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Research Paper

A case study on the real time transmission system for research funds

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Abstract

Background/Objectives: With aview topreventing the abuse and misuse of national research and development funds, which is increasing day by day, thisstudy investigated how systems can be efficiently constructed and redundant development can be minimized when systems are linked with those of variousmanaging institutions which support research and development funds from the viewpoint of research conducting institutions that have been provided with research and development funds.
Methods/Statistical Analysis: This study was conducted with aK government-funded research institute, which is a research conducting institution, in coordination with three institutions; the Ministry of Trade, Industry and Energy, the National Research Foundation of Korea, and the Institute for Information & Communications Technology Promotion.These institutions manage research & development projects.
Findings: Inthis study, to prevent the abuse, misuse, and unjust execution of national research and development funds, research-fundcard companies, research managing institutions, and research conducting institutions were linked with each other in real time.First,work efficiency was improved by setting a procedure through which the conducting institutions receive card use details from card companies when research fundcards have been used to execute funds in linkage with the internal executionsystems of the conducting institutions. The data on the execution of funds are transmitted to the managing institutions in real time to enable monitoring in real time.
In the past, a conducting institution had to construct a linked system and revise the internal management and execution systems every time a research project from a new managing institution was implemented.Therefore, in this study, when systems were linked, the systems were not directly linked to the DB table, but transmitted/received data by managing institution were analyzed to construct an integrated view and the integrated view was linked with conducting institutions' internal systems to minimize redundantsystem development.
Improvements/Applications: Unjust execution of research and development funds could be prevented in advance, and the transparency of research fund execution could be improved through system linked inreal time. In addition, the expandability of internal systems was improved through the system links and redundant system development when new projects are implemented could be minimized.

Keywords: *Research Fund Execution system; Real Time link; Prevention of Unjust Execution; Research Fund Card; System Integration*

1. Introduction

In South Koreannational research and development fundexecution systems, budgets compiled for managing institutions and departments that managenationalresearch & development projects provide budgets to diverse research project conducting institutions, so that the budgets are utilized.[1]The conducting institutions provided with research and development funds implement research & development with the budgets provided to them. For efficient research and development fundmanagementandexecution, individual conducting institutions construct their own research management and executionsystems to fit their operational environments and operate the systems separately. [2]
Since individual conducting institutions execute the budgets through their own systems and the managing institution are just notified of the results, the managing institutions cannot transparently and efficiently manage the budget[3], [4]Consequently, cases of unjustexecution of the research and development funds provided occur unceasingly. Therefore, to prevent the abuse, misuse, and unjustexecution of research and development funds, managing institutions that manage nationalresearch and development projects have been allowing conducting institutions to execute budgets after getting approval with entries of detailed information according to expenditures and purposes of use, instead of getting approval after executing budgets as was the case several years ago.
However, standards for entries of detailed information have differed among individual managing institutions, leading to the doubling of work in the position of conducting institutions that must integrate different pieces of detailed information for individual managing institutions. In addition, for conducting institutions to link their own managementsystems already in use with themanaging institutions'systems, systems separately developed for individualmanaging institutions lead to budget waste due to redundant development. Therefore, in this study, for transparent research fundexecution, the detailed information that must be entered by conducting institutions before theresearch fundexecution was linked to systems in real-time without manual operation to improve the efficiency and transparency of work, and the systems were standardized and modularized to minimize redundant developmentas systems are linked every time a research project is implemented.[5], [6]

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2. Materials and methods

This study was conducted with K government-funded research institute, which is a research conducting institution, in coordination with three institutions; the Ministry of Trade, Industry and Energy, the National Research Foundation of Korea, and the Institute for Information & Communications Technology Promotion, which t manage research & development projects.

2.1 System analysis and design

For conducting institutions to receive research and development funds from managing institutions to implement research projects, they should link their management systems with the research fundmanagementsystems of the individual managing institutions to transmit the details of research fundexecution to the managing institutions [Figure 1].

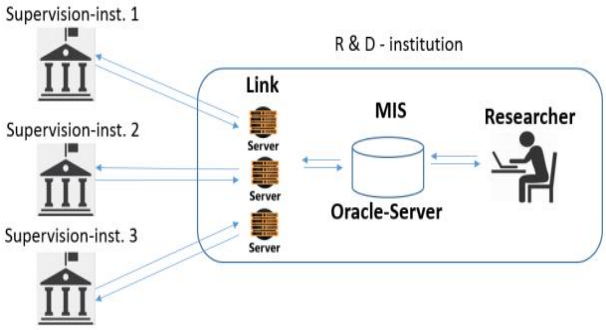


Fig. 1: System Link Diagram.

