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# Quantitative Management for IT Program in Public Sector

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Key Words: IT program, Project Management, Methodology

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## Abstract

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This study presents methodology framework that can help to manage IT program in the public sector. Existing project management methods usually focus on system providers and could have various and abstract interpretations. So, it is difficult to apply existing project management methods in the public sector. It also makes each individual project management easier by reflecting characteristics of IT project so that it can provide management models of performance measurement. It is found that given framework in management methodology get positive analysis and addition to be applied in the individual project management and various IT programs nationwide. It is expected that scientific and systematic project management can bring successful promotion and management of IT project through the application of this project management methodology.

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# I. Introduction

To react changes of user environment in IT technology actively and promote large-scale IT industry efficiently, scientific, systematic project management is essential. This management provides the possible substantial project management, promoting the successful IT and maximizing efficient budget control and its ultimate goal in the end.

However, there is no comprehensive methodology of project planning, drive procedure that reflect the characteristics of IT projects in the public sector by means of comprehensive management of established IT program. The existing methodology of project management focuses on system providers, so it is difficult to apply the methodology in an actual field. Substantial management methodology is absolutely needed to secure appropriate management level and quality of IT program in public sector.

This paper presents the application ideas by aiming at supporting the effective management of IT programs in the public sector driven by local governments, analyzing domestic and international cases, dealing with comprehensive description of development and operation of the projects, applying quantitative assessment, and developing quantitative measurement and check lists to evaluate methodology

framework, each process and detailed activities in the public IT programs.

This study concludes that the most prominent feature of IT program methodology in the public sector is not only to provide indigenous methodology suited for project management in the domestic and international environment but also to make the public IT program management measurable and visible on the basis of performance management system. Therefore, what is found in this study makes efficient management of IT programs by making use of the findings and maximizes investing performance of the IT programs in the end.

This study makes up the weak points of existing project management methodology like CMM and SPICE adding the subject of management, the extent of application, and management method. Through these customization for public sector environment, this study establishes the framework of project management methodology with processes and rules that could be applied in the public sector.

## II. Cases & issues

### 2.1 National promotion status and problems

IT Promotion in our country originated when the government launched computer network of administration work in late

1980s. The IT project is being driven systematically on the basis of 'CYBER KOREA 21'. Over the year 2003, government spent ₩1,600 billion on national IT project including cyber government and its budget is getting bigger.

Although various types of IT projects are promoted nationwide, most of the projects is dealt by each ministry individually. According to the existing studies related to IT project management in the public sector, major problems show up in promotion and management of IT project in spite of minor differences among the Accept an order and placing an order. They are unclear standard requirements and procedures, communication problems between contractors and agreement limitation, difficult management owing to operation in the public sector, disability to control the projects and high dependence on contractors in management[9,13,17]. Similar frameworks and guidelines like ISO/IEC 12207, PMBOK of PMI, SPICE, SA-CMM, Cobit of ISACA have to be complemented to be applied to a public sector and the proper education and public relations on these frameworks have not existed. The person has recently started paying attention on these frameworks.

The Accept an order and Placing an order are recognize these matters and point out that there are no concrete IT project managements as a medium of communication. In addition, IT projects

driven by MIC(Minister of Information and Communication) has inflexible outlines and directions in managing IT support project. It makes it difficult for businesses to manage projects. Businesses have difficulty in promoting and managing projects on account of unclear instructions for details. Studies suggest that outlines and directions be revised to be flexible so that business can manage projects. As a result, this study presents appropriate framework for IT management methodology that reflects problems from the existing management methodology.

## 2.2 Cases of IT program management

UK operates 'Gateway Process' so that projects ordered by its central government can control IT projects efficiently[15]. Every IT procurement project should apply this process, ministries and public agencies review IT projects by using it, and they report the results to the supervisory commission of OGC(Office of Government Commerce).

The main purpose of this process is to solve problems of government supply projects after reviewing by means of the publicly approved process and this makes supplies efficient since performers can expect expenses and results easily. Gateway Process review each major turning point before development is performed. This kind of turning point is called 'Gate'.

Each project has 5 gates and each gate operators Gateway review. The head of each ministry decides the project promotion on the basis of the results after reviewers get reports. Meanwhile, this process made 5% budgetary profit from 0.1% budgetary allocation in operating 16 pilot projects on a £3000 scale in 2001.

