MATT MAYEVSKY

THE CLOUDS ECONOMY

The Cloud Computing from Distant Yesterday,
through Deep Today, to Distant Tomorrow.

+

The International Atlas of Cloud Services and Tools.

FOREKNOWLEDGE

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Matt Mayevsky, a transformation futurist and author, particularly involved in the field of strategic foresight at the micro (enterprise architecture) and macro (reshaping of the market, the transformation of the system) level. The aim of his research is to discover the formulas of shaping the change, as well as the diagnosis of the importance and power of influence of probable events in the scenario analysis. In his works, he also deals with the identification of multi-dimensional effects caused by planned, strategic decisions in the 4P dimension (plausible, probable, preferable, possible).

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MATT MAYEVSKY

THE CLOUDS ECONOMY

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The Clouds Economy

by

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PRELUDE

PRELUDE

One of the characteristic features of the modern world is a bidirectional relative perception of space. In the physical space, our global village continues to shrink. The distance relatively reduces, lifestyle, entertainment, and work standardize. In the past, you could divide people into those who lived in the countryside and those who lived in the city, however, nowadays the division is already blurred. We all live in the village, although, it is now a Global Village. We are a little bit cooped up, there are more of us, but our friendships, in an increasing degree, are not based on geographic proximity, but rather on common interests, beliefs and passions. In the Village, two attributes are essential: the distance and availability. The distance, through the process of globalization, opens borders, and a variety of the modern means of transport - contributes to the World becoming smaller. And the 'availability' is the gateway to the Virtual World.

And it is the latter, the opposite direction of the relative perception of space. The Virtual World is like the universe after the Big Bang. It expands constantly and the boundaries after its explosion are invisible. New social networkings, networkings, a gaming zone, commerce, e-learning, e-everything broaden our entertainment and work space. This new reality is driven by user activity. This one, in turn, by providing content, requires ever more capacious, optimized data storage centers. The Virtual World spits out a lot of information, more or less useful. In the opinion of many observers, we are creating a virtual space trash, which justifies the development of new information technologies. But this is, apparently, an inherent side effect of the development of information civilization.

THE DOMINANT INFLUENCE OF NEW TECHNOLOGIES

A few decades ago, new technologies dominated mainly in laboratories, corporate research institutes and in the Sci-Fi books. Today, new technologies are ubiquitous. There is no day, an hour or a minute, without

a comment, a piece of information related to new technologies. New technologies have dominated our thinking, they are an inseparable part of our everyday life- they can help us but also complicate things at the same time. Nevertheless, they are the engine of growth for the modern economy. IT has permeated through all areas connected with entertainment, work, and education. So, are we allowed to claim that technology is information? In a sense- we are. Technology is the know-how, knowledge about how to improve or create new more effective methods of implementation of a specific task. Is it possible to imagine life without IT? Without computers, smartphones or GPS navigation? It's as if we suddenly turned off the lights, cut off electricity. The invisible becomes noticeable but only when we lack it.

CIVILIZATION OF INFORMATION

The imperceptible, especially for the average user of new IT technologies, are also changes which are taking place now. A quiet revolution amending our world from 2.0 to 3.0. Why such a numbering? This numbering is analogous to the numbering of the development stage of the Internet. Web 1.0 - that is, HTML, Web 2.0 - the social networking sites and tools.The above can be also applied to the development of the IT industry: I. The age of mainframes and computer terminals, II. The era of PC, III. The era of Cloud Computing and mobile applications. If, in turn, one refers to the famous futurist Alvin Toffler, we are still at the stage of the third wave - the post-industrial era, the era of information and services. Welcome to World 3.0.

For the purposes of this publication, I have adapted the following division of the information civilization development of the World:

- World 1.0 – the Analog Era
- World 2.0 –the Technotronic[1] Era
- World 3.0 – the Reconstruction Era (re-everything)

The numbering of individual stages is the most arbitrary and serves only as an introduction to the presentation of knowledge and information contained in this publication. As in the case of Toffler's wave, a close demarcation border between the various stages of development of the information civilization cannot be determined. Each stage is closely connected with the following one. In World 3.0 Analog World features are present, and in the Technotronic World are features of the Reconstructive World.

WORLD 1.0 – THE ANALOG ERA

The characteristic features of the Analog World, are among other things, the transfer of information based on voice transmission, books, newspapers, radio and television. With the dominant attributes of any of these messages are printed and radio waves. World 1.0 is almost all of our history. It was not until the age of industry that the development of technology accelerated, mass production developed, work and lifestyle reorganized. What happened at the beginning of the industrial era is happening right now, but in a different reality, scale and form. So, as in the past, technologies reorganize the whole industry - creating new ones, blurring the lines between old ones while some of them die out. The educational system does not keep pace with the changes which have taken place on the labor market, companies need specialists in new areas. This area of the reorganization is taking its toll in the form of higher unemployment. This is especially true in countries that are firmly embedded in a business and economic way in the previous era. The parallels are obvious. Every great wave of technology comes together with the need for changes, and these changes which aren't implemented properly and quickly result in crisis.

WORLD 2.0 - TECHNOTRONIC ERA

World 2.0 is the era of advanced electronics, computers, communications satellites. The term 'Technotronic' was invented and first used by Zbigniew Brzeziński in "Two Ages: America's Role in the Technetronic Era" in 1970. The Vision of the Technotronic Society, refers to other times and other reality, however, the issues raised in the publication are still valid. Population control, supervision of citizens, updated files with so-called sensitive data about people/citizens. But these were actually projections of reality warning us against side effects carried by Technotronic.

The Technotronic Era, in the economic area, is based more on services and information at the expense of industry. World 2.0 is the era of mainframes and PCs, desktop devices and the beginning of the Internet (Web 1.0). It is also the beginning of the development of mobile devices with mobile phones in the foreground.

The Technotronic world is the equivalent to the beginning of the third wave of Alvin Toffler's. It is the announcement of the new digital reality and the consequences that it brings. It is also the first step of failures, such as the Internet bubble of the early 2000s. This crisis was a crucial stage of self-cleansing and informative Internet business. The introduction of free-market principles to e-business contributed to the formation of new, healthy financial operations. It took a few years for the Internet to become a good field for business again,. The creation and development of Facebook, the development of Google, Microsoft's refresh, Apple's business explosion are the most spectacular evidence of the formation of the World 3.0 in the corporate space.