In this case, each conducting institution should link their system to the systems of individualmanaging institutions separately and should revise its internal system every time. In this study, to minimize the additional development, a system was developed so that system links can be integrated for management.

When a conducting institution uses research and development funds received after research agreements with managing institutions, it should use research fundcards issued by themanaging institutions[1]. Therefore, the conducting institution should receive the details of use of the research fundcards, execute the relevant funds in the internal system, and transmit the details of execution to the managing institutions. However, conducting institutions and managing institutions separately assign codes to projects after research agreements, and assign different codes to individual budget expenditures for budget execution for management. Therefore, when a conducting institution links its system with the systems of individual managing institutions to transmit executiondata, it should convert the codes of expenses into the codes used by the individualmanaging institutions for management. However, the conducting institution should separately link its system with the systems of the individual managing institutions to receive information necessary for code conversion, such as project information, expenditure information, basic codeinformation,and information on the research fundcards used. Therefore, inthis study, first, the system was improved so that the project information, expenditure information, and basic codeinformation received for code conversion can be syntagmatically managed and matched. All items in the DB Table for receiving the projects, expenditures, and basic codes of the individual managing institutions were extracted and an integrated view was created using the Join Query. Thereafter, the system was developed so that the managing institutions' codes can be matched with the conducting institution's internal managementcodes referring to the created integrated view. In addition, an integrated view of the research fundcard used was created and linked using the Join Query. [7], [8]

The government defined standards for the use of individual budgetexpenditures for research and development funds and does not approve executions that do not meet the standards and view them as improper executions. 1 Therefore, to manage whether conducting institutions that received research and development funds properly use the research and development funds properly, individual managing institutions determined input items for individual budgetexpenditures and require conducting institutions to enter and transmit the relevant input items for each case of the execution of the budgets. However, since the input items according to budgetexpendituresdiffer by managing institution, conducting institutions have difficulties in entering the relevant items during thebudgetexecution, because to enter input items according to the standards of each individual managing institutions, internal executionsystems should be separately developed to fit the input items of each individual managing institutions. Therefore, in this study, input items by managing institution were integrated by expenditure, so that conducting institutions are not required to separately enter input items by managing institution during budgetexecution. [Table 1] is shows the input items integrated byexpenditure.

Table 1: Table of Integrated Input-Items

SUB Item	Detail Item	Resolution item	Transfer item
Labor costs	Internal labor cost/ External labor cost	department, name, registration-number, participation-rate, period, account-number	payday, allowance, recipient, account, bankname, transfer-money
Research equipment cost	Equipment purchase cost	Product-classification, Electronic-taxbill(Product Name, Quantity, unit price, Supply Price, surtax, total-cost, Approval number, Business Number	payday, allowance, recipient, account, Bank-name, transfer-money, inspection-date, inspecter, NTIS-registration-number
Research activity cost	Expert utilization cost	Utilization method , Utilization period, Location, People information, account-number	payday, allowance, recipient, account, bankname, transfer-money
	Training cost	Educator name, registration-number, Educational institution name,period of education	payday, allowance, recipient, account, bankname, transfer-money
Research promotion cost	Domestic travel cost	trip-purpose, trip-period, Starting point, destination, Business traveler, registration-number, account-number	payday, allowance, recipient, account, bankname, transfer-money
	Meeting cost	Meeting date and time, Meeting place, attendants, belong	payday, allowance, recipient, account, bankname, transfer-money

Inthis study, the previous system, in which the details of research fund execution were transmitted in a lump when each project had been completed, was improved, so that data was transmitted in real-time for each case of execution.[9,10]The system was implemented so that the researcher of the conducting institutionshould apply for execution ofthe research funds, transmit the data to the managing institution when the execution has been resolved to get approval of the managing institution for the relevant case of execution, and transmit the final data after the execution has been conducted. Figure [2] shows a flow chart of the research fund budget execution.

