

Organizational Activity to Aggregate Tacit Knowledge for Managing IT System Migration Projects/Programs to Success

Hiroshi Ohtaka * Masahiro Isokawa * Motomu Koumura * Hiroshi Nishikawa * Hidemasa Kuwabara *

IPA (Information Promotion Agency, Japan) reports that serious defects of IT systems for social and economic infrastructures are increasing and IT projects for migrating old system are also increasing. We first review current methods and discuss why they fail to reduce IT project failures. We next point out that they lack an organizational approach to aggregate tacit knowledge, which experienced project/program managers have obtained as lessons learned from actual failures, and transfer them to less experienced managers. This paper propose an organizational activity to apply a project management method named *Mieruka*, which transfers the tacit knowledge to less experienced managers by tangible tools, to IT migration projects/programs.

Key Words & Phrases: IT System for Social and Economic Infrastructures, Tacit Knowledge of Project/Program Management, Organizational Project Management, System Migration, Knowledge Transfer

1. Introduction

IT (Information Technology) will be introduced much more widely and longer to our social and economic activities. Therefore, it is required for IT projects (IT development projects or programs) to achieve their goals for quality, cost, and delivery (QCD) of IT systems, whether they may be newly developed or they may be migrated from old systems.

However, worldwide failure rate of IT project has not decreased in many years, even after the PMBOK [1] has gained popularity today. For example, the achievement rate of cost and delivery goals of IT projects has not improved in many years, according to well-known surveys of IT projects including reports by Standish Group [2][3]. Moreover, increasing IT defects, which influenced negative effects to our social and economic activities, are reported by Japanese governmental agency [4] (Figure1).

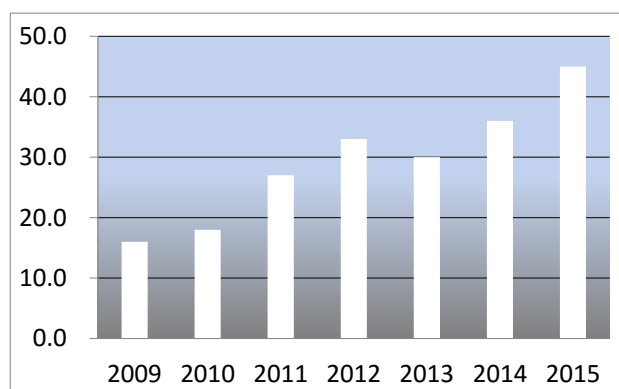


Figure 1 IT system defects/year (IPA)

In the IT firm, maintenance phase projects are increasing, while new development projects are decreasing [5] (Figure2). Renewal of buildings in maintenance phase can be accomplished simply by scrap-and-building with less legacy constraint. On the contrary, renewal of IT system basically cannot be completed without legacy migration of complicated data or software for various layers ranging from IT infrastructure to business process, which have been modified and cumulated in the existing system for many years after the first system launch.

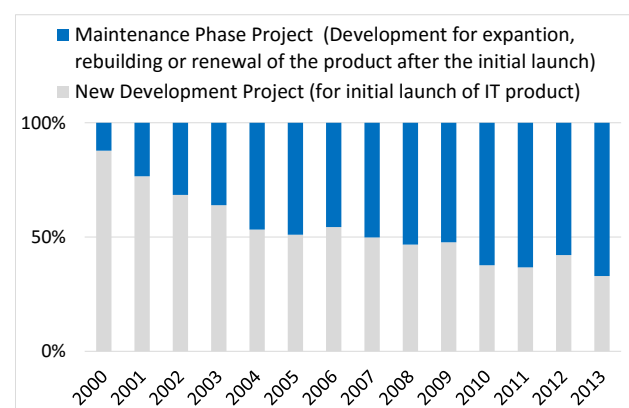


Figure 2 Increase of Maintenance Phase Project (IPA)

It is required that future economic growth may not be hindered by troubled IT projects including renewal of existing systems, which fail to achieve the QCD goals. In this paper, we first review the current methods and discuss why they fail to reduce IT project failures. We next point out that they lack an organizational approach to aggregate tacit knowledge, and show a method (named *Mieruka* method) and an

* IT *Mieruka* Institution.

activity (named *Mieruka* activity) to cope with the problem. We also propose a new approach to reduce troubles in IT migration projects by applying the method and activity.