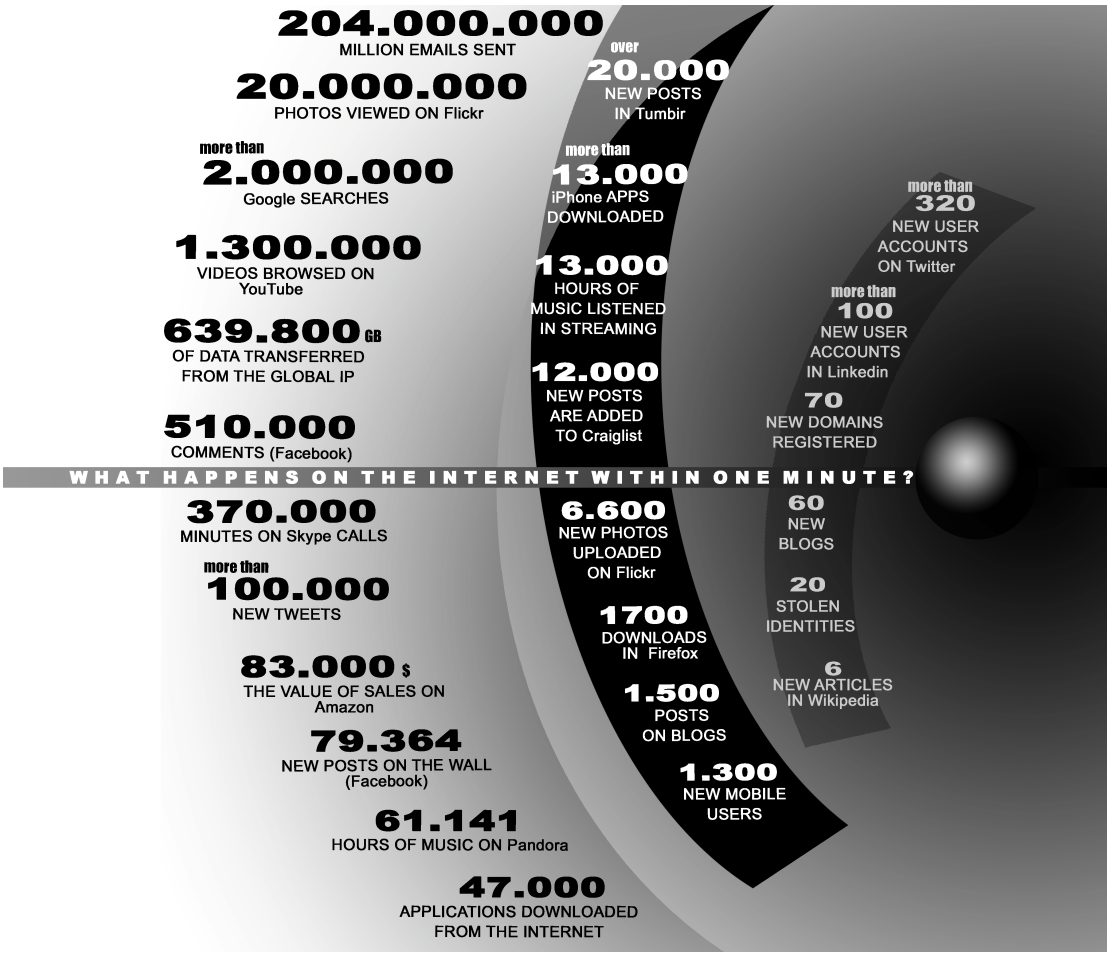
WORLD 3.0 - THE ERA OF RECONSTRUCTION (RE-EVERYTHING)

I agree with James Gleick who declared that the clearest feature of the contemporary world of new technology is 'Acceleration'.[2] We are bombarded with introduced, applied new technologies. Faster and faster, they arise in connection with new products, treatment of old products, new models. The market development of web, cloud applications has rated an incredible growth. Indeed, this is a feature of the market that is digitized. It also accelerates our lives (still in a hurry, despite the fact that we live longer, we feel that we have less time for everything). The Acceleration can be traced in the introduction of the first argument, that the relative distance in the Global Village is shrinking. Maybe/Probably, one word, which would include these two features, is 'shortening'. Shortening the distance and time.

World 3.0 is the Era of Reconstruction. Why Reconstruction? The reason is that we are at the stage of computerization of the world in which all areas are remodeling our lives. There is no need for longer distance or a few dozen years to feel and embrace the changes that we are witnessing. Our lifestyle is constantly changing. Let's concentrate on the entertainment, for instance. E-readers, 3D TV and movies, access to music, movies, books, games, from anywhere, on multiple devices, and what follows, the defragmentation of devices. The era of Technotronic was dominated by mainframes and PCs. Today there are mobile devices, such as smartphones, tablets, notebooks, ultrabooks, netbooks in the foreground.

Our relations are based more on the web-community virtual relations,. Being 'turned on' in streams of the relationship is now something obvious and natural. It may not be always conducive to the depth of the relationship, but being a 'connect' is for many people, as necessary as air to breathe. As users, we produce an incredible amount of data. This is our activity in the digital space which drives the development of information technology:

▼ **Infographics. What happens on the Internet within one minute?**



Source: Own work, based on infographics: “Go-Globe.com” and “What Happens in an Internet Minute”, Zoli Erods, April 4, 2012.

New technologies are quickly mastered by the private user. This is our private area of activity and usefulness of new solutions that make the whole structure of our world require changes. The more organized structure, however, the harder it is to change. This is not the first time that business follows the path trodden by the consumer market. The Cloud was more used by an individual rather than a business user.

A wave of change launched by hundreds of millions of individual users can not be without impact on business. I believe that companies which use Web 2.0 concepts to their current activities have greatest problems. And this is the leading element in the activity of individual users: showing themselves and their friends, openness and transparency, that encounter the resistance of matter from companies that want to be rather closed, opaque, hierarchical. The less formal structures, the more it is dependent on people. And this is exactly what the companies seek to avoid. Companies are testing ground, place and this is happening today - a specific attempt to use new options, methods of management and organization, conducive to the requirements of the world of new technologies. Not all of them are successful and only few will succeed. Industries and companies are very resistant to changes. But as well as the old technologies have their place in the modern world, as well the old style

of organization will survive in some cases. This is evolution. Revolution has reorganized many areas ruthlessly, regardless of the consequences, but in the background there is still ongoing evolution. Adapting to market requirements and customers is taking place. Just like in the nature organisms mutate, adapting to climate changes, and the strongest ones win, like here, alike, a similar process takes place. Only such organisms will win business, which quickly and best adapt to the changes.

