THE IMPACT OF VIRTUALIZATION AND CLOUD COMPUTING TO MODERN BUSINESS

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Abstract: Nowdays, the increasing application of information technology in modern business and life in general, virtualization and cloud computing are new solutions designed to increase the level of system abstraction and degree of utilization of computer performance. New technologies offer the flexibility, the ability to adapt workloads resources and to realize cost savings of IT infrastructure in terms of administration and support costs. The period when the big companies had a monopoly and control over resources and information are far behind us and the only companies to survive in the future are „smart" companies. This paper defines the terms virtualization and cloud computing and explains its importance as the challenge of rapid success and growth of the company. Special attention is focused on the savings and its benefits. The advantages of applying virtualization and cloud computing are numerous only in case they are implemented in the right way, although many managers have doubts about this technology. The data is obtained through an online survey which was conducted in the companies in Bosnia and Herzegovina as well as data Forrester Research that determined the current level of application of virtualization and cloud computing in the world and companies in Bosnia and Herzegovina. Besides, it pointed out the guidelines of the future steps.

Keywords: virtualization, virtual organization, cloud computing, smart companies, IT savings.

Introduction

Virtualization is latest trend in technology solutions that are designed to increase system abstraction level and computers performance capacity use. Virtualization is proven software technology that simply transforms IT environment. We are behind the time where big companies had some kind of monopoly and control over resources and informations. Only „inteligent" companies will survive in the future, with best and fasstest information flow.

In times of global crysis, it's very important for companies to achieve lower costs compared to competition, without changing product and service quality they offer. Planned investments in information technology is one of the ways for company to achieve such goal. In this research we will show solution known as virtualization or virtual platform, which enables easier management of information system and achieves savings who were not achiveable by other solutions. This paper will show benefits of virtualization because they are primary reason why virtualization has succed in previous years. Server virtualization and desktop computer virtualization are two most common implemented types and therefore we'll focus on benfits that these types provide.

IT infrastructure needs a change and virtualization can be a solution. Virtualization has big influence on arhitecture, infrastructure, processes, operations, people, skills and business in general. Virtual organization enables lowering operational costs and optimal use of resources. Accepting virtualization depends on organization, people need to understand this concept that embraces many questions and solves problems. Being familiar with technology is not enough. Transformation process, from classic to virtual organization, is complex managerial activity.

What is virtualization and what impact does it have on modern business

Constant inovations in fields of information technology make it most dynamic science of todays age. Virtualization is one of the latest inovations in this field which presents attribute of something that should be in present but it isn't. Concept of virtualization is based on abstract representation of funcionality and resources. For user (human or application) there is no difference between virtual and real funcionality, but real values and activities in virtual performance are different than those presented to user. Using virtualization it's possible to achieve lower costs, and this will be most noticable in larger and more complex systems. Todays powerfull PCs based on x86 arhitecture are projected for one operational system and very small number of applications on it, which leads to very low performance capacity use. Virtualization is the one that solved this problem. As an example, real operational system communicates directly with hardware while virtual operational system has for a user all attributes of real system but it is being runned on other real system. Therefore, communication is not being done with hardware but with another system. That other system is taking a role of hardware in communication with virtual system. The work of hardware is being simulated by program language and therefore work we call it virtual system. Virtualization can mean that user through virtual interface is using multiple computers as one.

Work of multiple applications and processes on single physical machine, sharing hardware between multiple operative systems on it, is what is considered virtualization. When we talk about shared hardware, we are talking about processor, memory, hard drive space and networking. With todays presence of powerfull machines, we are encountering servers that only for a fragment of their time use resources and are mostly free. That capacity, that is not being used, is something company is not allowed to have because optimization of business is one of the kys to success. Virtualization is allowing us to optimize resources available on servers, so instead buying new machine for operative systems or applications. Through virtual platforms we are able to use existing resources and through that we are lowering costs. This is most noticable in big companies that have large amount of computers. Lowering costs is not only existant in savings through not buying new computers. Costs are being saved through lowering maintance costs, having less machines means less maintance costs and having less computers is also beneficial for companies that are following ecological trends.

One of the biggest advantages of virtualization is that experts in company don't have to plan new infrastracture procurment, operative system installations and all other prework activities. Instead, they can focus installing applications on existing virtual server unit. Applications can be put to use shortly and the time saved from previous mentioned acitivites can be allocated on improving functionality of information infrastructure and optimization of business processes.

