Research of judgment of facility investment based on evaluating office quality by AHP.

Seiji Usui, Kazuaki Shirane
Data Ware Center
Yamatake Building Systems Co., Ltd.
4-12-1, East-Shinagawa, Shinagawa-ku, Tokyo 108-0023 JAPAN
usui-seiji@ybs.yamatake.co.jp

Eizo Kinoshita
Faculty of Urban Science, Meijo University
4-3-3, Nijigaoka, Kani, GIFU 509-0261 JAPAN
kinoshit@urban.meijo-u.ac.jp

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Summary*: Business administrators are worried how much the amount of facility investment of a branch is suitable. It can be said that it is very important to maintain the balance of facility investment, office quality and amount sold. It can be grasped which the bad item is facility investment, office quality or amount sold in each branch by calculating the suitable balance of them. And, it is possible the branch reaches the suitable state by solving the problem. It is thought that the office quality of the enterprise can be evaluated quantitatively by AHP. The method of judging good office or bad one is explained.*

1. Introduction

Business administrators are worried how much the amount of facility investment of a branch office is suitable. It is very important for a facility manager to get big amount sold in the company operation by a little investment. As for an office quality obtained by investing, it pursued according to the type of business is different. Because the office quality doesn't improve if the amount of the facility investment is increased. So it is important to make that the office quality and the amount of the facility investment are best conditions. However, if amount sold don't rise even if the office quality is obtained by the best facility investment, it is not significant for the facility manager. It can be said that it is very important to maintain the balance of facility investment, office quality and amount sold.
In this article, I compared a branch office with the main office about a model office. I calculated balance of the office quality and the facility investment and amount sold. And I introduce the method because I extracted bad balances of branch offices of from the one of the main office.

2. Office quality

2.1 Subdivision of an office quality

The facility investment and amount sold are already evaluated, but office quality must evaluate. I subdivide it to evaluate the office quality.
I performed a questionnaire to a facility manager of the main office and the branches in the model office and evaluated the office quality.
At first I put up four items. They are convenience of location, convenience of facility, comfort, reliability and safety. Next, I put up concrete items. Numerical value rises if I satisfy these items, and office quality rises. I show items of office quality for table1.

Table 1 Items of office quality

Convenience of location	Convenience of facility	Comfort	Reliability and Safety
Distance from station	Service facilities in building	Surroundings around office	State of approach from station
Distance from airport	Office Automation floor	Ceiling amount	Years since construction
Comprehensible address	Capacity of electricity	Illumination of common aria	Earthquake-proof system
Parking in site	Use on weekend and holiday	Right or wrong of individual air-conditioning	Security
Area of standard floor	Communication equipment and Optical fiber	Rest room	Function maintenance in emergency
Shape of standard floor	Correspondence for 24 hours	Smoking room	Surveillance camera
Scale of entire area	Waiting time of elevator	Entrance	
Value of status symbol	Elevator for load	Communication situation of cellular phone	
	Vending machine		
	Facility of cold water and warm water		

2.2 Evaluated office quality

It is evaluated quality of an office. I performed a questionnaire to a facility manager. I show the result for table2. They are evaluated with four phases. If these values become big, quality rises.