For business, incomparably greater than the Web 2.0 challenge is the implementation of cloud solutions. It's a challenge without precedence, because even the computerization of business had its slower start. Acceleration is relentless. The Cloud is both a challenge and a risk. CC is changing the way business users employ renewable power. The Cloud represents a fundamental shift from the traditional way of proceeding to a dynamic and flexible one. The Cloud is modularization, scalability, speed of the changes and adaptation to market needs. As Cloud Computing business users, we receive, among others:

- Access to global supermarket applications and services to improve our work,
- Unique way of sale (The Internet is the leading sales channel for digital products),
- Technical support, help in time,
- More invisible, non-invasive computing power,
- Globalization of small businesses,
- With the Cloud we become more independent.

Reconstruction is the era of the remodeling of proceeding and organizational structures: companies, government, school, hospital, bank. All institutions. Paradoxically, these which resist changes in the strongest way, they need such changes most and would also benefit from them most. is The largest area of reconstruction needs is where a large amount of data, a number of users, a centralized structure and also a geographically dispersed structure are.

DUE TO CLOUD PARADIGM SHIFT

The fundamental accelerator of changes in World 3.0 is Cloud Computing. And this is the main subject of this book. CC is a strategic part of the World 3.0 which actuates a technology avalanche effect comparable to remodeling the world via the Internet. The vast amount of data that is likely to be better organized now can accelerate the development of semantic technologies, work on better mating data, such as business intelligence, and consequently Artificial Intelligence.

In the era of mainframe computers, the forecasts for the future of the IT market, pointing to a paradigm shift in the direction of the PC were ignored, not to say, ridiculed. Nowadays, they are something obvious. Today another paradigm shift associated with increasing sales of mobile devices takes place, and hence, mobile devices displace PCs. An amount of data that is circulating, and the fact of impractical and non-economical storage of all personal data devices, force the market to look for new ways of dealing with this challenge. The Extension of services data storage, hosting, and storage of increasing amounts of data, as well as private unloading equipment from storage applications are just some of the factors affecting the development of the concept of Clouds.

However, Cloud Computing is not everything. World 3.0 includes many other elements, more or less related to the cloud, resulting from it, or being its ‘prequel’:

- Big Data[3]
- Virtualization
- Defragmentation devices
- Third Platform (Cloud Computing 1.0)
- Mobile Computing
- Internet of Things/Goods/Products

- Internet of Services
- Social Network Sites
- Web 3.0

THE STRUCTURE OF THE PUBLICATION

In the book, I focus on the aspect of the Clouds in the World 3.0 and Cloud-related elements. The structure of the book consists of four chapters, I. The Era of the Cloud Formation, II. Multidimensional Architecture of the Clouds, III. Cloud Physics, IV. Alternative Scenarios for the Future of Cloud Economy.

Each chapter consists of points and sub-points, so that the aspect could be explored more thoroughly. The first chapter is a thorough introduction to the Cloud. It covers issues related to technology and concepts that have had and still have a significant impact on the emergence and development of Cloud Economy. An additional element is the graphic presentation of the history of CC (CC timeline).

The second chapter discusses the Clouds system architecture. It explains how the Cloud works, what its components are, what the relationships between these elements are. Cloud Architecture brings possible solutions for the use of both business and private users.

The third chapter, examines a wide range of Clouds impact, for various types of social and economic aspects, including the IT organization, lifestyles of private users in the Cloud, the company and the administrative structure of the state. The third chapter is a specific description of the current and potential reality from the perspective of the Clouds. It gives answers to questions about time and space in the Cloud. This is a section showing the map of Cloud capabilities from the perspective of the business and private sectors.

The fourth chapter deals with the analysis of trends in CC, but it is a summary of the Cloud Economy, ten-scale. Moreover, we can find four alternative scenarios for Cloud Economy in the chapter.

The Cloud Economy is a book presenting a multidimensional perspective of Cloud Computing(CC): technological, social and economic. The publication explains what CC is, to whom it is dedicated and, how and why one should use cloud-based solutions. In addition, the book includes the description of the CC evolution from a distant yesterday, today, through a deep and distant future. The publication presents the latest and unique views, opinions and the news on the Cloud market. The whole is enriched with very modern graphic design, including dozens of infographics, tables, charts and graphs, through which the publication becomes a text and graphic record of the knowledge and the know-how about CC. Particular parts of the Cloud Economy have a different profile depending on an aspect there presented, that is: educational-popularizing, a textbook and informative. A reader will find here the broad and synthetic knowledge about Cloud Computing and its impact on business and our daily life. The book is enriched with practical content describing possible applications of Cloud solutions as well as several cases of the CC use and references to the real-world usage. The Cloud Economy is the first such extensive publication on CC which meets the broad nature of the swinging door to the Clouds' fascinating World.

CHAPTER I.

THE TIME OF CLOUD FORMATION

CLOUD PREQUEL

FOUR SPACES OF CLOUD-FORMING FACTORS

Cloud Computing, despite its seemingly simple formula, is a concept that has a broad impact on various areas of human activity and organization - just as great as the Internet has. However, the existence of the Internet is, at the first place, due to military purpose, then academic one, and in the end it migrated to the commercial zone.. The CC, in turn, came in the wake of a series of favorable economic and technological factors. But no less important were the regulations of states and changes in work and lifestyles based on the available ICT[4] solutions. Thus, all the factors forming Clouds are located in the four areas listed below:

- Political Space
- Market Space
- Social Space
- Technology Space

In The Political Space, Cloud, like the Internet, owes globalization and open borders its development processes. The financial crisis, which isolated flexible financing development of the organization, led to greater pressure on governments in the direction of greater flexibility and competitiveness of the economy and created the need for reorganization of the state administration bodies at both central and local levels. Government, as the largest organizational structure, also had to start looking for new cost-ef-

TIMELINE CLOUDS ECONOMY

Cloud is not such a new concept, as it may seem. The application of the CC took place in the fifties of the twentieth century in the work done by AT & T in the fixed telephony network. At that time, AT & T began to develop the architecture and system where the data could be located in the switchboard and made available for the business through redesigning and updated telephone networks. Although this service model has not been applied in IT for many years, this same concept has been developed to this day.

fective solutions, which would increase the efficiency of structures. In the era of reconstruction of business organizations for their flexibility, speed of operations, better customer service, it is not surprising that citizens expect changes related to a more efficient and effective use of individuals, groups and communities. In addition to the greater efficiency and simplification of administrative mechanisms, an increase in citizens' expectations in terms of transparency and insight into real development forecasts made by the administrative structures at the local and national level was noticed. This, in turn, is associated with the expectation of greater and more frequent (than on election day) involvement in making important for the country / region decisions (central and local level). The subject of cloud solutions in the state administration and self-government is very broad. Some countries, like the U.S., the UK, are already at an advanced level of works on cloudy effective administrative structures. Many governments, however, do not see the need, or are not aware of the benefits cloud-based solutions may bring. In the EU, the level of awareness and commitment of the member states is quite diverse. We can only hope that with time, the EU will impose a top-down policy of the use of new technological solutions on all administrations, and in order to avoid substantial disparities, not only within the EU but also in technological delay and in civilization consequence in relation to the process of 'cloudiness' in the USA, and in some Asian countries. Europe in order not to be doomed itself to becom the open-air touring of the world, must not only keep pace with the development and practical application of new technologies, but also take an active part in their creation and development processes.