To understand how virtualization works it is very important to understand what is virtual machine and virtual infrastructure. Virtual machine acts like a physical machine, it contains virtual processors, RAM, hard drive and netrwork interface. Also, virtual machine (later in text refered as VM) can standalone run operative systems and applications same as if its physical computer/server. For virtual machine it's characteristic that it is fully made out of the software, which means it doesn't contain any hardware components.

Basic characteristics of virtual machines are:

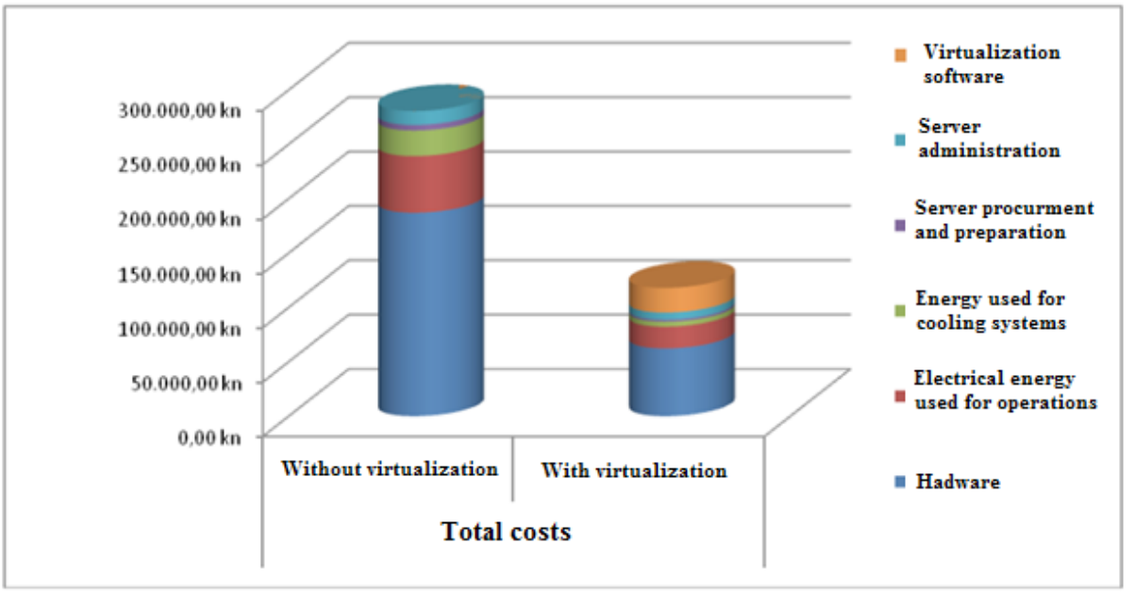
- Isolation – virtual machines are seperated from each other like they are physicaly seperated.
- Compatibility – virtual machines are compatible with all hardware standards based on x86 processors.
- Hardware indepedency – virtual machines are run independently from basic hardware.
- Virtual infrastructure – it enables sharing physical resources of phsyical machines on whole infrastructure. VM allows sharing resources of one computer to many virtual ones so we could reach maximum efficency.

Creating virtual infrastructure allows greater flexibility and higher speeds than using commonly using hardware. System resources, that are needed for individual applications, are distributed to virtual machines that are running those applications. That eliminates costs of installation and configuration of new hardware. As a result we are having maximum capacity usage and exceptional ability to manage valuable IT infrastructure.

Pros and cons of virtualization

There are many virtualization benefits, but we will mention only the most important ones. Cutting down costs: Systems not in use, in present time when optimization of all parts of the business is essential for companies survival, is not something company wants. Virtualization enables optimal use of available resources on servers instead buying new hardware. If we are to do consolidation of servers into one, we are lowering amount of hardware and with that even the physical space it takes. Large companies that have huge systems will have to rent or use less space for hardware and by doing so they are lowering costs. Less physical servers means less electrical energy spent and with that being said, we must take in consideration that fewer servers means less heating in room and less use of cooling systems which ultimately leads to saving costs in long term.

Picture 1: Costs overview before and after virtualization[1]



Simple maintance – if we lower the number of physical servers we have simplified system maintance, therefore we are lowering number of repetitive tasks that take time. Those tasks are control, configuration, upgading and similair tasks. Big advantage of system virtualization is easier system migration in virtual environment. It is certain that virtualization makes job easier when it comes to system administrator tasks and others involved in implementation and maintance of IT equipment, of course additional education is neccessary when it comes to managing virtual enviroments.

Productivity – once virtual environment is set-up IT personnel will perform tasks easily instead of taking hours to finish them. For example, migration from one server to another, or after server crashes and gets destabilized, using virtualization tools it takes only couple seconds to get it back in working state. Using virtualization efficently IT personnel will become more productive, and by them becoming more productive, downtime of servers will be lowered which increasese productivity on whole company level.

