Preliminary Analysis for Risk Finding in Offshore Software Outsourcing from Vendor's Viewpoint

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Abstract. It is meaningful to investigate the know-how of experienced project managers on the side of vendors about the risk in offshore software outsourcing. A survey is conducted to find out the main risk factors from the vendor's viewpoint. The questions asked include background information of vendor and respondent, suggestions to the client, and evaluations on experienced offshore projects. In all, 131 respondents from 77 vendors evaluate 241 offshore software outsourcing projects upon 30 items. The background information about the respondents and the vendors is summarized first. The preliminary analysis on the characters and the achievements of experienced offshore projects is reported in this paper. Some conclusions are drawn at last.

1 Introduction

Offshore software outsourcing is defined as a situation where a company (client) contracts out all or part of its software development activities to another company (vendor) which locates in foreign country and provides agreed productions or services [1]. In the era of globalization and specialization, companies are continuously forced to reduce production costs so as to keep sustainable competitive strength. Outsourcing non-core activities to the third parties has become a universal tool, which helps companies to concentrate on their profit-generating activities [2-5]. The primary motivation of offshore software outsourcing is the low cost of software development work in developing countries such as India, China. The benefits of offshore software outsourcing also include compression of project development time, easy access to resource pool of highly experienced IT professionals, and so on [6,7]. The trend towards offshore software outsourcing has been growing steadily since the 1990s and now offshore software

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outsourcing is playing an increasingly important role in the information technology strategies of major corporations.

However, particular countries tend to have distinct working ways, which can prove problematic when attempting cross border collaboration. It is well known that there are inevitable risks in offshore software outsourcing due to the existence of cultural difference, opacity of software developments at the offshore site, insufficiency of control over development team, and so on. It becomes very important to take good use of offshore software outsourcing practitioners' knowledge and estimate the risk for offshore software outsourcing decision-makings [8-9].

We designed one kind of questionnaire delivered to experienced project managers on the side of clients to extract tacit know-how knowledge in 2006, applied conjoint analysis method on data of virtual projects to analyze the partial utilities and importance of risk factors, and carried out structural equation modeling method on data of real projects to detect the relations among risk factors. Based on the research results, we proposed an experimental risk estimation method and designed a risk diagnosis tool named RASOD for offshore software outsourcing [10-12].

It is also meaningful to investigate the risk factors and analyze their relations with development result of offshore software outsourcing project from the vendor's viewpoint. In 2007, we delivered another questionnaire to experienced project managers on the side of vendors to find out the risk knowledge about offshore software outsourcing, by which we hope to know the main risk factors together with their influence degree as preceding research. The remaining contents of this paper are organized as follows. The survey content is described in section 2. The background information about the respondents and the vendors is summarized in section 3. The preliminary analysis on the characters and achievements of experienced offshore projects is reported in section 4. Some discussions and conclusions are given at last.

Table 1. Background information and suggestions to the client

Part 1: Background Information about company (vendor)	
Q11	Name of the company
Q12	URL
Q13	Location of the company
Q14	Size of the company
Q15	Foundation years of the company
Q16	Business location of the company in Japan
Q17	Type of software the company is good at
Q18	Experience of orders from clients in countries other than Japan
Q19	Difference strategies of the company
Part 2: Background information about respondent	
Q21	Number of years of IT experience
Q22	Number of years of experience in current company
Q23	Number of involved offshore projects
Q24	Current position/role
Q25	Type of software projects being in charge of
Part 3: Suggestions to the client	
Q31	
Q32	
Q33	

2 Survey Content

In order to find out tacit knowledge about risks in offshore software outsourcing, we design the questionnaire delivered to experienced project managers of vendors on the base of academy-industry collaboration [10]. The questionnaire consists of five parts.