The search for savings is also a major factor in the pro-cloud computing in the **Market Area**. Market needs are more severely suffered by market organizations than by the organizational structures of the state. For many companies, a change in the action, in order to increase flexibility, dynamics, efficiency, responsiveness to market needs, and consequently performance, is a struggle for business survival . In the case of Clouds, the central place from which one should begin these changes will be the IT department of the organization. This is the model of IT work that has an influence on the increase in efficiency of the IT infrastructure, organization, capital and labor. Depending to the industry, organizations suffer varying degrees of market pressure for a change. It (the pressure) is the greater, the greater the organization's dependence on new technologies and innovation is. Another factor in favor of migration to the Cloud is the need for support of competitive advantage in the innovative use of new technologies in the organization. Another factor, no less important, is the focus on the co-operation, partnership and collaboration. This is a change in the mode of action related to the interdependence and cooperation of the organization in the process of product development, logistics, sales. World organization has become very complex and interdependent at the same time. Focus on core business, pushes business support processes outside the organization. This, in turn, forces companies to specialize, which, first, results in increased organizational interdependence, and then, in feedback, in the form of pressure on the modular structure of the organization - open and ready for permanent cooperation.

Going one level down the organizational structure, we have the same needs, but based on other sources. The reorganization of working methods

In the 60's of the last century, the high cost and complexity of the IT infrastructure (mainframe computers) led to the fact that own computer centers were beyond the reach of companies. Processing was done on the basis of "beam" command. These service centers dominated until late 80's. In the 90's, a network data transfer mode began to develop. By the end of the 90's single service centers migrated to the Internet.

The pursuit of efficient ways to deliver IT services over the decades has resulted in solutions such as ISP's (Internet Service Providers - where the servers were located in the Internet access point) and Suppliers of Services / Infrastructure Application (Application Service / Infrastructure Providers) - where the outer infrastructure was leased to the client, and used by the customer, as long as long as the service had been paid.

During the late stage of the dot.com bubble the Application Service Provider (ASP) model began to enjoy increasing popularity, particularly in the banking sector. The ASP model was not flexible enough, though. For customers, the benefit was, of course, the access to the infrastructure they did not have to invest in, nevertheless, they had to declare what capacity and needs of the amount of computing power and memory they required. If

in the direction of greater flexibility, mobility, collaboration, reduced costs and increased productivity – these are the number one goal for many companies. In many companies, labor costs generate the greatest financial burden on the organization. It's no surprise that solutions to reduce these burdens are being searched for.

The whole big set of cloud-forming factors is located at the level of contact point between companies and the market, competition, and customer relationships. Starting from the last one of these elements, let's concentrate on the amount of data handled by the company based on the large amount of products and services on the mass market. Take, for example, financial services, banking, insurance, telecommunications, logistics (courier), and in particular Internet services companies like Google, Facebook, and Amazon. The amount of data in the market, concerning the customers, their behaviors, identified problems, the anticipated needs - it's all a gigantic amount of information that must be available in a number of places (defragmented organizational structure of the company, mobile workers), just in time (customer service, customer identification, access to their service history, orders, etc..), and what is the greatest challenge – conversion of information into knowledge, especially from unstructured data[6].

The last of the signaled Clouds-forming factors in the Market Space is the SME sector. Yes, all this huge market is cloud-creative and cloud-development factor. Why? Because, the need for growth and expansion of SMEs are implemented through tools and Internet services, and the Cloud accelerates this process. SMEs can not only globalize their operations, but with the use of the Cloud they can also compete with larger organizations. By migrating to the Cloud, SMEs obtain access to the same resources as corporations do. In conclusion, the emphasis shifts competitive advantage to innovative ways of existing resources and technology use.

There is probably no area of life in the **Social Space**, which is not in any way supported by cloud applications. Starting by listening to music, viewing and sharing photos, through project and task management, financial management, to reading digital books at the end. Most people are not aware of the fact that they already use cloud-based solutions. Just the first example: email, and the most popular services on the market, Gmail, Yahoo Mail, Hotmail. And then, all data on external servers, such as music (MyMusicCLoud, Amazon Cloud Player), documents (Google Documents), videos (YouTube, Tudou, Youku), pictures, and graphics (Picasa, Flickr), and the fastest growing market for storage services data (Dropbox, Google Drive, SkyDrive).

There are more digital devices on the market, there is a greater demand for mobility, and expectations for the smaller and more capacious device, and those reasons are sufficient to justify the development of cloud-based solutions. Manufacturers of digital devices have a difficult task ahead of them and it is not due to lack of capacity. Technological potential, which is already available, is just enough for many years of the digital arms race. The thing, however, is that it is hard to sense what the next hit will turn to be, what functionality will prevail, and that devices will be on market top. A classic example of a war in the market for digital devices are mobile

the customer needs grew - the service had to be scaled up which entailed additional time and costs for investment and development of infrastructure providers.[5]

Other IT services historically associated with the CC include Time-Sharing Systems, Collocation, Hosting and Outsourcing.

▼ Figure. The Evolution of Cloud Computing.

Source: Own work, based on: Frost & Sullivan.

phones, or to be more precise their successor, namely smartphone. Who remembers Nokia's dominant role today? And who is aware now that tech-better products of Nokia, lost to a better design, simplicity and perfect marketing of iPhone?

Such examples can be multiplied. There is no such a thing as homo economicus, it is rather homo motus, or a man receptive to trends, fashions and economic symbols. I believe most of the changes in our lifestyle can be noted in the field of entertainment. In business, at work, we are more conservative than we are outside the company. It is not only our taste that is changing, but ,most of all, the way of entertainment and content consumption we crave for. Thanks to portable devices, music can be present with us anywhere and at any time. We not only have access to an unlimited number of radio stations, but also to the entire music library that we have gathered. Audio was probably the first bastion that has been released from our physical living space and thanks to devices such as a cassette, walkman, discman, and devices for MP3 playing, music accompanies us everywhere. The games followed that trend, and then so did the video, and at the end digitized print, namely press and a book.

Our habits have changed thanks to the possibility of creating action groups, which are also accessible via the Internet. All kinds of networking services and / or community, and the option of sharing in the digital world: information, knowledge, music, movies, photos, documents, etc. were the stimulus for the development of our 'sociability.' Data exchange services for Peer-to-Peer and Web 2.0 revolution based on the creation of content by the user and all kinds of activities related to cooperation, interoperability, sharing played a great role in the process too.

