

CLOUD COMPUTING IN BUSINESS PROCESSES. A CAR PARTS SUPPLYING COMPANY CASE

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Abstract:

In order to survive in times of crisis and a volatile environment the contemporary organisations have to be quick on their feet i.e. capable of taking decisions swiftly. To this extent, new applications, based on Information Systems and Information Technology (IS/IT) that make it possible to analyse any organisation's current status swiftly and to respond to a developing situation appropriately, are particularly useful. Such applications are used in every operational area of an organisation, starting from cost calculation, through operational processes and ending up with monitoring. Watching developing trends gives a reason to put forward a theory that implemented IS/IT projects cease to play a support function, but more and more they are becoming the strategy of an organisation. In recent years new, functional systems have become available on the market. They are commonly dubbed "clouds". They are having a greater and greater impact on the operations of numerous organisations. This paper discusses theoretical aspects of cloud computing and a practical example of applying this solution in a business dealing with the distribution of automotive spare parts. In particular, this paper takes a closer look at the application of the statistics of internet search engine queries to the organisation of a company procurement system delivering products whose distribution represents the core business activity of the company.

Keywords: business processes, distribution, clouds computing, implementation

1. INTRODUCTION

Contemporary organisations in their efforts to establish a swift decision making process, focus on using Information Systems and Information Technologies (IS/IT). These make it possible, among other things, to analyse swiftly the current status of the organisation and to take appropriate steps in responding to ongoing changes. The application of IS/IT has had a noticeable impact on the management of both large corporations and small enterprises (Ross, 2011). They are applied to every business area of an organisation, starting from cost calculation, through business processes, ending up with monitoring. Cloud computing technology creates huge opportunities for cost reduction, for example, in the area of human resources management (Rakowska, Pastuszek, 2013). Monitoring ongoing trends gives grounds to put forward a thesis that implemented IS/IT projects cease to play the role of support function, but more and more they are becoming part of an organisation's strategy. In recent years new, functional systems have become available on the market. They are commonly dubbed "clouds". They are having a greater and greater impact on the business strategies of many organisations. In 2010-2015 the value of the global market for such solutions is expected to grow dynamically from US \$ 37.8 billion in 2010 to more than US \$ 270 billion in 2020 (Gartner, 2013, 2013a).

Generally speaking cloud computing is a solution based on the use of services delivered by a third party service provider, applying third party software and IT infrastructure (Mell & Grance, 2011). Such a solution eliminates a number of elements necessary in the case of a conventional approach to the use of information technology in an organisation including, in particular: the need to purchase and hold software licenses, to install software, to create IT specialist infrastructure, to administer software etc. Current cloud computing models refer to the grid-based solutions i.e. they are based on distributed networks, integrating and managing resources that are under the control of various domains and interconnected by means of a computer network. The forerunner of such solutions is the SETI (Search for Extra-Terrestrial Intelligence) initiative, designed to speed up the search for signs of life in the Universe (Minoli, 2005, pp. 7-10).

2. CLOUDS COMPUTING STRUCTURE AND DEVELOPMENT

2.1. Cloud structure and models

A typical cloud computing solution is adapted to the individual and (or) institutional users, for the various applications, developed by third parties in an IDE (Integrated Development Environment) environment, offering data storage and processing, taking care of data security, and also the size of the IT infrastructure (i.e. capacity and development level) meeting user expectations and an option to retrieve data and create back-up copies (Furht, Escalante, 2010, p. 3). The pioneering solutions in this area include but are not limited to the AWS system – Amazon Web Services (Amazon.com dating back to 2006), GAE – Google App. Engine (Google, 2008), Blue Cloud (IBM, 2008) or for example Azure (Microsoft, 2009). The cloud computing solutions and more advanced cloud services have a number of attributes, of which the most essential ones (Furht, Escalante, 2010, s. 8; IDC, 2013a) are as follows:

- the share of 3PP (Third-party Provider),
- Internet access, based on universal IT networks,
- minimum or no user IT skills necessary
- maximum customization to user requirements and their update in real time,
- price list with affordable rates – based primarily on duration of service enjoyment,
- user interface – universal, enabling the use of various stationary and mobile devices, taking into consideration at the same time and flexible system matching to their technical capabilities,
- resource sharing – with simultaneous adaptation of them to user needs and expectations.

