A Study on the Priority Selection for Information System Project Management Model

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Abstract: - This study focuses on the data reliability improvement of monitoring system in a steel manufacturing industry. The data obtained from the existing monitoring system is not the current micro data that reveals the current situation, rather it shows the average value (macro data) of between the current point and ending point. This macro data is not only difficult to analyze the factors causing errors, but also might have fatal influences on the quality of produced goods even the error is located within the tolerance level. Because the average value can be in the tolerance, but the maximum error value can be greater than the tolerance. Steel production process also produces tons of data, thus the required database should be capable of this huge amount of data. The proposed system in this study can collect large amount of data and also can analyze the collected data to quality control the steel production. And also the proposed system adopt the web-based technology, inquiries and analysis of data can be handled with no limit of time and space within the factory using the PC connected to the intranet. Hence, the system can increase the quality of manufactured products, and can raise the reliability of the products which is very important in the steel business. The accurate accumulated data from the system also can be used for developing new controlling model, operation technology, and new product development. This kind of improvements was very much required, but not possible, because the accurate micro data was not able to get in the old system.

Key-Words: IT project, IT project management, IT-BSC, PMBOK, AHP

1 Introduction

The development of computer and communication technology has great influences on the business administration. Firms can raise the efficiency of organization using information systems and can make the company more competitive through collecting and analyzing far more information. The budget of IT project is relatively small comparing to the construction, engineering works, or plant construction. However, the IT project budget is bigger and project period is also getting longer. The national information investments have been temporarily decreased from 6,300 million won in 2003 to 4,300 million won in 2004. But the investment of 2005 and 2006 again increased from 5,260 million won to 7,130 million won[11]. American business IT investment has continually been increased from 732,700 million dollars in 2003, 776,000 million dollars in 2004, and 825,000 million dollars in 2005[19]. The interest and investment in the IT projects has continually been increased in worldwide. The increased interest and investments in IT projects however, emphasize the importance of system management far more than before. Mahmood said that IT project generally takes more than two years to produce satisfying results [33], and Bakos, etc. also insisted similar argues that IT projects took few months to few years to get the project outcomes[12, 13, 14]. As these previous researches suggested the large amount of time and investment and suitable IT project management are definitely requested to make the IT project successful.

In the past, however, it was common to get the unsatisfactory results even though a lot of costs and efforts were invested. Fig.1 is the report from Standish Group in 2003, which shows the success ratio of IT project[42]. The success ratio increased almost doubled from 16% in 1994 to 34% in 2002. However, more than 51% of the total projects has changed pretty much of their original purposes as the projects being progressed.

2 Established Studies on IT Project Process

Established IT project management has mostly been the study on process. That is, it manages developers or developing process point on mostly software developing process like analysis, design, development, test, and so on. The typical methods are PMBOK, CMM/CMMI, and SPICE[15, 16, 27, 40].

Recently a research being carried out called PMO(Project Management Office) which is a study on management office of project. PMO means an office that is in charge of project management guide and methodology, personnel management, operation management and education for the successful project.

2.1 CMMI : Process Center

CMMI is the following model of CMM(Capability Maturity Model) which is widely used as the standard of established software quality warranty. Industry and Software Engineering Institute(SEI) of Carnegie Mellon University(CMU) under the support of the Pentagon measured the maturity of SW-CMM software process and developed it by uniting the elements like models that measure and evaluate the present process level among basic elements which should be applied to the model to establish the process improvement plan and the field of system engineering(SE)-CMM. The purpose of CMMI is to offer the guide that makes abilities of progress and management of organization improve for developing, achieving, maintaining of SW products and service[16].

2.2 ISO/IEC 15504

ISO/IEC 15504 is also called SPICE(Software Process Improvement and Capability determination) and a software process judgment model to judge and improve process as an international standardization project operated by ISO/IEC JTC/SC7/WG10. Fig.3 shows the composition elements of ISO/IEC 15504.

2.3 PMBOK

PMBOK(A guide to Project Management Body of Knowledge) is a project management guide published by PMI(Project Management Institute), an American project management specialists group which was founded in 1969 for the effective project management. PMBOK includes 9 of areas and 44 of processes. Each process specifically describes the application scheme by dividing up into Input, Tool& Technique, and Output.