The option of group play enriched the games available on the internet most intensely. While sharing of digital content entails the effect of contact and comments, in the case of games it is much more intense and full-bodied interaction. Generally, the gaming market is a 'giant' topic that requires further analysis. To sum up this thread, we can only conclude that the habits of younger generations differ dramatically not only from their parents' generation, but also from the colleagues who are about a decade older or younger. I have recently read an article on the use of digital devices by children, which was characterized by one of the described examples. A child at the age of pre-verbal, having for a while a tablet in their hands was next given a regular Illustrated magazine to play with. The child got bored quickly, seeing that moving pictures, that were available on the tablet ,do not start in the magazine ... So this 'toy' is probably broken…

Speaking about toys, ... and, at the same time, returning to a more serious tone of digital devices - it is their multiplicity, defragmentation of tasks that turns out to be quite important to synchronize data. If we are within our home network and all devices are in the vicinity, a network solution is sufficient. However, when the distance between devices increases, the cloud solution is essential.

These are only brief points of change in our behavior patterns and habits associated with our lifestyles.

Opportunities to improve the effectiveness and efficiency of the IT infrastructure were with the maturation of technologies such as SOA, virtualization, networking, and management automation. The evolution of the data center is worth noting.

▼ Table. Evolution of Data Centers.

name	description
Classic Server Room	Dedicated room where installed computers act as servers.
Virtualization	Temporary, non-physical version of, for example, the hardware platform, operating system, storage device or network resources.
Private Cloud	Intra-organizational IT infrastructure dedicated to: - Company as the owner and manager of infrastructure clouds - Virtual resources - Automation of management
Public Cloud	Multi-tenancy, shared IT infrastructure environment: - Offered as a service via web applications / web services on the Internet - The property of a third party - Utility pricing - payment for the use of real - Extreme scalability without the costs of the initial - Shared web hosting and data applications

Source: Own work.

In general, we can note the Social Space cloud-creative agents, and cloud-development on four levels:

The level of the relationship: the citizen - Administration / Institutions
- The need for faster, less invasive settling matters in government offices and institutions,
- Quick access to our data, shared by various agencies and institutions of government,
- Ability to handle routine and current affairs on the principle of 'one-stop-shop',
- Information help - precise, just-in-time.

The level of education and training
- School at home - alone or in a virtual classroom,
- Training anywhere - alone or in a virtual group,
- The end of printed textbooks and schoolbags,
- Collaboration, just-in-time data access between pupils, students and teachers, teachers and parents,
- Education and training model based on a smaller number of participants / students and quicker adaptation to changing market requirements,
- Model schools connected to cloud-based network, with the possibility of a global co-operation and exchange of experience, and participation of students in various international virtual classroom,
- Model based on teamwork, with an emphasis on collaboration skills, group management, and project management,
- Model based on multi-culturalism and global IT infrastructure schools.

The level of the relationship: user - user / users
- Virtual access to relatives, friends,
- Voice, text and video communication for free,
- Sharing everything that can be digitized,
- Common entertainment,
- Cooperation,
- Virtualization of work and play.

The level of personal preferences
- More space to store and share data,
- Smaller and lighter digital devices with more capacity and memory at a lower cost,
- Data synchronization,
- Faster access to data,
- Data ‘at hand’ - anything and everything,
- Increased bandwidth and widespread access to the Internet,
- More and more digital products and services for free.

I have just briefly defined cloud-creative and cloud-development factors in the Political, Market and Social Space. The cloud-creative factors and cloud-development in the Technology Space will be analyzed at some length later in the book dedicated to the economic and technological determinants. In the next section I will focus on two sets of determinants related to the emergence of the cloud and pro-developmental Clouds

Especially with the introduction of virtualization technologies, scalability issue has been largely resolved in the current ASP model. Virtual Machines (VM) can be allocated and implemented immediately. In addition to advances in network infrastructure, quality of the service and the speed of access to the Internet at even lower price[7] have improved.

If the history of the Clouds was limited to three key milestones, they would include: dissemination of IP, a microprocessor power surge, expansion and dissemination of wireless networks.

The modern concept of the Clouds began to develop most rapidly in 2003, when most large organizations started using Internet Protocol (IP) network management. Until now, most companies have dedicated leased lines applied to a data network. A move to the IP took place all over the world and it took just 24 months. This demonstrates business benefits due to this change. With the IP layer in a place, the network capacity can be dynamically allocated as needed, and users are billed only for what they use. Users no longer need to deal with the creation of forecasts for rental use and declare a constant amount of space. This meant ta conceptual change in cost policy for

factors. These sets of determinants are: 1) economic determinants, 2) technological determinants.

Economic determinants will include issues related to the multi-faceted needs of companies and organizations and the IT market. However, the determinants of technology provide an overview of technologies and concepts prior to the Cloud and have an impact on its appearance, and the technologies and concepts to complement and support the development of Clouds.

CLOUD-CREATIVE ECONOMIC DETERMINANTS

The cloud is a natural consequence of decades of Acceleration. The explosion of a huge amount of data has launched a new business needs. The most important of these is the need for flexibility. The change did not come from new technologies, but appeared thanks to the need to cut costs. And all these began together with the financial crisis and global recession. Most organizations were forced to reduce costs and risks in order to survive, and therefore launched a completely new business models. Market demands are forcing companies to consolidate, also in the area of IT.

Significant breakthroughs often occur immediately after periods of economic difficulty. Businesses may freeze investment in times of crisis, and when conditions change for the better, they want to make up for lost time, focusing on improvements in operations. And then they look for and invest in new, radical ideas. There are many sources and causes of Clouds.

IT MARKET RECONSTRUCTION

The evolution of the IT market in the direction of seeking more cost-effective and efficient solutions resulted in different concepts of network, among which Cloud Computing wins greatest popularity. In response to the new needs of business and individual customers, IT suppliers had to reconsider their 'boxed' approach to SMEs, and the one dedicated to large organizations.

On the way to the idea of a more effective method of service, the experience of market services for consumers through Internet applications became the inspiration. An application that is available on a single platform of information, allows you to monitor the use of the functions by the customer, gather comments about problems on the fly, and to simplify application development methods. And, instead of providing new versions of the applications to the tens of thousands of customers, tens of thousands of customers had an access to a simple place where they could either download the revised application, or work on it in the option of the access to the Internet. Another valuable experience was the fact that a fussy individual customer, accustomed to the fact that the majority of functions performed on the Internet for free, has a low willingness to pay for anything. On the other hand, during the intensive development of new applications, it became more and more difficult to draw the user's attention and get him/her

most large organizations. Besides, not only the costs reduced. The change from leased lines to IP also launched a greater operational flexibility.

