Design of a Platform for the Integrated Project Application Process

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ABSTRACT

It is thought efforts for enhancing R&D management are very important for improving the efficiency of national R&D. Specialized institutions in each ministry of Korea have built and operated their own R&D management system for applying, receiving and managing R&D projects. In this reason researchers should visit the project application system of each relevant ministry to apply a project. Also different application documents should be submitted to specialized institutions of each ministry. This study also aims to build a portal service which can be jointly used by all ministries for the purpose of convenient project application. To do this we designed a portal service for linking seamlessly from project notice to project application, and identified nine constraints (e.g., legal constraints, process-related constraints, systematic constraints) which can affect the design of service. Also we identified stakeholders by whom these constraints can be resolved. Our results can be used to design or implement integrated services through linking individual services in R&D management system.

KEYWORDS

R&D management; Constraints; Service Integration; Information Integration; Project Application

1 INTRODUCTION

As more budgets are increasingly made for national R&D, the efficiency of R&D investment is thought very important. As a result, there is an increasing demand for improving researcher's research efficiency and enhancing efficient research management. With respect to this, the NTIS (National Science & Technology Information Service)[1,2] functions as an advanced service for enhancing the efficiency of R&D. However, specialized institutions in each ministry of Korea have built and operated their own R&D management system for applying, receiving and managing R&D projects[3,4,5,6,7,8]. In this reason researchers should visit the project application system of each relevant ministry to apply their projects. Also many applicants feel difficulty in submitting an application by different format to specialized institutions of each ministry.

This study also aims to build a portal service which can be jointly used by all ministries for the purpose of convenient project application. To do this we designed a portal service for linking seamlessly from project notice to project application, and identified nine constraints (e.g., legal constraints, process-related constraints, systematic constraints) which can affect the design of service. Also we identified stakeholders by whom these constraints can be resolved.

2 RELATED WORKS

Many countries including the US and Japan have built and operated their R&D information system proper to their R&D environment[9,10,11,12,13]. The NTIS and the e-Rad are managed and operated in different manners in terms of providing information and service as described below. That is, while Korea's NTIS is a distributed and integrated service system for enabling all ministries to

connect and jointly use national R&D information, the e-Rad of Japan is an integrated service system just applied to specific research grant programs although it is cross-ministerial.

NTIS: The NTIS has been built as a national R&D knowledge portal for providing information regarding national R&D projects in connection with each ministry and institution. In NTIS, 330 standard metadata are connected and managed by systematically, which needs joint use thereof in the cross-ministerial level, for example, avoiding redundant similar projects in advance. Each ministry builds a system which supports real project management for the process from receiving R&D projects to outcome management, connects and just provides standard information to the NTIS.

e-Rad: The e-Rad operated by the Ministry of Education, Culture, Sports, Science and Technology of Japan is an online cross-ministerial system for a series of process about R&D management focusing on the 'competitive fund scheme (public research grant) [2,3]. The projects for e-Rad (research grant) are classified into the following two types. One of them is competitive fund which is used as a public research grant by 8 ministries. The other is project research fund which is a research grant politically supplied to project research about important research areas specified by the government of Japan.

Table 1 illustrates the compared contents of service supported by the NTIS and the e-Rad for the full cycle of research management from project notice to outcome report[14].

Table1. Comparison between NTIS and e-Rad

Step	NTIS	e-Rad
Notice	-Guide cross-ministerial project integration.	-Guide joint projects of each ministry.
Application and reception	-Manage researcher No. -Provide researcher information. -Search cross-ministerial similar projects. -Search cross-ministerial punishment information.	-Manage researcher No. -Provide researcher information. -Manage research institution information. -Apply and receive integrated projects.
Evaluation	-Connect and manage evaluator details. -Support recommendation of evaluator candidates. -Support automatic negotiation of evaluators.	-Register and manage evaluator details. -Select evaluators. -Register and manage evaluation result.
Agreement	-Make an agreement about research project for each ministry. -Connect and manage agreement information of each ministry. -Issue research grant for each ministry. -Provide research grant information.	-Make an agreement about research projects. -Register and manage agreement information. -Unify issuing research grants. -Provide research grant information.
Outcome report	-Connect, collect and manage outcome information. -Conduct cross-ministerial verification of outcomes. -Connect and manage 8 outcomes. -Investigate and analyze R&D outcomes. -Collect statistics about R&D outcomes.	-Register and manage outcome information. -Evaluate outcomes.

