New methods in industrial engineering and production management

Monografie – Politechnika Lubelska

Politechnika Lubelska
Wydział Zarządzania
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Politechnika Lubelska
Lublin 2012

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Publication approved by the Rector of Lublin University of Technology

ISBN: 978-83-62596-91-1

Publisher: Lublin University of Technology
ul. Nadbystrzycka 38D, 20-618 Lublin, Poland
Realization: Lublin University of Technology Library
ul. Nadbystrzycka 36A, 20-618 Lublin, Poland
tel. (81) 538-46-59, email: wydawca@pollub.pl
www.biblioteka.pollub.pl
Printed by : TOP Agnieszka Łuczak, Włocławek Poland
www.agencjatop.pl

The digital version is available at the Digital Library of Lublin University of Technology: www.bc.pollub.pl
Impression: 100 copies

Spis treści

Practical usage of cloud computing in computerinte-grated manufacturing

dr Tomasz Cieplak, dr Mirosław Malec

Keywords
cloud computing, internet of things, manufacturing, cloud manufacturing, manufacturing as a service.

Abstract
An idea of cloud manufacturing will be described. The very concept of Computing Cloud found its use not only in the field of company IT infrastructure. As usual, the overlap between innovative ideas resulted in the new kind of technology - so called Cloud Manufacturing. The Manufacturing Cloud is a distributed, though isolated structure whose main function is production. In contrast with computing cloud, which computes and creates data, the production cloud creates products. Changing the approach from one focused on production to the one concentrated on services, which is inspired by the notion of cloud computing, makes cloud manufacturing an attractive and most logical solution.

1. The concept of computer cloud

In order to illustrate the genesis of Cloud Computing, it is useful to take advantage of one of numerous cloud services offered by Google. Google Trends app instrumental for analyzing user queries in Google search engine.

Figure 1. The number of searches of the term Cloud Computing in Google search engine.
Source: http://www.google.com/trends

Figure 1. illustrates that the term Cloud Computing appeared in the public awareness of Internet users only on the turn of 2007/08. However, this term was recorded for the first time as early as in 1997, when during INFORMS conference Rama Chellappa - a professor at the University of Maryland defined cloud computing as "the emerging computer paradigm, whose computation limits are established not by technical boundaries, but by justified requirements [1]". The first research articles concerning the issue were published in 2008. Cloud Computing is a new, yet dynamically developing branch of computer science. Moreover, it may strike as surprising that Cloud Computing has quickly come to enjoy great popularity in many other fields, influencing such areas as social networking, which can be exemplified by Facebook and Twitter services.

One of the more peculiar changes, which is taking place in recent times, concerns the phenomenon inverse to the trend common in 1970s and 1980s. In response to progressing miniaturization and popularization of microprocessors modern business technologies were adopted by individual users. This trend applied both to hardware (calculators, faxes and computers) and to software (e-mail, office suits). Initially all those tools were used by company employees and researchers. As time passed, however, they became commonplace among individual users. Currently the reverse phenomenon is in effect - many tools and technologies created for mass market are being adapted in business environments. The trend - often referred to as the consumerization of computer science - can be best reflected by the practical utilization of network communicator, which while created with individual user in mind, quickly became one of the common tools in daily business contacts. The same can be stated about social networking services which nowadays serve as an important advertising business platform and the tool for gathering information on consumer preferences. All of those transformations fosters the rapid growth of Cloud Computing, which is the foundation of the vast majority of all social networking portals.

1.1. Cloud Computing - historical view and implementation

In order for Cloud Computer to come to consumer market it needed a technical realization.

In the 1960s the first mainframe class computers emerged on the consumer market. At the beginning those computer systems were dedicated to a single user only. In 1970s a new type of computers appeared - one which enabled multiple users to share access-time to a single computing resource. In accordance with modern framework, it can be said that this resource was virtualized and that the virtual machine was subscribed to multiple users who shared the system (although each of them could perceive it as working on a separate computer). Those virtual instances were made available in the model of thin client - through remote

terminals (back then with green, monochromatic screens). This access mode was perceived as a direct analogy to the concept of virtualization of computer systems made available in the cloud. Back then, however, only one machine was shared among its users. In case of Cloud Computing the entire computing system is created from potentially thousands of machines.