2.4 The Critical Point of Established Study

In the cases of CMMI, ISO/IEC 15504 and PMBOK, it will define the maturity level of the project running process and if the level of process maturity is high, a product (i.e. the level of outcome) will be evaluated high. However, these methods have the limit that measure of qualitative side on project's business side or stakeholders is impossible. That is, there are a lot of various elements in IT project which are its own peculiar social elements, political elements, trouble management elements after system development. So there should be more additions of elements that measure non-technical elements to established methods.

3. Analysis of Difference between IT Project and Other Project

3.1 Features of IT Project

It is not easy for IT project to prescribe clearly Needs and Expectations of project stakeholders in the beginning stage. Thus, it is also not easy to be said about the exact volume of the project, job scope and cost estimation. Especially the IT project always requires new techniques and there should be a system that accommodates the changes of technique from the project progress in the case of long-term project.

McDonald pointed out that IT projects are more difficult than other industries' projects because of unclearness of project scope, difficulty of quality measurement[38]. Table 2 lists the differences of IT projects and non-IT projects.

<Table 1> Differences of IT Projects and Non-IT Projects

Project Component	Non-IT Project	IT Project
Project	Not integrated with most Business functions	Usually linked with business processes and organizations systems
Project structure	Often stand alone	Usually multiple projects with numerous interdependencies
Scope	Well defined	Less defined and subject to change
Change control	Well defined	Definable change control process but more difficult to track
Stakeholders	Fewer; easier to identify	More; more difficult to identify
Staffing/resources	Often full-time (depends upon organizational structure)	Usually part-time; skill sets used as task progress dictates
Staffing	Best people in critical	Best people available;

	skill set; average in others; more generalists	mostly specialists
Large projects	Divide by organization Or Establish stand-alone unit	Allocated by specialty (risk areas) across organizational lines
Risk	More easily identified; oorly managed but usuall with less negative impact	Not easily identified; poorly managed with high project/ organizational impact
Metrics documentation	Poor to fair	Moderately good, but poorly applied
Lessons learned	Poor to fair	Poor
Budget and schedule estimation	Good	Poor

Source : James Taylor, "MANAGING INFORMATION TECHNOLOGY PROJECTS", 2004.

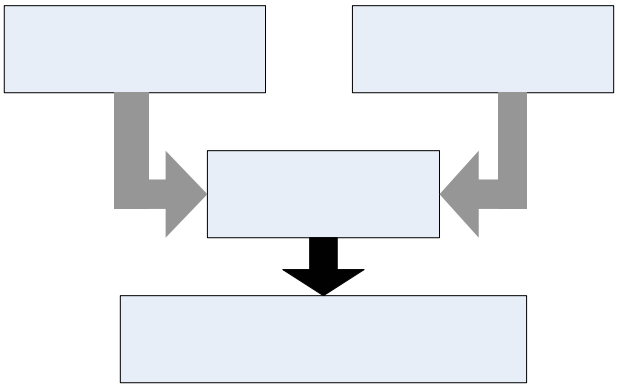
Also, Standish Group suggests the failure factors of IT project below[43].
Main failure factors of IT projects
- Final users' participation insufficiency
- Executives' support insufficiency
- Poor project management and plan
- Matters of Needs, Scope, Methodology, and Presumption

4. Suggestion of Improved IT Project Management Model (centering around PMBOK & IT BSC)

4.1 Drawing Direction of Improved IT Project Management Model

According that the volume of IT project is getting enlarged and long-term in these days, the need of systematic management is suggested not only technical parts, but non-technical elements. That means, in the case of it project, there should be the management and interest for not only technical part like developing methodology and developing tools, also economic worth effected on the organization by the project, control over change relationship between stakeholders, and derived technique and spreading effect from the result of operated IT project.

Therefore, I in this paper try to draw a management model for the systematic management of IT project from dividing technical viewpoint and managing viewpoint. Managing index of technical viewpoint was based on PMBOK and managing index of managing viewpoint used IT-BSC. IT-BSC is a model applied Balanced Score Card (BSC) system by Kaplan and Norton to information system[24]. PMBOK is the project management guide published by PMI, American project management specialists group, that is consisted of 9 of process areas and 44 of processes[40].
Fig.1 is a picture that shows the process to establish the IT project management model about to be suggested by this work.