2. Current Methods

The PMBOK is a common body of knowledge for every firms including the construction firm and the chemical plant firm. Its Software Extension [6] also has been published based on the PMBOK guide 5th Ed. [1] to compliment IT specific knowledge (particularly agile developing process). The purpose of the extension is to “improve the efficiency and effectiveness” of software projects (managers, teams and members).

However, they do not necessarily aim to “improve the achievement rate of QCD goals of IT projects (ARP)”. Actually legacy project checklists based on the PMBOK and the extension have not been enough to avoid IT troubles as illustrated in Figure 1. To avoid such failures, we had a sectional meeting with experienced project managers who learned various lessons from actual IT project failures in major Japanese IT companies by the support of Information-technology Promotion Agency, Japan (IPA). In the meeting, they point out the following problems of the legacy checklists and insist that there must exist much variety of practical management knowledge (tacit knowledge) to be considered.

- Key factors to lead IT systems to serious troubles or not (dominant items) can not necessarily be found when we only look into individual facts (inside individual project, system or resources) by using the legacy checklists. The legacy checklists are not enough to identify the dominant item to avoid serious troubles particularly in large scale IT projects,

- The legacy checklists are difficult to avoid reproducing the same IT troubles happen in the past, since they not necessarily include knowledge of lessons learned from the past failure projects. This makes difficult for less experienced project managers to be sure how to make decisions for specific countermeasures in their field projects and even why individual item in the legacy large checklists is important or not.

- Also the legacy checklists do not suggest actual practices sufficiently to field project managers in their IT projects. For example, they often lack specific suggestion whether the corresponding check practices

should be done quantitatively or qualitatively or both.

This paper clarifies a method (*Mieruka* method) based on not only the PMBOK knowledge but also the knowledge of the experienced IT project managers. We also clarifies an organizational activity (*Mieruka* activity) for continuous improvement of the method in the IT firm, to improve the ARP.

Furthermore, we focus on management knowledge of legacy migration, which will be required much more often in the future as illustrated in Figure 2, but are not involved in the PMBOK and its Software Extension. Since less practical research of the knowledge has been observed in other activities, we initiated research in the continuous *Mieruka* activity for developing additional *Mieruka* method to manage IT legacy migration projects to success by ourselves.

3. *Mieruka* Method

3.1 Making Tacit Knowledge Available

However, the “tacit knowledge” of the experienced project managers is difficult for less experienced project managers to practice. That is, the tacit knowledge is invisible for ordinary project managers. Therefore, after we aggregated tacit knowledge of experienced project managers in the sectional meeting of IPA (named “Project *Mieruka*”, which means visualizing tacit knowledge by transforming hidden knowledge inside experienced project managers), we developed the following “tangible tools”, so that the less experienced project managers can understand them sufficiently enough to introduce them to their actual IT projects immediately [7][8][9][10].

- 1) Bird’s-eye view diagram, to identify the dominant item to avoid serious IT troubles,

- 2) Case of failure project, which records facts of actual failure project as well as lessons learned (causes, effects and countermeasure to avoid reproducing the same failure),

- 3) Check sheet, which shows checkpoints of projects, as quantitative lessons learned from the failure cases,

- 4) Measured analysis data, which shows data-to-be-checked in projects, as qualitative lessons learned from the cases,

- 5) Table of categorized item (Integrated tool), which identifies specific countermeasure for project managers to practice in their field projects by integrating all of the above knowledge.

See explanation of these five tools in Appendix A.

3.2 Systematization of the Tools

We systematizes the tools and classifies them into qualitative, quantitative and integrated approaches, for immediate introduction to actual IT projects.

[Qualitative approach tools]: Bird's-eye view diagram, Case of failure project, Check sheet,

[Quantitative approach tool]; Measured analysis data,

[Integrated approach tool]; Table of categorized item

Figure 3 shows the total system of the method, which we call *Mieruka* method. Books published before 2008 [7] [8] [9] [10] involve the basic body of the knowledge covering from upper phase to lower phase of IT project management. A past paper [11] reports that loss by executed unsuccessful projects was reduced by 20% to 30%, after introducing and practicing the method.