In the past it was exactly the insufficient amount of computing resources that contributed to the invention of terminal-mainframe relation, so the computers could be used to their full capacity by multiple users. The same purpose can be seen in virtualization in the Cloud.

As computer science developed further, the client-server model superseded mainframe solutions. The increase of computing power forced a shift into centralized resources and more powerful distributed systems. In the era of PC class computers and desktop applications this shift was nearly paramount: The computing resources were moved to desktop computers and new application model - thick client. Perhaps the best example of this is Microsoft Office software suite. The mainframe machines remained dominant solution only in corporate environments.

The standardization of networking technologies simplified the methods of connecting the systems into one whole. In the 1980s the TCP/IP protocol became the key protocol of the Internet. Following this trend, in the 90s the HTTP protocol emerged which bolstered the dynamic development of WWW services and, as a result, changed the shape of business applications. This new model was called Thin Client. The world of Information Technologies was ready for the dawn of new era - the era of Cloud Computing [5].

1.2. Cloud Computing and Virtualization

It was stated before that the current model of sharing available resources of multiple computers is based around the notion of virtualization.

Due to the character of the Computer Cloud this concept will be analyzed from the perspective of a virtual platform. A virtual platform is a technique of computer resources isolation i.e. separating operating system from the fundamental physical resources. Instead of launching operating system directly through the hardware, the OS cooperates with a new layer of software - so called virtual machine monitor. Virtual machine monitor directly collaborates with the hardware and makes their resources available to virtual OS. In effect, one physical server can run several instances of virtual machines. Additionally, the new instances can be mounted and launched on request, which lays the foundation to elastic computer resource management. The question arises: what is the point of virtualization and what advantages does it bring? The latest research results appear to confirm that in most companies server class computers are used only to

6-10% of their maximal capabilities. The remaining computational power goes to waste - the costs of electricity, cooling and hardware maintenance are not returned in the form of accomplished computing tasks. Furthermore, the appearance of new tasks forces the unnecessary implementation of separate computers. In case of advanced server installations, such as Data Centers, this trend contributes to increased maintenance costs (mainly concerning hardware and energy) and insufficient amount of computing power. Such phenomena are described by PUE (Power Usage Effectiveness) parameter. For standard server installations this parameter amounts to 2.5. This means that for every 2.5 W of electric energy used by the servers, only 1 W is actually used for computing. Virtualization minimizes this adverse phenomenon. For example, the Data Centers of such companies as Google and Microsoft are characterized by the PUR value of 1.125. The conclusions are obvious: due to virtualization of many OS instances on one machine, many computing tasks can be realized on the same hardware using its resources to the fullest extent, saving energy, space and natural environment as a result. For that reason, virtualization has become a significant topic, taking into consideration the sheer scale of informational solutions.

Thus, virtualization is often perceived as the groundwork for the Cloud technology. Virtualization has been accepted largely due to financial premises - mainly the increased cost-effectiveness - which prompted the raise of effective server installations by 65% - even more with good task planning. This naturally leads to conclusion that it is possible to increase the efficiency of computing, while decreasing the amount of available computing resources. Such phenomenon can be clearly observed in the example of Amazon company. Amazon was the first firm to launch services in Cloud Computing model in 2006. This was caused by the release of computing resources which were previously occupied by the tasks connected with Internet marketing. Amazon's EC2 solution was a pioneering step on the market. Initially it was labeled as Hardware as a Service. Currently it is referred to as Infrastructure as a Service (IaaS).

1.3 Cloud computing

Having introduced the new service standard on the market the Amazon corporation forced the competition to embrace the innovative technology - Cloud services.

