Improvement Measures for Construction Business Information Systems through the Analysis of User Requirements

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1. Introduction

In line with the rapid changes in the IT paradigm, many researches are being carried out to link the latest technologies to the information handling systems in the construction area. Action plans are being devised to integrate the latest technologies such as Internet of Things (IoT), Building Information Modeling/Geographic Information System (BIM/GIS), and satellite imaging into Continuous Acquisition & Life Cycle Support (CALS), which provides diverse information created during construction projects. If the system operation and development environments will not be considered, however, measures for integrating the latest technologies will only increase the system complication and reduce the efficiency. This study identified system problems and presented solutions to effectively apply the new operation measures. The findings of this study, which were based on the analysis of the user requirements for the past six years, will be the measure of system operation and improvement efforts.

2. Relevant Researches

2.1. Overview of the operation of CALS

CALS, which is a work support system designed to provide various information created during construction works to constructors and orders, is composed of the construction CALS portal, construction project management, construction approval, land compensation, and facility maintenance systems. MLIT devises system promotion plans every five years and prepares annual operation measures in a bid to promote the utilization of systems, but these efforts without considering the overall system environment make the operation of systems more difficult. Moreover, the 2015 plans for the development and operation of functions involves the adoption of the IoT technology, although wireless communication technologies and devices connecting wireless communication data to servers are required to use the said technology. On the other hand, CALS, which was gradually developed in the way that individual units were separately developed, beginning with the development of the construction project management system in 1998, is composed of 1 (server):N (individual systems). Moreover, individual systems' development platforms are different from one another, and the systems were developed using the non-standard Web method, making it very difficult to develop and operate new functions. If new technologies such as IoT and BIM/GIS will be applied to CALS, it will only increase the system complication and decrease the system efficiency. Thus, CALS needs to be urgently improved.

2.2. User requirements

CALS, through Help Desk, handles the requirements of 37,000 system users. Such requirements were found to vary widely, such as questions irrelevant to the system, the method of using the system, the setting of the user PC environment, the method of inputting data, and function and interface problems. This study gathered user requirements accepted by Help Desk from 2008 to 2013 and classified them, except for the questions that were irrelevant to the system, into five types and 14 items, and quantified them (Table 1).

[Table 1] User requirements by type and system

Type	Item	Construction project information unit system					Cumulative total
		Project management	Land compensation	Facility	Approval	Portal	
Handling errors	System error	500	10	28	19	25	582
	Program error	183	33	49	17	17	299
Request for services	Register/change user	1,200	114	46	843	323	2,526
	Input/revise data	4,740	942	326	3,176	139	9,323
	Request for data	97	18	107	206	77	505
	Remote support	1,817	73	68	111	8	2,077
	Confirm data	3,861	632	107	711	126	5,437
Inquiry the method of	Work process	20,184	2,257	359	3,529	279	26,608
	Install relevant program	1,121	17	41	85	3	1,267

use	Setting of environment	1,910	34	54	338	13	2,349
Improving functions	Improve processes	82	44	21	10	6	163
	Improve interfaces	15	31	26	11	17	100
	Add functions	13	7	1	1	11	33
Others	Others	98	26	12	33	84	253
	Total	35,821	4,237	1,245	9,090	1,128	51,521

The analysis of the data for the past six years revealed a total of 51,521 CALS user requirements, 30,224 inquiries about the method of use (59%), 19,868 requests for services (38%), 881 cases of handling errors (2%), 295 cases of improving functions (1%), and 253 other cases (under 1%). Of these, the inquiries about the method of use (work process) and the requests for services (input/revise data), regardless of the increase in the number of users, continued to increase.
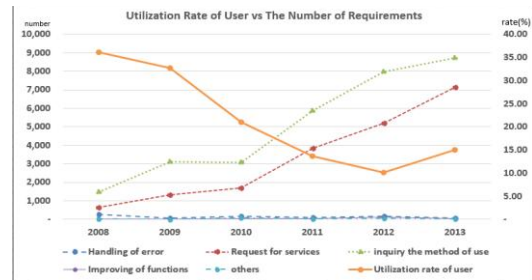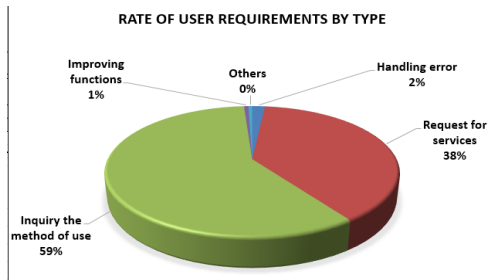

Figure 1. Rate of User Requirements by Type.   Figure2. Utilization Rate of User VS Number of Requirements

The analysis revealed that these results were attributable mainly to the changes in the user environment (PC, network, security, etc.), the frequent changes in the Web service functions, and the high dependence on universal software (Active※based universal platform, etc.). The analysis of the CALS function improvement results over the past six years revealed 34 cases of new-function development, three cases of changes in the usual platforms (partly applied), and the partial application of the e-government standard framework (one-unit system's main page UI), but there was no case of changes in the development frameworks, and there were over 15 cases of services being linked with other agencies to provide relevant services. Specifically, added to the initial CALS development framework (Web1.0-Web1.5 development standard grammar, etc.) were mobile and e-government standard framework Web2.0-based new functions and Active※based usual software, and the UX-based UI and the data processing process were changed. After all, forcibly added to CALS's non-standard development platform were the Web-standard-based new functions, thereby increasing the system complication (work process) as well as the user requirements. To address these problems, the physical server configuration type should be uniform (Server 1: Logical System 1), the non-standard Web development method should be standardized (Web2.0), the development platform of individual construction project information systems should be standardized, the ratio of Active※based universal platform software should be reduced, and limitations in linking with other agencies' services should be analyzed and reflected in the improvement efforts.

3. Conclusion

This study derived areas subject to improvement before reflecting the latest information technologies in CALS. Towards this end, the system operation status and the user requirements for the past six years were classified into five types and 14 items, and were analyzed. The analysis revealed that inquiries about the method of using the system (work process) and requests for services (input/revise data) had the highest ratio, but that regardless of the increase in the number of users, the addition of new functions to the system (Active※based SW) and the retention of non-standard development platforms increased the number of user requirements. To address these problems, the physical server configuration type should be uniform, the non-standard Web and development platforms should be standardized, and the ratio of Active-X-based universal platform software should be decreased so as to reduce the system complication and to adopt the new IT technologies.

4. References

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