Table 2. Evaluation items for experienced offshore project

Part X: Evaluation of experienced offshore software outsourcing project (X=4,5)	
ID	**Characters of developed system**
QX01	Type of software(Customer application, Middleware, Embedded software)
QX02	Period of development
QX03	Order size
QX04	Times of receiving orders
QX05	Difficulty level of required technology
QX06	Type of development model required and of that desired in your view
QX07	Main appeal of your company to the client
QX08	**Share of development between client and vendor**
	Problems encountered in development
QX09	Was technology level of client higher than necessary, lower, or appropriate ?
QX10	How did you solve them when incomplete specifications or doubtful points existed ?
QX11	What was the biggest problem concerning miscommunication?
QX12	What was the biggest problem encountered during brief meetings?
QX13	Whether did you and the client expect long-term relationship?
QX14	What was the biggest geographic constraint?
QX15	Did you experience problems about development environment?
	Quality requirements for development work
QX16	Function requirements
QX17	Performance requirements
QX18	Efficiency requirements
	Development achievements and risks
QX19	Company image (including reliability) was improved
QX20	Company technology level (including specialist education) was improved
QX21	New technology was acquired
QX22	Sale was increased
QX23	Profit was improved
QX24	Business knowledge (not technology knowledge) was acquired
QX25	Influenced by the change of exchange rate
QX26	Was the client concerned by brain drain in the vendor
QX27	Did brain drain happen in developing period
QX28	How much was the change of the specification
QX29	How much was the change of schedule/period
	Development result of the project
QX30	Please evaluate the development result of the project

Table 3. Inquiring items about sharing of development between client and vendor

No.	Development Stage	Development Process
1	Requirements Analysis	Business Planning or Product Planning
2		Requirements Analysis
3		Development of Requirements Specification
4		Requirements Specification Review
5	Architecture Design	Architecture Design
6		Architecture Design Review
7		Architecture Implementation
8		Architecture Implementation Inspection
9	Framework Design	Framework Design
10		Framework Design Review
11		Framework Implementation
12		Framework Implementation Inspection
13	Component/Module Design	Component/Module Design
14		Component/Module Implementation/Construction
15		Component/Module Implementation Inspection
16	Testing Design	Test Case Development
17		Component/Module Unit Testing
18		Integration Testing
19		Functional Testing
20		System Testing
21		Acceptance Testing (Validation)

The first three parts are used to inquire background information about the respondents and their companies, the contents of which are listed in Table 1. The first part is about the background information of the vendor. Nine questions are prepared in this part. The questions, *company size*, *foundation years* and *company difference strategies*, are asked aiming at finding out whether there is relationship between the maturation degree of vendor and the development result of offshore projects. The second part is for the background information of the respondent. Five questions are asked in this part, which are used to check whether there is bias among the respondents in subsequent research. In the third part, the respondent is asked to put forward three suggestions to the client according to his experience, which may indicate his discontent toward the client.

The other two parts are for the evaluations of experienced offshore software outsourcing projects, which are the main parts of this survey. In the fourth part and the fifth part, the respondents are urged to think of two offshore software development projects they experienced and to evaluate a set of pre-defined items upon those projects. The same questions are asked in these two parts. If the respondent experienced only one offshore project, he/she could evaluate just that project. The inquiring items are divided into six sections roughly as shown in Table 2, which include *Characteristics of developed system*, *Share of development between client and vendor*, *Problems*

encountered in development, *Quality requirements for development work*, *Development achievements and risks*, and *Development result of the project*. In this paper, the inquired items in these two parts are analyzed together, so those items are expressed by the IDs with prefixed *QX*. To investigate how the client and the vendor share the development processes, twenty-one processes are selected to describe the software development activities as listed in Table 3. These twenty-one processes belong to five development stages including *Requirements Analysis*, *Architecture Design*, *Framework Design*, *Component/Module Design* and *Testing Design*. The respondent is asked to select the share status from *Actively participating*, *Occasionally participating* and *Un-participating* for the client and the vendor respectively. The maintenance process is not included here because this research concentrates on the development processes but not on the whole software cycles though the maintenance process also requires the joint activities between vendor and client.