<Fig. 1> Development Procedure of New IT Management Model

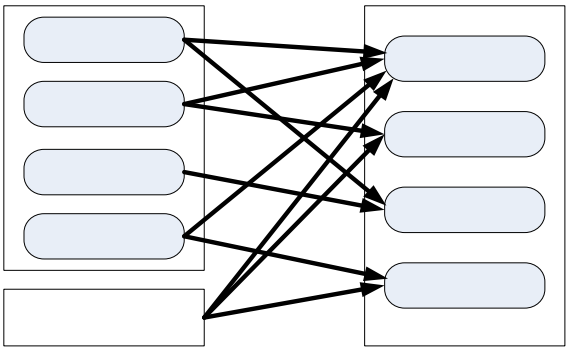
<Table 2> Management Items of Established Researches

Established Researches	Viewpoint	Typical items
IT-BSC	Viewpoint of business contribution	IT cost management, Business worth of new IT project
	Viewpoint of Users	IT service supplier, Users' partnership, User satisfaction
	Viewpoint of operating process	Development methodology, IT operation, Solution of problem, User education, IT personnel management
	Future-oriented viewpoint	Continuous education of IT personnel, Accumulation specialty education of IT personnel, Application portfolio management, Work related to new techniques
PMBOK	9 of knowledge areas	Integration management, Scope, Cost, Period, Quality, Communication, Human resources, Risk, Supply

Table 2 shows the IT system evaluation index and project management items which are suggested by IT-BSC and PMBOK. As seen here, IT-BSC estimates information systems by dividing it into 4 of viewpoints; viewpoint of business contribution, users' viewpoint, viewpoint of operating process, and future-oriented viewpoint, apart from the established technical management.

4.2 Selection of 4 of Viewpoints of IT Project Management Model

In this work, I established an IT project management model based on the preceded studies on PMBOK, IT-BSC and information system outcome measurement.



<Fig. 2> Each Viewpoint Confrontation Relationship between Management Items of Established Studies and New IT Management Model

As seen Fig.2, this work reclassified viewpoints of IT-BSC and PMBOK into 4 of new viewpoints. The reasons why I did that are as followed.

First, the reason I used the term "managemental" is as followed.

For the successful execution of the system, it should consider management of resistance of the change brought by computer and managemental problem among users after system development, so it could be called "managemental viewpoint" including indexes that can measure these elements.

Second, the reason I used the term "social" is that it should tune the final user, the project team, the organization which manages the project team and the relationship among all stakeholders related to the project directly/indirectly, too.

Because of this reason, "social viewpoint" was said, and there was new index added apart from index of IT-BSC.

Third, the reason of using the term "future-oriented" is that it systematically manages/applies knowledge and experience achieved from project, and re-education programs for capability strengthening of team will be a future-oriented element to raise competitive of organization.

Fourth, the reason of using the term "technical" is that it in this area includes technical parts like rules or procedures for IT project management. And the technical viewpoint suggested by this work was reordered operation viewpoint of IT-BSC, 9 of knowledge areas of PMBOK, and some new indexes in the viewpoint of technical.

Table 3 is the definitions of 4 viewpoints suggested by this work.

<Table 3> Redefinition of Each Viewpoint for the IT Project Management

Viewpoint	Definition
Managemental Viewpoint	It is the meaning whether the project to be operated is how fit to aims and business strategies of organization, and of management after developing System in order to complete the project successfully.
Technical viewpoint	It is the meaning of technical effort needed in order to get the quality and result which customers satisfy with.
Social Viewpoint	It is an effort to keep the relationships of all stakeholders well, and meaning of managemental element in all involvers like organization and customers the team who are operating the project.
Future-Oriented Viewpoint	It is the managemental item of knowledge and techniques, re-education of the team, derived technique and ability improvement of human resources.

In order to find out the right index applied to these four of new viewpoints, I first selected indexes with a lot of frequency of use from the indexes being suggested by various established researches. Before it goes through the statistical verification for the rightness evaluation of indexes selected by this, I in person visited and interviewed developers experienced enough in IT related project, project managers, project support managers and final users after talking on the phone. And I rearranged indexes which fit to the viewpoint suggested by this work based on the interview result. Also in order to make sure the selection of indexes is reasonable, I referred to 7 of evaluation indexes features suggested by Falknet & Benhajla(1990); Operationality, Clarity, Completeness, Non-Redundancy, Representativeness, Forecasting, Differentiability and 5 of standards of Jerry L. Harbour(1997);Specific, Measurable, Attainable, Realistic, Timely to select indexes[18, 29].