Testing – virtualization enables us simple system restore in previous state which is great feature that you want to have when you are testing new applications that could crash server. Before testing, only thing we have to do is make a backup copy of system in case we face some errors durign the testing that would crash server. It is not uncommon that we want to test applications or systems before putting them to use. It is recommended to test applications in safe environment where downtime of servers wouldn't hurt business performance or operational functions.

When we are talking about cons of virtualization, we must mention all in one place problem. Biggest issue that is troubling virtualization is that everything is in one place. If error happens on one server that is host of virtual machine, all machines are unavailable. Although this sounds terryfing, it is not. Systems can be secured with redundant servers that will take over all functions in case of crash/downtime. We can take additional measure such as backups that will secure our data. Another issue that virtualization comes up with is new servers.

1 D. Đorđević, D. Glavašević and D. Krnjak (n.d) „Ekonomski učinci primjene softvera za virtualizaciju"

Virtualization demands powerfull servers that support virtualization technology. Although we are lowering number of physicaly needed server units, we can't rely on using old server for virtualization solutions. This could mean additional costs in IT departments budget, but in long term virtualization pays off. When we are talking about number of servers, there is one issue that must be adressed in virtualization. Once we learn how to install servers easily, amount of servers could increase faster than number of administrators that are needed to maintaine them. It's is neccesary to limit resources for virtual servers because we might find ourselves in situation of overburdened virtual server. Compliance and skills of IT personnel play biggest role in this situation. If we are creating virtual machines that are going to be unused just like physical ones used to be, than we haven't optimized our system at all.

Education plays major role in virtualization. To virtualize environment we need to have IT personnel capable of understanding technology for virtualization, therefore education is neccesary for IT staff. Adding new layer of complexity, we are adding a possibility of new problems to come. Solving those problems can significantly increase time of fixing other issues at hand. This only applies if we have uneducated personnel. With proper education and benefits of central management that is brought through virtualization, it is almost certain that intervention times will be lower.

Virtualization in numbers

Virtualization technology use leading world companies, and based on these numbers, we can see how important position virtualization takes:[2]

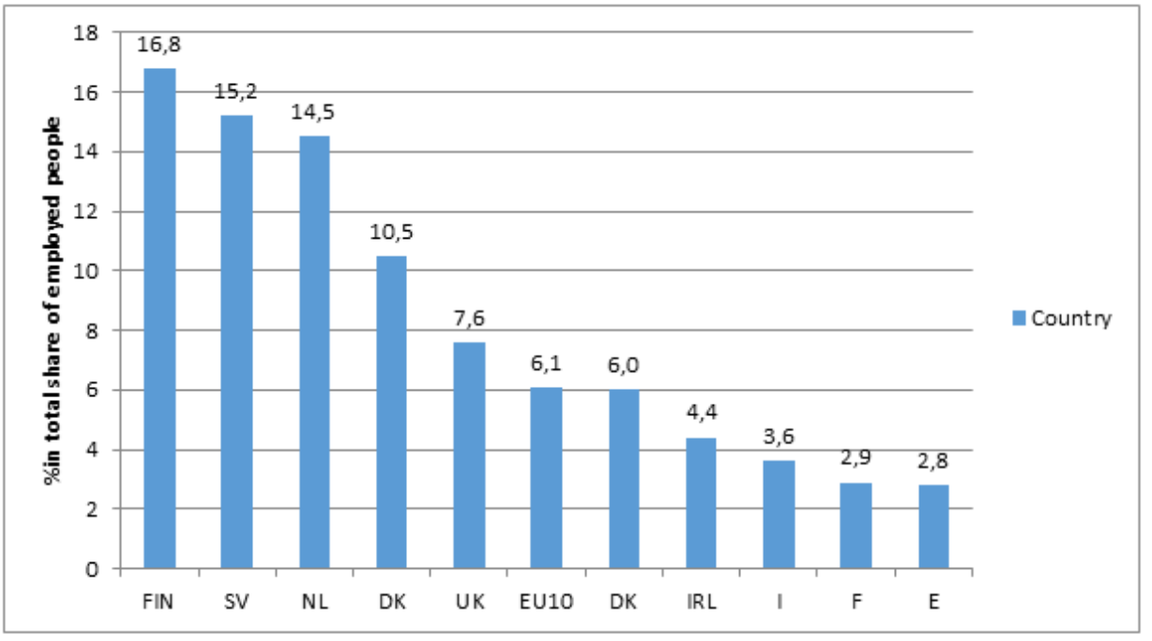
- 100% - companies of top 100 companies use virtualization.
- 98% - of first top 500 companies use virtualization (491 out of 500)
- 96 – of first top 1000 companies use virtualization (955 out of 1000)
- 50 out of top 50 banks use it
- 5 out of 5 top global aerial companies
- 9 out of 10 top chemical companies
- 5 out of 5 top oil companies
- 10 out of 10 top pharmaceutical companies

Development degree of virtual business practice in developing countries

Characteristics of new age, that is business in 21st century are: globalization, knowledge and ICT. Characteristics that affect virtual organizations are: characteristics of market, production process and strategic goals of organization.