By cloud computing models, we mean, among others (Linthicum, 2009, p. 11):

- SaaS – Software as a Service – the customer purchases all required system and software functionalities depending on their requirements,
- PaaS – Platform as a Service – sales of a complete set (platform) of applications in line with customer expectations via any interface,
- DaaS – Desktop as a Service – e.g. the user purchases a customized virtual machine,
- IaaS – Infrastructure as a Service – the third party providing the customer with an IT infrastructure (hardware, software and service); under this model the customer provides the service provider with their own software to be installed on hired hardware,

- CaaS – Communications as a Service – the purchase of a telecommunications environment supporting the operations of the organisation.

2.2. Cloud computing management

Cloud management is based on the collocation of distributed organisational resources and cloud computing models (technical resources). Despite their varied physical locations, collocation will safeguard the obtaining of synergies and added value for the organisation. This can be described as follows (Rakowska, Pastuszak, 2013):

- distributed organisational resources due to, among others, business process outsourcing (BPO), development of remote working procedures, development of social networks, globalization and a growth in the international mobility of companies and workers,
- using the distributed cloud computing models (offered by diversified suppliers for diverse markets),
- the creation of added value for the organisation and its customers thanks to the integration guaranteed by the cloud management processes.

The expected additional impact of applying such solutions will be certainly the optimization of the organisational operating costs. In 2011 a survey was commissioned by the European Commission among the community of businesses using cloud computing. Based on the survey findings, conclusions were drawn that the related savings accounted on average for 10-20% of the costs of installation and the use of the IT infrastructure. In 36% of surveyed businesses, the utilization of cloud computing generated savings of up to 20% (or above) of IT expenses (IDC, 2013b). It could be said that the combination of such IT savings along with the organisational savings through business process outsourcing (BPO) could generate additional benefits not only for individual businesses but also for the whole regions (Clarke, 2011).

Cloud computing is now a leading trend in the IT application environment. In 2013 more than half of businesses stated that in 2014 their priority will be to create a private cloud. The businesses have adopted the term “private cloud” and the general concept of a higher level of automation and fast delivery of resources. The cloud computing technology market is expected to reach an estimated value of US \$ 241 billion in 2020, and also by 2016, the vast majority of expenditure in IT business will apply to platforms and cloud applications (Gartner, 2013).

The cloud computing utilization method depends on the size of the business, the nature of operations, and personnel operational methods. From the perspective of each company the computing cloud is adaptable, if its implementation generates tangible benefits for the company. Major aspects of cloud computing application include:

- the ability to boost efficiency,
- acceleration of the implementation of new solutions,
- the opportunity to cut operating costs,
- enhancement of solution scalability along with dynamic corporate growth,
- the opportunity to enter into new business areas thanks to application of innovative technology,
- the option of selecting a solution model depending on company needs.

In the IT market, cloud computing represents a new business model and additional sales channel for services. Using a cloud-based software delivery model, the software developer does not encounter the traditional logistic problems in dealings with its customers. The major benefit of a cloud-based model is the flexibility of service scalability, which works particularly well in small, dynamically growing companies. Cloud computing enables small companies to enjoy solutions that until recently were reserved almost exclusively for large organisations. Thanks to cloud computing such advanced services as CRM, ERP or a contact centre are available to companies with a workforce of below twenty people. A survey carried out by Keralla Research Institute shows that professional tools are used by almost 19% of small and medium-size enterprises (SMEs) in Poland. In the microbusiness segment the utilisation rate was only 38% (Keralla Research, 2014). Despite the risk of losing full ownership of data, companies are more and more willing to move their business into the cloud, because most of the time it generates huge benefits, mostly economic ones. Cloud computing technology enhances also company flexibility and gives new, bigger growth opportunities while reducing organisational costs.

3. CLOUDS IN THE COMPANY

3.1. The Company, its needs and course of implementation

The studied company which decided to implement cloud computing technology is a typical automotive wholesale business and deals with the sales of filters for motor vehicles, excluding motorbikes. The studied company is located in south-eastern Poland. The company was established in 2003. It is microbusiness, with a staff of 8 people, run by a natural person. The filters offered by the Company have applications in the automotive, industry and agriculture sectors. The cloud computing business model was implemented in 2011, however, innovative implementation projects are still in progress.