Gateway Process of UK is different from that of our country in that it applies standard review framework, which was developed according to the situations and environment of UK, in monitoring IT projects in the public sector and its efficiency is very high. As a result, this study presents more scientific and systematic IT project management on the basis of UK methodology.

### 2.3 Issues on IT program management

It is said that IT projects or information system development project comes to naught at the rate of more than 80% nationwide and worldwide[14]. Even though the success-failure decision standards are varied, successful cases are very rare in terms of satisfaction of people joining the project. Especially, many projects are closed regardless of many problems with the inside system. Many a researcher points out major factors affecting the failure of IT projects[2,11,17]. They are i) false prediction to initial expenses and duration, ii) no right and effective application of

revised plans, iii) making the same mistakes again without proper training on operator's role performance. iv) wrong direction in performing projects without knowing actual environment.

Meanwhile factor iii) and iv) are directly related to IT project management methodology. Therefore, when methodology is proposed, these major factors should be considered. It means methodology can't accommodate actual IT environment and project operators perform the project without any real experience. Consequently, methodology should reflect special features of the projects, not general system development[13].

### 2.4 Comparison to current methodologies

Comparison with the frameworks which is suggested in this article with another current frameworks and guidelines is below:

**Table 1. Comparison to current methodologies**

| Items to compare                 | Existing framework | Suggested framework |
|----------------------------------|--------------------|---------------------|
| Application                      | High quality of SW | Business            |
| Subject of management            | System provider    | System manager      |
| Extent and object of application | Comprehensive      | Partial             |
| Approach                         | Step-wise, Static  | Process, Dynamic    |

### III. Management methodology for IT program ; Constitution and Assessment

This chapter details the basic courses of making up methodology, given methodology system and models and styles to measure and evaluate management standard.

#### 3.1 Basic issue of making up methodology

To accomplish scientific management of IT in the public sector, the parties concerned and main operators should agree with environment factors, situations and features and provide methodology framework for systematic and scientific management of IT projects so that they can apply it to IT projects in the public sector[4,5]. There are two basic courses ; i) suggestion and application of appropriate management standard, ii) introduction of quantitative performance management system.

##### *a. Suggestion and application of appropriate management level*

Before mentioning the methodology framework, definition management's level is essential to decide major targets of IT projects. However, it is hard and crucial to

determine the level. It is not easy to establish the exact management's level in terms of the existing subject groups. Although done, each group has differences in the level. When subject groups are divided into 3 different groups ; agency in full charge, managing agency, developer, CMM certification in the public sector, it is difficult to discuss management level. But it is expected below level 2[9]. Accordingly, if practical situations are taken into consideration, the level 2 of SA-CMM is fine to satisfy the management's level. This methodology presents procedures and techniques for IT projects to support core process area that is necessary more than level 2 of CMM.

##### *b. Introduction of Quantitative Performance management system*

As we see recent methodology like SA-CMM, SPICE, Cobit-III, international standards and UK cases, quantitative measurement system tends to be generally introduced.1,3,6,7,14]. Dabbins & Donnely survey shows 11 kinds of common successful factors (security of continuous management clarification by using standard, schedule management, systematic quality control, etc) to ensure information system in the public sector [2]. It is said that project management by using measurable standard is the most important of all factors. As a result, IT project management methodology needs to accept this factor. in this paper

discussed management methodology for IT project and apply quantitative measurement system to secure management clarification and high performance.

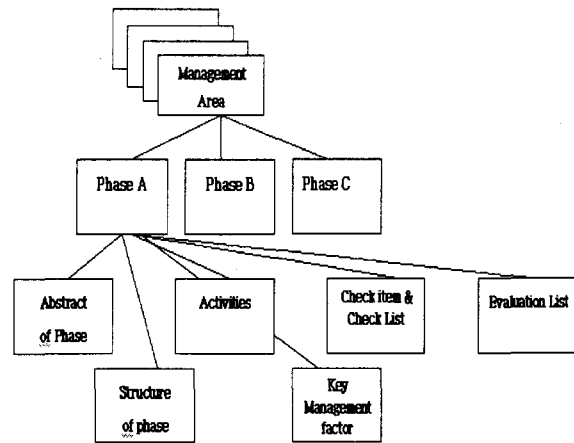
### 3.2 Structure of IT project Management Methodology

Methodology proposed in this study is the actual, comprehensive guide that comprehends all steps including the establishment of strategic course, accomplishment of planning, management and review of processed services. This includes supports and instructions for comprehensive project management[8, 10,12]. In general, quality evaluation of information system development is established and reviewed at every step in favor of developers and users. However, second-level evaluation is desirable for performance review because IT project management has its characteristics.