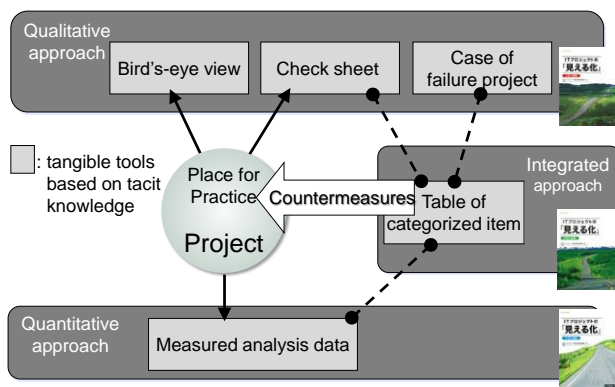


Figure 3 System of *Mieruka* Method.

3.3 Further Subjects for Reducing Troubles

However, the followings are to be resolved.

1) The sectional meeting “Project *Mieruka*” begun to decline from 2008 and was ended in governmental organizations. Increased IT troubles have been observed from 2009 to the present (Figure 1).

2) The original *Mieruka* method have aggregated tacit knowledge only for developing new IT systems. We don't have any method for legacy migration yet.

We discuss how to cope with these subjects next.

4. Continuing *Mieruka* Activity and Applying *Mieruka* Method to Legacy Migration

4.1 Lessons from Toyota's *Mieruka* Activity

Kaizen [12] is well known activities to improve products in Toyota. Incidents such as product line halts are immediately shared with executive managers by field operations at Toyota. Which phase is abnormal and the current status of the product line are also displayed by systems. Such organizational activities

for visualization are called *Mieruka* [13]. It becomes possible for the executive managers to have a greater opportunity to participate in fieldwork and support field persons to solve problems and improve quality and productivity by the *Mieruka*. Such practices to improve the products incrementally have continued for more than 40 years in the private organization (Toyota). The stable organizational philosophy to continue the activities without termination made Toyota's quality and productivity have globally competitive (Figure 4)

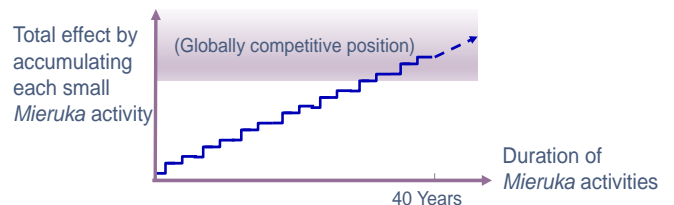


Figure 4 Incremental Improvement by *Mieruka*

Focusing back on the IT firm, since there is no assurance for the activity to be continued for more than tens of years like Toyota, a subject is that it is not clear who should keep improving such organizational *Mieruka* activity in the IT firm without IPA.

4.2 *Mieruka* Activity for Continuous Improvement of the Method in the IT Firm

The subject indicates that any private IT organization should practice the following activities.

-1 Research Activity

To keep researching to develop tangible tools, based on tacit knowledge in expertized IT project managers, before they may disappear,

-2 Propagating Activity

To continue propagating the tools and make the tacit knowledge to be transferred to younger generations,

-3 Organizational Activity

To organize project managers or their company organizations who participate in the activities.

4.3 Initiation of the Activity

To initiate the organizational *Mieruka* activity, IT *Mieruka* Institute (ITMI [14]) was established as a non-profit-based private organization in Japan, for continuous improvement of the method in the IT firm, like *Mieruka* in the automobile firm, whose activity has been continued for more than 40 years. Figure 5 shows the current *Mieruka* activity.

Also for reducing legacy migration troubles, a working group (WG) is organized in the research

activity of the ITMI, this year. Tacit knowledge are being aggregated from experienced members and the following tangibles tools are being developed in the migration WG.

1) Bird's-eye view diagram of migration risks

One can plan and execute legacy migration with less trouble, by reviewing bird's-eye view of the migration and major risks illustrated in Figure 6.