Another significant factor in the Clouds timeline (2006 and 2007) is the change in the CPU. Providing high performance in a very small space at asignificantly reduced energy consumption, has led to a reduction in the cost of processing and the speed and ease of scaling. This, in turn, has led to the fact that the traditional PC microprocessor and server model have turned out to be outdated. Computing needs can be managed through flexible blade server groups that you can dedicate to your needs, which leads to a new model of the investment and greater flexibility.

Finally, there is an explosive expansion of wireless networks. It has expanded the boundaries of public and corporate networks and, at the same time, it dynamically launched the consumerization of technology, in the form of dynamic sales of smartphones and tablets. Millions of mini-applications spread all over the world, and the barriers between technologies began to crumble. Today, the amount of content in a digital circuit doubles every six months and it includes voice telephony,

to try to take advantage of the new product offered by the IT developer. Therefore, the business model began to evolve in the direction of the concept of freemium - the basic functions are free, while others are available for a small fee. All of these new experiences of the client market, they were a great training ground for the application of similar mechanisms for business to business market.

Savings, for IT vendors, in the age of exploration the effective use of infrastructure, are very important. Capital-consuming investments do not always work out due to the unpredictable infrastructure boundaries. You could, of course, plan and forecast the approximate use of owned hardware and software, but only if you possess a multi-annual contracts for the implementation of specific services for large customers. Assuming that we are talking about large customer support only. Thus, IT infrastructure could be only dedicated to large organizations. For smaller customers boxed tape solutions - standardized software that is running on the customer's IT infrastructure remains.

At a time when large organizations began to invest themselves in their IT resources, efficient use of infrastructure owned by IT organizations began to diminish. The market got tighter (internal and external competition). First of all, the increased number of fully unused resources was noted. Paradoxically, this led to both large organizations and IT vendors having the same sort of problems. These two categories of bodies had to find a way to a greater resource flexibility, scalability and cost-effectiveness of use of their IT infrastructure.

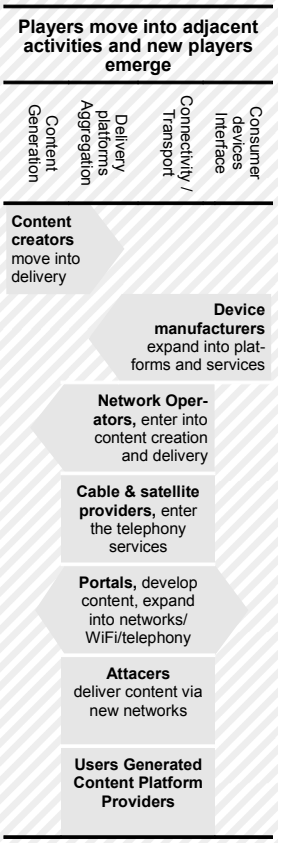
A significant area of the client, which had so far not been effectively cultivated by IT vendors, was a huge market for SMEs. Small and medium-sized businesses could not afford expensive solutions dedicated and personalized to small organizations' needs. The market, as Nature, does not like empty space. A niche, which was developed by larger developers and IT vendors started to be slowly filled with smaller competitors. These smaller developers are responsible for a breakthrough on the market. And bigger IT players have eventually begun to move in that direction.

Small developers did not have the capital to spin-up and operate large business organizations. They had to look for other ways and methods to support the market. In addition, they remained primarily to support the SME market, left on the margins of mainstream IT activities of larger competitors. The central battleground became the Internet due to common and relatively cheap access – optimal costs for both suppliers and customers. Applications which were run, delivered, supported, developed and available on the Internet became developers' secret weapon. This direction hit the jackpot. Lower costs, flexible labor resources and infrastructure adapted quickly to customers' needs, and what is most important, low prices triggered an avalanche of solutions, delivered over the Internet.

Changes in the IT industry are not only caused by looking for savings, although this factor is always crucial. Another important challenge that still awaits its solution is **handling more and more data** that is in circulation in the company. In particular, the company supports hundreds of thousands, video, animation, and business data.

Not only barrier between the technology began to be smooth. Also, the boundaries of industries began to blur, as illustrated by the example of graphics based on McKinsey's analysis.

▼ Figure: Migration and Borders were Shifted Industries.



Source: Own work, based on: Digital Ecosystem Convergence between IT, Telecoms, Media and Entertainment: Scenarios to 2015. 2007. World Economic Forum.[8]

You can also say that the history of the Clouds has its origins in the ... online

and sometimes millions of the customers, where the result of information must be exactly on time and in a particular place. In this case, the conventional approaches cannot be successful. Factors triggering the enormous amount of data in the form of increase in the number of digital devices sold, and the subsequent increase in the content created by customers, only reinforced the expectations of business customers for effective ways to handle large amounts of data (Big Data).

In the company, one of the key issues is the time of **customer service and interaction with clients**. With more services, more customers, call center service is simply no longer enough . And even if it turns to be some kind of solution it must be based on just-in-time information. This information must include previous dealings with the client (historical data), but it should be also available to other departments within the company in order to respond to emerging issues and needs appearing on time. This requires the reorganization of all the existing organizational structures and information. The problem is now of such a kind that the changes are so dynamic that organizations must act like some kind of transformers- they have to change their shape and functions constantly.

They are looking for the ways to automate and simplify customer service. And this is a specific paradox, since this direction, on the one hand dehumanizes the relationship with the customer, but, at the same time, it collides with the opposite direction - the expectation of a direct contact between the customer and the employee of the company. The one that has never dealt with the customer service of the bank, telecom operator, hosting provider, etc. does not know how much patience you need to have today in order to listen to all the commands and instructions aiming at resolving the problem without human intervention from the company. So, it is invested in an extensive infrastructure to replace the unreliable and costly human factors (reduction in the number of customer service staff to support the staff infrastructure that supports the client in an automated manner). The idea good enough, but existing solutions still leave much to be desired.

Cooperation should be, and in many cases it the main mantra of companies. It is not only about working with the client. It's also about cooperation within the organization and co-operation between the organizations, bodies orbiting around the company. In addition to the obvious communication (savings, savings, savings), is also an access to shared resources and collaboration tools. And once again the network works out. To choose from, either own - intra / extra-nets, or the public, or the Internet.