The structure of IT program management methodology is illustrated in figure 1. It consists of management area, each phase. Each phase is made up of abstract of phase, structure of phase, activities, check item & check list, evaluation list. Management area has 4 steps (operator selection, development, completion, operation) according to turning points in life cycle for the whole project management. Operator selection is a series of process from creation to assignment, operator selection, and

singing the contract. Development area includes activities like commencement, supply, IT planning, analysis, planning, interim audit, and test. Completion area contains final audit, inspection, completion. Operation area is composed of ownership transfer, operation, and management.

Figure 1. Structure of IT Program Management Methodology



Meanwhile, each phase is the basic unit for IT project management and life cycle of overall project management consists of 16 phases. This detailed phase is restructured on the basis of process from IT support project and knowledge & information resource management performed by NCA (National computerization Agency). Abstract of phase describes outlines of related phases. Structure of phase presents activities and its process. The Activities deals with major management points of detailed activities. Key management

objectives and CSF(Critical Success Factor) to control them successfully. With check item & check list, major checking items are defined and detailed check lists are presented by reflecting successful factors and check points.

**Remarks)** F(Fully achieved), L(Largely achieved), P(Partially achieved), N(Not achieved), A(compliance evaluation item), B(performance evaluation item)CA(Complete-charge Agency), MA(Management Agency), DE(Developer)

**Table 2. Four phases of Management Area Management Area**

| Management Area     | Phase  |
|---------------------|--|
| Developer Selection | IT planning, Assignment, Developer selection, Contracting  |
| Development         | Commencement, H/W Supply, Information Planning, Analysis, Design, Audit, Implementation, Testing |
| Completion          | Inspection, Completion   |
| Operation           | Ownership transfer, Operation and management   |

### 3.3 Performance measurement

Management subject are designated according to detailed check items. Evaluation lists specify management subjects to make it possible separating check items. It should be divided into two items; compliance evaluation (A) and performance evaluation (B) of project accomplishment.

This section describes performance measurement of major check items in 16 phases of IT project management according to IT project management methodology presented in the prior section. SPICE(Software Process Improvement and Capability Determination) of ISO/IEC provides measurement and evaluation model as a basic concept[7]. SPICE is suited for determining risk from organization or project review and its successful performance. And it also has similarity to IT project management activities in that SPICE collects proof and performs suggested modification. In this respect, evaluation performed by SPICE is appropriate for measuring and reviewing IT project management.

**Table 3. Example of check list**

| Major check item | Detailed check item | Measurement |   |   |   | N/A | Type | Subject |    |    |
|------------------|---------------------|-------------|---|---|---|-----|------|---------|----|----|
|                  |                     | F           | L | P | N |     |      | CA      | MA | DE |
| 2.1              | 2.1.1               |             |   |   |   |     | A    | O       |    |    |
|                  | 2.1.2               |             |   |   |   |     | B    | O       | O  |    |
| 2.2              | 2.2.1               |             |   |   |   |     | A    | O       | O  | O  |
|                  | 2.2.2               |             |   |   |   |     | B    | O       | O  | O  |

Meanwhile, measurement of performance results from major check items of 16 phases in IT project management is distinguished according to check item features. And it also divided two cases ; simple performance evaluation and performance evaluation of project accomplishment. However, in a more completed management methodology sense, performance evaluation of project accomplishment for all detailed check items needs to be reviewed. As a result, this study

presents two types of measurement in terms of compliance and performance.

*a. Performance level measurement*

Most of the major check items for each phase in IT project management methodology determines propriety of project management by measuring management performance level. SPICE divides process level into 4 phases to determine performance level of IT project management. Operators determines performance level of major check item with proof collected through proof collection procedure.

- ① Not achieved (N) ; 0%~15%
  - Almost no performance proof of detailed check items defined in major check items.
- ② Partially achieved (P) : 16%~50%
  - No performance proof of detached check items defined in right systematic approach.
  - Some kind of performance is not possible to predict.
- ③ Largely achieved (L) : 51%~85%
  - Outstanding performance proof in right systematic approach and related check items.
  - Process performance can be varied according to areas.
- ④ Fully achieved (F) : 86%~100%
  - Perfect performance proof in complete, systematic approach and

detailed check items defined in major check items.