2) Case of failure project

We are now widely aggregating not only actual failure cases but also cases, where serious troubles could be eventually avoided but should have occurred in usual cases (so called *Hiyari Hatto* cases in Japan). An example of the latter case is shown in Figure 7.

3) Others

We are to practice research activity based on comprehensive process of the WG to aggregate much more tacit knowledge and identify tangible tools including Bird's-eye view diagram of stakeholders in migration, tools in quantitative *Mieruka* approach and others as listed in Table 1.

These tools may be used for reducing troubles in the future, through the activity of ITMI in Figure 5.

5. Expected Effects

The followings present expected effects for IT project success caused by the *Mieruka* method for IT migration and the *Mieruka* activity, based on what have been obtained in our study so far.

5.1 Reducing Duplicated Migration Troubles

Figure 7 is one of failure cases that was aggregated in the activity in the migration WG. We also obtain another similar case (the firm to which user company in the case belongs is different from the case of Figure 7. The user replaced an existing vendor to new one at legacy migration, due to worse relationship between the user and the existing vendor and actual serious troubles happened in the case, while they were slightly avoided (*Hiyari Hatto*) in Figure 7).

Thus, we obtained the same lesson learned (ex. necessity of Bird's-eye view diagram of stakeholder in migration as a tangible *Mieruka* tool) from the different two cases, soon after the activity in the migration WG was initiated. This indicates that at least two similar serious troubles (causing magnificent cost overrun etc.) at legacy migration could have been avoided in the past if we had shared the tangible *Mieruka* tool beforehand.

Therefore, if we obtain more *Mieruka* tools in the WG, then it can be expected to reduce much more duplicated troubles actually at legacy migration in the future.

5.2 Expected Effect by Continuing *Mieruka* Activity

If we continue and expand such *Mieruka* activity as the WG to aggregate much more tacit knowledge of experienced manager and transfer them to tangible *Mieruka* tools and providing the tools to less experienced managers as illustrated in Figure 5, total IT troubles may decrease in the future.

By continuing such activity longer and increasing more participants to the activity in ITMI, it may not impossible for the negative spiral in Figure 5 (including worse reputations about IT jobs among young like '3K' in Japan) to change gradually to the positive spiral (including improved business of user/vendor company with less IT troubles as well as improved motivation of younger generation).

6. Conclusions

By proposing *Mieruka* method and *Mieruka* activity also for legacy migration, we suggest how to move forward to develop IT systems much more successfully.

We assume that a lot of project managers, who have developed, maintained and migrated IT systems for their long work life, should have experienced the same troubles with each other. Because, even within a few members in the small migration working group, we could easily find the same tacit knowledge and the common tangible tool, by sharing individual project experience and trouble.

We believe that it becomes much more possible for the negative spiral in the IT firm to change to the positive spiral, if more project managers participate in our non-profit-based activity. It is our future study to increase such participants, who have the same will with us to improve the ARP and the IT firm.

Furthermore, despite the fact that legacy migration management is inexpensive knowledge, which will influence success or failure of IT projects/programs much more in the future, less research has been practiced except us so far. It is also our goal to propose our research achievements to worldwide organizations including PMI, so that the knowledge should be involved in IT specific standards like the Software Extension of the PMBOK.

● When keep taking no countermeasure against increasing IT troubles...

