regional economic development and a symbol representing the wealth and prosperity of a region. Fluctuations in economic development exert a direct effect on the management of office buildings. Of multiple real estate development types (e.g., office buildings, residential buildings, commercial buildings, hotels, and factories), office buildings are considered an investment item with a relatively high return because of their favorable lease performance over the long term and stable income generation. However, office building rent is affected by factors such as the economy, geographical location, transportation convenience, and market positioning, all of which cause fluctuations in rent [1]. The conventional approach for leasing office buildings entails landlords determining the rent according to their market experience. However, such an approach easily overlooks geographical factors, inhibiting the ability of a landlord to find adequate tenants. In contrast to regular buildings, an office building can be viewed as a vertical city that contains various problems concerning safety, transportation, hygiene, and energy consumption that are difficult to resolve. Office buildings with a higher number of floors tend to exhibit more problems related to safety, durability, and comfort, and property management requirements for such buildings are also extensive in the areas of physical structure, building features, electromechanical components, air conditioning, and elevators.
The rental market for office buildings in Taipei City is deeply affected by the overall economy and political activities. In addition, the demand for office buildings in Taiwan has decreased in recent years, but developers and builders have continued to erect additional buildings. From 2008 to 2015, the total floor areas of unrented A-grade office buildings in Taipei City increased from 18 million ft² to 24 million ft² (an increase by 6.5 million ft² in seven years). Amidst an excessive supply of office buildings lingering on the rental market for an extensive period, landlords must also contend with the negative effect of economic recession when attempting to lease their buildings.

2. **Research methods**

This study conducted in-depth interviews [2] with experts who have participated in and executed real estate projects. After the experts’ opinions were collected, related literature and actual cases of office rentals in Taipei 101 were reviewed to establish indicators of factors that affect rent. Finally, an anonymous questionnaire survey was conducted. The Delphic hierarchy process (DHP) and analytical hierarchy process (AHP; Satty, 1980) were employed to construct a core indicator framework and rank the weighted indicators.

2.1. **Expert interviews**

The experts consisted of members of management teams in domestic and international enterprises as well as professional consultants who have participated in real estate projects. According to their professional backgrounds, the experts were divided into two groups, namely the management group and consultant group. A total of 26 experts were invited. Table 1 summarizes the composition of the experts.

| Group            | Type                   | No. of experts | Ratio  | Total   |
|------------------|------------------------|----------------|--------|---------|
| Management group | Taipei 101             | 4              | 15.4%  | 26.93%  |
|                  | Local enterprise       | 1              | 3.84%  | 7.69%   |
|                  | Foreign enterprise     | 2              | 7.69%  | 15.38%  |
|                  | Tenant coordinator     | 12             | 46.15% | 73.07%  |
|                  | Real estate appraiser  | 4              | 15.38% |         |
| Consultant group | Property management consultant | 3 | 11.54% | |
|                  | Total                  | 26             | 100%   | 100%    |

Hartman (1981) proposed an anonymous written discussion that could help experts of different professional backgrounds reach a consensus [3]. In addition, in-depth interviews can be conducted with experts to identify new core values associated with the rent of office buildings.

2.2. **Literature review**

Various theories have been proposed regarding the determination of rent for office buildings, including the bid rent function theory proposed by Alonso in 1960 [4]. Alonso’s study concurs with that of Huang and Chang (2005) [5], who explored the office location shifts of large-scale enterprises in the Taipei Metropolitan Area and reported that accessibility to comprehensive facilities and distance from the central business area affected the amount of rent that tenants were willing to pay. Holloway and Wheeler [6] used the data of top 500 enterprises compiled by Fortune magazine to analyze office location shifts between 1980 and 1897. Lin [7] divided factors affecting the determination of office building rent into regular, regional, and individual factors; in addition, physical factors such as design quality, building materials, facilities, and property management also affect the rent. According to these prior works, factors affecting office building rent can be divided into economic, location, and physical factors. Economic factors include economic growth [8] and the consumer price index, location factors include transportation convenience and business district characteristics, and physical factors include building area and building age. [9] On the basis of these three major factor types, this study compiled 25 core indicators to establish an evaluation framework for office building rent (Table 2).
Table 2. Key factors affecting office building rent

| Goal                        | Level 1                                                                 | Level 2                                                                 |
|-----------------------------|--------------------------------------------------------------------------|--------------------------------------------------------------------------|
|                             | 1. Ceiling height                                                        | 2. Seismic damper                                                        |
| Building facilities         | 3. High-grade building materials                                         | 4. Independent air conditioning                                         |
|                             | 5. Backup power supply                                                   | 6. Main business district                                               |
|                             | 7. Shopping district                                                     |                                                                          |
| Geographical location       | 8. Restaurant selection                                                  | 9. Zoning                                                               |
|                             | 10. Recreational space                                                   | 11. Public facilities                                                   |
|                             | 12. Business facilities                                                  |                                                                          |
| Nearby facilities           | 13. Two power stations supply                                            | 14. Healthcare resources                                                |
| Transportation convenience  | 15. Accommodation selection                                              | 16. Proximity to Taipei Mass Rapid Transit (MRT) stations               |
|                             | 17. Proximity to highway interchanges                                    |                                                                          |
|                             | 18. Parking space                                                        | 19. Public transportation                                               |
|                             | 20. Road connection to major networks                                    | 21. Renowned landmark                                                   |
|                             |                                                                          | 22. Green building and smart building[10]                               |
|                             |                                                                          |                                                                          |
| Image                       | 23. Friendly neighbors                                                   | 24. Social image                                                        |
|                             | 25. Adequate property management                                         |                                                                          |