This solution will be presented in the examples of possible utility and usage. In its basic classification Cloud Computing was divided into three layers. The first layer - the above said IaaS - lies closest to hardware. The next layer - PaaS (Platform as a Service), does not allow the user access to Operating System, but offers him elastic, scalable framework for creating and running their applications. SaaS (ang. Software as a Service) constitutes the third layer of application, which are made available as services[3].

Although both solutions belong to the same class, their implementation and capabilities are strikingly different. The first difference is the number of operating systems available that the user can utilize. EC2 (Elastic Compute Cloud), true to its name, is a very flexible solution. It enables the user to install one of Linux platforms or Microsoft Windows Server. Apart from that the user has a selection of a few hundred of OS images, configured and prepared for specific tasks. In case of Windows Azure the OS choice is limited to implementations of Microsoft Windows Server 2008 images. The billing scheme is another significant difference. It is characterized by different set of parameters, which influence the final price. On account of the character of this publication the author will refrain himself from comparing both solutions. This will be the subject of another work. In case of IaaS, its essential advantage is enabling the user to full access to the purchased system which he can then managed as he pleases and run any software on it. Nonetheless, with IaaS cloud it is vital to remember that many of Cloud features such as scalability and failover mechanisms are not available there by default. They can be utilized only if the programmer knows how to implement them in the given solution.

For that reason, if the user doesn't require full control over the system, but puts scalability and reliability above it he should consider using PaaS solution. PaaS services are offered on a number of platforms: Google App Engine. Microsoft Windows Azure, Ruby on Rails IN Cloud and Force.com - Salesforce.com. One of the key advantages of PaaS is its separation from hardware infrastructure and operating system, thanks to which the issues of hardware malfunction, licensing and installing updates are non-existent. Although the user has to abide certain rules and limitations in the created software, he doesn't need to utilize specialized techniques enabling him to tap onto scalability of available resources.

Cloud Computing does not restrict its capabilities to programmers. The users may count on ready, pre-made solutions adapted to their needs. This service model is called SaaS. It does not allow for creating applications. Instead it permits using ready software which runs and is made available within the cloud. Google Apps. Microsoft Office 365 and Windows Live are the best examples of this model. Perhaps the most renowned SaaS applications are community based social portals and apps such as Facebook, Flickr, Picasa and many more.

The abovementioned classification should serve as a guidepost only. Cloud Computing services are still being developed, and therefore they are divided differently depending on the source. Figure 2 illustrates a more exhaustive classification, although further in this article the author will focus on the three fundamental layers. According to David S. Linthicuma, the concept of Cloud Computing (see Figure 2.) encompasses the following five layers (from the most dependent on hardware at the bottom to most abstract at the top).

Another important characteristic of Cloud Computing is its availability. Both Google Apps and Windows Live belong to Public Cloud Computing model. In this type of service anyone can become its user after obtaining free access or purchasing a pass. Private Cloud Computing stands for solutions prepared with a particular customer in mind: corporations, state institutions and large companies - it works best for big players. In case of private cloud all the resources are dedicated to a single user. This ensures the security and safety of data and services, better efficiency as well as dedicated technical support for every client.

There is also the third availability model - hybrid cloud. According to this model some of services are closed and available only to the private user, while another part is made public, for individual users. This solutions proves to be most common in Cloud Computing applications responsible for managing state-citizen services. Perhaps the most interesting example of this technology is the entire information system on the Crown Dependency of the United Kingdom - the Isle of Man. EMC company was responsible for implementing Hybrid Computing Cloud for administrative representatives - the private layer, and private individuals, citizens - the public layer [2].