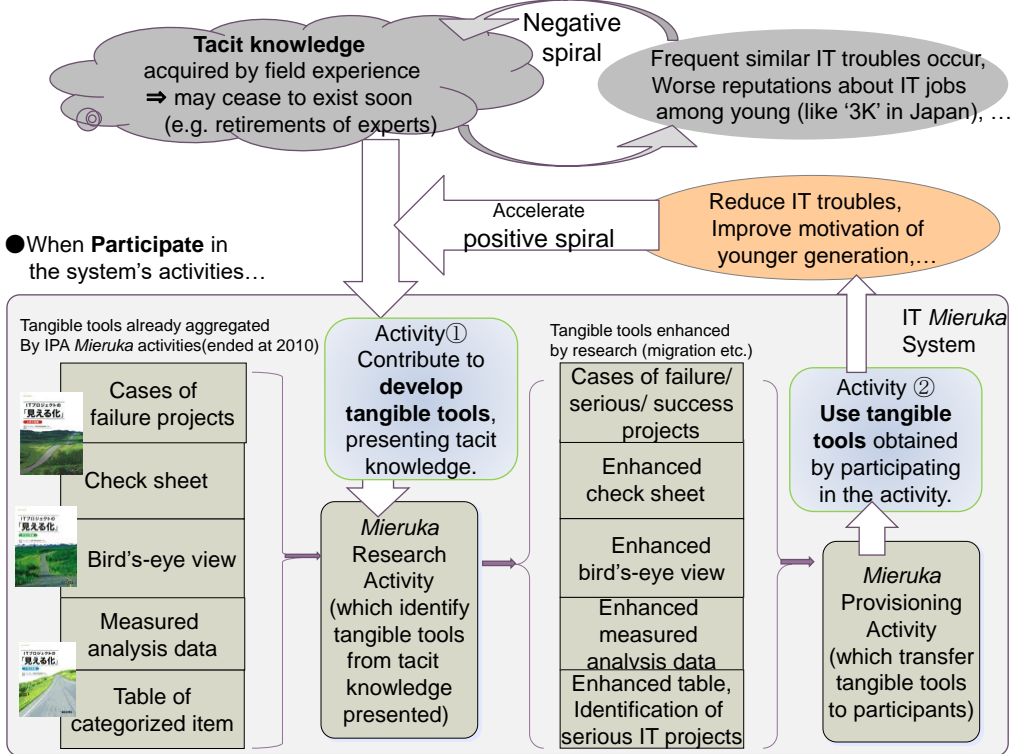


Figure 5 IT Mieruka Activity

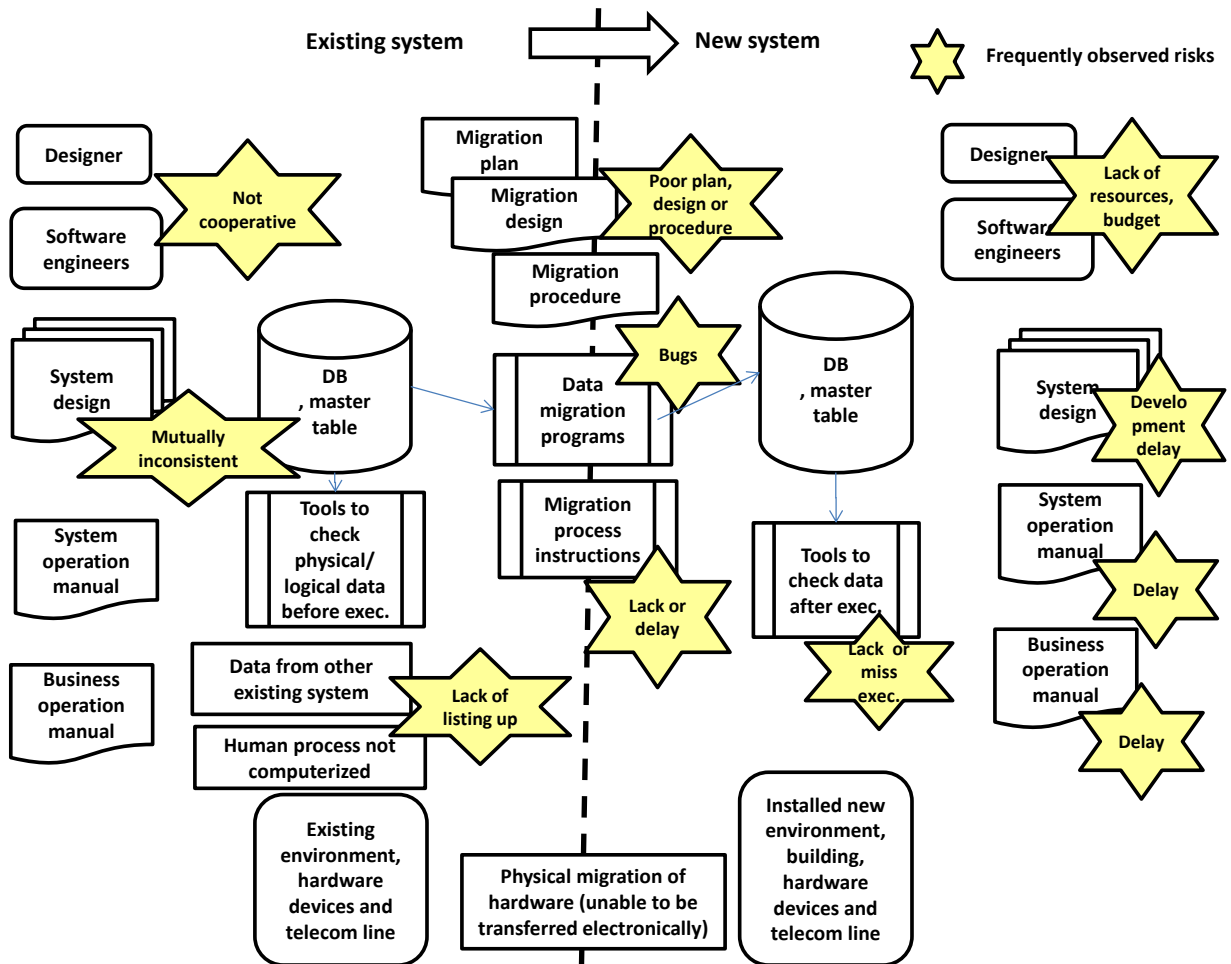


Figure 6 Bird's-eye View of Migration Risks

No.1 (Title) Serious troubles should have happen at system migration by replacing vendors

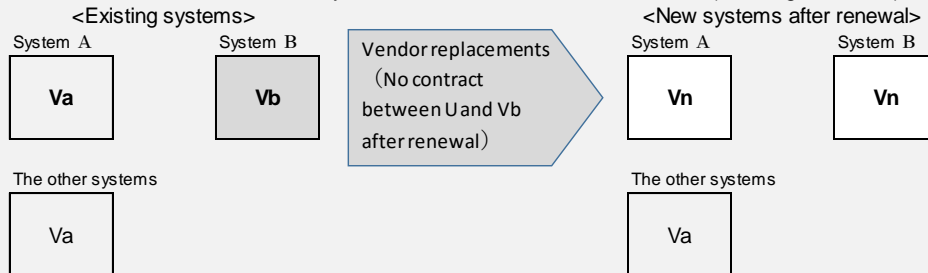
Phenomena of the trouble

The following two in existing systems for user company U, which have been in maintenance phase for more than 10 years are to be renewed.

System A (initially developed and maintained by vendor Va)

System B (initially developed and maintained by vendor Vb)

However, User U ordered of both system renewals to brand new vendor Vn (see diagram below).



Although U provided Vn source codes and documents of the existing systems, detail of data specification including their definitions are not clear without supports from the existing vendors Va and Vb. Vn asked Va and Vb for their supports, but they refused. Serious troubles including DB destructions should have happen after launching new systems.

Miss management actually practiced (cause of trouble)

Vendor Vn thought it might be possible to get details of existing systems from existing primary vendors Va and Vb or their sub-constructor, by paying enough fees for their supports, even if there was no assurance of it in RFP provided by user U.

Management to be practiced

It is almost impossible for new comer (Vn) to take over whole of existing systems from other rival vendors itself, even when enough budget.

User U should receive commitments from existing vendors for supporting new vendor to migrate the systems, before disclosing RFP for the migrations.

If not, vendor Vn should make proposal by presenting clear condition for user to lead existing vendors to provide necessary supports for new vendor, when they lose competitions for the migration RFP.

Risk symptom to be careful

Sales person in vendor Vn tried to reduce as many conditions as possible in his proposal for receiving orders of the system migrations by keeping friendly ship with user U (This caused elimination of important conditions for existing vendor supports).

Countermeasure when problems cannot be avoided

When new vendor received migration orders by missing the risk symptom, Vn could occasionally avoid serious trouble at migration of system A by asking user U to order Va to support Vn. However, Vb should resolve problem of migrating system B by itself, due to declining business relationship between U and Vb. ... (details is now under security review of WG. IT may be disclosed at publishing book from ITMI.)