3. Questionnaire survey and DHP/AHP Analysis

Also called the expert judgement method, the Delphi method is a type of group decision-making approach commonly used in qualitative research. In this method, experts’ experience and knowledge are adopted to address a specific topic through multiple rounds of feedback and questioning, thereby minimizing the discrepancy between the experts’ opinions. The AHP is mainly employed when addressing a decision problem that involves unknown or uncertain situations with numerous evaluative criteria. This method is prevalently used in behavioral science, marketing strategies, and investment portfolios.

Khorramshahgol and Moustakis proposed the DHP in 1988 [11]. In this method, the establishment of the hierarchy and comparison matrix is accomplished through the Delphi method, and the remaining process is identical to that of the AHP. The AHP is a multicriteria decision theory developed by Saaty in 1990 [12] to systemize complex problems and facilitate the selection of the optimal decision. When a problem entails more than one evaluation factor, multicriteria decision-making can be adopted to simplify the problem. The AHP not only helps experts reach a consensus, but also uses standardized criteria to enhance the reliability of the results, thereby ensuring the rigidity of the evaluation. Through using the AHP, the evaluative value and weight of each factor can be identified to serve as a reference for decision-making. The DHP not only features the advantages of the AHP but also utilizes the group
decision-making model of the Delphi method to reduce the discrepancy between experts’ subjective opinions that occur when the AHP is used to establish a hierarchy and perform pair-wise comparisons of different individuals or groups [13]. This study adopted the AHP to analyze data collected from the questionnaire. Microsoft Excel was used to calculate the weight of each indicator. A total of 40 expert questionnaires were distributed; 36 responses were returned, and 26 were valid (Table 3).

**Table 3. Statistics of expert questionnaires.**

| Group                | Target                  | No. of distributed copies | No. of returned copies | No. of valid copies |
|----------------------|-------------------------|---------------------------|-----------------------|-------------------|
| Management group     | Finance department      | 5                         | 4                     | 4                 |
|                      | Engineering department  | 5                         | 5                     | 1                 |
|                      | Management department   | 5                         | 5                     | 2                 |
|                      | Tenant coordinator      | 10                        | 10                    | 12                |
| Consultant group     | Real estate appraiser   | 5                         | 5                     | 4                 |
|                      | Property management consultant | 10             | 7                     | 3                 |
|                      | Total                   | 40                        | 36                    | 26                |

The questionnaire return rate was 90%. Analysis of the consistency of the valid questionnaire responses yielded a consistency ratio of ≤0.1 when all collected data were included in the analysis. As shown in Table 4, the weight ranking of the Level 1 constructs was in the following descending order: geographical location (29.99%), transportation convenience (24.25%), image (20.41%), building facilities (15.06%), and nearby facilities (10.29%). This indicates that geographical location is the most crucial factor affecting office building rent, followed by transportation convenience.

**Table 4. Analysis of Level 1 constructs.**

| Rank | Item                  | Weight of the management group | Weight of the consultant group | Combined weight |
|------|-----------------------|-------------------------------|-------------------------------|-----------------|
| 1    | Geographical location | 29.92%                        | 30.07%                        | 29.99%          |
| 2    | Transportation        | 17.23%                        | 31.28%                        | 24.25%          |
| 3    | convenience           | 27.54%                        | 13.28%                        | 20.41%          |
| 4    | Image                 | 19.52%                        | 10.60%                        | 15.06%          |
| 5    | Building facilities   | 5.80%                         | 14.77%                        | 10.29%          |
|      | Nearby facilities     | 100%                          | 100%                          | 100%            |
|      | Total                 | 100%                          | 100%                          | 100%            |

After the data were summed, the five most essential indicators were identified from among the 25 indicators established in this study. In descending order of importance, these indicators were main business district (11.57%), proximity to MRT stations (9.97%), renowned landmark (7.65%), restaurant selection (7.46%), and public transportation (6.29%). The ranking of the weighted indicators is summarized in Table 5.
Table 5. Ranking of the weighted indicators using the AHP.

