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Research Article

Monitoring and Warning System for Information Technology (IT) Outsource Risk in Commercial Banks Based on Nested Theory of Excel Logical Function

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Abstract: Due to high dependence of modern financial institutions on Information Technology (IT), IT outsource service of commercial banks tends to have explosive growth, followed by outsource risk, one of major risks that commercial bank facing. Through identifying IT outsource risk points of commercial banks, this study establishes index system of IT outsource risk consisting three kinds of classifications, based on which, monitoring and warning system of outsource risk are founded via Excel logical function and banks are selected as examples to carry out real operations. Besides, relevant strategies and advice for IT outsource risk monitoring are proposed to offer new ideas and approaches for management of IT outsource risk in commercial bank.

Keywords: Excel logical function, IT outsource, monitoring and warning, risk management

INTRODUCTION

In recent years, to enhance self-competitiveness, commercial banks hand over more and more non-main businesses to IT facilitators to reduce self-operative cost by professional skills and improve IT project management (Bao, 2013). However, IT outsource faces certain risks; for example, banks are likely to lose competitive advantages due to wrong choice of IT service contractor and improper management. As a result, several problems will occur, such as disability of bank science and technology, service interruption, information disclosure and service level decline (China Banking Regulatory Commission, 2013), which has severe impact on commercial bank development and seriously threatens market stability. That is why risk identification, analysis, evaluation and control of bank IT outsource appear to be of great importance.

Pointing at outsource risk and management, Zheng (2012) generalized 8 risk points, namely credit risk, strategy risk, fame risk, dependence risk, collection risk, information security risk, contract implement risk and operative risk. According to those risks, related controls in details were come upon. Besides, Yue (2013) explained financial service outsource risks and concluded six steps for financial service outsource, including core-competitiveness analysis, choice of best outsource project, outsource demand establishment, contractor evaluation, award of contract, project implement and termination of contract, which is in demand of risk management.

Referring to existing literature, most researches were limited in outsource risk recognition and control, instead of systematic studies on framework establishment of outsource risk management through quantitative analysis (Qin and Feng, 2013). Therefore, this study identifies outsource risks in commercial banks to build indexes of outsource containing four kinds of classifications. Having adopted Excel logical function, this study founds monitoring and warning system of outsources risks, with the expectation to offer ideas and ways for IT outsource risk management of commercial banks.

IDENTIFICATION OF IT OUTSOURCE RISK IN COMMERCIAL BANKS AND ESTABLISHMENT OF RISK INDEX

Identification of IT outsource risk in commercial banks: In the view of outsource business flow, four kinds of IT outsource risks are concluded like outsource contract risk, outsource purchase risk, outsource cooperation risk and the third suppler risk.

Establishment of commercial bank IT outsource risk index: To evaluate and monitor risk points in an effective way, what comes first is the accurate establishment of risk indexes with high activity. On the basis of accuracy, applicability and metrizability, the paper confirms risk indexes according to risks mentioned above, among which, 5 indexes are for contract risk, 4 for purchase risk, 7 for cooperative risk and 1 for the third suppler risk. Please refer to Table 1.

Classification of commercial bank IT outsource risk index: According to different natures, risk index can be

Table 1: Dynamic monitoring and warning of commercial bank IT outsource risk indexes