The Internet is not just a place where we upload collaboration and data. This is the place from which we draw the computing power (applications run on the Internet), but also an excellent channel of distribution of digital products, such as Software. Many of the issues raised above are related to the reorganization of the IT needs of the organization and IT. Therefore, the solution of Cloud Computing is not a new technology, it is a new, or, to be more precise, it is the modernized concept of organization and the use of IT resources.

bookstore. Amazon.com started its cloud-based business from the fact that all the server resources possessed, consumed only 10% and the remaining 90% were not used. I am a supporter of the thesis that every problem is an opportunity to make better changes. So it was in the case of Amazon.com. The issue created a business opportunity and a chance running the cloud dominoes. Let's investigate individual events in the history of Clouds Economy on the timeline.

→ 1936

HARDWARE

In 1936, at the University of Cambridge, Alan Turing invented the principle of the modern computer. He describes an abstract digital computing machine composed of a large memory and a scanner that moves back and forth (in memory), symbol after symbol, reading what it finds (in memory), and writing the next symbols.

→ 1939.01.01

BUSINESS

David Packard and Bill Hewlett (Stamford University graduates) start Hewlett-Packard. Their

The IT market has developed a technological (r)evolution, and the market now expects IT solutions to measure current expectations - not without impact on the IT market itself, but on IT organizations as well.

RECONSTRUCTION OF ENTERPRISE

Many of the issues raised in the subject line concerning reconstruction of the IT market is converging with the need for the reconstruction of enterprises. These two trends overlap and are interdependent. You only need to note the specific perspective of the expectations of companies.

Focus on the core business of the company. Businesses need relief from the side function. Moreover, this trend is not new, and the method has been known for years. Cloud Computing, in this case, is nothing else but outsourcing of a part of delegated tasks to the cooperating entities. The need for concentration is associated with the requirements of the market, its dynamics, competition, varying customer needs, technological race. Especially this last factor is important. One of the fashionable terms, sometimes misused by business today, is innovation. Everything has to be innovative in order to be sold better. Sometimes it is a simple touch-up, or just marketing, which has nothing to do with innovation, however, the need appears. This need can be very well managed and used at a higher concentration on the company's core business. The Cloud is the result of the commercialization of convergent technologies which enable organizations to get rid of a lot of fixed costs and focus on its core business. For organizations, the acquisition of a set of on-demand services, paying only for what is needed and what can be realistically used activates a revolutionary change in the organization and costs.

The need for more efficient use of the infrastructure has already been mentioned in the section about the reconstruction of the IT market. It is worth noting, however, that the organization is not only the IT infrastructure. The emphasis on greater productivity also applies to capital and labor resources. In particular, the work is a weighing factor of changes here. Beside the subject of labor costs, legislative load contracts (depending on the country, contracts are often unbalanced, their center of gravity lies more on the employee's side, or the side of the operator), the need for reconstruction is localized in the organization of work and that will be discussed in following paragraphs.

Mobile work, telework. A worker 'released' from the physical desk, for some people is a good and motivating movement, a necessary evil for others, and almost a heresy for the rest. Much depends on the culture of the organization, industry, competition, and, most of all, on the main decision maker in the company. Why are Mobile Computing and teleworking so important? Firstly, they are often associated with the need to work in the field (mobility), due to the nature of the product or service provided by the company. Sometimes it's just a necessity. Teleworking is a different case. It is rather the direction associated with the search for savings. Even if the tools (computer, phone, desk) do not change the cost (regardless of whether the employee performs work in the office or at home) two other

first product is not a computer, but the HP 200A Audio Precision Oscillator, which is becoming a very popular part of test equipment for engineers, mainly due to its unique design and low costs. In 2007, HP revenues exceed $ 104 billion ...

→ 1940-1950

BUSINESS

In the 1940s and 1950s, Frederick Terman, as a dean of engineering at Stanford University, encouraged lecturers and graduates to start their own businesses. He is credited with supporting the development among other Hewlett-Packard and Varian Associates and other companies using modern technologies until Silicon Valley was developing around the campus of Stanford University. Terman is known as 'the father of Silicon Valley'.

→ 1943.10.04

HARDWARE

Researchers at the University of Pennsylvania begin work on the Electronic Numerical Integrator and the Computer (ENIAC), the machine is capable of remarkable, for its time, speed. The work on the ENIAC was

factors have a significant impact on cost reduction: first, reduction of costs associated with less office space and second, time and commuting costs of the employee. Another important saving factor is flexible working time of teleworkers. Depending on your needs, teleworker can work more or less for your organization. They can be leased temporarily, or in order to carry out a specific task. Besides, the teleworker can adjust their working time and the amount of time and work for more than one client. Both, in the case of Mobile Computing and teleworking access to key information resources of the company. The need lies also and plays a key role mainly on the supplier's side. With the access and monitoring of the effects of mobile employee and teleworkers, the company has a live update of information about the performance of their tasks, time effects and labor costs. The more mobile employees, teleworkers and the greater the company's organizational defragmentation, the greater the need for network and / or cloud-based IT infrastructure.

Once again, I have to notice a greater amount of data factors in circulation. However, this is a very important factor and it weighs to the entire market and users. Companies, as never before, need a better and more precise handling data coming from different directions, from the enterprise to the market, from the market to the enterprise market in many different directions, and within the company. Previous basing on the existing Business Intelligence solutions is not enough. The need to deal with the greater than ever amount of data in circulation increases together with an effective analysis and conversion of this data into useful knowledge. Nothing but the access to information is not enough. As in the case of other resources, in this case, the resource information must be more efficient. A performance is associated with related information, the capturing trends, with precise access to the logical structure of information which becomes useful knowledge adaptable to current operational and strategic planning.

A new paradigm of the organization (not just companies) is a Change. A Continuous Change. In a dynamic business environment where competition is no longer directly related to the large capital and large organizational structure, where small businesses can compete with corporations, and where customers are less and less inclined to loyalty as they yield to momentary fashions and have a greater awareness of choice and access to information, organizations need to change. Not only change but keep on changing.

TECHNOLOGICAL CLOUD-CREATIVE FACTORS

Cloud Computing, which is the processing of data in the Cloud, reminds previous technologies and marketing phenomena such as network computers, on-demand access infrastructure (Utility Computing), Distributed Computing and virtualization.

A full understanding of Cloud Computing requires a broader perspective, including both elements related to CC, but also those on which CC could be based.. And so we can identify precursors of CC:

shrouded in mystery of war, as its main goal was to determine the 'firing tables' for artillery shells. Before the ENIAC, the work had been performed by women (called 'computers') who operated in large groups on mechanical calculators.

→ 1946
CONCEPT
Roberto Bus creates the first e-book – the Thomisticus Index, in the form of an electronic index to the works of Thomas Aquinas.

→ 1948.21.06
SOFTWARE
The world's first computer program: Manchester Baby was launched.