Figure 7 Example of Case of Failure Project

Table 1 Mieruka Tools for IT Migration

Category	Document to be analyzed	Mieruka tools to visualize risks
Stakeholder	RFP (User)	Bird's-eye view of stakeholders in migration
	Proposal (Vendor)	
Scope	Requirement definition	Bird's-eye view of migration
	Basic design	
Working item	WBS	Default WBS template Check list of working item
	Gantt chart	Default schedule template
Progress	Progress reports	Tools in qualitative Mieruka approach
		Tools in quantitative Mieruka approach
Countermeasure		Case of Failure Project

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Appendix A. Details of *Mieruka* Tools

First as the Bird's-eye view diagram in the qualitative approach tools, we gave shape to several sample figures to understand "dominant item," which decides if the total project may fail or succeed, from various points of view (stakeholder, system configuration and others). Exhibit 1 shows an example of the diagram from stakeholder viewpoint to identify the dominant item including customer organization. The diagram indicates structural problem inside customers – the situation that the project owner does not take part in the project.

The Check sheet as another qualitative approach

tool is considered as that it helps managers understand better than other usual checklists. The reason is that the list is contrived to consider not only the PMBOK but also IT specific knowledge. New areas of knowledge, which are familiar with field project managers, are added from lessons from failed projects and Software Engineering; "Customers," "Organization," "Basic Action," "Motivation," "Task Management," and "Technology" in Exhibit 2.

We developed two kinds of Check sheets: a self-check sheet for the project manager (PM), and a hearing sheet for the inspection specialist, such as the PMO (Project Management Office). Exhibit 2 shows an example of display using the Check sheet. Outcomes of assessing risks including extended knowledge areas by only the PM (left), by both the PM and PMO (right), and the difference between the PM and the PMO (lower figure).

The summary of the Case of failure project is made of 193 failure cases that had actually happened in the past, which include lessons learned from previous IT projects. Failure makes project managers understand how to avoid making the same mistakes. The experienced managers developed a database based on cause, effect and countermeasure to avoid the same troubles. Figure 7 shows the same format which records the cases mentioned above.

As the quantitative approach, we created 232 items of the Measured analysis data for the qualitative approach in order to judge the concrete status of the project numerically. It is necessary not only to watch if scheduled tasks on a progressing project are executed or not, but also to understand the project's actual progress objectively based on fact data.

The Integrated tool is designed for project manager to understand the whole status of the project, like the cockpit drill, by associating Categorized items to the Check sheet, the list of measured analysis data as well as the Case of failure project.

Exhibit 3 shows an example of the Integrated tool. Experienced managers have tacit knowledge corresponding not only to the individual tools (the Check sheet, the Case of failure project and the Measured analysis data) but also additional tacit knowledge to integrate them. To make the integration knowledge tangible, we developed the additional tool (also called the Table of categorized item) by combining all the tools as illustrated in the Exhibit 3.

More detailed information can be obtained from references [7] [8] [9] [10].