Level-one index	Level-two index	Level-three qualitative index	Level-three quantitative index	Weight (%)	Type-I
IT outsource management	Risk of outsource contract	IT outsource contract is not passed through IT risk management department.	Statics	5.110	Management
			Dynamics	5.110	defect
		Operative risks related to outsource monitored and controlled by bank are not confirmed in outsource contract.	Statics	4.070	Management
			Dynamics	4.070	defect
		Security responsibility of and requirement for outsource companies are not confirmed in outsource contracts.	Statics	7.330	Management
			Dynamics	7.330	defect
		Contract variance of outsource companies is not fully considered.	Statics	3.080	Management
			Dynamics	3.080	defect
		Vital information is let out and distorted without secrecy agreement from outsource staffs.	Statics	7.330	Management
			Dynamics	7.330	defect
	Risk of outsource purchase	Outsource does not match institution structure, report line, business strategy and overall risk control of commercial bank.	Statics	7.020	Management
			Dynamics	7.020	defect
		Evaluation of key IT outsource risks does not carried out regularly with report of outsource activities.	Statics	7.020	Management
			Dynamics	7.020	defect
		Detailed evaluation on financial stability and technological experience of outsource companies does not complemented.	Statics	7.020	Management
			Dynamics	7.020	defect
		Risk of the same outsources company for several banks are not taken into consideration.	Statics	5.850	Management
			Dynamics	5.850	defect
	Risk of outsource cooperation	Outsource services do not reach expected level.	Statics	2.380	Management
			Dynamics	2.380	defect
		Outsource contract cannot be carried on because of great financial and staff loss of outsource companies.	Statics	3.950	Management
			Dynamics	3.955	defect
		Intellectual property disputes occur to both sides.	Statics	1.110	Management
			Dynamics	1.110	defect
		Important information is obtained by outsource staffs who are not effectively monitored and controlled.	Statics	4.830	Human factor
			Dynamics	4.830	
		Information got by outsources staffs for work demand is not destroyed after the end of contract.	Statics	5.760	Human factor
			Dynamics	5.760	
		Backdoor and malicious software created by outsource staffs during software development are not detected.	Statics	5.760	Human factor
			Dynamics	5.760	
		IT service outsource emergence is not effectively prevented and controlled without contingency plan.	Statics	3.130	Management
			Dynamics	3.130	defect
	Risk of third suppler	Outsource facilitators are unable to ensure outsource service-related measurements once the third suppler comes across problems.	Statics	19.230	Management
			Dynamics	19.230	defect
Overall outsource risk			Statics		
			Dynamics		

Level-one index	Type-II	Real value (Yuan)	Acceptance value (Yuan)	Warning
IT outsource management	Yes or no	1	1	No
		1	1	
	Yes or no	1	1	No
		1	1	
	Yes or no	1	1	No
		1	1	
	Value	30000	100000	Slight
		50000	100000	
	Value	0	100000	No
		0	100000	
	Yes or no	1	1	No
		1	1	
	Value	1	1	No
		3	4	Moderate
	Value	20000	100000	Slight
		20000	100000	

Table 1: Continue

Level-one index	Type-II	Real value (Yuan)	Acceptance value (Yuan)	Warning
	Value	0	100000	No
		0	100000	
	Value	0	100000	No
		0	100000	
	Value	0	100000	No
		0	100000	
	Yes or no	0	0	No
		0	0	
	Value	0	100000	No
		0	100000	
	Value	100%	100%	No
		100%	100%	
	Value	0	100000	No
		0	100000	
	Yes or no	1	1	No
		1	1	
	Value	0	100000	No
		0	100000	
Overall outsource risk		Normalization processing: 0.37	Normalization processing: 1	No
		Normalization processing: 0.41	Normalization processing: 1	No

classified with multi-angle, helping monitor outsource risks in a comprehensive and accurate way. As in study, risk index is typed from three aspects.

Qualitative index and quantitative index: In Table 1, qualitative index has visual statement of risk behavior characteristics, while quantitative index is able to present risk levels under abnormal circumstance by exact values, whose combination is supposed to comprehensively and accurately confirm risk points.

"If-type" index and "value-type" index: To measure and control 17 risk points involved in commercial bank IT outsource, accurate quantization and monitoring are necessary. For one thing, once indexes are divided into "occurrence" and "non-occurrence", they are named "if-type" indexes which are valued "1" for "yes" and "0" for "no". For another thing, when an index stays with "occurrence", its order of severity influences risk degree, which is regarded as "value-type" index. Based on a algorithm, the index is turned into number values between 0 and 1.

Static index and dynamic index: Static index and dynamic index are determined by the monitoring cycle, among which the former, its cycle lasts for a month when abnormal changes of a quantitative index value are observed and with a one-year cycle, the later records index changes, which is the basis to judge risk occurrence probability.