3 DESIGN OF A PLATFORM THE INTEGRATED PROJECT APPLICATION PROCESS

Service elements for support research management thought important to enhance the efficiency of national R&D are described below by comparing the NTIS with the e-Rad.

- Guide integration of cross-ministerial projects.
- Make a budget for cross-ministerial joint cooperation projects and support distribution.
- Support management integration for project application and reception.
- Manage and jointly use cross-ministerial agreement project information (including research grant).
- Support management integration of researcher and evaluator details.
- Support report and management of researcher outcomes, and outcome verification.

However in the view of researchers it is more important to provide convenience of national R&D participation. In Korea specialized institutions in each ministry have built and operated their own research project management system for applying, receiving and managing their R&D project. In this reason researchers should visit the project application system of each relevant ministry to apply their project as shown in Figure 1. Figure 1 describes as-is process of R&D project application. That is researchers can view the integrated notice information through the NTIS, but there is no system to allow them to view full project information they applied. Moreover researchers should check their project applied through the project management system in each relevant ministry where they apply a project to a plurality of ministries. And some application documents which have different format should be submitted to each ministry, but also a lot of institutions want offline document submission for a project although the document is received on line. Investigation of forms submitted in the step of project application and agreement in each of 17 ministries reveals at least 2 to 17 types of forms. The low level of sharing information among systems contributes to redundant submission of information by researchers, and low efficiency of similar project search and using punishment information. A ground is needed so that the NTIS can be an integrated portal service for joint use of researcher information and project application.

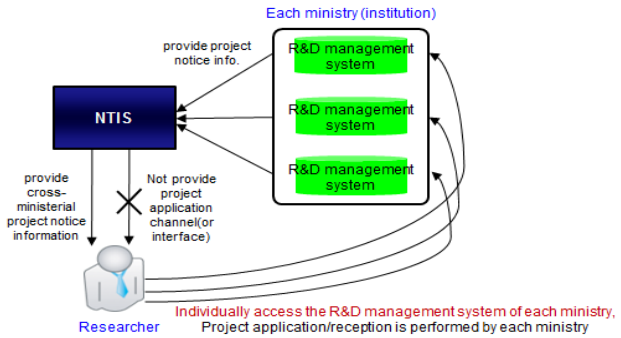

Figure 1. As-is process of project application

To solve this problem we designed a portal service from project notice to application and reception to enhance researcher's easy access and convenience. That is, the NTIS is just an integrated interface as portal, and notice and application implemented by the project management system of each ministry. Therefore researchers can easily access the project application system of each ministry after viewing project notice information through just accessing the NTIS. The NTIS shares project notice and application information with systems of each ministry.

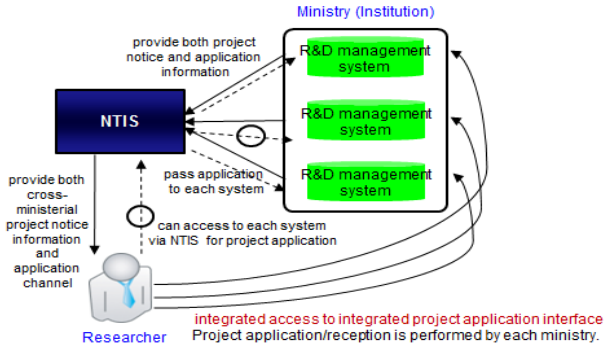

Figure 2. To-be process of project application

To do this, promotion in detail can be summarized in terms of regulation, standard, system, information as below.