3 Basic Survey Results

In April 2007, we carried out this survey with the support of the members of SSR (Joint Forum for Strategic Software Research). We adopt intentional sampling in order to assure the return rate though random sampling does not include bias. The questionnaire is written in three languages respectively, which are Japanese, Chinese and English. The answer sheet is designed in the form of EXCEL file and sent to the companies on the side of vendors by the members of SSR. The respondent can fill the electrical form directly and send it back by e-mail, or do it on printed sheet and send it back by FAX or mail. In nearly two months, 131 questionnaires sent back by email were received in total, which are from 77 companies on the side of vendors. The offshore software outsourcing projects in which the development result (QX30) was not evaluated are ignored. In the responses, there are 128 projects in the fourth part and 113 projects in the fifth part evaluated by the respondents. In all, 241 offshore software outsourcing projects are evaluated completely. The number and percentage of responses divided by country are listed in Table 4. Eighty-five percent of the respondents are from China. Only three respondents in India sent back the questionnaires. In the following part of this paper, an evaluated project is called a sample. That is to say, there are 241 samples for the risk analysis in the vendor's viewpoint in this research.

Table 4. Number of respondents, companies, and projects divided by countries

Country	Respondent		Company		Project	
	Number	Percentage	Number	Percentage	Number	Percentage
India	3	2	3	4	5	2
China	112	85	59	77	208	86
Vietnam	8	6	8	10	15	6
Other	8	6	7	9	13	5
Total	131	100	77	100	241	100

Firstly, let us describe the statistics of background information of 77 vendors. 54 vendors have staff in excess of 100. The foundation time of 54 vendors is over five years. 64 vendors have set up business locations in Japan. For 68 vendors, type of software that the vendor is good at is customer application software. 46 vendors have accepted orders from clients of countries other than Japan. For company difference strategies, the respondent is asked to sort four items according to their importance, which are low price, high quality, technology level and communication ability. It is shown that 45 vendors select *high quality* as the most important item and 44 vendors select *low price* as the last item. The detailed result is shown in Fig.1. It can be deduced that most clients use *high quality* as main standard for selecting the vendors.

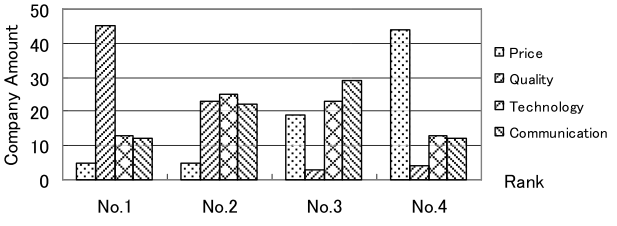

Fig. 1. Statistics for company difference strategies

Secondly, let us describe the statistics of background information of 131 respondents. 95 respondents have the IT experience of over 5 years. 88 respondents have worked in current company for over 3 years. There are 69 respondents who have taken part in over 10 offshore software outsourcing projects. 51 respondents are project managers and 30 respondents are project members. 108 respondents are in being charge of the development of customer application software. Among 131 respondents, 112 persons are from the companies of China.

As a response to the third part of questionnaire, 298 suggestions toward the clients are received from 111 respondents. 52 suggestions are about communications, which reflects that communication is both important and difficult. 42 are about the description of specification files and 31 suggestions are about requirement analysis.

4 Evaluations on Offshore Projects

4.1 Development Result of the Project

In the question QX30, the respondent is asked to evaluate the development result by selecting one from five choices including *Great Success*, *Success*, *Ordinary*, *Failure* and *Dead Failure*. Statistics of evaluations divided by country of vendors is shown in Table 5. The percentage of *Success* exceeds 70 percent and the percentage of *Ordinary* is 20 percent. Most of the answers are *Success* and *Ordinary* as expect that success rate would be very high. So the development achievements (QX19-QX24) are considered in order to evaluate the development project comprehensively.

Table 5. Statistics of development result divided by country

Development result	Total		China		India	
	Number	Percentage	Number	Percentage	Number	Percentage
Great Success	9	4	5	2	1	20
Success	175	73	158	76	3	60
Ordinary	49	20	41	20	0	0
Failure	5	2	3	1	1	20
Dead Failure	3	1	1	0	0	0
Total	241	100	208	100	5	100

Table 6. Statistics of software types

Software Type	Total		China		India	
	Number	Percentage	Number	Percentage	Number	Percentage
Customer Application	194	80	172	83	2	40
Middleware	16	7	12	6	1	20
Embedded Software	22	9	17	8	2	40
Other	9	4	7	3	0	0
Total	241	100	208	100	5	100

