

<http://ansinet.com/itj>

ITJ

ISSN 1812-5638

INFORMATION TECHNOLOGY JOURNAL

ANSI*net*

Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Study of Solution Development Methodology for Small-Size Projects

Joon Ho Park, SungHo Chin, Jaehwa Chung and Kwang Sik Chung
Korea National Open University, Dongsung-dong, Jongno-Ku, Seoul, Korea

Abstract: Medium-size system integration or IT Solution Company's solution development project has limitation as like human resource limitation, budget limitation and expert limitation. Especially it is hard to maintain many IT experts for medium-size and small-size system integration or IT Solution Company. Thus in order to efficiently and beneficially complete projects, medium-size and small-size system integration or IT Solution Company should have appropriate solution development methodology. Solution development projects for medium-size and small-size system integration or IT Solution Company are usually short-term and small budget so that they need slim and light-weight solution development methodology. But usual medium-size and small-size system integration or IT Solution Company do not have their own appropriate solution development methodology. Thus, if those kinds of solution development methodologies are applied to solution development projects for medium-size and small-size system integration or IT solution company without some modifications, shortage of human resources, incompleteness of solution and deliverables could arouse. Especially unnecessary paper works (deliverables and documentations) to both of projects teams and client's wastes project resources and time. We analyze previous solution development methodologies and derive mandatory deliverables and optional deliverables. Before deriving them, we newly define procedures and tasks for each project stages which are necessary to projects team and clients, from client and expert of interviews. Our proposed solution development methodology can easily leverage the development overhead of short-term projects. Optional deliverables can be omitted by the contraction between project team and client.

Key words: Project methodology, solution development methodology, software engineering

INTRODUCTION

Solution development methodology for small-size project is standardization of techniques and utilities which are needed to manage the process of performing projects for System Integration (SI) or solution development (Choi, 2011). A solution development methodology for small-size project consists of multiple components such as task procedures, task methodology, project development documents, management method and development tools etc. A solution development methodology for small-size project is composed of procedural steps, methods, standard templates, quality control and configuration management and a project is conducted with the human resources who are able to follow a solution development methodology for small-size project. Solution development methodologies for big-size projects or medium-sized projects are appropriate for large-scale projects that are usually conducted by big companies. However, the solution development project that is conducted by a small-size company is supposed to be completed with low budget, short period and the minimized human resources. Even for the same solution

development methodology for small-size projects, a solution development methodology for small-size project can be differed in task procedure and task method etc. according to business scale and development processes. If previous solution development methodologies were uniformly applied for every project without considering business scale and development processes, then human resources and time would be wasted for delivering project development products (solutions, documents and etc.) (Jung, 2010). Because small-size companies do not have constraint human resources who can lead project by following the procedures of previous solution development methodologies, or who have experience of the deliverables guide for solutions, documents and etc. And also previous solution development methodologies require the large number of solutions, documents and etc. Moreover, small-size companies adopt previous solution development methodologies or theoretical solution development methodologies for small-size projects without modifications and considerations of their project environment, but those kinds of solution development methodologies for small-size projects are not effective or productive and do not deduces the development failures

(Park, 2000). Therefore, a new solution development methodology for small-size project is needed that considers the status of small-size project environments for efficiency and productivity (Lim, 2011).

PREVIOUS WORKS AND ANALYSIS

In general, most of domestic solution development methodologies for small-size project have used the previous methodology that is adopted from foreign countries and revised according to big-size company's circumstances and needs. Since, previous methodologies of foreign countries are established by the accumulated experiences and know-hows in long term, adaptation of the methodologies should be considered and could be modified based on the enterprise's circumstances and needs. The representative solution development methodologies of foreign countries are METHOD/1 (Andersen Consulting), NAVIGATOR(Ernst and Young), IEM(James Martin) and 4FRONT(Deloitte) and solution development methodologies devised for domestic circumstances are Innovator (Samsung SDS), POS-IEM (Posdata), SLC(LE-EDS) and HIST4FRONT(Hanjin Information Systems and Telecommunications) etc. (Kim, 2011).

In this study, in order to analyze solution development methodologies, we categorize them in according to the number of employees. We think that the number of employees means a project size and budget that the company is able to participate in. Therefore, the previous solution development methodologies can be categorized into three folds (Lee and Park, 2010):

- **Large size companies:** Level A: more than 2,500 employees
- **Medium size companies:** Level B: 300-2,500 employees
- **Medium and small size companies:** Level C: Under 300 employees

In this study, through analyzing five solution development methodologies of level A (eGovFrame, CBD, LG CNS, Samsung SDS and Marmi IV) and level B (Dongbu CNI and Kolon Benit), we induce the issues for making solutions, documents and etc. and procedures when we apply the above solution development methodologies to short term solution projects.