Every business, before taking the decision to switch from conventional IT resource management model into a cloud computing model, should carry out an in-depth strategic analysis beforehand with the focus on the application of new business model including in particular the prevailing needs. Based on the analysis of the current status and potential future needs of the studied company, analysed from the angle of an implementable computer system, a number of areas were identified, where cloud computing solutions could be implemented. These included in particular (Cieplak, 2011):

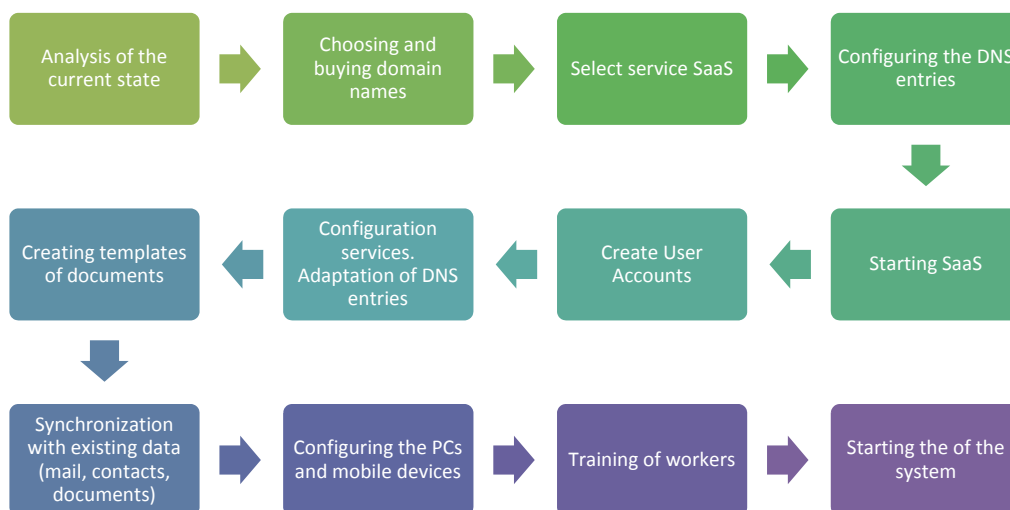
1. Company internal communications.
2. Information dissemination and communication using mobile devices.
3. Communication with the suppliers and customers of the wholesale business (distribution company).
4. Data archiving and creation of back-up copies.
5. Efficient and fast communication using Web-based instant messaging.
6. An option of online conversations and conferencing – voice and video transmission.

Since most of the needs were concerned with company communication with its internal and external customers, a decision was taken to apply an optimum solution based on the SaaS model. A decision about the selection of such a solution was supported by the following arguments:

- price – for microbusinesses free software is available,
- ease of implementation – configuration is straightforward and does not consume too much time,
- Short implementation time – only data merging with the archival data and personnel training are required,
- operational reliability – the service providers assure (based on the monitoring of service indicators) that service is available 99.99% of the operational time,
- availability – in the service market there are many available solutions of this type.

As a basis for building B2B (business-to-business) contacts, the PaaS model was recommended. A decision about the implementation of this model is determined by: integration with the internal communication system, no project start-up costs – the use of Google App Engine, access to the database engine, application automatic saleability and integrated protection system. Figure 1 shows the implementation procedure for SaaS model in the company.

Figure 1: Service implementation flowchart under SaaS model in the company



Source: Cieplak, 2011, p. 21

3.2. The solution used is based on cloud computing technologies

3.2.1. Google Apps

In the company **Google Apps for Business pro** was implemented. It is a cloud-based office suite, which offers to all company personnel efficient and effective co-operation from any place and using any device. The Google Apps tools enable the control of resources and decide to whom and to what extent they will be made available. A network of data centres is exceptionally secure and guarantees reliable access to data on 24/7 basis. Everything that is created in Google Apps is automatically saved in the cloud computing environment. Google Apps comprises customized applications matching company needs. This includes e-mail with a Google browser, up to 30 GB of disk space for data storage, an option of offline work and custom e-mail addresses. The Business Apps suite also offers Google Disk, which gives access to data necessary to work from any location. The Google Apps implementation facilitated the day-to-day activities of the company related to document management, invoicing, budgeting, work planning etc.