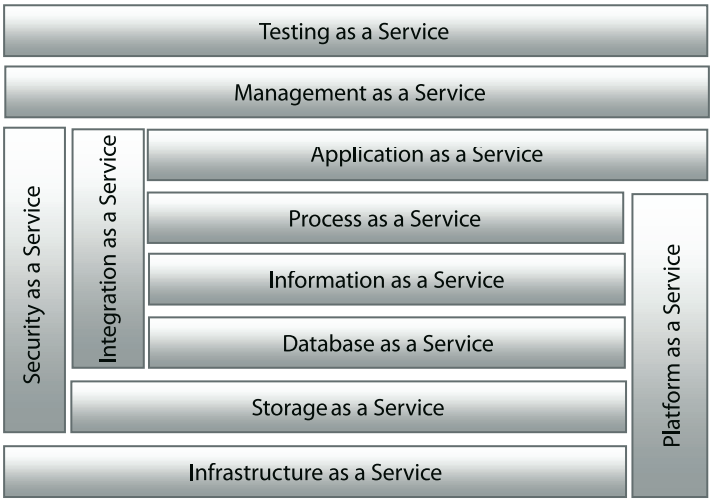

Figure 2. The Cloud Computing Ladder according to D. S. Linthicum.
Source: [5]

2. Cloud Computing vs. Cloud Manufacturing

The very concept of Computing Cloud found its use not only in the field of company IT infrastructure. As usual, the overlap between innovative ideas resulted in the new kind of technology - so called Cloud Manufacturing. Just like its IT counterpart, the Manufacturing Cloud is a distributed, though isolated structure

whose main function is production. In contrast with computing cloud, which computes and creates data, the production cloud creates products.

This novel production approach was engineered very recently and is based on so called DAMA concept Design Anywhere, Manufacture Anywhere). The technology requires the ability to easily exchange design and production data between multiple remote facilities. DAMA helps create efficient connections between production resource planning, company resource schemes and the system of relations with the clients. The Cloud Computing model suits such complex and advanced systems perfectly. The production sector accepted two key adaptation types: the production based on cloud computing technologies and actual manufacturing cloud [8].

2.1. Cloud Computing and intelligent production systems

The use of Cloud Computing is becoming more and more common, from small, niche utilities to large systems used in leading world-wide companies. Some production enterprises already reap benefits of early implementation of the cloud, promoting intelligent manufacturing techniques and efficient, dynamic business processes which do away with traditional models.

In case of computing cloud, its adaptation to production sector focuses around the fields of IT and business models which this technology has proved to enhance. The key areas are: pay-as-you-go model, dynamic scalability in response to the current needs, and flexibility of the implemented solutions. This adaptation concentrates on the business processes management (BPM), especially: human resource (HR), customer relationship management (CRM) and also - to a degree - enterprise resource planning (ERP).

Cloud Computing offers plenty financial benefits. The most obvious of those is the reduction of certain functionalities, which were necessary in traditional IT infrastructure, leading to better cost-effectiveness. In case of the solutions which rely on Cloud Computing model, some of the improvements and adjustments can be done on the process level of the enterprise, and carried out by IT specialists with the use of intelligent cloud computing technologies. When another path of process production is initialized , the IT specialists can conduct modifications without stopping the process, Furthermore such changes are implemented much quicker than in traditional systems. [5]

Once installed in the enterprise, the intelligent business processes and computing cloud become reliable tools, which foster B2B cooperation model. This model contributes to improving trade solutions and logistics on the line producer-warehouse and warehouse-producer.

Furthermore, cloud computing can be used to extend many other facets of production industry, by moving away from traditional process in favor of new

solutions which bolster the operational performance. For example, companies which work in traditional way, through their official representatives, who during negotiations with their clients fill in traditional order forms, can publish their offer in the cloud, making their services publicly available. Thanks to the adaptation of cloud technologies, the collaboration between companies can be realized on a large scale. For example, the process of planning and the chain of deliveries can be connected together forming one cloud-like system. In consequence, different cells of the same organization can obtain access to the data, prepared by the marketing department. In traditional business model the same analysis would require official face-to-face meeting, a conference or a consultation on the telephone. However, in this case the computing cloud creates cooperative environment, which while it gives the employees free reins, it's also very transparent and comprehensive. Usually selecting cells and departments within the enterprise which can easily transfer to the computing cloud is a fairly easy task. Of course, there are corporate structures where the implementation of the cloud would prove cost-ineffective or even impossible, at least at present. Hence, the production companies interested in this technology require an intelligent mechanism, which would facilitate the integration. One of such systems is Cast Iron, which serves to create integration exactly in this approach.