Innovator, Samsung SDS solution development methodology consists of 4 steps totally and 13 procedures, 23 tasks and 27 solutions, documents and etc. are induced (Samsung SDS, <http://sds.samsung.co>

[kr/data/upload/sjis/09122120219.pdf](http://sds.samsung.co.kr/data/upload/sjis/09122120219.pdf)). For completing solution development project by the Innovator, the total service period becomes 120.6 days when the duration time of the solution development project for small-size project persists six months. This indicates that each solutions, documents and etc. is supposed to be completed for 4.47 days arithmetically to complete the 27 solutions, documents. 6, 8, 3 and 9 solutions, documents and etc. are required in each step of analysis, design, development and implementation, respectively. Therefore, issues for making solutions, documents and etc. and human resources management could be arisen when the Innovator, Samsung SDS solution development methodology is directly applied to a small-size project for a small-size company. That is, the large numbers of solutions, documents and etc. are required for solution development methodology for small-size project which is beyond the ability for small-size company from the view of human resources and project time (usually 3 months). Because the small-size company's projects period is shorter than that of Level A companies, the large number of solutions, documents and etc. reduce the quality of solutions, documents and etc. Since, a small-size company determines the human resources and project time according to project budgets, the small-size company cannot assure enough time to increase the quality of solutions, documents and etc. and to conduct the project simultaneously. And also the numbers of employees who have experience of various tasks, deliverables and solutions are not enough. The reasons for those issues are as follows:

- As conducting a project, there are no task guidelines or procedure steps to make the PDPs
- When the period for a solution development project is reduced, there are no guide lines for optional and mandatory development products
- The standard guide lines, such as standard format for deliverables or code comments guide lines, do not exist

Through the classification of previous solution development methodologies in procedure levels, the comparison results of the solutions, documents and etc. with each solution development methodologies are categorized into two folds. First, solutions, documents and etc. made more than four times among previous solution development methodologies are defined as mandatory deliverables. Secondly, solutions, documents and etc. made less than three times among previous solution development methodologies are defined as optional deliverables.

We analyze seven big solution development methodologies that are commercially and theoretically recognized as legacy solution development methodology. We analyze each solution development methodology's development stages, procedures and solution and deliverables. And we adjust each solution development methodology's development stages and procedures for comparison, since they have slightly different stage name and procedure name for same task and activities.

E-Government Frame consists of analysis stage, design stage, development stage and operation stage. An analysis stage has eight deliverables (Ministry of Public Administration and Security, www.egovframe.go.kr/). A design stage has eight deliverables. A development stage has two deliverables. An operation stage has two deliverables. But E-Government Frame has difference with other solution development methodologies which is that it does not define procedures and tasks at each stage. Thus we cannot analyze procedures and tasks and we take it as reference methodology. E-Government Frame has totally four stages, twenty deliverables.

Samsung SDS's Package methodology consists of analysis stage, design stage, development stage and implement stage (Samsung SDS, <http://sds.samsung.co.kr/data/upload/sjis/09122120219.pdf>). An analysis stage has three procedures and five tasks and eight deliverables for them. A design stage has three procedures and seven tasks and eight deliverables for them. A development stage has two procedures and four tasks and three deliverables for them. An implement stage is common to the other stages and is always included in the other stages. It has four procedures and twelve tasks and thirteen deliverables for them. Samsung SDS's Package methodology has four stages, twelve procedures, twenty three tasks and twenty six deliverables.

MaRMI solution development methodology has plan stage, architectural design stage, incremental development stage and delivery stage (Ham *et al.*, 2004). A plan stage has two procedures and five tasks and four deliverables for them. An architectural design stage has eight procedures and twenty five tasks and twenty six deliverables for them. An incremental development stage has ten procedures and twenty two tasks and nineteen deliverables for them. During incremental development stage, MaRMI solution development methodology completes source codes, database design, converting programs and on-line help programs. A delivery stage has one procedure and three tasks and three deliverables for them. MaRMI solution development methodology has four stages, twenty one procedures and fifty five tasks and fifty two deliverables.

Kolon Benit's compass Web-based solution development methodology has analysis stage, design

stage, construction stage and evolution stage (Kolon Benit, <http://www.kolonbenit.com>). An analysis stage has eight procedures and twelve tasks and twenty nine deliverables for them. A design stage has four procedures and twelve tasks and twenty six deliverables for them. A construction stage has four procedures and eight tasks and eleven deliverables for them. An evolution stage has two procedures and six tasks and eleven deliverables for them. Kolon Benit's compass Web-based solution development methodology has four stages, eighteen procedures, thirty eight tasks and seventy seven deliverables.