DETECTION AND WARNING OF IT OUTSOURCE RISK IN COMMERCIAL BANK

If risk identification and risk index system are decided, it is able to further build monitoring and warning system of IT outsource risk, which can warn commercial banks before risk occurrence to take relevant measurements.

Constitution of monitoring and warning system for IT outsource risks in commercial bank: Warning system in the study is basically divided into four steps, i.e., construction of risk index system, confirmation of risk warning level, dynamic data processing and warning outcome processing, which is presented in Fig. 1.

Operating mechanism of monitoring and warning system for IT outsource risks in commercial bank: If the monitoring and warning system for IT outsources risks wants to operate with high activity, three conditions need to be guaranteed firstly, namely reasonable risk index, accurate index threshold and reasonable risk level (Wang, 2013). In Table 2, according to different index values, risks in this study include no warning, slight warning, moderate warning, serious warning, extremely serious warning and super serious warning.

Application of monitoring and warning system for IT outsource risks in commercial bank: After selecting several commercial banks as examples, this study puts the monitoring and warning system into practice to test its operability and practicability.

To begin with, skilled personnel from case commercial banks process real values of level-three static indexes and acceptance values of dynamic indexes. Secondly, based on proportion with acceptance values, real values adopt normalization processing to make the results limit between 0 and 1 and ensure warning areas for all indexes. Thirdly, monitoring and

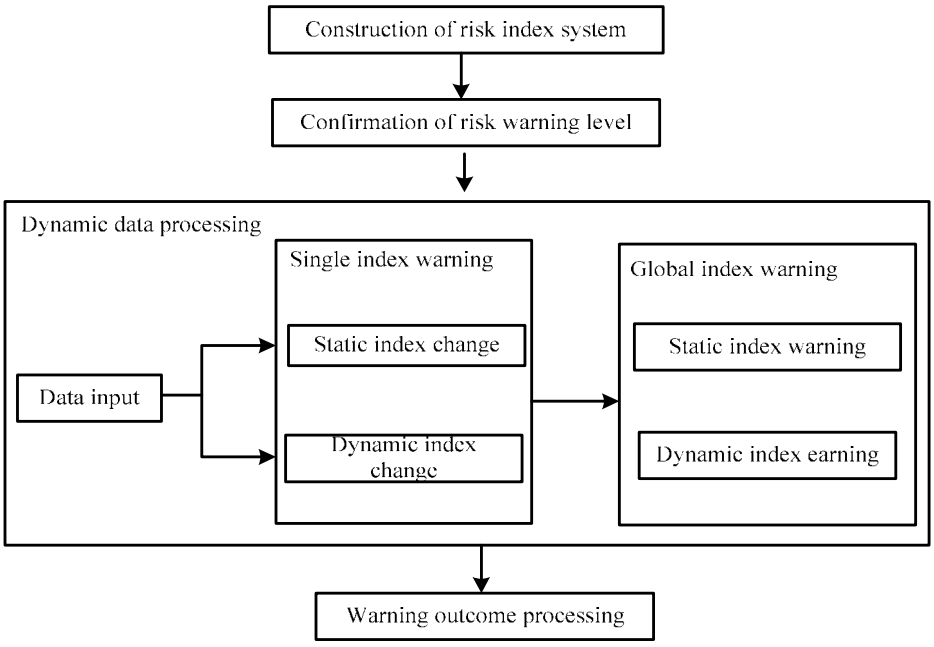

Fig. 1: Monitoring and warning system of IT outsource risk in commercial bank

Table 2: Warning criteria of value index

Warning level	Loss value	Risk description
Super serious warning	More than 100% or a million (RMB) overall outsource capital	High risk
Extremely serious warning	50-100% or half million to a million (RMB) overall outsource capital	Higher risk
Serious warning	30-50% or three-hundred thousand to half million (RMB) overall outsource capital	Moderate risk
Moderate warning	10-30% or one-hundred thousand to three-hundred thousand (RMB) overall outsource capital	Lower risk
Slight warning	0-10% or zero to one-hundred thousand (RMB) overall outsource capital	Low risk
No	0	No