Table 7. Statistics of development result divided by software types

Development result	Customer application		Middleware		Embedded software	
	Number	Percentage	Number	Percentage	Number	Percentage
Great Success	7	4	2	13	0	0
Success	150	77	5	31	17	77
Ordinary	31	16	8	50	5	23
Failure	3	2	1	6	0	0
Dead Failure	3	2	0	0	0	0
Total	194	100	16	100	22	100

4.2 Characters of Developed System

Statistics of software type of the developed system is shown in Table 6. Eighty percent of the developed software systems belong to customer application software, which may be due to that a majority of questionnaires are from China. The development result divided by software types is shown in Table 7. Statistics of period and order size of development is shown in Fig.2 and Fig.3 respectively. The cross tables of development period/size and development results are shown in Table 8. For 134 projects the vendors have three or more contracts with the clients. For 86 projects, the respondents think that their companies have ability enough to accomplish the development though the technology level required is a little high. For 108 projects, the respondents think that technology level required is medium and company can finish the development easily.

Statistics of development models required and that adopted is shown in Fig.4. For the characters appealed by the client, the appreciated order of four items is *Quality*, *Technology level*, *Communication skill* and *Price*, which is the same as the order about the difference strategy of company.

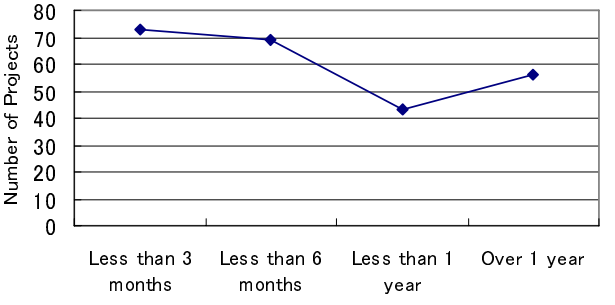

Fig. 2. Period of the development

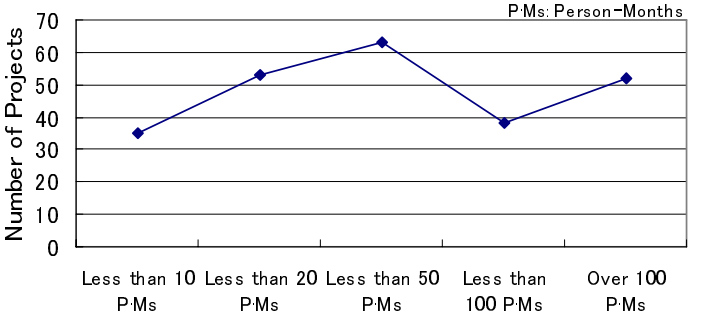

Fig. 3. Order size of the development

Table 8. Cross tables of period/size of projects and evaluation of the projects

	Period of development	**Great Success**	**Success**	**Ordinary**	**Failure**	**Dead Failure**
1	Less than 3 months	3	57	11	2	0
2	Less than 6 months	1	43	23	0	2
3	Less than 1 year	2	31	7	2	1
4	Over 1 year	3	44	8	1	0
	Size of order	**Great Success**	**Success**	**Ordinary**	**Failure**	**Dead Failure**
1	Less than 10 person-months	2	19	13	0	1
2	Less than 20 person-months	1	45	6	1	0
3	Less than 50 person-months	1	46	13	2	1
4	Less than 100 person-months	2	27	9	0	0
5	Over 100 person-months	3	38	8	2	1

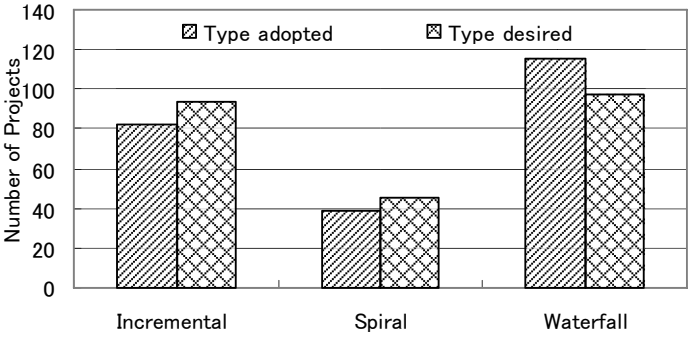

Fig. 4. Type of development models adopted and that desired

4.3 Share of Development Processes by Client and Vendor

The software development activities are divided into and described by twenty-one development processes. The respondents are asked how the vendor and the client participate in these process and to select one status from *Actively participating*, *Occasionally participating* and *Un-participating*. By the responses, we hope to know the effect of share of development processes on the development achievements. The number of projects in which the vendors and the clients think they are actively or occasionally participating in each of the processes is shown in Fig.5 and Fig.6 respectively. It is shown that the vendors actively participate in 7 processes from No.13 (Component/Module design) to No.19 (Functional Testing) and the clients actively participate in the other 14 processes.

