

Economic and Environmental Effects of the Transition to Cloud Computing

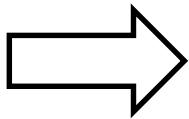
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State of Affairs

- Trends in ICT are influenced by technological innovation. They lead to increase speed microprocessors, memory capacity of computers and transmission speed of computer networks.
- Integration trends contribute to reducing the size of the equipment, reducing their power consumption and increasing their functionalities.



The transfer intelligence from end devices into networks.

Long-term problem of many companies is unavailability of ICT.

The reason is the price of the needed applications and infrastructure.

The situation is changing, but awareness of the possibilities of current solutions and ICT services among business managers is minimal.

Cloud Computing (CC)

Viable solution which ensures quality information technology for companies offers cloud computing.

The aim of using the services of CC is to increase the quality of the used IS. This makes it possible to increase the competitiveness of companies and institutions, taking into account their financial and investment opportunities.

Technological trends

- Consolidation and virtualization of data storages helps to reduce the number of physical data servers. Resistance of servers against downtime at the same time increases. Extensibility of such architecture is easier.
- Virtualization of computing resources will provide greater flexibility in obtaining higher processing power. You can disconnect or turn off computing capacity when not needed.
- Standardization and transparency of business processes – can achieve greater flexibility and optimization of the basic activities of the organization - while reducing costs and management overhead, maintenance and development of this environment.
- Increased performance and mobility of individual applications and services - can ensure to move entire applications instead of local performance. Tools of virtualization enable to move virtual computers in running without interruption of service. Operating in this manner can change the configuration to facilitate upgrading hardware and software.
- Desktop Virtualization - improves security, simplify management and is able to enforce standards.

Current trends in ICT services related to the management of companies and organizations

- Process management of firm and its ICT
- The pursuit of unique and effective integration of ICT with the business models, with corporate culture and business processes.
- Strengthening the relationship between business and science.
- The use of scalable ICT services.
- Increasing part of external ICT services via outsourcing, ASP or CC.

The pros and the limiting factors CC

The pros cloud computing	The limiting factors CC
Applications or services are provided from centralized data centers through the network. The management software of each PC is eliminated.	The Potential risk of permanent preservation operation of information technology over the Internet (reliability).
Users do not need know the technologies and they do not need themselves control their operation. For access to applications and data on a server is uses a Web browser (SaaS - software sa a service). HW can also be provided as a service (IaaS - infrastructure as a service) providing a physical computing environment. As a service is also provided computing platform(PaaS – platform as a service), contains components for construction of applications, such as operating system, database system, web server, and more.	The increased cost of transfer of large volumes of data.
High scalability (dynamically scalable resources), and elasticity	Concerns about the safety of sensitive data and data at all.
Reduction of licensing costs, provider rents for more users (multitenancy).	Lack of control over their own data, valuable data are outside the firm.
CC changing software on service where the consumer does not pay for the license but for it how much it is used. The computing power is becoming a commodity that is to buy and to scale as needed.	Problems in managing permissions and of roles if your portfolio of CC applications grows.

Transfer of risk and responsibility

A significant benefit of CC for the customer is the transfer of **risk** and of **responsibility** to suppliers of services.

Responsible for:

- Implementation
- Audit
- Security
- Monitoring
- Schedule the necessary capacities
- Maintenance and support
- Availability management



Distribution models CC

- **SaaS**

The service provider has administrative control over applications and is responsible for its updating, installation, maintenance and security. Users are not forced to invest advance, they pay in the agreed term and only for the actual duration use. SaaS reduces the need to anticipate the extent of demand and infrastructure investment. Costs are known in advance, no surprising the increase.

- **IaaS**

Offered is a computing infrastructure in a agreed configuration in a virtualized form. Provider of solution is responsible for the delivery of ordered of processing power and connection through the network. The customers then install the operating systems and make operational everything themselves according to their requirements. Put simply this is a rental server hardware in the agreed configuration. Price IaaS is created based on supplied RAM, CPU, storage size and connectivity. The advantage of using IaaS are zero cost of the hardware and very low cost when you upgrade.

- **PaaS**

It provides complete resources for development and maintenance of custom applications. Provider provides support for the entire life cycle of creation and use of applications it also provides the operating system for the entire solution, including the necessary superstructures. To customer is thereby offered development platform, to which will place their own applications (similar hosting). There are not in renting already created applications, applications the customer develops itself. The disadvantage is the large dependence on the provider.

Utilization of CC

This long-term problem of firms and institutions is solved - inaccessibility of many ICT due to their price and the required infrastructure.

Users have no more worries about application management, servers and computer networks.

They can focus on choose of extent and quality of services purchased from the provider, measurement its consumption and of their price.

Cloud Computing - ecological effects



- **Utilization of servers** - multitenancy, single server is able to ensure the operation of several companies, all thanks to infrastructure sharing (is absurd keep a 10% reserve of power when the demand is for 100%).
- **Dynamic provisioning** reduces wastage of computer resources allocates server capacity in accordance with demand. From a technological point of view is normally the actual use of server performance one-third. In the CC solution would be more than two-thirds use.

A virtual environment reduces the need for physical servers. Important is flexibility of using next computer sources (CPU, memory, storage) too.

- **Increased efficiency of data centers** - space to reduce emissions and energy intensity is in the increasing efficiency of data centers (various energy losses, inefficient cooling unnecessarily working storage arrays, etc.).

It is assumed that only large companies offering services CC have enough money, knowledge, land, special sections devoted to exploring this region, so they are much more effective in reducing energy and emissions released. There is the study, which showed that for very large groups of users can CC reduce energy consumption and CO2 emissions in the finals by up to 30% compared to cases where the application is installed on the computer at the premises. For small businesses is the result impressive, close to 90%.

The view from a different angle



The number of data centers grows significantly, as well as their energy demands.

The results of another study from the Environmental Protection Agency show that data centers in the U.S. consumes 1.5% of all energy produced in the U.S. In 2020 CO2 emissions should achieve 680 million tons per year, which is more than the entire aviation industry .

We can not expect people to suddenly begin to produce and consume less information.

- Solving this problem is in other possibilities, such as greater efficiency in hardware generally and priority use of environmental resources: **water, sun, wind.**

Summary

Changes in business strategy and business processes require changes in ICT equipment. The quality of company processes is often dependent on the capabilities and features that IS offers.

The project SP2011/112 was Conducted and focused on the use of IT to support SMEs in the Moravia-Silesia Region. The purpose of the project was segmented SME according to used applications and used ICT services. Partial goal was to determine how the companies are aware of the possibilities of using CC.

The project was solved at Faculty of Economics, VSB-TU Ostrava under the guidance of the author.

Conclusion

- The information technology has become a tool necessary for businesses and institutions.
- Development of CC in Europe lags behind the global average. However, the report Disclosure Carbon Project in London, shows that the use of CC in firms in the UK and France will triple in the next two years.
- Barriers to the adoption of new ICT must be overcome. The results of the above-mentioned surveys suggest that the rate of use of ICT is not low, it is mostly medium.

Investing in the new ICT, it should be reasonable, with new services that enable companies to increase their competitiveness with lower costs.

Thank you for your attention