Table 2 The result of questionnaire

	Convenience of location								Convenience of facility									Comfort								Reliability and Safety					
	Distance from station	Distance from airport	Comprehensible address	Parking in site	Area of standard floor	Shape of standard floor	Scale of entire area	Value of status symbol	Service facilities in building	Office Automation floor	Capacity of electricity	Use on weekend and holiday	Communication equipment and Optical fiber	Correspondence for 24 hours	Waiting time of elevator	Elevator for load	Vending machine	Facility of cold water and warm water	Surroundings around office	Ceiling amount	Illumination of common aria	Right or wrong of individual air-conditioning	Rest room	Smoking room	Entrance	Communication situation of cellular phone	State of approach from station	Years since construction	Earthquake-proof system	Security	Function maintenance in emergency	Surveillance camera
Tokyo main	3	3	3	4	4	4	4	2	2	4	3	4	4	4	3	3	4	4	3	4	3	4	4	4	4	2	4	4	4	3	3	3
Hokkaido branch	4	1	3	4	2	3	2	2	1	2	4	4	3	4	4	3	2	4	4	2	3	2	4	2	3	3	4	2	3	1	3	3
Tohoku branch	4	1	4	4	2	4	2	2	1	4	4	4	4	4	4	4	4	4	4	4	3	4	4	3	4	4	4	3	4	3	4	4
Northern Kanto branch	4	2	4	4	4	4	4	3	3	4	4	4	4	4	4	4	4	4	4	4	4	2	4	2	4	2	4	4	4	2	3	4
Ibaraki branch	4	1	4	2	3	3	2	2	1	2	4	4	3	4	3	4	2	4	4	4	3	4	4	4	4	3	4	4	4	3	3	3
Eastern Kanto branch	2	1	3	4	2	3	1	1	1	3	3	4	2	4	4	3	2	3	2	3	2	4	2	2	3	4	2	2	4	2	2	3
Yokohama branch	3	1	4	4	4	4	4	4	3	4	4	4	4	4	3	4	4	4	4	3	3	2	4	4	4	4	4	3	4	3	4	3
Nagoya branch	3	2	1	3	3	4	3	2	1	4	4	4	2	4	4	2	4	3	2	4	3	4	4	3	4	4	4	2	4	2	3	3
Osaka branch	2	2	3	4	3	4	3	2	2	4	4	4	4	4	3	4	4	4	4	4	4	4	4	4	4	3	4	3	4	3	2	3
Shikoku branch	4	1	4	4	2	3	4	2	3	4	4	4	3	4	1	3	2	3	3	3	3	4	4	3	3	4	4	4	4	2	2	3
Chugoku branch	2	2	3	4	1	4	2	1	1	1	2	4	2	3	1	2	2	3	2	2	3	1	2	2	1	4	1	2	2	1	3	3
Kyushu branch	2	3	4	3	2	4	4	3	3	3	4	4	4	4	4	3	4	3	2	4	4	3	4	2	2	3	4	3	4	1	4	3
Average	3.1	1.7	3.3	3.7	2.7	3.7	2.9	2.2	1.8	3.3	3.7	4.0	3.3	3.9	3.2	3.3	3.2	3.6	3.2	3.4	3.2	3.2	3.7	2.9	3.3	3.3	3.6	3.0	3.8	2.2	3.0	3.2

2.3 Intention investigation of a facility manager

I was able to evaluate office quality. However, by a type of company industry, importance of each item changes.
Therefore, I have to investigate it for a facility manager which items are important. A questionnaire of intention investigation reached this time, too. I show a result for table 3. A result evaluates it with five phases. If numerical value becomes big, importance rises.
As for the average, the upper section is the mean of a small item, and the lower berth is the mean of a large item. "4.6" in the left of the upper section are the means of " Distance from station ". In addition, "4.03" in the left of the lower berth become the mean of " Convenience of location ".