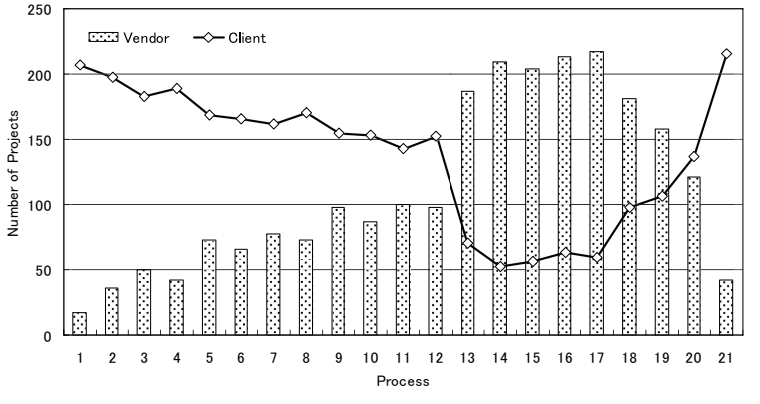

Fig. 5. Actively participated processes

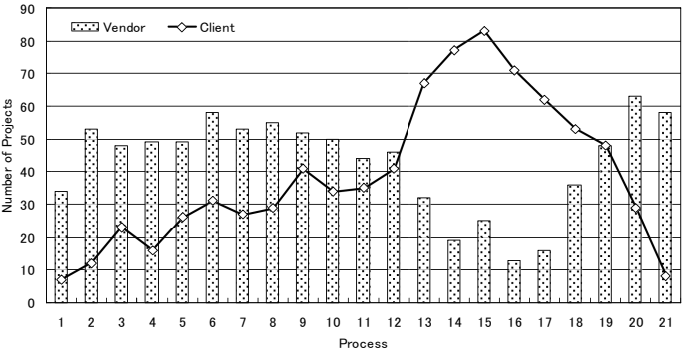

Fig. 6. Occasionally participated processes

4.4 Problems Encountered in Development

For the technology level of the client, in 77 samples the respondents think that there are problems in brief meetings though the level of client is high, and in 99 samples the respondents think that there are no problems. 173 samples show that those problems can be solved by brief meetings when specification is not complete or there are doubtful points. For issues not understood by each other, the respondents of 117 samples think that it takes much time on the documents with large amount and the respondents of 103 samples think that the problems occur because the statement of client is ambiguous, which is shown in Table 9. The respondents of 198 samples think that both client and vendor expect to keep long-term relationship, which is the same as the expectations. In 102 samples the respondents urge that face-to-face communicating besides that by telephone is necessary about physical environment, though in 95 samples it is reported that there are few problems. For issues about development environment it is shown that there are no problems.

Table 9. Main problems in understanding and brief meeting

Issue not understood by each other		**Number**
1	Requiring high level of foreign language to treat documents	41
2	Taking much time to treat documents with a large mount	117
3	Having different level in security and information management	34
4	Having difference in understanding of intellectual rights	11
Issue about brief meetings		**Number**
1	Having problems due to ambiguous statement of client	103
2	Having problems due to un-polite statement of client	3
3	Taking more time for collocutor having no power of decision	61
4	Can't confirm the right content for collocutors are often different	16

4.5 Requirements for Development Work

Responses to three questions concerning requirements for development work are summarized in Table 10. In 148 samples, the respondents report that there are no problems about the function requirements. In 150 samples, the respondents show that the performance requirements can be realized. In 182 samples, the respondents report that there are no problems about the efficiency requirements.