<Table 4> Detailed Management Indexes for IT Project Management

Viewpoint	Index	Researchers
Managemental Viewpoint	Business value, Risk of business, market share, technology movement analysis, project value, consignor feeling, consignor contract, labor cost, upkeep, reserve fund, project estimate, team construction, team management, administration support, consignor management, talent employment	Edberg(1997), Bakos(1998), GAO(1998), Mahmood(1998), Martinson(1999), Barua(2000), Meyerson(2001), Gold(2002), Seddon(2002), Grembergen(2003), Seo(2004), Jang(2004), Matt(2005)

Viewpoint of Business Contribution

Viewpoint of Users

IT-BSC

Future- Oriented Viewpoint

Viewpoint of

Technical Viewpoint	Requirement analysis, WBS, scope plan, scope definition, scope change/control, scope verification, work order, resource estimation, term estimation, time control, risk identification, risk analysis and evaluation, risk management plan, risk monitoring, form management, verification on product, product confirmation	Edberg(1997), NIA(1997), GAO(1998) Martinson, (1999), Barua(2000), NIA (2001), Gold(2002), Kan(2002), Kuruppuarachchi(2002) Seddon(2002), CMU/SEI(2003), CMU/SEI(2006), Grembergen(2003), PMI(2004), Jang(2004)
Social Viewpoint	User participation, user satisfaction, communication with user, executive's will, executive's support, operation of project support team, technical ability of PM, leadership of PM, team education state, team's quality, communicatio among the team, teamwork, role and responsibility	Edberg(1997), GAO(1998), Martinson(1999), Jurison(1999), NIA(2001), Gold(2002), Grembergen(2003), PMI(2004), Jang(2004)
Future-Oriented Viewpoint	Documentation, accumulation of knowledge (KMS construction), classified user, KMS management, new-technology development, period of new-technology development, estimate of new-technology development, derived technology research, technical personnel maintenance, education program	GAO(1998), Martinson(1999), Barua (2000), Meyerson(2001), NIA(2002), Gold(2002), Seddon(2002), Grembergen(2003),

Table 4 is what each viewpoint and related indexes are arranged with related researchers on the basis of Falknet & Benhajla, Jerry L. Harbour and interview data of IT specialists.

4.3 Selection of the Midlevel Management Items according to 4 of Managemental Viewpoints

4 of managemental viewpoints for IT project management were established in Table 7 of 4.2 Art and indexes related to each viewpoint were re-arranged based on established researches. However, those 4 viewpoints are largely-classification items, so midlevel management items were developed by the common features of indexes. The reason is as followed.

First, managemental viewpoint are itemized into business, finance, and administration.

A project is an action to achieve particular aim. However, projects are getting bigger and more complicated, success/failure of project considerably effects on the business result. 『Business Item』 is the item that manages how well the project agrees to aim and strategy of organization and how much it contributes to achieve that.

Second, technical viewpoint are itemized into Scope Management, Time Management, Quality Management, and Risk Management.

Technical viewpoint arranged with knowledge area of PMBOK. Scope, time and cost are the typical limit conditions of all projects. When these three conditions meet the balance, satisfied result of quality can be gotten. If one of the elements changes, it will affect not only other elements, but the quality of the outcome[38]. Therefore, that is the reason why risk management in the process of project is the typical management element.

NIA(National Information society Agency)(1997) suggested scope, time, cost, and risk as the most important management areas for the information system management among 9 of knowledge areas of PMBOK[9].

To run the project successfully, there is nothing more important than the role of the project manager who leads the project team. Also the interest of the organization that supports the project and participation of users controls the success/failure of the project. Social viewpoint was divided up into midlevel of customer, organization and the inside of team.

Fourth, 『Future-Oriented Viewpoint』 is an index to measure the formation of systematic management of accumulated knowledge and future value creation base through running project.

This management area is the item to measure how much it has been constructing the base for the new value creation based on the knowledge accumulated from projects in the past and running project at present.

Table 5 is a table that shows the management model about to be suggested by this work by arranging each viewpoint and each management area and each index.

4.4 Data Collection and Enforcement of Sample Analysis

In order to analyze importance and validation of IT project management indexes suggested by this work, I did questionnaire and interview with IT project specialists. And also to secure converging opinions in balance and objectivity of specialists' opinions, I classified interviewers into 4 groups according to what they do and chose people who work for at least 7 years.