- Establish a system for mapping project notice information and application information of each ministry.
- Develop a method of applying cross-ministerial unique No. to provide guidelines used in each ministry.
- Establish a window for providing cross-ministerial integrated notice and simplified project application information.
- Facilitate information connection so that project notice and application information of each ministry (institution) can be immediately announced in the NTIS.
- Develop and supply an API for registration of notice and application information to connect notice and project application information between the NTIS and ministries (institutions).

We designed a service scenario among stakeholders when researchers apply a project through the NTIS. Figure 3 shows sequence flow about the request and response technically when an applicant applies a project through NTIS.

① Researchers login to apply their R&D project proposal at the NTIS, and request a project application function. Here the personal identification key is a mandatory factor to use at login process between the NTIS and other project management system of each ministry.

② The NTIS requests a token including the user's login information to SSO linking module. After the token is issued, the NTIS transfers the token to project application system of other institute.

③ Each project application system requests a login process to the login agent.

④ Login agent which is installed on each institute's project application system checks token's validity and calls inner login module.

⑤ After processing the login request, project applicants input project application information into project application system of each institute, and then the information is transferred to the NTIS to be viewed by applicants.

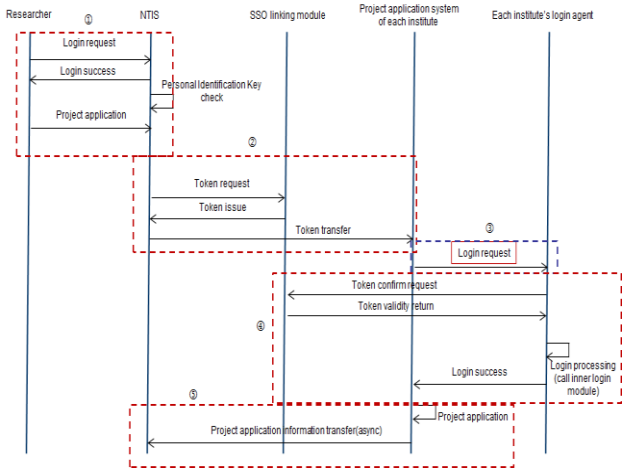

Figure 3. Service scenario

In addition we identified nine constraints (e.g., legal constraints, process-related constraints, systematic constraints) which can affect the design of service. Constraints are problem elements imposed by the system environment. To implement the proposed design of project application service as portal, these constraints should be resolved. Nine constraints can be described as below and Figure 4 shows overall constraints.

- C1-National R&D common regulation: This defines some rules which ministries or institutes follow in common during national R&D management. Therefore the regulation of each ministry should basically conform to this national R&D common regulation. To link project notice and application information between NTIS and the system of each ministry, national R&D

common regulation should include rules of the information integration or link. This regulation can institutionally support the integrated project application service as portal.

- C2-Ministry R&D regulation: Each ministry also defines some rules for managing the national R&D project. However it includes additional or more specific rules according to the ministry's R&D characteristics. Each ministry R&D regulation should comply with national R&D common regulation. Conflict between common regulation and ministry's regulation should be resolved. For example, each ministry R&D regulation should also include rules of linking project notice and application information between NTIS and the system of each ministry.
- C3-R&D management process: This basically consists of notice, application and reception, evaluation, agreement, and outcome management. However this can be different according to viewpoints of each ministry's R&D management.
- C4-Role & responsibility: When the NTIS is connected with systems of representative specialized institutions of each ministry, it is very important to define roles and responsibility for service operation. These roles and responsibility have closely relationship with other parties.
- C5-R&D management document: R&D management document should be submitted in each step of project application, reception and agreement. It is necessary to standardize the forms of document.
- C6-Information items: It is necessary to standardize items to be entered in R&D management. R&D information items to be managed are determined according to R&D evaluation policy of each ministry and government R&D survey & analysis. The items are closely related with regulation, management document.
- C7-Integration with external systems: The system of each ministry can be connected with other system such as management information system and cash management system. Therefore design factors such as integration time, synchronization method should be determined in consideration with external systems.
- C8-Technologies: Different technologies can be applied to each system such as different SSO and document automation technology. When we design integration module among services, we should consider these differences.
- C9-System environment: This can be different such as operation environment of DB and server and network environment. These should be considered in constructing one-stop service when connecting one-stop service of NTIS with R&D management system of each ministry.