Component Based Development (CBD) solution development methodology has requirements stage, specification stage, system building stage and delivery stage (Robey *et al.*, 2011). A requirements stage has two procedures and two tasks and six deliverables for them. A specification stage has four procedures and fifteen tasks and thirty five deliverables for them. A system building stage has five procedures and eighteen tasks and thirty two deliverables for them. A delivery stage has four procedures and nine tasks and eleven deliverables for them. CBD solution development methodology has 4 stages, fifteen procedures and eighty four deliverables.

LG CNS' VOC solution development methodology has requirement analysis stage, package customizing stage, package integration stage and package deployment stage (LG CNS, http://www.lgcns.co.kr/GHP_FILES/way4u.pdf). A requirement analysis stage has five deliverables. A package customizing stage has five deliverables. A package integration stage has six deliverables. A package deploying stage has eight deliverables. LG CNS' VOC solution development methodology has four stages, twenty four deliverables. LG CNS' VOC solution development methodology does not define a procedure and task.

We analyze 7 solution development methodologies and shows the frequency number of tasks at each procedure (Fig. 1). Most of tasks are focused on design task, specification task, system building task. We define them as mandatory task.

And we interview solution experts about unnecessary deliverables of short-term project (Fig. 2). We define unnecessary deliverables as table definition, entity definition.

Dongbu CNI solution development methodology has nine stages; plan stage, analysis stage, design stage, system building stage, test stage, implementation stage, delivery and closing stage, infrastructure stage and inspection stage (Dongbu CNI, <http://blog.naver.com/itsmkorea>). And it has twenty one procedures and forty two deliverables and does not define task. For comparison with other solution development methodology, we

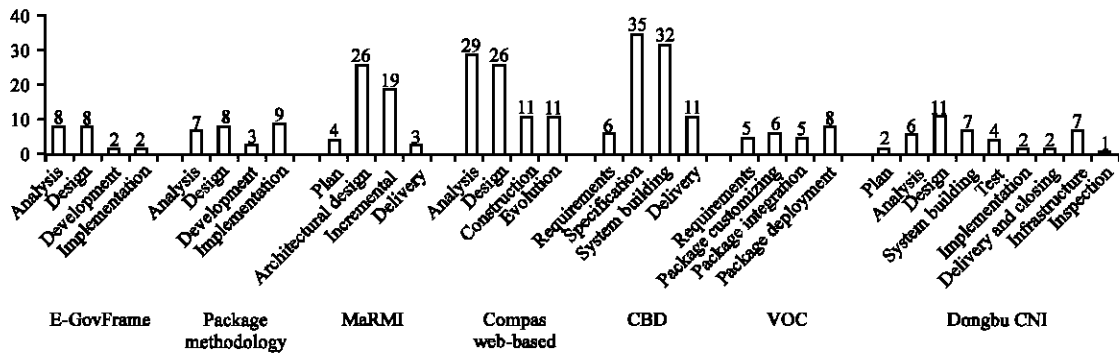


Fig. 1: Analysis of IT solution development methodologies

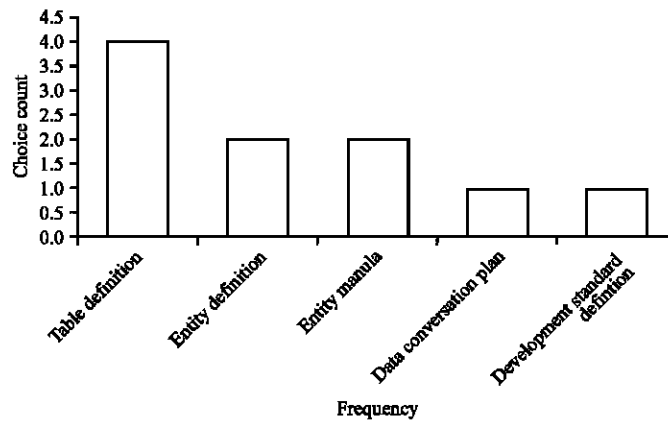


Fig. 2: Experts' unnecessary deliverables of development methodology

classify Dongbu CNI solution development methodology's plan stage and analysis stage into other's analysis stage, classify Dongbu CNI solution development methodology's design stage into other's design stage, classify Dongbu CNI solution development methodology's system building stage and test stage into other's development stage and classify Dongbu CNI solution development methodology's implementation stage, delivery and closing stage, infrastructure stage and inspection stage into other's implementation stage. A plan stage has one procedure and two deliverables. Before the analysis stage, the plan stage is completed and an execution schedule and a project action plan are delivered. An analysis stage has one procedure and six deliverables. A design stage has five procedures and eleven deliverables. A system building stage has four procedures and seven deliverables. A test stage has one procedure and four deliverables. An implementation stage has one procedure and two deliverables. A deliver and closing stage has two procedures and three deliverables. An inspection stage has one procedure and one deliverable. Dongbu CNI solution development methodology has nine stages and forty two deliverables.