<Table 5> Definition of IT Project Midlevel Management Area

Viewpoint	Management Area	Definition	Index
Managemental viewpoint	Business	To manage how well running process agrees to the purpose and strategy of the organization and how much it can contribute	Business value, risk of business, market share, technology movement analysis, project value, consignor selection, consignor contract
	Finance	To manage the cost needed to run the project	Labor cost, expenses, reserve fund, project estimate
	Administration	To manage administration needed for project processing	team construction, team management, administration support, consignor management, talent employment
Technical viewpoint	Scope management	An action that exactly understands what customer asks for and embodies the scope of work to produce successful outcome	Requirements analysis, WBS, scope verification, scope control, scope definition
	Time management	An action that estimates the time of work process in real and takes a right action when delay happens by monitoring	Duty definition, work order, resource estimation, time estimation, time control
	Quality management	Actions that are executed to get the satisfied outcome which satisfies customer	System perfection, security, shapes management, form management, verification on products, product conformation. Validation, Verification, interoperability
	Risk management	An action to minimize effectiveness of the element which has a negative effect on achievement of project target or the possibility of happening	Risk estimate, risk control, risk solution
Social viewpoint	Customer management	Final users' interest and participation	User participation, user satisfaction, communication with user
	Organization management	To manage will and support for the success of executive of business which the project team is belonged to	Executive's will, executive's support, project support team operation
	Management the Inside of the team	To manage project participants' state; project manager, the team's quality, communication inside the team, teamwork, roles and so on.	Technical ability of PM, leadership of PM, education state of the team, quality of the team, communication inside the team, teamwork, role and responsibility
Future-Oriented viewpoint	Knowledge management	To manage knowledge accumulated and technologies gained through running the project	Documentation, accumulation of knowledge(KMS construction), classified use, KMS management
	R&D	Possibility of new technologies and derived researches	Development of new technology, period of new technology development, new estimate of technology development, work on derived technology
	Human resource	To guarantee specialists with professional techniques and to bring up talent through education programs	Technical personnel maintenance, education program

For models that measures out qualitative elements suggested by this work, there are Multi-Attribute Model proposed by Martin and Aizen(1975) [34] and Analytic Hierarchy Process(AHP) proposed by Saaty[3],[5],[8].

To get more objective weighted value in this work, AHP method was chosen to compute precedence. If CR(Consistency Ratio) of AHP is smaller than 0.1, it will be evaluated rational. Otherwise, if CR is smaller than 0.2, AHP can be called to have a consistency that accommodates.

In the work by Lee Changhyo(2000), he suggested, " in the case of AHP method needed, if the group that have practical-knowledge and are professional experienced; if its character is homogenous, it should be enough to have 10 or 15 people"[6]. It explains that the number of sample of this work is not large, but it possibly has a statistical efficiency.

5. Analysis Results

5.1 Importance Analysis of 4 Viewpoints of Each Group

Table 6 is the result that weighted values were counted the questionnaire result of 4 viewpoints of each group by AHP method. CR of this work is less than 0.2, so, all viewpoints should be the level of acceptance.

<Table 6> Importance of Each Group in the 4 of Viewpoints

	User group	PM group	PMO group	Outsourcing group	Total weighted-Value
Managemental viewpoint	0.0720	0.2570	0.4850	0.6322	0.3615
Technical viewpoint	0.4570	0.3890	0.1042	0.2037	0.2885
Social viewpoint	0.1600	0.2257	0.0884	0.0941	0.1421
Future-Oriented viewpoint	0.3110	0.1283	0.3224	0.0700	0.2079
CR	0.1905	0.0439	0.0224	0.1085	

Analysis and explanation of Importance result of each group are as followed.