2.2. Cloud Manufacturing

The name "Cloud Manufacturing " originates from the concept of networking manufacture based on Internet, and so called "distributed production". Most contemporary manufacturing networks integrate distributed resources in order to conduct production tasks. Without those substantial elements, the stable, transparent and high quality cooperation between different segments cannot be guaranteed. In a typical distributed production environment the supplier of production resources and their recipient have limited coordination. For this reason the adaptation of manufacturing networks is slow and not very efficient [9].

Changing the approach from one focused on production to the one concentrated on services, which is inspired by the notion of cloud computing, makes cloud manufacturing an attractive and most logical solution. Here cloud computing comes across as a natural evolution and convergence of a number of independent trends, such as: virtualization, grid computing, pay-as-you-go, Internet as a medium, content outsourcing and WEB 2.0 [6]. Similarly, cloud manufacturing is perceived as novel, interdisciplinary field, which encompasses such technologies as: agile manufacturing, manufacturing network, Internet of Things and Cloud Computing. Cloud manufacturing reflects two concepts - the integration of distributed resources and distribution of their integrated counterparts. Paraphrasing the official NIST documentation of cloud computing [4], cloud manufacturing

can be defined as a model enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable production resources, i.e. computer interfaces, production tools and manufacturing capabilities. The access to production cloud can be immediately assigned or released with minimal expenditure on management and reduced involvement of the service provider.

In cloud manufacturing model all distributed resources are constrained within cloud services and managed centrally. The users may take advantage of cloud services as they need. Among many services offered in this technology the following enjoy the greatest popularity: product design, product manufacture, testing, management and other and other. The manufacture cloud platform conducts search, intelligent mapping, recommending and performs many services associated with product manufacture [9].

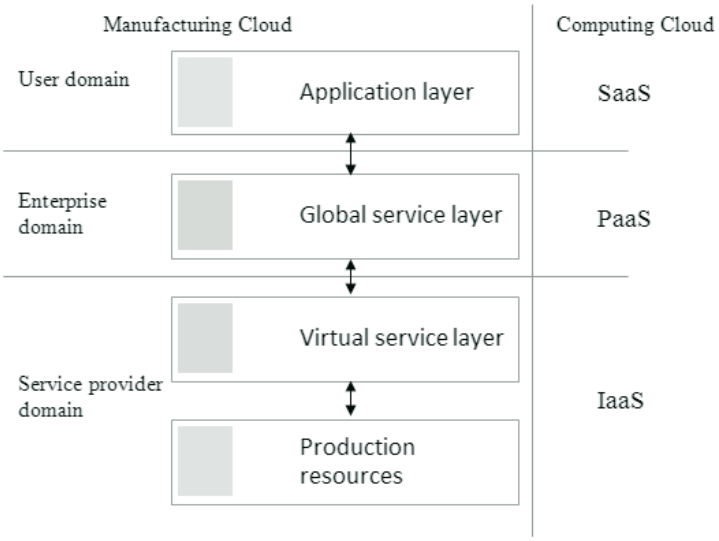

Figure 1. The practical implementation of production and traditional computing cloud.

Conceptually, Manufacturing Cloud comprises four layers: production resources, virtual services, general services and application layer [7].

Production resources

The production resource layer consists of all the resources required in the production cycle of a product. Resources can be divided into two categories: physical hardware resources and abstract software

Originally those resources were referred to as equipment, computers, servers, materials and semi-finished goods. Later the definition was extended to encompass simulation software, analytical tools, knowledge, norms and employees.