Table 3 The result of intention investigation

	Convenience of location								Convenience of facility									Comfort							Reliability and Safety					
	Distance from station	Distance from airport	Comprehensible address	Parking in site	Area of standard floor	Shape of standard floor	Scale of entire area	Value of status symbol	Service facilities in building	Office Automation floor	Capacity of electricity	Use on weekend and holiday	Communication equipment and Optical fiber	Correspondence for 24 hours	Waiting time of elevator	Elevator for load	Vending machine	Facility of cold water and warm water	Surroundings around office	Ceiling amount	Illumination of common aria	Right or wrong of individual air-conditioning	Rest room	Smoking room	Entrance	Communication situation of cellular phone	State of approach from station	Years since construction	Earthquake-proof system	Security	Function maintenance in emergency	Surveillance camera
Tokyo headquarters	5	5	4	5	4	4	4	4	4	5	5	5	5	5	4	4	4	5	4	4	4	5	4	4	4	5	4	4	5	5	5	4
Hokkaido branch	5	4	3	5	5	5	4	3	3	4	5	5	4	4	4	4	3	4	4	4	3	4	3	3	3	4	4	4	5	5	4	4
Tohoku branch	5	1	4	5					1	4	4	5	3	5	2	2	2	3	3	3	2	3	3	5	2	4	3		5	5	3	4
Northern Kanto branch	5	5	4	5	5	4	5	3	4	5	5	5	5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	5	5	5	4
Ibaraki branch	4	2	4	5	4	5	4	3	4	4	5	5	4	5	4	5	3	4	3	4	4	5	5	4	3	4	4	4	5	4	5	4
Eastern Kanto branch	4	1	2	1					2	5	5	3	5	3	4	4	3	2	4	3	3	5	4	2	4	5	4		5	5	5	5
Yokohama branch	5	2	4	5	4	5	4	4	4	5	5	5	5	5	4	5	4	4	5	4	4	5	4	5	4	5	4	5	5	5	5	4
Nagoya branch	4	4	4	5	4	4	5	2	1	5	5	5	5	5	5	2	5	4	4	4	4	5	5	5	5	5	5	4	5	4	4	5
Osaka branch	5	4	4	5	5	5	5	4	4	5	5	5	5	5	4	4	5	5	5	5	5	5	4	4	4	5	5	4	5	5	5	5
Shikoku branch	5	4	4	5	5	4	3	4	4	5	5	5	4	5	4	4	3	3	4	4	3	4	4	4	3	4	4	3	5	5	4	4
Chugoku branch	4	5	2	1					2	5	5	2	5	4	5	4	1	2	2	3	1	5	4	4	4	1	4		2	4	4	3
Kyushu branch	4	4	4	4	4	4	4	3	4	4	5	5	5	5	4	4	3	3	4	4	4	4	5	4	4	4	4	4	5	4	4	4
Average	4.6	3.4	3.6	4.3	4.4	4.4	4.2	3.3	3.1	4.7	4.9	4.6	4.6	4.6	4.0	3.8	3.3	3.6	3.8	3.8	3.4	4.5	4.1	4.0	3.7	4.2	4.1	4.0	4.8	4.7	4.4	4.2
	4.03								4.12										3.94								4.35					

2.4 Calculation of importance of office quality.

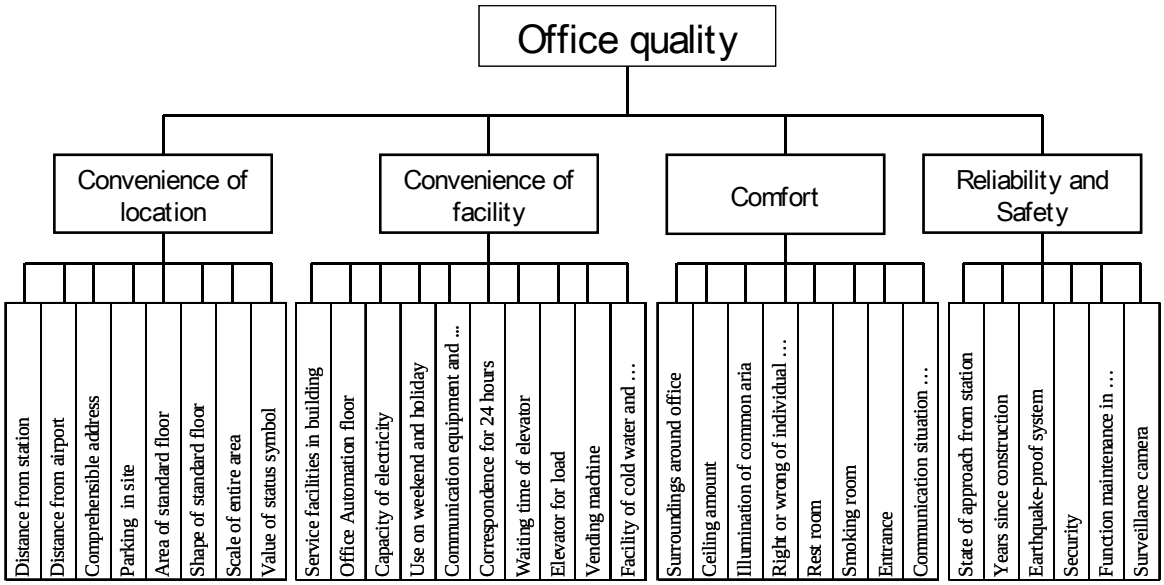
2.4.1 The use of AHP.