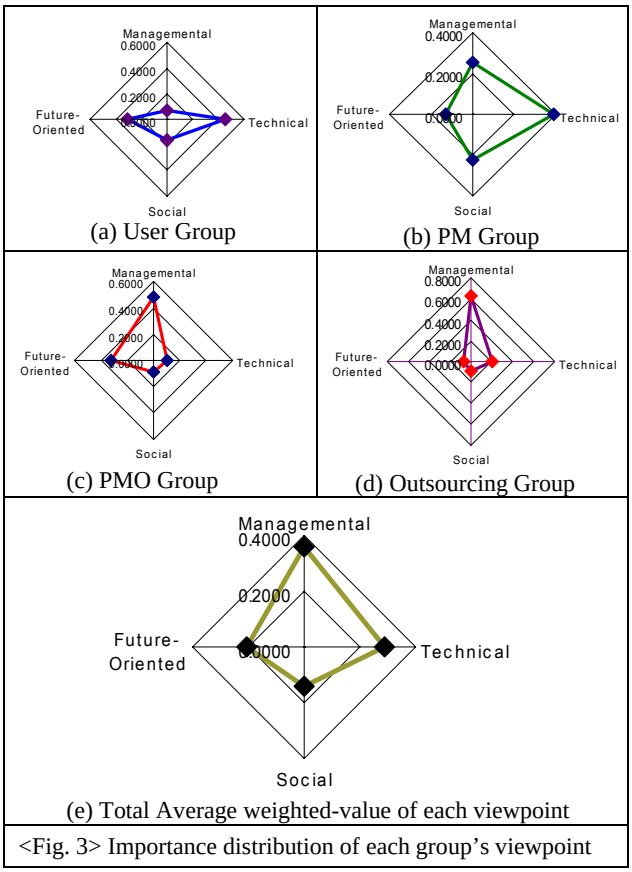
User group evaluated technical viewpoint and future-oriented viewpoint as an important element. From this, we may judge that in the user's position, there is nothing more important than technical accuracy and stability. Also he/she pretty considers the knowledge and techniques gotten from the IT project. However, managemental viewpoint that has strong inclination for business was evaluated low importance relatively whether because user's position is low.

PM group that is responsible for the project recognizes technical viewpoint the most important element as the same as users' group does. It might be the PM responsible for the project thinks what the most important thing is to present satisfactory outcome which user wants. However, different from other group, PM group evaluates importance of managemental viewpoint, social viewpoint, and future-oriented viewpoint with balance. I think PM responsible for the success/failure of the project at the end must have an interest in every element related to successful IT project. Further more, PM group shows that it considers not only the relationship to the customer very important, but to teammates. This says PM group recognizes a project cannot be successful if there isn't a communication between stakeholders, even though there is a perfect project management method.

PMO group, a representative of organization's managemental will, that manages a project group has a high interest in processing project and operational items and financial items with considering the relationship to other projects being processed in the organization at present. And also by systematically-managing technologies and knowledge achieved through projects, PMO tries to strengthen capabilities of organization.

Outsourcing group is a group that is outsourced to run the practical developing work while IT project runs. Therefore, it shows very sensitive reaction in managemental viewpoint which includes business elements and financial elements. Analysis result supports this, too.

Fig.3 expresses how much each group feels the importance of 4 viewpoints as a graph. It shows quite clearly that precedence of the same element while IT project runs is different in each group.

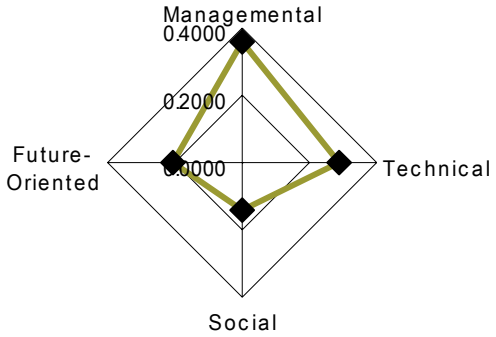


<Fig. 3> Importance distribution of each group's viewpoint

5.2 Importance Analysis of Midlevel Managemental Items of Each Group

First, User group put a high weighted-value on operation item, time and quality items, and technology

and experience items.
Second, PM group put a high weighted-value on financial item, time and quality items, and customer management.
Third, PMO group shows the highest interest in financial management item, time management item and customer management item.
Fourth, outsourcing group has a high interest in business management item and put a very high precedence on time management item.



<Fig.4> State of importance of IT project management viewpoint of each group

Fig.4 expresses importance of 4-viewpoint for IT project management of each group in a graph.

6. Conclusions and Further Research

This study tries to suggest a better evaluation model by adding the indexes suggested from many researchers, but not much being adopted by current evaluation models. And several other factors are also which can check the managerial effectiveness. To check the rationality of the suggested model, questionnaires were distributed to selected professionals, and responses were statically analyzed using AHP method.

This study can be meaningful because of following reasons.
First, this study re-arranges IT project management evaluation indexes by balanced scorecard, which may be a new trial.
Second, this model includes human factors of developers and users who are directly related to the project development and operation.
Third, important items of each stakeholder have been separated, and the weights of each item have been quantified to have fixed values.
In the further researches, more variables can be added to clarify the managerial and social factors, which are included in this model but not sufficient. IT system is by nature future-oriented. So the variables which may show the future viewpoints could be added. Some of current variables are comprehensive. So the variables can be separated in more detail if needed. If these further researches can be done, the model will be more practical to help IT project management could be more successful.

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