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Reliability and Information Systems Infrastructure

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Abstract—The reliability of information systems infrastructure is critical. After all, it is the basis of other business systems and processes in the organization. In a turbulent world development of a robust and reliable information system infrastructure is a challenge. Infrastructure should run as a solid foundation for operations, but be flexible when needs change. Information systems infrastructure should also provide a shield against different kinds of threats, such as viruses and hacking from the outside world. Understanding elements that impact the reliability of infrastructure is therefore an important element in the development of reliable information systems infrastructure.

Keywords— reliability, robustness, information system, infrastructure, development, standards.

I. Introduction

INFORMATION systems are the basis for processes and activities in any organization and company. It is a foundation for manufacturing, sales, and a variety of functions in the organization, depending on the field, industry, or sector in which they are operating. The common element in any organization is information systems, often equally necessary elements such as electricity or heating.

One of the most important requirements for infrastructure is reliability. This is also the case with information systems infrastructure; they should run as the backbone for operations in the organization. Robustness is not the only requirement, especially for information systems. Information systems are also expected to be flexible, so that changes can be made rapidly if there are changes in the competitive environment, for example. The development of information systems with several goals and objectives, partly controversial, can be challenging, [1].

This article studies the development of information systems infrastructure in an organization, [2]. We look at technologies and systems needed to provide infrastructure, which is at the same time robust and flexible for changes. In a turbulent environment, a reliable information systems infrastructure is an asset and critical for successful operations.

II. Information Systems Infrastructure

Information systems infrastructure refers to technologies and systems that are the basic technological platform for other applications, [3], [4]. Infrastructure functions as the mortar for technologies and systems, different processes, and activities in an organization, [5]. Information systems infrastructure includes both technical and software components. However, there are also other important elements than sophisticated technology or cutting-edge applications; infrastructure includes a human component. Here, it refers to the expertise and knowledge of people who are involved in the management and development of information systems and infrastructures. It is noted that often the human component is the most critical.

Infrastructure is about technologies and systems that are shared among users, functions, and units throughout the organization, [6]. For example, a common email system is used in every department in the organization. In contrast, a printer is mostly used by people working on the same floor or part of the building, not necessarily by all staff members of the organization. Sharing does not necessarily mean that all users share.

Infrastructure is a concrete and solid foundation for operations, [7]. It is intended for long-time use, for years to come. Infrastructure is developed and changed incrementally to meet the needs of users and the environment. Infrastructure is not something that is easily thrown away and replaced with other technologies. This means that it should also be flexible

so that expansion and growth are possible.

Information systems infrastructure management includes several tasks. These range from planning and analysis to feasibility study, to implementation and managing the use and growth of the infrastructures, [3], [8]. Infrastructure management can also be seen as a combination of maintenance and development activities. Here are some activities that deal with maintenance, such as working on implementing software or configuring systems, whereas other activities can be about finding bottlenecks and solving problems, which potentially require infrastructure development in the future. Infrastructure management is a continuous process of identifying development areas, analyzing their importance and feasibility, and managing development projects through different development stages. It is also about managing the systems so that they operate reliably in daily operations and processes. In this perspective, infrastructure management can be regarded as a continuum of development and maintenance activities, covering a wide range of technologies and applications throughout the organization.

Several aspects in infrastructure development are important, [6], [9]. These include user information needs, system controls, connectivity, portability, future expansion, and feasibility. Information systems should enable and increase efficiency and effectiveness, and this is not possible if the needs of users of technology and business are not met. Understanding the needs is, therefore, a crucial aspect in infrastructure development. System controls are about access control, together with security and crisis management practices.

Connectivity refers to the methods, ways, and variety of different technologies and situations where information systems are used. In other words, if users need to access data with mobile devices from the other side of the world, it should be possible. Opening ports to remote access and enabling the use of systems with different terminal devices and applications should reflect the information needs of users. This is referred to as portability, making information systems accessible and available to users with different devices and technologies, the ability to connect and share data across different systems and technologies, [10], [11]. Standards and standards compliance play an important role; they allow different technologies and systems to be connected. Information systems developers need to consider compatibility as a top priority.

Any new technology or systems will be installed and integrated into the existing infrastructure. The result is an environment where new technology needs to work with older systems and technologies, an infrastructure that is a combination of hardware and software from different manufacturers and developers. Compatibility becomes a critical element in infrastructure expansion and development activities. Flexibility to changes and future expandability are important development aspects in any infrastructure.

Infrastructures are intended to be used for a long time. As a technological backbone of operations, they also have other impacts. Technology can have a widespread and profound impact on the whole organization, processes, and users. It should be noticed that there are more than technical aspects here; infrastructure has the potential to change how people interact and work it can change processes within the organization. For example, distance work increases the importance of cooperation, cohesion, and organizational culture. Instead of looking at working hours, the emphasis will be more on results, not time spent working. Coordination of staff and teams is more challenging, and there is clearly need for trust. As a result, the organizational impact of technology and infrastructure development can become an important aspect in information systems development, [12].

III. INFRASTRUCTURE MANAGEMENT TASKS

Infrastructure management depends on several background factors, [6]. They are different across industries and in each organization, so comparing otherwise similar companies does not tell everything. Infrastructure management reflects the role of information systems and technologies in the organization.

