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ASSESSING THE EFFECTIVENESS OF DIRECTORY SERVICE BASED RESOURCE MANAGEMENT FOR SMES IN KOREA

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Abstract. *Today's complex business environment needs the integrated management of distributed IT resources. However, many IT solutions for managing these resources require lots of efforts and time. Investing lots of money over full-featured solution to manage distributed IT resources is a substantial burden to small and medium enterprises (SMEs). As an alternative approach for cost-effective integration of distributed IT resources, directory service based resource management (DSRM) has been tried to reduce such burdens between SMEs. DSRM solutions are continuously expanding the range of its application from a niche segment to major solution market for resource management. However, there are currently insufficient researches on the effectiveness of DSRM. In this paper, authors have measured IT capability of 31 Korean SMEs for their resource and account management method via a questionnaire. Survey result shows that SMEs that are using directory service have higher level of IT resource management capability than the other companies. Authors also investigated two major obstacles for SMEs to use directory service are lack of automatic synchronization method and absence of administrative personnel.*

Keywords: Directory service, Distributed resource management, Account management, SME

1. **Introduction.** Management of IT resources that are usually distributed over multiple sites has always been an important issue for modern companies. And there has already been a software market for distributed IT resource management solutions with high-performance and full-featured functionalities. Large corporations with enough resources and abundant personnel have already adopted these solutions to streamline related business activities [6-8]. However, for SMEs with limited money and less manpower, these expensive solutions have been a significant burden to adopt.

To obtain cost-effective solution for distributed resource management, SMEs in Korea have been interested in directory service based resource management (DSRM). Since many commercial operating systems are already equipped with directory service (DS), if distributed resource management solution can be implemented over existing DS, then SMEs will be able to own such solution with significant cost savings. However, there are currently insufficient researches on the effectiveness of DS. Because DSRM solutions are usually offered by small solution vendors or are custom-built as an in-house solution within SMEs, there is not enough information available for potential users to refer to. To facilitate the adoption of DSRM among SMEs, the effectiveness of DSRM should be answered in advance with some actual evidences. In this study, authors are interested in assessing the effectiveness of DSRM for IT resource management of SMEs. By measuring

SMEs' IT capability level on resource and account management through a survey for 31 Korean companies, authors point out that the capability level of SMEs with DS is higher than that of the other companies which are not using DS.

The organization of this paper is as follows. In Section 2, DSRM approaches are briefly explained with some related work on distributed resource management. In Section 3, our research method is explained in detail. Survey results are given in Section 4. Finally, conclusions are given in Section 5 with some further research issues.

2. **DSRM Approaches.** Many types of IT resources such as servers, storages, and auxiliary computing devices are connected to network across multiple remote sites, and companies are utilizing various solutions to effectively manage these distributed IT resources. Since many heterogeneous devices should be interconnected and be able to interoperate, a number of technologies and related standards have been developed to handle corresponding integration problems. CIM (Common Information Model) and WBEM (Web Based Enterprise Management) of DMTF (Distributed Management Task Force) are notable examples of such standards. CIM and WBEM are being utilized for the management of distributed IT resources in a variety of fields ranging from ubiquitous sensor devices to networked servers. WBEMservices, OpenPegasus, SNIA CIMOM and OpenWBEM are famous open source implementations of these standards [1-3]. In recent years, much attention has been focused on achieving both cost reduction and business efficiency through the virtualization of physical resources. DMTF's VMAN (Virtualization Management) Initiative is one of leading entities that drive technology development and standardization. OVF (Open Virtualization Format) is a famous standard of VMAN Initiative that enables installation and deployment of virtual alliances [4,5].

With regard to software systems that support distributed IT resource management, ITAM (IT Asset Management) solution market has been established to support related business operations. From the perspective of IBM, ITAM solution covers the whole processes from acquisition to disposal of technology assets. It includes work, service, contract, inventory and procurement within its management scope. Several professional solutions for managing such wide range of assets are already being deployed and used in the large companies [6,7]. However, these full-featured solutions are significant burden for SMEs to own because they require substantial cost and time to introduce and operate. Considering the fact that most of asset management operations in SMEs are largely for managing IT resources, it is not realistic for SMEs to invest lots of money into total solution with full features that are seldom used. SMEs need some cost-effective alternatives with IT sub-feature. DSRM is considered as one of such alternatives that can satisfy these needs of SMEs.