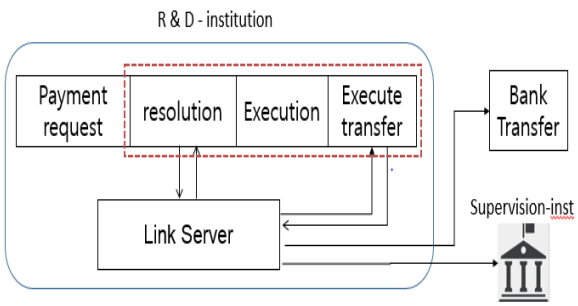


Fig. 2: Execution Process of Research Funds.

2.2 System implementation

In this study, to implement theresearch fundexecutionreal-time transmission system, a DBMS was constructed using Oracle 11g and a program was developed using Nexacro 14, which is an html five based development solution.
[Figure 3] shows project and expendituresmatching screens of a managing institution and aconducting institution. Projectand expenditurescan be searched separately by managing institution and can be searched byproject name, project identification number, expenditure name, expenditure code, or managing institution code.

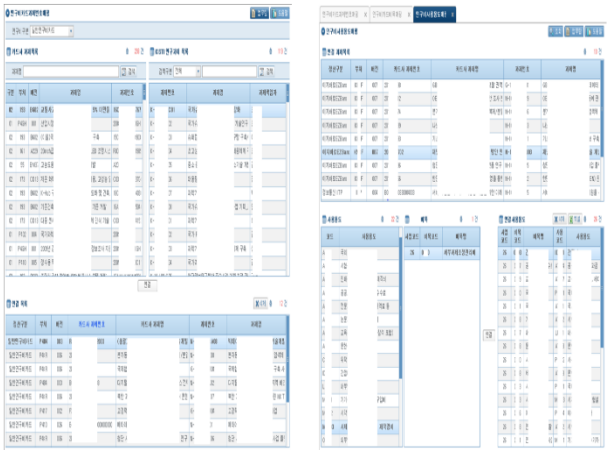


Fig. 3: Code Match Program UI.

The information matched as such is referred to theconducting institutions' researchers as basic data to check theinput items when applying for the execution of research and development funds, and when creating transmission data by converting the codes of the input items into the managing institution codes to get prior approval when an execution has been resolved.
[Figure 4] shows a screen for the entry of anexecution request of related data by researchers when applying for execution. Since the detailed data that must be entered when requesting anexecutiondiffers according to budgetexpenditures the screen for entry was designed to change dynamically. When anexecution is requested in relation to labor costs, the screen will be changed so that participant names, participant registration numbers, participation periods, participation rates, amounts paid, and account information can be entered. In addition, when a payment is requested in relation to research equipment costs, the screen will be changed so that electronic tax invoice numbers, product names, quantities, unit prices, and supply values can be entered.



Fig 4: Payment Application Input Program UI.

[Figure 5] shows a screen to create and manage transmission data for the transmission of execution request data to the managing institution. The codes are converted referring to integrated and matched projectcodesandbudgetexpenditure itemcode and transmission data is created to fit the data form of each managing institution. When transmission has been completed, the present situation of transmission, such as approval and errors can be monitored.

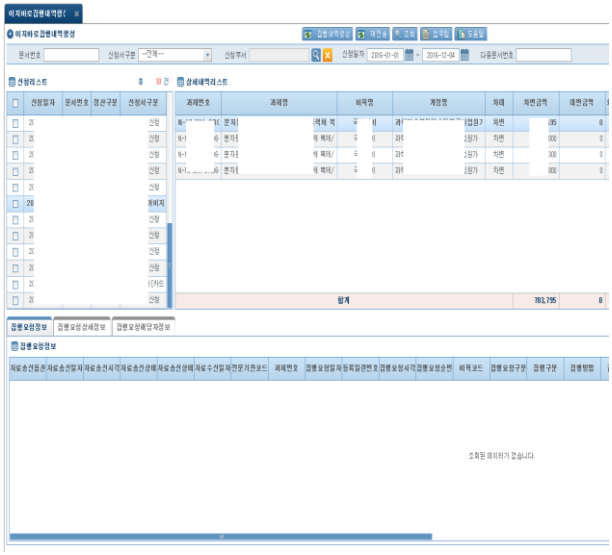


Fig. : Transmit Manage Program UI.