→ 1949.15.06
IDEA
MIT Professor, Jay Forrester created the concept of "Memorial Elementary [the core]" (Core Memory). While working as a professor at the MIT (the Massachusetts Institute of Technology), Forrester finally installed magnetic core memory in the Whirlwind computer. The core memory made the com-

Autonomic Computing (automation) computer systems capable of self-management.

Mainframe: computers used mainly by large organizations for highly complex task of processing large amounts of data, such as census, consumer statistics, industry statistics, enterprise resource planning, and financial transaction processing.

Client-Server Model: consisting of the distribution of applications between software vendors (or servers) and clients.

Grid Computing: virtual machine, constructed as a network cluster. Grid computing is based on pairs of computers for the purpose of execution of more complex tasks. In the following sections this topic will be expanded.

Peer-to-Peer: both suppliers and customers, using distribution architecture without the need for a central location for the distribution.

Utility Computing: rental of data processing resources, such as hardware, software, and networks on-demand. In the following sections this topic will be expanded.

Service-Oriented Computing: like Cloud Computing, the direction of implementation of the computer technology in the Software-as-a-Service option.

Services Oriented Architectures: CC services are often associated with the term 'Service-Oriented Architecture'. But you must not confuse these terms, even though they are compiled to support the implementation of the services. By CC, companies are able to have access to services hosted on third-party servers on the Internet. With Service-Oriented Architecture, companies will benefit from the application of integrated services in a more lightweight manner than on traditional platforms.

Service Oriented Architecture (SOA) is perceived as a flexible set of design principles used in the development phase and system integration. The implementation of SOA-based architecture provides a loosely integrated set of services that can be used in many areas of business. Although SOA is closely associated with many services in the Cloud, it is mainly dedicated to business use.

Some believe that SOA is dead, or at least anticipated by Cloud Computing, BPM, mashups and SaaS. The others argue that SOA and CC should go hand in hand. Attempts to reactivate the dynamic development of SOA are through integration into the CC. According to some experts, SOA and CC can offer a complete package of services.

Cloud Gaming: a way of delivering games on computers. Data for the games is stored on a provider's server.

Distributed Computing: field of computer science dealing with distributed systems. The distribution system consists of many autonomous computing

puters more reliable, faster and easier to use. The data storage system remained popular until the development of semiconductors in 1970.

→ **1951**
HARDWARE
The computer LEO starts to work. In October 1947, the directors of J. Lyons & Company, (the famous British tea rooms catering) decided to play an active role in promoting the development of commercial computers. In 1951 the LEO I computer was the world's first computer for office work. The company LEO Computers Ltd was established in 1954. The LEO II computers were installed in a number of UK offices, including the Ford Motor Company.

→ **1953**
HARDWARE
Jay Forrester installed magnetic core memory at MIT.

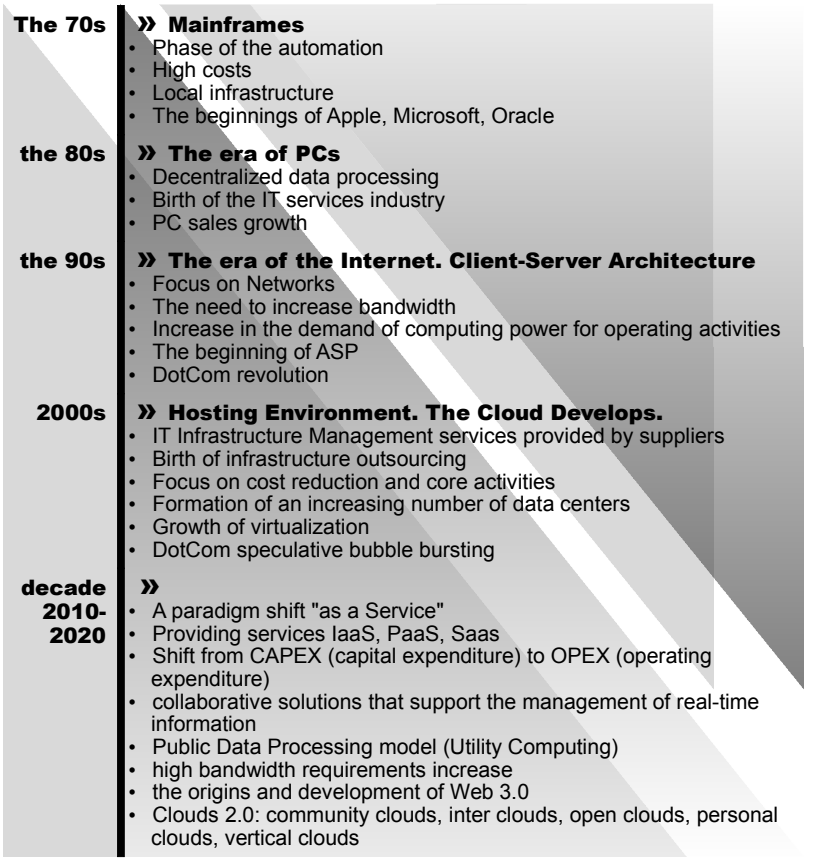
1953.02.07
HARDWARE
IBM announces a series of 650 computers, which were

units, which communicate with each other through the network to achieve common goals.

Virtualization: a temporary, non-physical version, for example, the hardware platform, operating system, storage device or network resources. A virtual machine (a computer, a server, etc..) is a complete non-physical machine, consisting of a set of files and programs running on real physical machine. The purpose of virtualization is to centralize administrative tasks while improving scalability and more effective utilization of hardware resources. What does this mean? For example, the parallel use of multiple operating systems run on a single processor (CPU). For what purpose? To reduce overall costs. The rest of the book expands this topic further more thoroughly.

Computer Cluster: the architecture consisting of a set of loosely coupled computers, cooperating as one system. Cluster members are usually connected to each other through fast local area networks. The main task of clustering is to improve the efficiency and availability of operating data as a single system alternative to less efficient and cost-effective way of working of single computers with comparable speed and availability.

▼ Infographic: IT Cloud-Creative Decades



Source: Own work.

used in the rest of the decade. IBM 650 stores information on a rotating magnetic drum and provides results on programmed punched cards. Its memory wrote down the number to the 10th digit after the decimal point.

→ **1954**
BUSINESS
Jack Tramiel founds Commodore.

1954. 01.10.
HARDWARE
IBM announced a computer model of the 705.

→ **1955.02.10**
HARDWARE
ENIAC retires. On October 2, 1955 at 23.45 ENIAC power was finally turned off.

→ **1956.13.09**
HARDWARE
IBM introduces the IBM 350 - the first hard drive, as a part of the IBM 305 RAMAC computer. The first hard drives for personal