- No weak-points all over the project.

*b. Performance achievement measurement*

Major check items for performance achievement use P(pass) and F(fail) to determine it achievement. For the final measurement result, P(pass) is turned into F(fully achieved) and F(fail) is N(not achieved). Final evaluator comes from the result added to performance level measurement.

**Table 4. Performance level measurement**

| Detailed check item<br>Major check item | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| 1.1                                     | N | P | P | L |
| 1.2                                     | F | L | P | P |
| 1.3                                     | L | N | P | L |
| 1.4                                     | L | F | P | F |

**Table 5. Performance achievement measurement**

| Detailed check item<br>Major check item | 1     | 2     | 3     | 4     |
|---|-------|-------|-------|-------|
| 1.5                                     | P → F | P → F | F → N | P → F |
| 1.6                                     | F → N | P → F | P → F | P → F |
| 1.7                                     | P → F | F → N | P → F | F → N |
| 1.8                                     | F → N | P → F | P → F | F → N |

3.4 Evaluation of performance results

Evaluation of managing level using major check items use vector type evaluation used



in SPICE. This evaluation can be relatively compared with other projects and make a contribution to management level achievement objectives and improvement of management methodology. Evaluation procedures are

- ① Measurement results divides detailed check items F(fully achieved), L(largely achieved), P(partially achieved) and N(not achieved)
- ② Measurement results are calculated by vector percentage
- ③ Performance level can be measured by adding all values from major check items repeatedly : To measure achievement level in phase 1, for instance, major items(1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8) is (0, 25, 50, 25), (25,25, 50, 0), (0, 50, 25, 25), (50, 25, 25, 0), (75, 0, 0, 25), (75, 0, 0, 25), (50, 0, 0, 50), (50, 0, 0, 50). Average of each check item performance level is (40.625, 15.625, 18.75, 25). In phase 1, therefore, major check items get that F is 40.625%, L is 15.625%, P is 18.75%, N is 25%.
- ④ When average values from F and L is not exceed 60%, it is impossible to proceed the next phase.

**Table 6. Performance level measurement**

| Major Check Item | Fully achieved (F) | Largely achieved (L) | Partially achieved (P) | Not achieved (N) |
|------------------|--------------------|----------------------|------------------------|------------------|
| 1.1              | 0(0)               | 25(1)                | 50(2)                  | 25(1)            |
| 1.2              | 25(1)              | 25(1)                | 50(2)                  | 0(0)             |
| 1.3              | 0(0)               | 50(2)                | 25(1)                  | 25(1)            |
| 1.4              | 50(2)              | 25(1)                | 25(1)                  | 0(0)             |
| 1.5              | 75(3)              | 0(0)                 | 0(0)                   | 25(1)            |
| 1.6              | 75(3)              | 0(0)                 | 0(0)                   | 25(1)            |
| 1.7              | 50(2)              | 0(0)                 | 0(0)                   | 50(2)            |
| 1.8              | 50(2)              | 0(0)                 | 0(0)                   | 50(2)            |
| <b>Average</b>   | 40.625             | 15.625               | 18.75                  | 25               |

\*0 : Each unit of performance level

## IV. Conclusion

This paper presents the application ideas by aiming at supporting the effective management of IT projects in the public sector driven by local governments, analyzing domestic and international cases, dealing with comprehensive description of development and operation of the projects, applying quantitative assessment, and developing quantitative measurement and check lists to evaluate methodology framework, each process and detailed activities in the public IT projects.

Considering that existing frameworks and guidelines like ISO 12207 and CMM are not optimized for the application in the public sector, this study suggests framework model with flexibility, expansion, and simplicity. And this study is suggestions on the application the framework in the twenty IT projects of NCA in 2003 and in various IT projects and information projects driven by

the departments of government.

However, the existing IT project management methodology in the public sector is designed by using models from NCA. So, it deals with common and general points in project management.

Taking influence into consideration, this management methodology should be revised properly to apply all public sectors after the parties concerned provides opinions, model tests are applied, and application possibility is identified step by step to minimize side effects. Further researches and activities are needed in the future.

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