Table 3: Warning criteria of "if-type" index

Occurrence	Warning level	Excel logical order
Yes (no)	No warning	= IF (Y = 0, serious warning, no warning)
No (yes)	Moderate warning in general (according to real situations)	

Table 4: Warning level of IT outsource risk

Warning level	Risks	Risk description
Super serious warning	More than 100% of acceptance value	Super high risk
Extremely serious warning	More than 50-100% of acceptance value	High risk
Serious warning	More than 30-50% of acceptance value	Higher risk
Moderate warning	More than 10-30% of acceptance value	Moderate risk
Slight warning	More than 0-10% of acceptance value	Low risk
No warning	Less than acceptance value	Without risk, basically

warning are carried out from two aspects. On one hand, warning areas indicate warning levels once single indexes monitored exceed security top-limit and suggest standard measurements to control risks, which are performed in Table 2 and 3. On the other hand, the whole index system is monitored to have weighed sum of real values and acceptance values, respectively. Besides, acceptance values are divided into six warning levels which are related to weighted sum of real values, based on which, risk management is implemented. Please refer to Table 4. The two aspects operate simultaneously; if an index is detected abnormal, single warning area and the whole warning area give the warning signs and present relevant levels, while the dynamic changes are realized by Excel logical function:

- Warning level is divided with different standards when single indexes are monitored.
  As for "if-type" indexes, its warning criteria and logical orders operate as follows.
  For instance, if operative risks related to outsource monitored and controlled by bank are confirmed in outsource contract (Table 1), the occurrence value will be "1" meaning "yes" and the warning area

Table 5: Array and weight calculation of primary IT risk point in commercial bank

	1	2	3	4	5	6	7	8	9	10	Product	Extract	Footing	Normalization
1	1	7/6	7/5	7/5	7/9	7/6	7/8	7/8	7/8	7/8	1.22	1.05	10.83	0.10
2	6/7	1	6/7	6/5	2/3	1	3/4	3/4	3/4	3/4	0.26	0.71	10.83	0.07
3	5/7	5/6	1	1	5/9	5/6	5/8	5/8	5/8	5/8	0.04	0.45	10.83	0.04
4	7/9	5/6	1	19/5	5/9	5/6	5/8	5/8	5/8	5/8	0.08	0.52	10.83	0.05
5	6/7	3/2	9/5	6/5	1	9/5	9/8	9/8	9/8	9/8	12.01	1.86	10.83	0.17
6	8/7	1	6/5	8/5	5/9	1	1/3	1/2	1/5	1/3	0.02	0.36	10.83	0.03
7	8/7	4/3	8/5	8/5	8/9	4/3	1	1	1	1	4.62	1.47	10.83	0.14
8	8/7	4/3	8/5	8/5	8/9	4/3	1	1	1	1	4.62	1.47	10.83	0.14
9	8/7	4/3	8/5	8/5	8/9	4/3	1	1	1	1	4.62	1.47	10.83	0.14
10	8/7	4/3	8/5	8/5	8/9	4/3	1	1	1	1	4.62	1.47	10.83	0.14

automatically shows "no warning". Otherwise, the value refers to "0" meaning "no" and "serious warning" shows up (specific level is affected by index risks).

When it comes to "value-type" indexes, their major task is loss measurement, whose warning criteria refers to overall capital as presented in Table 3. The following is the logical order.

Take "increased cost without the consideration of outsource contract variance" (Table 1) as the example; presuming that overall capital for latest outsource project is 1.2 million (RMB), Excel function makes the warning area present "slight warning" once occurrence value reaches 30 thousand (RMB). But if the occurrence value is 0, "no warning" will be the hint.