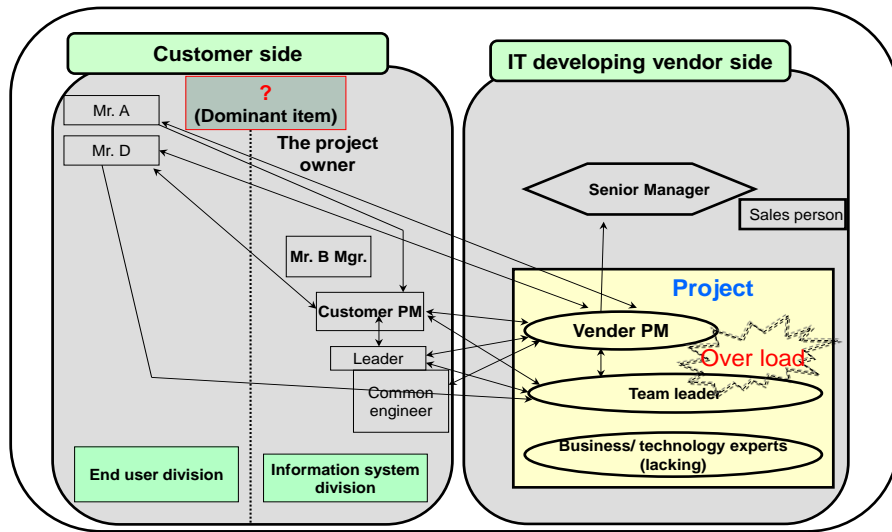
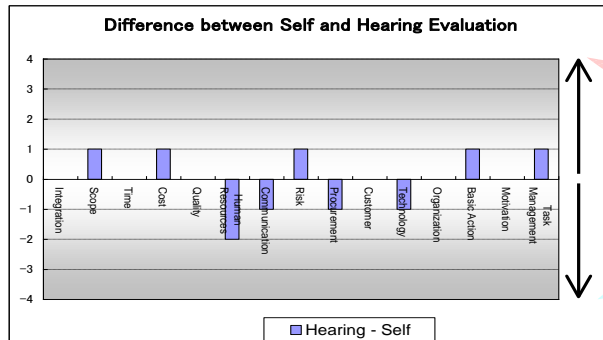
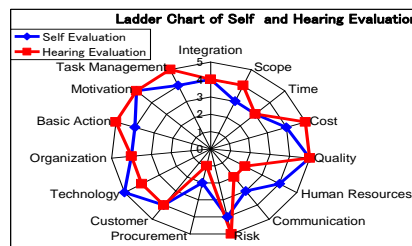
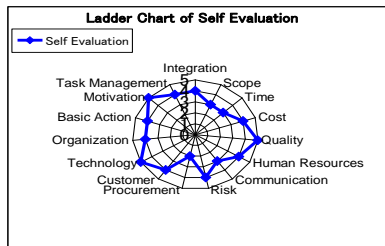


Exhibit 1 Example of Bird's-eye View Diagram



PM's view concerning his project is more *pessimistic* than PMO etc.

PM's view is more *optimistic* than PMO etc.

Exhibit 2 Example of Display Using Check Sheet

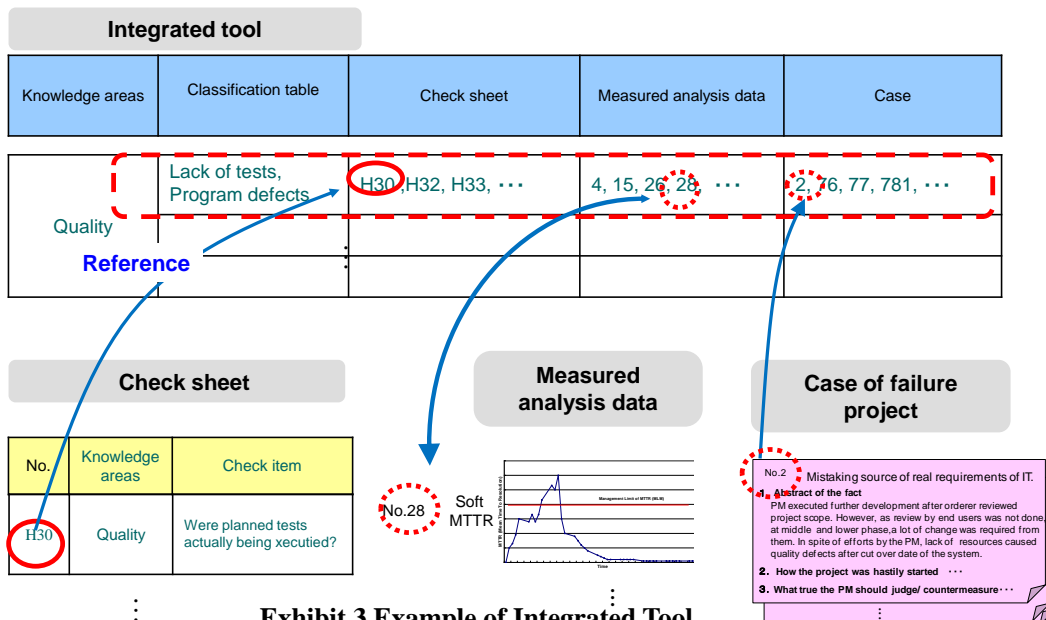


Exhibit 3 Example of Integrated Tool