3. Result and Discussion

In this paper, a systematic construction plan to prevent theunjustexecution of research and development funds and how to efficiently manage research and development funds is presented. In addition, matters that must be considered when constructing the system from the viewpoint of research conducting institutions were presented through a case of construction.

1) For efficient research and development fundmanagement, real-time links were implemented instead of the transmission in a lump after execution.
2) Integrated views and matching programs were developed for integrated management of the received data.
3) Integrated views and pop-ups were developed for the integrated management of research fundcard use.
4) A program for dynamic changes of the input screen was developed to allow diverse input items
5) A program to create and manage transmission data by themanaging institution was developed
6) By constructingreal-time transmission and integrated management programs, the transparency of research fundexecution was improved, budgets for additional development could be reduced, and works could be managed syntagmatically so that work efficiency could be improved.

4. Conclusion

In the society of unlimited competition, the government's budgets for research and development funds are increasing day by day. As with the foregoing, cases of abuse, misuse, and unjustexecution of research and development funds are also increasing. To prevent such unjustexecution, the government is preparing diverse countermeasures. In this paper, an execution of a real-timedata transmission system is presented as one of such countermeasure. In addition, matters that must considered when the real-time transmission system is constructed from the viewpoint of research conducting institutions are analyzed and an efficient construction plan is presented. Since this study addressed the case of construction of a certain research institute, when a system is constructed based on this study, the construction plan should be tailored to fit the environment of the managementsystem already developed and being operated by each institution. In addition, for efficient research and development

fundmanagement, not only cross-national policies should be prepared, but also management systems should be integrated, so that research institutes and institutions can commonly utilize the integrated management system.

References

[1] Ministry of Science and ICT and Future Planning.Manual of Research Management on National Research Development Project.2017. http://www.korea.kr/archive/expDocView.do?docId=37677, Date accessed: 11/30/2017.

[2] Sang-June Park, Ji-Yeon Byun,Min-Ho Cho, and Dong-Won Kim.Innovation Resistance in Adoption Process of New R&D Grant Management System, Korean Management Science Review. 2007, 24 (2), pp. 19 - 31.

[3] Ho-Kap Lee and Kwang-Soo Shin.A Study on Transparency of Research Fund Supported by Government.Korean Journal of Accounting Research. 2007, 12 (3), pp.189-209.

[4] Jun-Shik Hong.A Study about the Analysis of Spending Practices for National R&D Funds, Korea University, Graduate School of Public Administration, 2008.

[5] Han-sol Jang. A Study on Suggestions for Improving Research Administration: focusing on the H Institute, Hanyang University,Graduate School of Business, 2016.

[6] Byung-tae Kim.Characterization of the Research Fund Management System of the Participating Research Institutes and Universities. Science and Technology Policy. 2006, 16 (4), pp.79-88.

[7] (http://www.ndsl.kr/ndsl/search/detail/article/articleSearchResultDetail.do?cn=JAKO200666067282267, Date accessed: 11/30/2017).

[8] Seong-Man Choi, Cheol-Jung Yoo and Ok-Bae Chang.Integrated Management Data Warehouse Development Process of Research Expenses in Enterprise Environment.Korea Information Processing Society Review.11-D (1), 2004, pp.183-194. (http://journals.kips.or.kr/digital-library/manuscript/9212/download, Date accessed: 11/30/2017).

[9] Ki-Man Jang, Hoe-kyung Jung, and Chang-Su Kim.Real-Time Fraud Detection using Data Quality Diagnosis Techniques for R&D Grant.Journal of the Korea Institute of Information and Communication Engineering.2015, 19 (11), pp. 2609-2614.

[10] Jung-Eun Kim and Min-Sik Kim.Improvement of R&D Funding Management System for National R&D Program.Korea Information Society Development Institute, 2014. (https://www.kisdi.re.kr/kisdi/common/premium?file=1%7C13612, Date accessed: 11/30/2017).

[11] Young-hak Kim andSeung-yeop Han.Real-time Integrated R&D Management System for Transparent and Efficient Government R&D Fund Management. Asian Society for Innovation and Policy. Proceedings of 2013 Fall Conference. Oct. 31, 2013, pp. 296-310. (http://www.ndsl.kr/ndsl/search/detail/article/articleSearchResultDetail.do?cn=NPAP12033697, Date accessed: 11/30/2017).