Dongbu CNI solution development methodology has two times stages more than the number of other solution development methodologies' stage. But deliverables number of Dongbu CNI solution development methodology is almost same with other solution development methodology.

And we interview solution experts about necessary deliverables of short-term project (Fig. 3). We define mandatory deliverables as solution manual, current system analysis, requirements definition, source code and test plan.

SOLUTION DEVELOPMENT METHODOLOGY FOR SMALL-SIZE PROJECTS

We derive mandatory and optional deliverables of the analysis phase based on the proposed two criteria for comparison. In our analysis, there are five mandatory deliverables and six optional deliverables (Table 1).

We derive mandatory and optional deliverables of the design phase based on the proposed two criteria for comparison. In our analysis, there are eight mandatory deliverables and four optional deliverables (Table 2).

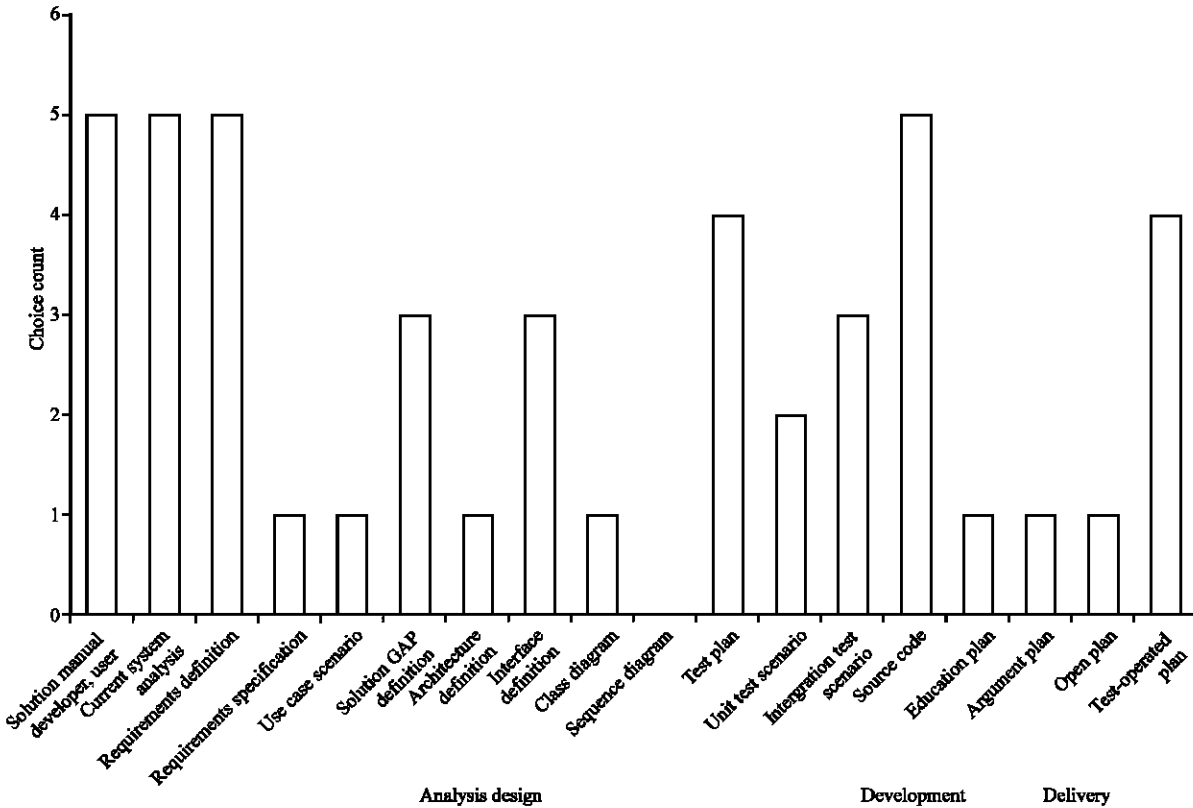


Fig. 3: Experts necessary deliverables of development methodology

Table 1: Mandatory and optional document of analysis task

Task	Division	Document
Analysis (requirements)	Mandatory deliverables	Interview results
		Requirements analysis
		System analysis
		Gap analysis
		Architecture design
	Optional deliverables	Use-case diagram
		Work flow diagram
		Component diagram
		ERD
		Interface list
	Interface design	