3.2.2. Google Analytics

However, the major benefit – on the top of easier access to data – is offered by the implemented **Google Analytics tool**. It provides ongoing access to information about the users of Company's web store. Thanks to the appropriate applications, Google Analytics can be integrated easily with the company's in-house procedures, creating custom applications, using the API interface. The available analytical services include analysis of content and community, mobile data, conversion and advertising. This tool analyses, among others, the location of users by geographical location as well as behaviours of new and repeat customers. The most essential functions of Google Analytics include:

1. Visitor flow and path analysis.
2. Trend analysis.
3. Analysis of correlations.
4. Webmaster tools – Keywords and traffic.
5. Fusion tables

Re 1. Visitors flow and path analysis

The Visitor Flow Report (see Fig. 2) shows in graphic form, the visitor flow in the portal from the moment of entering the website until the place where visitors have left the site (drop offs). It is a mobile website. Customers who enter the home page of the web store, move later to the subsites browsing through the Web store product list. Their activities are analysed in real time. The nodes shown in Figure 2 represent a selected value of dimension used to filter website visualisation (e.g. the first column). Their connection represents a path from one node to another and traffic intensity on such a path. Fig. 2 represents the number of visitors to the website using a selected dimension (e.g. source of visitors, type of campaign, type of Web browser), the relative number of visits to a website or group of websites and details about connections, nodes and node drop-offs. Based on the report, data, regarding customer traffic intensity and marketing channels can be compared. By default the visitor flow displays the first three interactions with a maximum display of eight interactions. It should be noted that after adding the required number of steps, an option *Highlight Traffic* is available, which makes it possible to check if traffic from a certain source has reached a threshold of minimum commitment (for instance three or four customer interactions with website content).

Figure 2: Visitor flow



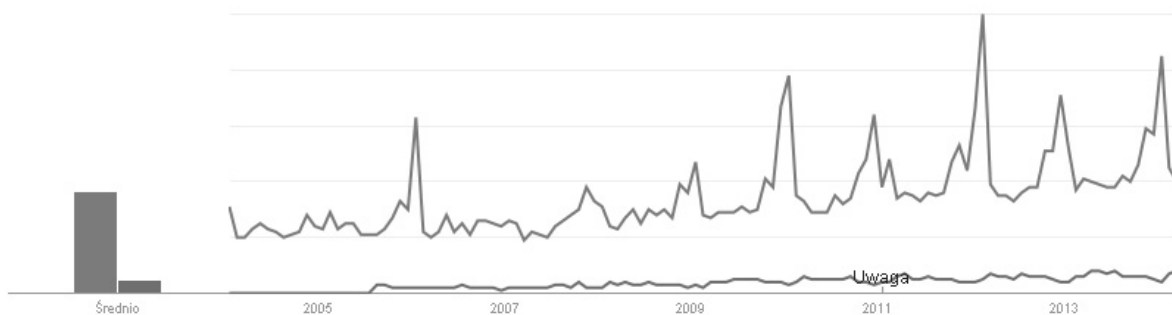
Source: <https://support.google.com/analytics/korwex/1709395?hl=pl>

An analysis of the customer activity path may suggest that users fail to find searched for products or the internal search engine does not return useful results. It also enables the analysis of the place where the path was interrupted. Using this tool, company personnel are able to analyse which paths on the website are more popular than other paths and what is a typical user path. For instance the appropriate path may look as follows: *Home page > Product page > Shopping basket > Cash-desk or also e.g.: Start > Product > Search > Search results > Search > Search results > exit*. An atypical path requires appropriate attention and the taking of relevant corrective actions.

Re) 2. Trend analysis

Another implemented Google tool is **Google Trends**, showing a list of the most popular searches. Using this tool, it is possible to determine whether a certain commodity will be popular in the future. It shows on a graph the user queries about a certain commodity (e.g. oil filters, car batteries etc.) and allows— within a certain time interval – to build up a sales forecast for the future based on trend extrapolation (Fig. 3).

Figure 3: Interest in the purchase of car batteries (upper curve) and oil filter (lower curve)



Source: <https://www.google.pl/trends/explore>

Re) 3. Correlation analysis

The **Google Correlate** tool searches for entries corresponding to the main product trends. It shows correlation of searched for entries with other correlated words in a selected country and within a

selected timeframe. Using this tool, advertisements can be created with advertising slogans based on correlated words. Fig. 4 shows an example of correlation with an entry: *oil filter* (in US market).