I have to calculate importance of office quality for the facility manager. It is very easy if I assume values of the result of table 3 to be importance of office quality.
However, I cannot let reflect which the facility manager makes much of among large items of office quality. Furthermore, a mistake is reflected when one of the managers made a wrong decision. But it can be settled by using AHP. AHP was used for decision, but I use importance calculated by a process to calculate there.

2.4.2 Making of the layered structure.

I show the layered structure of office quality for figure 4.

Figure 4 the layered structure of office quality



2.4.3 Important standard.

When I use AHP, I perform pair comparison and must decide important standard. I calculate the value that divide small value by big one comparing a pair on a result of table 3. I decide standard importance about table 5. Of course big value is important. For example, I perform pair comparison of "Convenience of location" and "Convenience of facility". "Convenience of location" is 4.03 on table 3. And "Convenience of facility" is 4.12. It is below to divide "Convenience of location" by "Convenience of facility".

4.03/4.12 = 0.978

The important standard is equal on table 5..

Table 5 The important standard.

Equal	Under 0.75
Weakling	More than 0.75 under 0.80
Strong	More than 0.80 under 0.90
Very strong	More than 0.90 under 0.95
Absolute	More than 0.95

The pair matrix of the evaluation standard is below and show for table 6.

Table 5 The pair matrix.

	Location	Facility	Comfort	Reliability and Safety
Convenience of location	1	1	1	1/3
Convenience of facility	1	1	1	1/3
Comfort	1	1	1	1/3
Reliability and Safety	3	3	3	1

2.4.4 Result

I perform a similar calculation about alternatives. The office quality finally follows as table 6.

Table 6 The office quality.

Distance from station	0.041	Surroundings around office	0.012
Distance from airport	0.004	Ceiling amount	0.012
Comprehensible address	0.006	Illumination of common aria	0.004
Parking in site	0.023	Right or wrong of individual …	0.059
Area of standard floor	0.033	Rest room	0.027
Shape of standard floor	0.033	Smoking room	0.018
Scale of entire area	0.023	Entrance	0.009
Value of status symbol	0.003	Communication situation …	0.027
Service facilities in building	0.002	State of approach from station	0.030
Office Automation floor	0.024	Years since construction	0.030
Capacity of electricity	0.046	Earthquake-proof system	0.167
Use on weekend and holiday	0.024	Security	0.167
Communication equipment and ...	0.024	Function maintenance in …	0.076
Correspondence for 24 hours	0.024	Surveillance camera	0.030
Waiting time of elevator	0.008		
Elevator for load	0.007		
Vending machine	0.003		
Facility of cold water and …	0.004		

3. Main office is compared branch offices

3.1 About facility investment, office quality and amount sold

I show facility investment, office quality and amount sold for figure 4. The facility investment and amount sold use a value as is. The office quality is demanded by multiplying a value of table 2 by a value of table 6. I show facility investment, office quality and amount sold for table 7. And I did a normalization about each item.

Table 7 Facility investment, office quality and amount sold(normalization).

	Office quality	Facility investment	Amount sold
Tokyo main	0.097	0.113	0.120
Hokkaido branch	0.065	0.052	0.046
Tohoku branch	0.101	0.071	0.036
Northern Kanto branch	0.091	0.106	0.073
Ibaraki branch	0.093	0.090	0.153
Eastern Kanto branch	0.069	0.059	0.111
Yokohama branch	0.099	0.182	0.137
Nagoya branch	0.085	0.071	0.086
Osaka branch	0.096	0.069	0.088
Shikoku branch	0.086	0.051	0.043
Chugoku branch	0.039	0.054	0.046
Kyushu branch	0.079	0.083	0.062

3.2 The balance of facility investment, office quality and amount sold.

3.2.1 Compose facility investment and amount sold.

I have to make a comparison object two because it is difficult to calculate balance of three items. And I compose facility investment and amount sold. It is demanded dividing amount sold by facility investment.
It is efficiency of facility investment for amount sold.
I show result dividing amount sold by facility investment for table 8. And I did a normalization about it.