2 Source: http://www.vmware.com/company/customers/

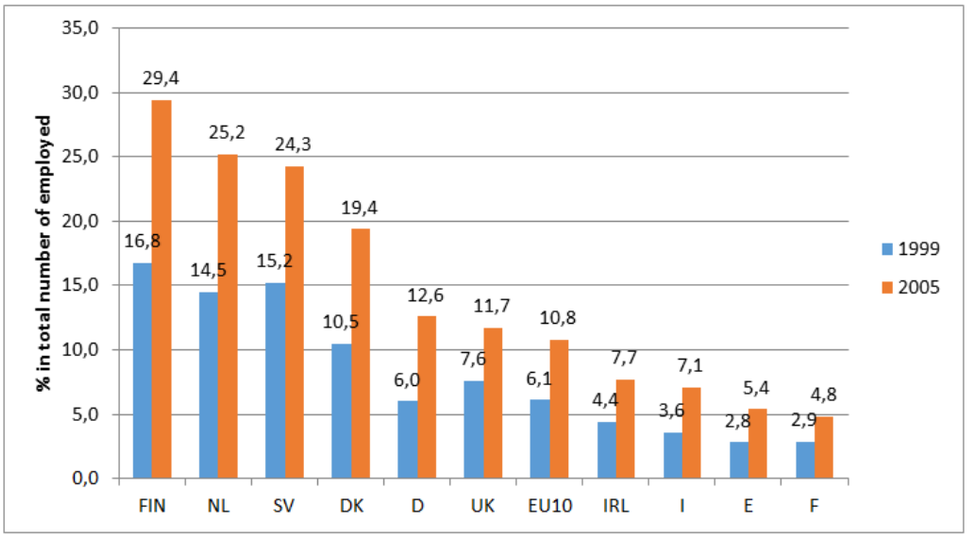
Chart 1: Teleworkers share in develping european countries



As we can see in chart 1, we have presented teleworkers share in total number of employeed in developed countries. Biggest share in total number is measured in Finland (16.8%) while that share is lowest in England (2.8%). Although England is on last place, United Kingdom is on 5th place with 7.6% among European countries, positioning itself in front of EU10 (6.1%).

On the next chart we can see data from period of 1999 and 2005. Clearly we can see that with advance in information technology there is advance in share of teleworkers in total number of employeed people. In Finland that had biggest precentage in share, there was a leap from 16.8% to 29.4%. Netherland takes second place with rise from 14.5% to 25.2% while United Kingdom has shown rise as well holding position in front of EU10 with 11.7%.

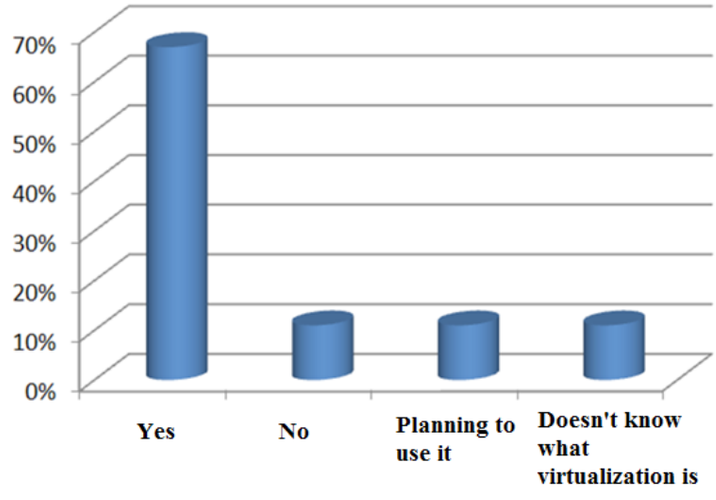
Chart 2: Estimated share of teleworkers in total number of employed in 2005.