Production capacity is a subcategory which consists of immaterial, dynamic resources representing the ability of the organization to carry out required task using particular competence.

Virtual manufacture services

The fundamental tasks this layer is responsible for are: identification of production resources, their virtualization, encapsulation of virtual services and their execution. A number of technologies can be used to identify production resources: RFID, a network of wireless sensors, GPS, etc. [10].

The virtualization of production resources entails creating abstract logical assets based on physical counterparts. Resource virtualization is of paramount importance for the Manufacturing Cloud.

The last phase of virtualization is the encapsulation of resources which turns the available assets into cloud-production services. In order to accomplish this task a selection of description protocols and description languages are used. The following standards are in most widespread use: Simple HTML Ontology Extension (SHOE), DARPA Agent Markup Language (DAML), Web Ontology Language (OWL) and others.

Global services

Global services rely on the implemented set of cloud computing technologies - usually PaaS solutions. Using sensors and tools from Internet of Things, such as RFID, intelligent detectors and nanotechnologies the implementation of global services is possible and fairly straightforward. Nonetheless, in order that all tools can be utilized, the production enterprise must be characterized by centralized effective management in order to take full advantage of dynamic cloud services. There are two kinds of cloud operations that can be realized in the global service layer, which are both based on the nature of resource management in this environment as well as the users' needs. These are partial and full service modes. In the full service mode, the global service layer takes full responsibility for all operational actions. This type of cloud can be dynamically monitored and managed to balance out the production resource load. In the partial service mode it is the processing tools that usually constitute the axis of production cloud. In this case the global service layer is responsible for placing, locating and calculating the usage, cost and monitoring of production resources. The service provider, on the other hand, is tasked with the completion of ordered product and its quality assurance.

Application layer

The application layer is an intermediary between the user (the ordering party) and the production resources of the cloud. Similarly to computing cloud, the

services of application layer have the same function as SaaS cloud. The user is enabled to take advantage of specialized software such as: modeling and simulation systems, and product designs suits. This layer also grants access to automated test systems allowing better monitoring of billing costs in manufacturing cloud [9].

Conclusions

Cloud computing has become a revolutionary solution extending beyond the rigid boundaries of informational technologies. It is now in widespread use across many fields of business. An example of this is the creation of production cloud, which is slowly evolving from one idea to another, from one abstract concept to the next. It is likely to become a common solution in the domain of production and manufacture.

The following technologies make up production cloud environment: Internet of Things, intelligent sensors, RFID, computer networks and computing cloud. All of them open world of new possibilities for producers, distributors, and above all, creators of new and innovative products. The production cloud may become the solution to reduce production costs, streamline the design and manufacture processes, as well as balance out the resource load on the world-scale.

Koncepcje zastosowania modelu chmury obliczeniowej w systemach komputerowo zintegrowanego wytwarzania

Streszczenie

W artykule zostanie przedstawione pojęcie chmury produkcyjnej. Od niedawna istniejące pojęcie chmury obliczeniowej znalazło swoje użycie nie tylko w sferze IT. Często spotyka się zjawisko akceptacji technologii z jednej dziedziny w innej, takim przykładem może być zaczerpnięcie idei chmury obliczeniowej i wdrożenie jej do chmury produkcyjnej. Chmura produkcyjna jest systemem rozproszonym, poprzez izolację struktur, których głównym zadaniem jest produkcja. W odróżnieniu od chmury obliczeniowej, która przetwarza dane i informacje, chmura produkcyjna tworzy produkty. Zmieniając podejście, w którym najistotniejszym jest tylko wytwarzanie, na takie w którym najistotniejsze są usługi wytwórcze, chmura produkcyjna jawi się ciekawym logicznym rozwiązaniem wielu problemów produkcyjnych.