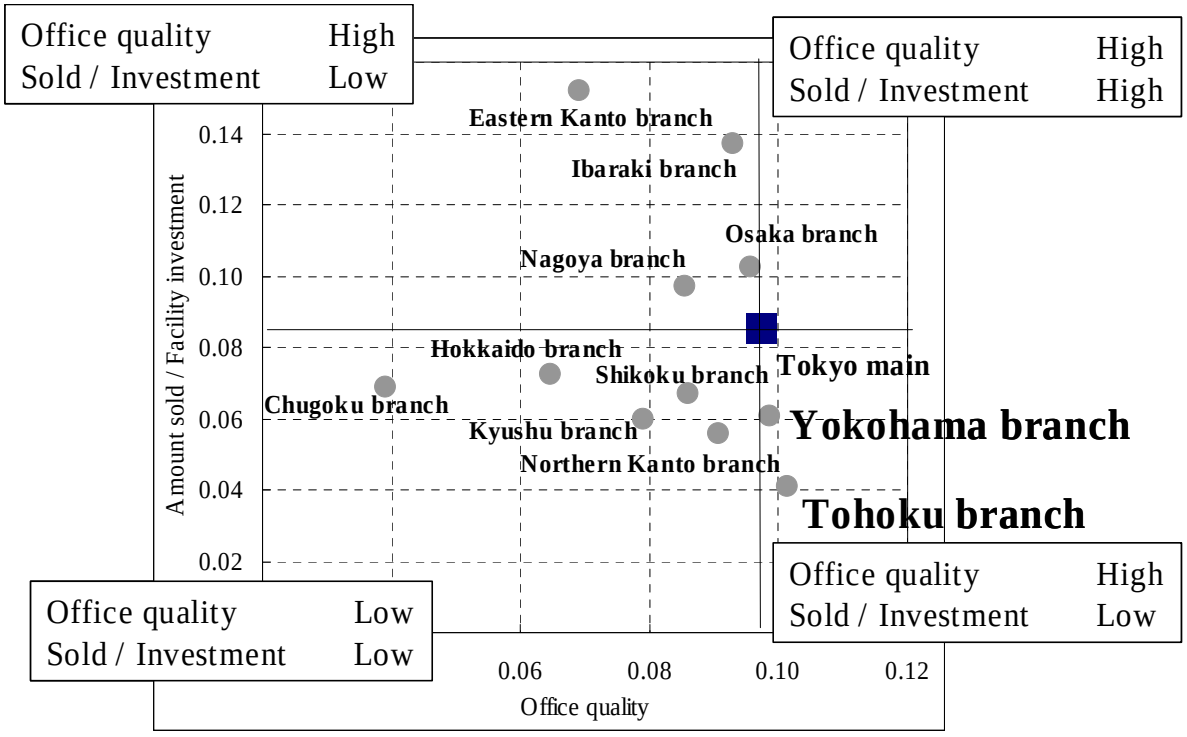
Table 7 Dividing amount sold by facility investment (normalization).

	Amount sold / Facility investment
Tokyo main	0.086
Hokkaido branch	0.072
Tohoku branch	0.041
Northern Kanto branch	0.056
Ibaraki branch	0.137
Eastern Kanto branch	0.152
Yokohama branch	0.061
Nagoya branch	0.097
Osaka branch	0.103
Shikoku branch	0.067
Chugoku branch	0.069
Kyushu branch	0.060

3.2.2 Extraction of a bad balance office.

It is shown the balance of office quality and amount sold / facility investment in a correlative figure for extracting a bad balance office. I show the a correlative figure for figure 9.
If office quality of the branch is higher than one of the main and amount sold / facility investment of the branch is lower than one of the main, the branch is a bad balance office.
Therefore, bad offices are Yokohama branch and Tohoku branch.

Table 8 Correlative figure(Office quality and Amount sold / Facility investment)



4. Conclusion

In this paper, The method of judging good office or bad one is explained. It was calculated by the balance of facility investment, office quality and amount sold. However, it is a problem to evaluate office quality. So I used AHP to evaluate office quality.

Because office quality was evaluated, a bad balance of facility investment, office quality and amount sold was able to extracted.

An extracted branches can make balance better by lowering facility investment. But this case, office quality decrease. Because a main investment is wage charges, a facility manager may think about a move to a place of cheap wage charges.

Because office quality decreased in this case,. it will be a problem that consider office quality and relations of amount sold in future.

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