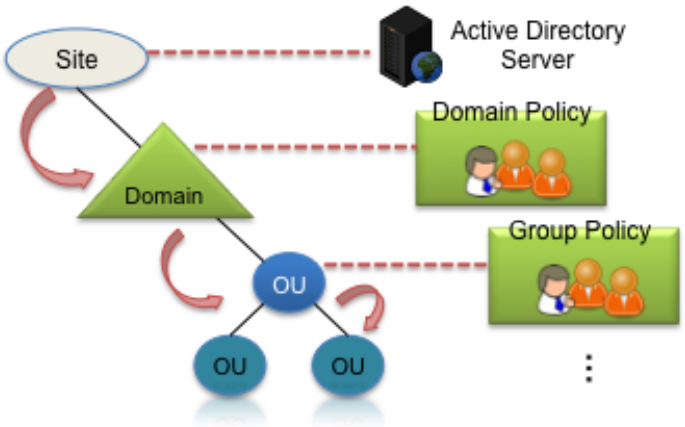

FIGURE 1. Applying group policy in the AD

Directory is a standardized repository that contains various data such as user information, security, and distributed resources. It plays a role of information source for distributed objects in a networked environment. DS is a centralized system that automates management of such information, and enables interoperation with other directories. LDAP (Lightweight Directory Access Protocol) standard enables the access to such directories regardless of the specific application or particular operating system [8]. Because LDAP implementations are independently provided as open source solutions or integrally delivered as a subcomponent of commercial operating systems, utilization of DS can be convenient and cost-effective.

AD (Active Directory) is an LDAP implementation that is provided by Microsoft. In AD, information is hierarchically organized into name spaces. Users can easily find and access archived information by navigating hierarchical structures. All of networked resources and their attributes can be named and deployed as objects in their corresponding domain. AD provides group policies and policy based central management. It also provides delegation of such managerial controls. With these versatile capabilities of AD, it is possible to implement a cost-effective IT asset management solution for SMEs, and these kinds of solutions are referred to as DSRMs in this paper.

3. **Research Method.** For those companies that are considering the introduction of DSRM, the actual evidence that DSRM approach really improves their business efficiency is needed the most. In order to answer these requests, authors have carried out a survey that asks IT capabilities of company in regards to management of IT resources and distributed accounts from 31 Korean SMEs.

Questionnaire consists of two sets of questions. A-set has four questions that are directly related with the utilization of DS. With A-set questions, we can understand whether a company owns DS or not, and the company utilizes DS for issuing account, authentication, and authorization. B-set has 16 questions that ask the degree of management for networked resources or accounts. Professionals that are currently working at the IT solution business have joined to develop survey questions. Several IT capability assessment methodologies are also referred while building questions. Figure 2 shows two example questions that are included in the questionnaire.

A3. If the directory services are introduced in your company, then what is the scope of application for service based authentication?
B. PC logon authentication
S. PC logon and e-mail service authentication
R. PC logon, e-mail service, and resource access related authentication
D. Complete authentication for all user tasks

B8. Do you have an automated way to gain access to the internal resources from the external user accounts?
B. No access is allowed.
S. No special restrictions for access to internal resources from the external users.
R. Manually control accesses from the external users, if needed.
D. Systematically control accesses from the external users based on the policies.

FIGURE 2. Sample questions from the questionnaire

Reply to each question is formatted into 4 levels, which are B for basic, S for standardized, R for rationalized, and D for dynamic level. And each level is credited to a point from 1 to 4, respectively. Total credit point for all 20 questions is used to determine the IT capability level of that company. Dynamic level is credited to a company with total credit point that is higher or equal to 68 points. Rationalized level is credited for total

56 points or more. Standardized level is credited for total 40 points or more. The others that are less than total 40 credit points are assigned to basic level.

Table 1 summarizes the result from 31 Korean SMEs. Among these companies, 15 companies have answered that they are using DS, and the number of companies for each capability level B, S, R and D is 3, 8, 1, and 3, respectively. The other 16 companies that are not using DS are all in the basic level. With this result, we can carefully say that the IT capability level of SME is highly related with the introduction of DS.

TABLE 1. Summary of credit points for questionnaire

Average (Std. Deviation)	Using DS	Not using DS
For all 20 questions	51.9 (12.9)	30.2 (5.0)
For B-set 16 questions	40.1 (10.6)	26.0 (5.1)
Number of companies for each level (B, S, R, D)	(3, 8, 1, 3)	(16, 0, 0, 0)

4. **Survey Results.** Survey result in Figure 3 clearly shows that the IT capability level differs between companies depending on whether they are using DS or not. In case of companies that are not using DS, the most of their IT assets are passively managed in a manual way. However, even within the companies that have answered to use DS, the level of utilization is not high enough, and the majorities are still remaining in standardized level as is shown in Figure 3. There even exist three companies that have introduced DS, but still remain at the basic level. This implies that the introduction of DS does not guarantee higher IT capability level. The degree of actual utilization of DS really determines the IT capability level.