| Level 1                  | Level 2                              | Cumulative weight | Rank |
|--------------------------|--------------------------------------|-------------------|------|
| Building facilities      | Ceiling height                       | 1.17%             | 25   |
|                         | Seismic damper                       | 3.22%             | 10   |
|                         | High-grade building materials         | 1.30%             | 14   |
|                         | Independent air conditioning          | 2.37%             | 20   |
|                         | Backup power supply                  | 2.69%             | 16   |
|                         | Main business district               | 11.57%            | 1    |
|                         | Shopping district                    | 3.12%             | 11   |
|                         | Restaurant selection                 | 7.46%             | 4    |
|                         | Zoning                               | 3.54%             | 9    |
|                         | Recreational space                   | 2.67%             | 17   |
|                         | Public facilities                    | 2.84%             | 14   |
|                         | Business facilities                  | 2.83%             | 15   |
|                         | Dual power supply                    | 2.48%             | 18   |
|                         | Healthcare resources                 | 1.49%             | 23   |
|                         | Accommodation selection              | 1.78%             | 22   |
|                         | Proximity to MRT stations            | 9.97%             | 2    |
|                         | Proximity to highway interchanges    | 2.26%             | 21   |
| Geographical location   | Restaurant selection                 | 7.46%             | 4    |
|                         | Zoning                               | 3.54%             | 9    |
|                         | Recreational space                   | 2.67%             | 17   |
|                         | Public facilities                    | 2.84%             | 14   |
|                         | Business facilities                  | 2.83%             | 15   |
|                         | Dual power supply                    | 2.48%             | 18   |
|                         | Healthcare resources                 | 1.49%             | 23   |
|                         | Accommodation selection              | 1.78%             | 22   |
|                         | Proximity to MRT stations            | 9.97%             | 2    |
|                         | Proximity to highway interchanges    | 2.26%             | 21   |
| Nearby facilities       | Parking space                        | 4.03%             | 8    |
|                         | Public transportation                | 6.29%             | 5    |
|                         | Road connection to major networks    | 3.12%             | 12   |
|                         | Renowned landmark                    | 7.65%             | 3    |
|                         | Green building and smart building    | 2.92%             | 13   |
| Transportation convenience | Parking space                      | 4.03%             | 8    |
|                         | Public transportation                | 6.29%             | 5    |
|                         | Road connection to major networks    | 3.12%             | 12   |
| Image                   | Renowned landmark                    | 7.65%             | 3    |
|                         | Green building and smart building    | 2.92%             | 13   |
|                         | Friendly neighbors                   | 4.98%             | 7    |
|                         | Social image                         | 2.38%             | 19   |
|                         | Adequate property management         | 5.88%             | 6    |

4. Conclusions

Conventional approaches for determining office building rent have overlooked the habits and intentions of tenants, resulting in a large gap between landlords and tenants regarding the lease rate, and tenants usually need to spend a considerable amount of time persuading landlords to reduce their rent. However, the occupancy rate of rented offices in Taipei 101, which was once the tallest building in the world and has received the Leadership in Energy and Environmental Design platinum certification, has continued to increase each year. In-depth analysis in this study indicated that the rental strategies adopted by Taipei 101 differ from those of other office buildings. In line with the egg theory proposed by Kostolany [14], the strategies of Taipei 101 involve regularly observing changes in market demand and supply and adjusting rent on an irregular basis. This supports its ability to meet the needs of tenants; hence, the occupancy rate of Taipei 101 remains high.

Analysis of the data collected from the expert questionnaire revealed that of the factors affecting office building rent, the main business district indicator in the geographical location construct is most crucial, followed by proximity to MRT stations, being a renowned landmark, and restaurant selection. By contrast, hardware-related indicators such as building materials and business facilities, which are
considered essential factors in conventional rental strategies, are actually not as crucial as other indicators. This analysis result accorded with the conclusion reached by the experts in this study. This study discovered that because of the flourishing economic activity in the main business district, enterprises are more willing to accept high rent for office buildings in this area; hence, this consideration becomes the primary factor affecting office building rent. In addition, increasing awareness of employee benefits also increases the importance of factors such as transportation convenience, restaurant selection, and environmental safety.

In response to the changes in the overall economic trend and business district scale, how to prevent subjective factors from affecting rental strategies is a problem to be resolved by landlords. By using evaluative indicators that are reasonable and logical, landlords can devise rental strategies in line with market needs, thereby achieving their operational goals and generating maximal profits within the shortest period of time.

References
[1] Hekman JS 1985 Real Estate Econ. 13 32-47
[2] Jin Z and Yanhong D 2013 Journal of Puyang Vocational and Technical College 26
[3] Hartman A 1981 Educ. Leadersh. 38(6) 495-497
[4] Alonso W 1960 Big rent function theory
[5] Huang MY and Chang CO 2005 Manage. Rev. 24(4)
[6] Holloway S and Wheeler J 1991 Econ. Geogr. 47(1) 55-72
[7] Lin YY 2006 Real-estate appraisal Q&A (Taipei: Wensheng Book Store)
[8] Glindro ET, Subhanij T, Szeto J and Zhu H 2011 Int. J. Cent. Bank. 7(3) 163-204
[9] Cheng-Yao J 2018 A Study of the Interactions between Taipei Office Submarkets
[10] Eichholtz, P and Quigley JM 2012 Europ. Econ. Rev. 56(5) 903-904
[11] Khorramshahgol R and Moustakis VS 1988 Eur. J. Oper. Res. 37 347-354
[12] Saaty TL 1990 Eur. J. Oper. Res. 48(1), 9-21
[13] Yang DJ, Chen Y and Yeh CL 2005 J. Public Aff. Rev. 6(1) 76-110
[14] Kostolany A 1906-1999 Egg theory