Table 2: Mandatory and optional document of design task

Task	Division	Document	
Design	Mandatory deliverables	Test plan	
		Interface design	
		Table list	
		Table design	
		User's manual	
		Operator's manual	
		Integration test results	
	Optional deliverables	Unit test results	
		WebApp design	
		Integration test scenario	
		System test scenario	
		System test results	

We derive mandatory and optional deliverables of the development phase based on the proposed two

Table 3: Mandatory and optional document of development task

Task	Division	Document
Development	Mandatory deliverables	Source code
	Optional deliverables	Component diagram

Table 4: Mandatory and optional document of implementation task

Task	Division	Document
Implementation (operation)	Mandatory deliverables	Education plan
	Optional deliverables	Pilot operating plan and journal

criteria for comparison. In our analysis, there are one mandatory document and one optional document (Table 3).

We derive mandatory and optional deliverables of the implementation (operation) phase based on the proposed two criteria for comparison. In our analysis, there are one mandatory document and one optional document (Table 4).

In summary, we derive 15 mandatory deliverables and 12 optional deliverables for each phase. In these documents, mandatory deliverables for analysis phase are five and the deliverables for design phase are six and, there is one optional document for each phase.

As shown above, we can confirm that the deliverables for the analysis and design phase are composed of 23 documents out of 27. In these phases,

5.6 times deliverables are produced compared to the development and implementation phases. Based on the deliverables to be created in the analysis and design phases, we propose the deliverables and methodology to enable the limited and no-experienced manpower creates the deliverables in the short-term projects. We also derive problems and issues through the interview for the current business clients and the survey on the project attitude of the developers.

CONCLUSION

For IT projects for service solutions or system integration, there are many kinds of IT service development methodologies that are developed and customized by each global company that has sufficient human resource and experts and sufficient budget. Thus these kinds of IT service development methodologies are appropriate to small-size project.

In this study, we present solution development methodology for small-size project that is appropriate to small-size companies that have constraint of human resource and budget. St first step, we analyze previous IT service development methodologies that are used for big-size companies and previous theoretical IT service development methodologies. And we have interviews with many experts and clients who present and propose their opinions for mandatory and optional deliverables for each stage. From the analysis and the interviews, we drive mandatory deliverables and optional deliverables for each development stage.

Those project procedures and stages are appropriate for short-term projects and through the three stages that are newly proposed in this paper are integrated with the analysis and design procedure. In the analysis stage, education task by the introduction and education of the solution to the customer, so that clients are aware of the specific requirements in order to understand the solutions and products of the short-term projects. From detailed requirements analysis, the frequency of project plan and

development changes can be reduced that occur in the development phase and clients' requirements can be satisfied. By following proposed solution development methodology for small-size project, the high quality of short-term project could surely be guaranteed. We have a plan to design and develop solution development project management tools and standards deliverables format.

REFERENCES

- Choi, M.J., 2011. A study on the application effect and improvement of agile methodology for project management. Master's Thesis, Hanyang University, Graduate School of Engineering.
- Ham, D.H., J.S. Kim, J.H. Cho and S.J. Ha, 2004. MaRMI-III: A methodology for component-based development. ETRI J., 26: 167-180.
- Jung, C.H., 2010. The Road to SI Project Professional. YoungJin Publisher, Korea.
- Kim, D.H., 2011. The audit method for improving the project quality by applying the agile methodology. Master's Thesis, Konkuk University Graduate School of Information Technology, Seoul, Korea.
- Lee, J.Y. and S.H. Park, 2010. The IT services industry globally competitive Strengthening. Research Paper, Korea IT Service Industry Association, Seoul, Korea.
- Lim, Y.T., 2011. Development of engineering methodology using process extraction model for small to medium size organisations. Ph.D. Thesis, The Graduate School of Ajou University, Seoul, Korea.
- Park, S.J., 2000. A study on the tailoring of object-oriented software development methodology for small/medium scaled projects. Master's Thesis, Sogang University Graduate school of information and Technology, Seoul, Korea.
- Robey, D., R. Welke and D. Turk, 2001. Traditional, iterative and component-based development: A social analysis of software development paradigms. Inform. Technol. Manage., 2: 53-70.