Figure 4: Correlations with the entry “oil filter”

Correlated with oil filter	
0.9724 spark plug gap	0.9580 rear
0.9721 plug gap	0.9578 sway bar
0.9692 brake caliper	0.9562 drain plug
0.9679 oil capacity	0.9547 valve adjustment
0.9674 engine oil	0.9539 change oil
0.9624 oil drain	0.9535 firing order
0.9618 oil drain plug	0.9534 motor mount
0.9610 clear coat	0.9505 spark plug
0.9601 turn signal	0.9491 oil level
0.9591 paint code	0.9482 gear oil

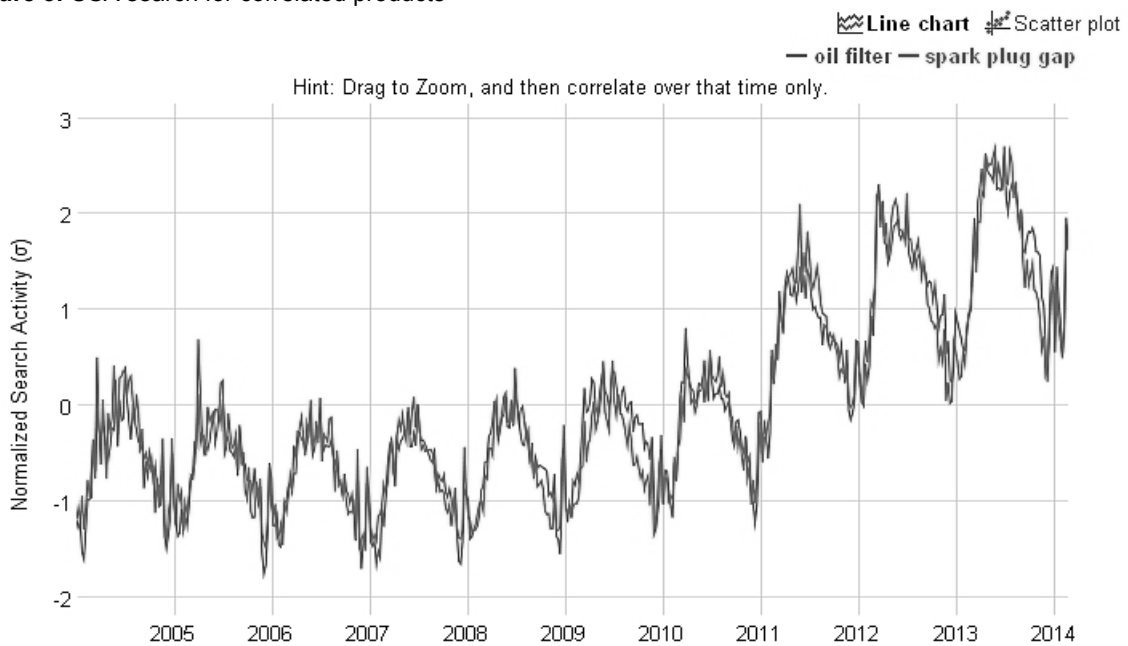
Source: <https://www.google.com/trends/correlate&prev>

Re) 4. Webmaster tools – Keywords and traffic.

Keywords:

This tool has been implemented to improve business processes in the company. The tool uses structural data and diagnostic tools, preparing a website for Google indexation. It gives information about the company status in the browser, repetitive elements on the corporate website and whether Google recognises words that can be indexed by data type (articles, events, local businesses, products, applications). *The Keywords in content* site contains a list of major keywords and their variants found by Google during the process of the indexation of corporate website. Information from the website combined with the report on searched-for entries and a description of the website in the search results for selected keywords give an insight into the interpretation method of website content by Google. The weight of each keyword depends on how often a certain keyword is found on the website. To see examples of websites where such keywords are present, one has to click on the individual keywords. Keywords and their variants are listed by incidence. This enables webmasters to check indexation status and website optimisation (Fig. 5).