Fig. 1. Infrastructure management and background factors (Source: created by the author)

Infrastructure management is affected by the relative importance of information systems and the information intensity of the organization (see Fig.1). For example, in a bank, information systems are critical to processes, whereas in a company in construction they are not as critical for daily operations. In a bank, practically everything depends on information and information systems; in construction can continue even without computers, at least for a while. The result is that in information-intensive organizations, plenty of attention and resources are put into information systems infrastructure because of the critical role of information systems (Fig. 1.).

Information technology is expensive. The cost of information technology and systems, such as enterprise resource planning applications, can be very high. New technologies, their implementation projects with planning and training, come with a high price tag. In addition, maintenance of existing systems and technologies can be significant. Financial resources are also needed to ensure the development

of infrastructure. Here as well, financial elements reflect the importance of information systems in the organization (Fig. 1).

Human skills and expertise play an important role in information systems infrastructure [6]. The cultural elements, how people approach information systems and technology, are different across companies (Fig.1.). In some organizations, technology is seen as a source of problems, being useless and unreliable, whereas in other companies it is considered a vital component in daily operations. Clearly, there are plenty of differences in attitudes towards technology.

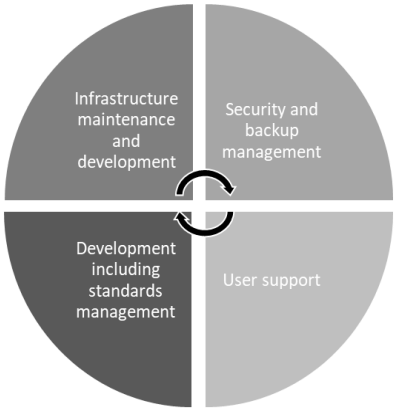

Fig. 2. Critical tasks in information systems infrastructure management (Source: created by the author)

Several tasks are critical for information systems infrastructure, [7]. Information systems and resources need to be protected from viruses, hacking, and similar threats. Infrastructure should also be safeguarded from natural disasters, floods, and fire. Backup arrangements, proper planning of where data is stored, and how it can be shielded from different threats are critical tasks. This is a very important domain for information systems department; the threats are constantly changing and, in the worst case, can severely impact operations. Developing security, security processes, and recovery planning are critical for any organization (See Fig. 2).

Backup management is a large domain, including selecting backup technology, software, and procedures. How, when, and where is a need for processes that guarantee proper backup of critical data. This involves deciding what, how, and how often to back up. Furthermore, procedures for restoring lost data from backups should be developed and tested periodically. Shortly, backup management is a challenging area for IT departments.

There are also other tasks that should be managed (Fig.2.). User support is important as it helps users to continue with their work as soon as possible if there are interruptions. Help and advice are also available to make the most out of technology. User support arrangements can be very different. The problem can be solved if you know a colleague who knows how to work with a certain issue. At the other end of the spectrum is a professional help desk, providing advice and support for users. Support services can also be outsourced, so that they are provided by a service center from an outside organization. In this case, however, local IT staff is needed as not everything can be solved from a distance.

IV. ROLE OF STANDARDS

Standards have an important role in information technology, [13]. In infrastructures, their role is even more critical because infrastructures are intended for long-term use. In the long run, it becomes necessary to make changes in infrastructure, and this is possible if technologies and applications follow standards. Standards allow new technologies and systems to be implemented and integrated into other technologies when they follow standards.

Standards make connecting technologies and systems from different manufacturers possible. There are different standards, [14], [15]. Official standards are the result of consensus. These standards are developed by a large group of stakeholders, including participants from industry and representatives from government agencies. Agreements are the result of an incremental and recursive process, which is typically a quite time-consuming method to achieve standards. When there are new participants joining the conversations, they cause topics to be revisited. They typically specify technical specifications that need to be followed, making technology standard or compliant with a standard. In other situations, there is a need to develop a way to connect and exchange data between different systems or partners.

Industry standards are another type of standard. This refers to a standard which is common and typical, even though it has not been officially agreed on. Industry standards are often a result of delays and the long time required to develop official standards. Instead, products and solutions developed by industry organizations with significant market influence become dominant choices for developers of infrastructure. They can be proprietary technologies and systems, but still function very well. For example, devices running on the operating system Z are compatible with other devices using the same operating system.

Standards compliance of technologies and systems is important, [13], [15]. They act as an intermediate between different devices, technologies, and systems. Having products and systems that adhere to common standards makes it possible to interconnect. Here, being able to make the connection rapidly with minimal additional costs and effort is critical.

The importance of standards becomes evident when there is a need to connect different technologies and systems. Here, customized software needs to be programmed to convert data received from the communication partner or system into another, in a compatible data format. In a case where there are several communication partners or systems, the situation results in substantial expenditures. Different connections must be programmed for each partner and system, just to make the

systems and data formats compatible. This will require resources, cause high costs, and take a long time. It is therefore understandable that there is a pressure to develop and agree on uniform standards.

V. CONCLUSION

In all organizations, small and large, information systems are the basis of operations and processes. It is therefore important to have an information systems infrastructure that is reliable and robust [7]. [6], [16]. Here, we underline the importance of having a reliable infrastructure, which is robust even in extreme situations. Information systems infrastructure should be built so that it performs and can handle even high traffic loads.

Infrastructure planning plays a key role in the development of reliable information systems infrastructure. With careful planning and infrastructure monitoring, bottlenecks and malfunctioning devices can be identified and eliminated before serious consequences happen. It is still a reality that even the most sophisticated technologies and systems can fail, and there are always new or unexpected threats. Development of a reliable information systems infrastructure is therefore a continuous process, not something that could be finished or completed.

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Conflict of Interest

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