Speaking from real operation of bank outsource, "increased cost without the consideration of outsource contract variance" are found to have static and dynamic index loss belonging to slight warning, so do "extra cost and loss caused by financial situations and technology defects of outsource companies". In addition, dynamic indexes for "evaluation frequency of IT outsource risks in the implement of outsource contract" do not get 4 (the standard value), which means "moderate warning". Besides that, rest indexes are found to be "no warning". This tells that outsource contract, financial and technological situations of contractor and timely evaluation of risks should be paid attention to because potential risks are detected in IT outsource of commercial banks.

- Warning levels of the whole index system are determined by each index's weighted sum whose expression is performed as formula (1):

$$\text{Real value of outsource risk} = \sum_{i=1}^{n} k_i\, x_i + \sum_{j=1}^{m} k_j\, y_j \,/\, y'_j \quad (1)$$

In above formula, k refers to weight of each index, x is for real value of "if-type" index, y for real value of "value-type" index, y' for acceptance value of "value-type" index, n for number of "if-type" index and m for number of "value-type" index:

$$\text{Real value of outsource risk (top-limit of security area)} = \sum_{i=1}^{n} k_i\, x'_i + \sum_{j=1}^{m} k_j \,/ y''_j \quad (2)$$

In formula (2), k means weight of each index, x' refers to acceptance value of "if-type" index, y'' presents acceptance value of "value-type" index taking normalization processing, n is for number of "if-type" index and m for number of "value-type" index.

Table 4 performs proportion and level statement of six warning levels (no warning, slight warning, moderate warning, serious warning, extremely serious warning and super serious warning) that are determined according to sliding scale of outsource acceptance value (top-limit of security areas).

- Calculation of index weight applies 1-9 proportion criteria and method of analytic hierarchy process (Deng *et al*., 2012). To be specific, this study borrows idea of 1-9 proportion criteria and method and scores (1-9) risk points in the same level in weight comparison, followed by normalization processing of product's fourth power of elements in each row of judgment matrix to obtain relative weights. What shown in Table 5 is judgment matrix and relative weight calculation of top-level risk points scored by IT workers and risk point determination can be found in "weight" of Table 1.
- Based on above statements, warning situation and overall risk value of each index, as presented in Table 1, can be maintained according to real values of 17 indexes in outsource risk index system. On the whole, warning level remains as "no warning" even with some risk hints, which is due to smaller weights, indicating higher risk levels measured by indexes. So once warning happens, it is likely to be severe warning, showing demand of attention to warning situations of single index. On the condition of abnormality occurrence to most indexes, changes of outsource risks exceed acceptance value (1) to reach 1.3 with prompt of "serious warning". If so, information department is required to take timely actions to figure out risk sources and control risks.

CONCLUSION AND RECOMMENDATIONS

Via warning system on account of Excel logical function, this study detected hidden risks in case banks, successfully completing effective monitoring and management of IT outsource risks, which fully proves

scientificity of technological method founded in the paper for detecting bank IT outsource risks.

While enjoying profits and convenience brought by IT outsource, commercial banks should focus on outsource risks that are supposed to be controlled with strategic consideration (Wang, 2011). Therefore, the paper proposes several effective advice for outsource risk management.

Improvement of outsource risk management: Since management defect results in outsource risk, banks are ought to set institutions for IT outsource risk management. With regular meetings, the institutions are made to report problems and potential risks occurring in IT outsource service (Yue and Lv, 2013).

Focus on risk warning of single risk index: Some indexes in determination of IT outsource risks occur with low probability, but cause huge damages once happen. So commercial banks need to consider single index changes besides whole risk index system.

Enhancement of warning area accuracy: Risk warning areas determined with past experience data witness certain deviations; thus to improve accuracy of warning areas, banks should have flexible monitoring, meaning to optimize and adjust warning areas in time according to relative indexes.

Choice of proper IT facilitator: Institutions of bank IT outsource risk management are supposed to evaluate cooperative facilitators whose financial and operative ability are analyzed for the demand satisfaction of bank current and future development (Wen *et al*., 2013).

To sum up, commercial banks should take outsource risk seriously and bring IT outsource risk management into comprehensive risk management system. Referring to research ideas in this study, banks can establish IT outsources risk management system in the view of risk management flow, to make risks under control to the greatest extent.

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