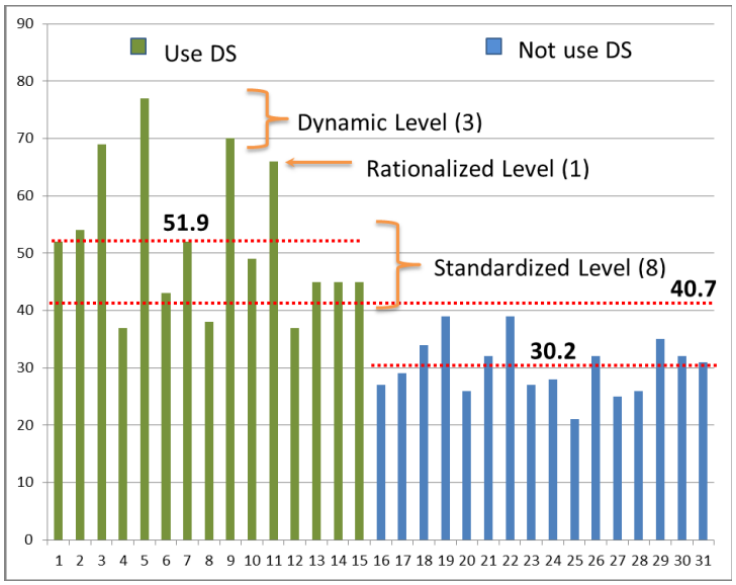

FIGURE 3. Level difference between companies

Authors have further investigated the degree of DS utilization and possible reasons for low utilization among the companies that have introduced DS. For all 31 companies, authors also have further questioned about obstacles for using DS. Results for additional survey are depicted in Figure 4. It is found that 67% of the companies show the degree of DS usage less than 40%. However, only 26% of companies show high degree of DS usage above 60%. The reasons for low degree of utilization are largely attributed to the burden for manual management and to the lack of sufficient managerial personnel. It is notable that the mismatch between organizational structure and directory structure (23%) is also pointed out as one of obstacles that make the utilization of DS to be low. The difficulty

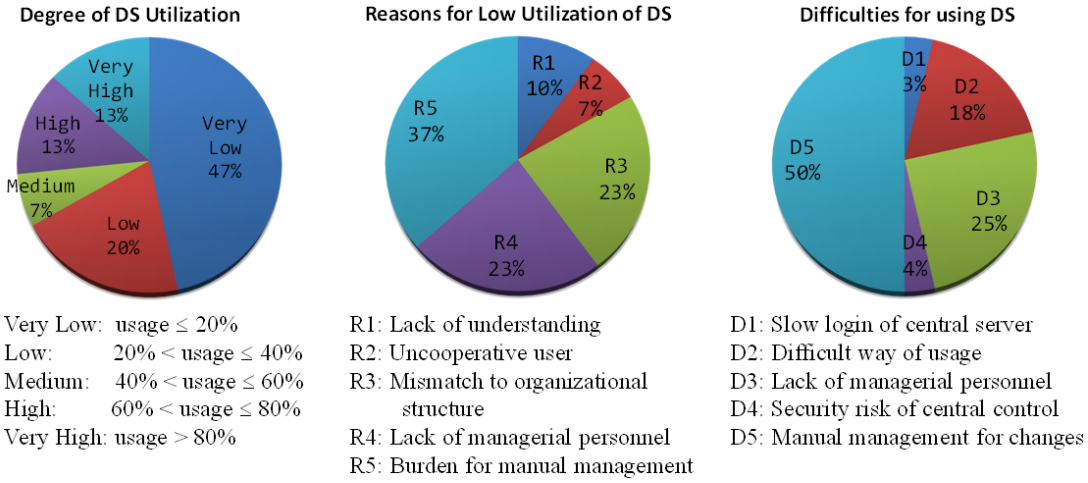

FIGURE 4. Survey results for DS usage

for using DS is largely attributed to manual management for changes (50%) and to lack of managerial personnel (25%).

Survey results reveal that to facilitate the usage of DS within SMEs, there should be a way to minimize manual tasks, and thus reduce the burden to allocate extra personnel for DS. This means that some solutions that automate managerial tasks for DS are needed for SMEs. In addition to this, directory structure should be aligned to the company's organization structure. Any changes to one structure should be automatically synchronized to the other structures without manual interventions.

5. **Conclusions.** SME's IT resource management capability differs between companies depending on whether they are using DS or not. Companies using DS show higher level of managerial capability compared to the other companies that do not use DS. However, not all DS using companies show higher level of IT capability. Some companies are still at the basic level even though they are using DS. To identify the reasons for this, authors have further investigated the obstacles for using DS. By summarizing the difficulties for using DS, and the reasons for not using DS, authors have found that automatic synchronization between organizational structure and directory structure is very important to facilitate the usage of DS for SMEs. Though the survey is conducted just for 31 Korean SMEs, its implication can be used valuably for the other companies that are considering the introduction of DSRM.

For the further study issues, it is needed to increase the number of companies for robust statistical result. It is also worthwhile to compare the difference in IT capability level between SMEs and large companies for resource management.

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