Table 10. Requirements for the development work

Item	Content	Number
Function Requirements	Having detailed specification	93
	Having no special questions	148
Performance Requirements	Difficult to realize	14
	Possible to realize	150
	Having no special problems	76
Efficiency Requirements	Having detailed specification in resource utilizing	58
	Having no special problems	183

4.6 Development Achievements and Risks

Six questions are asked about the development achievements. The statistics is listed in Table 11. It is shown that the respondents are very conservative in the evaluation on the technology aspect and sale aspect. On the other hand, most of them agree that offshore development can improve company image remarkably.

Five questions are inquired about the development risks. In 177 samples, the respondents think that the change of exchange rate has some influence on the offshore development projects. By QX26 and QX27, it is checked whether the more the brain drain is, the higher the risk is for many Japanese client companies think that too rapid or too much brain drain will delay the development, which is a risk factor. In 156 samples, the respondents report that the clients concern about the brain drain of vendor, and in 151 samples the respondents report that there is some brain drain during developing period. The cross statistics of the change of specification and the change of schedule/period with the development result is shown in Fig.7.

Table 11. Evaluation of development achievements

ID	Item	Having remarkably	General	Not having
QX19	Improving of company image	160	75	6
QX20	Improving of technology level	125	112	4
QX21	Acquiring of new technology	108	120	13
QX22	Improving of sale	88	138	11
QX23	Improving of profit	64	153	20
QX24	Acquiring of business knowledge	99	126	15

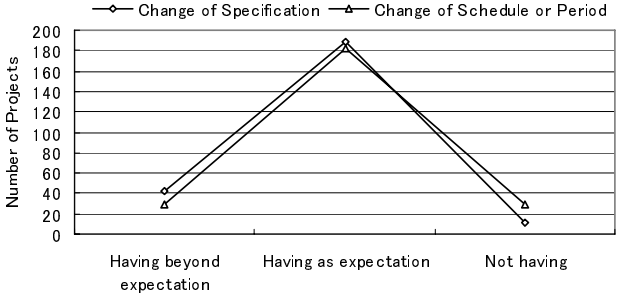

Fig. 7. Change of specification and schedule/period

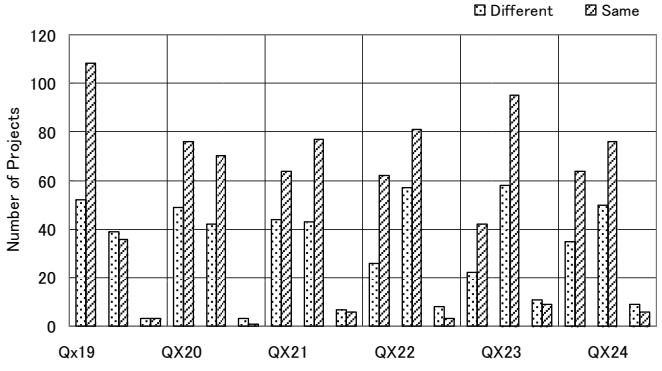

Fig. 8. Cross statistics of consistency of difference strategy of vendor and appeal to client with the development achievements

5 Discussions

5.1 Difference Strategy of Vendor and Appeal to Client

In the first part of questionnaire for background information of vendor, the difference strategy of vendor is asked. The respondent is urged to sort four items including *Price*, *Quality*, *Communication skill* and *Technology level* according to the difference strategy of his company. In the fourth/fifth part of questionnaire, the appeal of vendor to client is asked and the respondent is urged to select one item from *Price*, *Quality*, *Communication skill* and *Technology level*. It is investigated whether the consistency of difference strategy of vendor and appeal to client has influence over the development achievements and development result. Fig.8 and Fig.9 show the cross statistics of the consistency of difference strategy of vendor and appeal to client with the development achievements and development result respectively. For every development achievement (QX19,QX20,…,QX24), the amounts of samples for three choices (*Having remarkably effect, General effect and Not having effect*) are listed from left to right in order in Fig.8. The same analysis is done for the influence of the consistency of software type that the vendor is good at and software type of the offshore project

over the development result and the cross statistics is shown in Fig.10. According to the statistics, there is no obvious effect on the development achievements and result whether it is consistent.