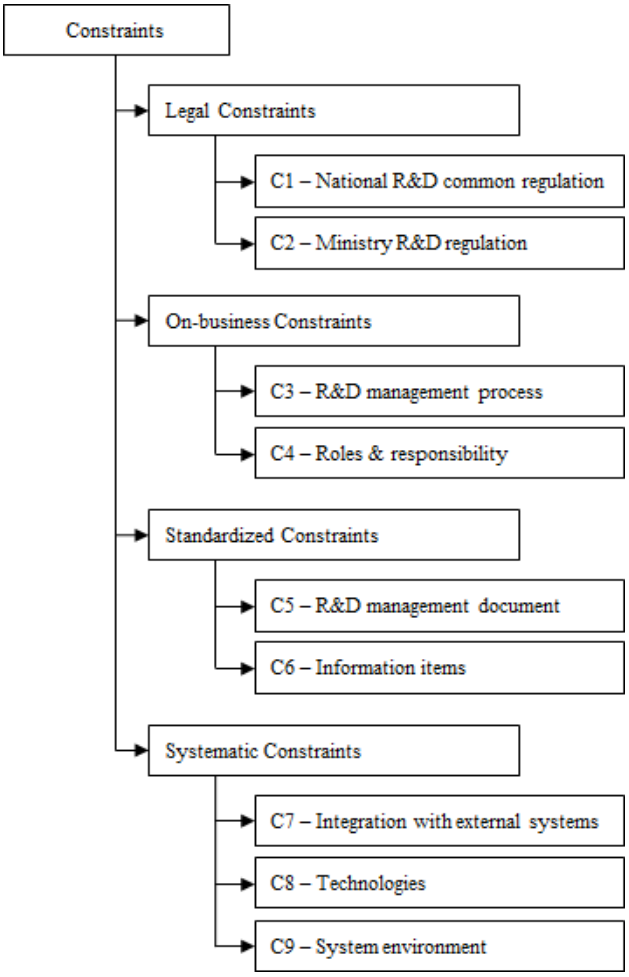

Figure 4. List of constraints

In Table 2 we mapped the constraints to role and responsibility of stakeholders. That is, each stakeholder should resolve the constraints in cooperated with other stakeholder.

Table2. Role and responsibility of stakeholders

Constraint	NTIS	Each ministry
C1-National R&D common regulation	✓	
C2-Ministry R&D regulation		✓
C3-R&D management process		✓
C4-Roles & responsibility	✓	✓
C5-R&D management document		✓
C6-Information items	✓	✓
C7-Integration with external systems	✓	✓
C8-Technologies	✓	✓
C9-System environment	✓	✓

5 CONCLUSIONS

This study also aims to build a portal service which can be jointly used by all ministries for the purpose of convenient project application. To do this we designed an integrated project application service as portal for linking seamlessly from project notice to project application, and identified nine constraints (e.g., legal constraints, process-related constraints, systematic constraints) which can affect the design of service. Also we identified stakeholders by whom these constraints can be resolved. Our results can be used to design or implement integrated services through linking individual services in R&D management system.

It is necessary to review constraints in detail and to study promoted design in terms of regulation, business, standardization, and system on the basis of the implications for the direction of developing integrated services proposed in this study. With this process, it is necessary to study an improvement method for more researcher-friendly research management with R&D efficiency.

ACKNOWLEDGEMENTS

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