We have conducted research in Bosnia and Herzegovina among 100 companies. Research was conducted online through Google Doc questionnaire. Analyzed companies included small businesses (1 to 49 employed), middle businesses (50 do 99 employed), large businesses (100 to 250 employed), very large businesses (250 to 499) and biggest businesses (from 1000 to 4999 employed). Companies were from public and private sector, different industries variating from education, agriculture, media, marketing and other services.

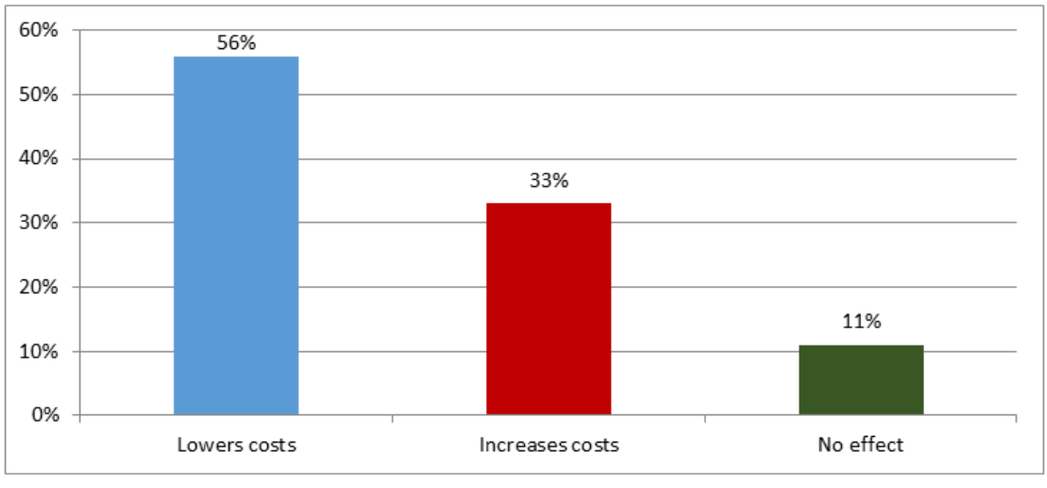
Many of the questioned companies have heared of some sort of virtualization (70%) while 10% of them doesn't even intend to use it. Also, 10% of audience doesn't even know what virtualization is.

Chart 3: Representation of virtualization knowledge and use in Bosnia and Herzegovina



Research showed that virtualization lowers costs in 56% of analyzed companies while it increases them in 33% of the anaylzed companies. Increased costs while using virtualization suggests bad managing of virtualization and insufficency of skills and know-how.

Chart 4: How does virtualization affect costs in companies in Bosnia and Herzegovina



Conclusion

It's a fact that we all are functioning under some organization and they are changing over the time. Business concept in 21st century is very complex and it requires from organizations to respond to modern challenges. Globalization is strenghtening communication and coordination through whole world. It is required minimal respond time on certain changes that are becoming norm and our reality. In that situation, information technology is coming to our aid, offering flexible business structure.

Information technology has evolved from being side kick to managaing important processes such as transactions and other important business processes. There is increase in methods of how we store our data, which increased number of servers. Specialized applications for fields like accounting and finance almost always are done on seperate, reliable servers with redundant hardware, ensuring business continuity. This combination of factors has transformed IT environment into a messed mass of isolated, specialized and not enough used servers. Rise of costs is getting bigger because of software complexity and need to manage all the time rising number of data.

Virtualization applicativity allows easier managing of information system and enables savings that hasn't been provided by any other solution. IT infrastructure needs a change and virtualization can present one of the solutions. It has big influence on arhitecture, infrastructure, processes, operations, people and business in general. Therefore, virtual organizations lower costs through optimal use of resources.

What virtualization does? First and foremost, it decreases number of servers, lowering costs in many ways through electrical energy, physical space rents and other direct costs related to maintance and work on servers. Lowering number of hardware, we are lowering number of personnel that was needed to manage and maintain hardware, lowering additional total costs. Virtualization can be achieved using free software, saving money on expensive licenses.

Constant reduction of budget while keeping expected quality of services is definition of efficent IT according to conducted studies. New technologies promise flexibility, that is, ability to adjust existing resources for operative needs. Most organizations use virtualization and cloud computing, figuring out balance between resource capacity and overload of applications. Research conducted in Bosnia and Herzegovina showed that biggest obstacles in virtualization process are transfering from physical to virtual environment, insufficient cooperation with users and problems with servers. In future years it is expected great increase in implementation of virtualization in Bosnia and Herzegovina. That is confirmed by facts that leading companies in Bosnia and Herzegovina have already recoginsed potential of virtualization and implemented it and even small and medium companies are going in that direction because they are having opportunities that they couldn't access before because of lack of resources.

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