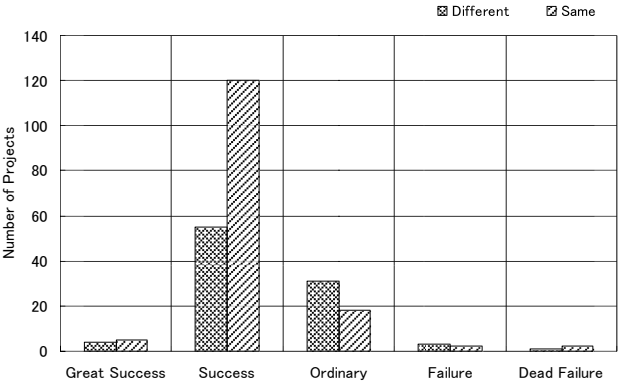

Fig. 9. Cross statistics of consistency of difference strategy of vendor and appeal to client with the development result

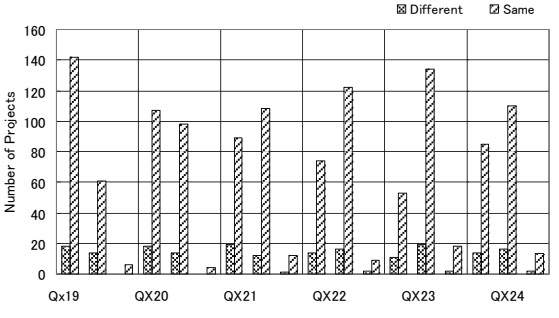

Fig. 10. Cross statistics of consistency of software type with the development achievements

5.2 Factor Analysis of Development Achievement

In order to evaluate offshore development project comprehensively, six items about the development achievements (QX19-QX24) are used besides the development result (QX30). Factor analysis is applied so as to reduce the number of variables for subsequent analysis. Principal components method is selected to extract component and varimax method is used to rotate the component matrix. Three components are extracted according to the scree plot and the rotated component matrix is shown in Table 12. All the Initial EigenValues of these three components are bigger than 1. The first component mainly expresses the information of QX20, QX21 and QX24, which are all about technology aspect. The second component mainly stands for the information of QX22 and QX23, which are about sale aspect. The third component reflects the information of QX19 and QX30.

Table 12. Rotated component matrix

	Component		
	1	**2**	**3**
QX19	0.330	0.277	0.755
QX20	0.861	0.046	0.244
QX21	0.849	0.173	0.155
QX22	0.120	0.862	0.218
QX23	0.220	0.863	0.125
QX24	0.618	0.410	0.020
QX30	0.072	0.097	0.911

5.3 Future Research Work

As the preceding research, a questionnaire is designed and delivered to experienced project managers on the side of vendors to find out the risk knowledge about offshore software outsourcing. The preliminary analysis on the characters and achievements of experienced offshore projects is reported in this paper. As the future research, whether there is relation between the development share status and the development result will be investigated and the research on the share of development process between the client and the vendor in the whole cycle will also be expected. Further analysis will be done to find out the difference between the projects evaluated as success and the projects evaluated as failure, and to examine the root causes for the projects evaluated as failure and dead failure.

6 Conclusions

A survey is conducted to find out the main risk items from the vendor's viewpoint in order to support decision-making for offshore software outsourcing projects. The questionnaire includes background information of vendor, background information of respondent, suggestions to the client, and evaluations on experienced offshore projects. 131 respondents from 77 vendors sent back answer sheets and 241 offshore software outsourcing projects are evaluated. This paper reported the primary analysis on the received samples. Some main conclusions are drawn as follows:

1) Japan clients-oriented vendors are mature in both the company scale and the development experience. The vendors give first rank to *High Quality* in the difference strategy of company, which reflects the starting point of Japan clients while selecting offshore outsourcing vendors.
2) Requirement analysis and specification design are still main issues in offshore outsourcing development. Because of the existent difference of culture between clients and vendors, farther communication and mutual understanding are necessary. The technology level is not the main issue affecting the success of offshore development projects.
3) The evaluation on the achievements of technology and revenue is low though it is thought that company image is improved.

4) Changes of specification and schedule/period are problems beset the vendors. The brain drain in vendors has little influence on the development work.

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