Figure 5: USA search for correlated products



Source: <http://www.google.com/trends/correlate/search>

Traffic

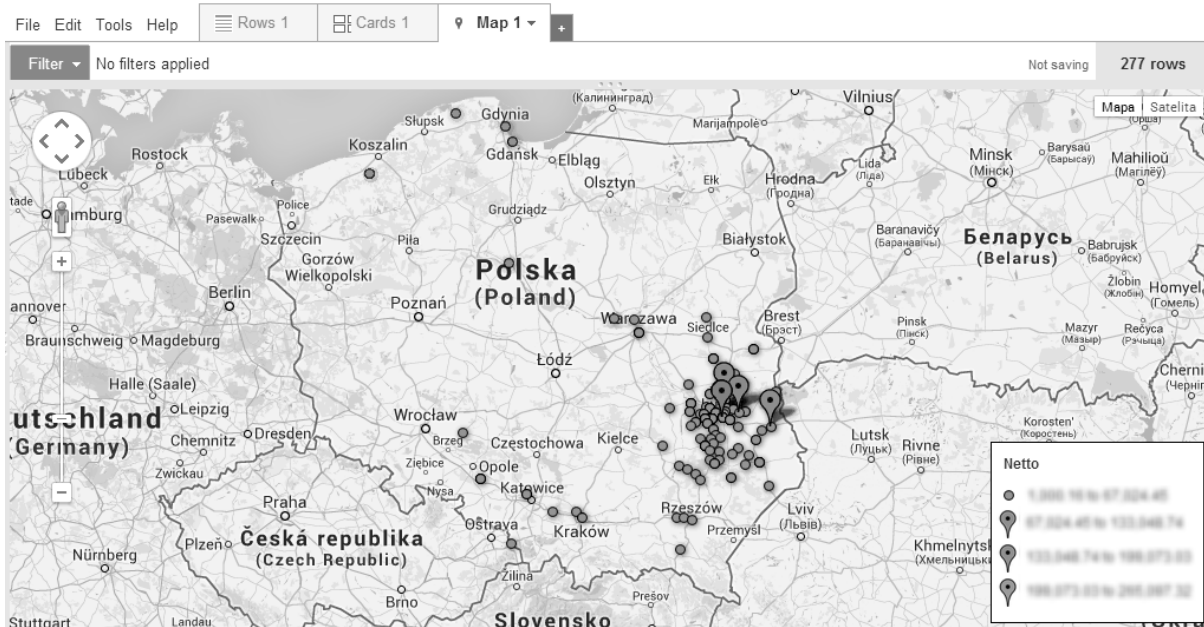
The “Search-Related Traffic” menu contains the following data:

- *queries*: total number of search entries, which within a certain period of time caused website returns in the results,
- *list of queries*: specific user queries that result in the finding of the URL and website in the search results,
- *hits*: number of website hits in search results; the change shows an increase /decrease of the daily average compared to the previous period,
- *clicks*: number of website element clicks in search results for a specific entry; the change shows an increase /decrease of the daily average compared to the previous period,
- CTR (click-traffic-rate), e.g. percentage of hits leading to clicking on the website; changes show an increase or decrease in percentage points of the CTR daily average compared to the previous period,
- *average website position in the search engine*: average best position of the website in the search results for a specific entry; the change shows a difference compared to the previous period (green colour means that the average position of the website has improved).

Re) 5. Fusion Tables

The studied company also uses **Fusion Tables**, being an experimental visualisation of data of Web applications for collection and sharing of large data tables (Fig. 6).

Figure 6: Company operational area



Source: <https://support.google.com/fusiontables/korwex/2571232?hl=pl>

Google Fusion Tables is an application for online data management, designed for easy collaboration and data publication on the Web. It supports the transfer of large resource files, their merger and offers simple queries about company data and its products. Placemarkers on the map show the geographical coverage of company operations. Fusion Tables automatically detect data about the geographical locations of customers and the size of trade turnover generated by them.

4. CONCLUSIONS

From an economic perspective, the benefits derived from a cloud computing model implementation carried out by the Company are really significant. A decision about the implementation of a new management system, using an advanced IT solution is a strategic move. The cloud computing model is a real alternative for existing traditional business management systems and IT investments implemented by companies. Before taking a decision about switching from the traditional IT resource management model to cloud computing, every company should analyse the advantages and disadvantages of such a project. The migration of IT resources into the cloud computing environment implies enhancement of economic efficiency, but also giving up control over third party infrastructure providers. Therefore it is crucial that the balance between these two criteria has been studied thoroughly using risk analysis.

The analysis of the distribution company's case study showed that the migration of data processed previously using desktop computers to the virtual data processing centres enhanced access to advanced software, in a situation of limited financial resources, and indirectly enhanced the company's product range availability on the marketplace. The implementation of a cloud computing model led also to better utilization of the capabilities of IT applications already existing and used by the company. Data management outsourcing, thanks to convergence power, enhanced operational flexibility and the efficiency of logistic processes in the Company. The implementation of solutions available in a cloud computing model is connected with the number of tangible economic benefits. This includes primarily the reduction of total IT maintenance costs, a significant decrease in expenditure on IT training, a shorter time-to-market process, which implies the opportunity for faster product launches and the generation of financial benefits expressed as revenue growth.

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