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Cloud manufacturing as a new concept of industry

dr inż. Grzegorz Kłosowski

Keywords
Cloud computing, cloud manufacturing, smart cloud, internet of things, collaboration, electronic commerce, online commerce

Abstract
This article presents an innovative approach to the subject of integration of manufacturing processes. The idea is based on the concept of information flow in a SaaS (Software as a Service) model but this vision is not limited to the realm of information management. Cloud Manufacturing method (cloud manufacturing) lies in developing a comprehensive web application that integrates the following processes in partially or fully automated way:

- The ordering process in which the principal, using the interactive online form, enters the details of the execution of the contract (parametric characteristics of components, number, latest acceptable completion date, etc.)
- The process of linking orders and contractors in which the order goes to the respective companies that potentially are able to accomplish them. The selection of potential contractors takes into account information about the machines, contractor's geographic location, etc. The part of the process mentioned above is performed fully automatically. Potential contractors accept or refuse the customers' requests. In case of acceptance the contractors provide completion date and price. This part of the process requires the human interference,
- The process of offer selecting in which the client chooses from a list of offers the best one,
- The process of tracking the order since its acceptance (signing agreement) until the acceptance receipt of the final product by the customer.

1. Introduction

Recently, cloud computing is recognized as a very fast growing idea within IT sector. This idea corresponds with some other modern concepts connected with IT such as Internet of things, grid computing, collaboration etc. [1]. There are many definitions of cloud computing [2], but it seems that this trend can be considered as a business-oriented multidisciplinary research field as a result of evolution and convergence of several computing trends [3]. Cloud computing model seems to be so versatile and flexible that it successfully manages to be used in various fields of business and science. Examples are: manufacturing processes management [4], online commerce [5], conference origination [7], biomedical information sharing [8] etc.

Cloud computing consists of three main system structures: SaaS (Software as a Service), PaaS (Platform as a Service) and IaaS (Infrastructure as a Service) [1]. It is easy to notice that all the elements mentioned above are treated as a services – XaaS (Fig. 1). This fact is one of the fundamental assumptions of cloud computing philosophy in which all the applications and processes are treated as a service. This approach well corresponds with BPM (Business Process Management) concept. Cloud-based BPM gives additional advantages for the organization resulted from synergy effect. It causes that the business becomes more flexible, affordable and deployable (open for new concepts implementations). All the virtual ideas that refer to the information exchange should finally give the real benefits. In business world those virtual concepts are treated as a tools that allow managers to obtain such benefits as: cost reduction, faster order processing, effective management, better supervising, higher level of performance etc. It shows that nowadays, the very important matter is to find the forceful way to use the virtual IT concepts in real business environment. In this paper, the new concept of cloud computing incorporated into business processes automation is presented.

2. Cloud computing vs. Cloud manufacturing

Cloud manufacturing concept directly results from cloud computing idea. First of all let's take a closer look at the XaaS model (Fig. 1).

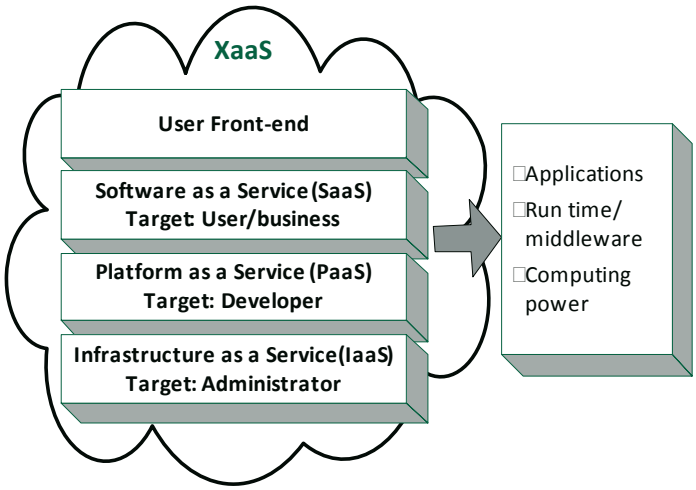

Fig. 1. Cloud computing layers and services [1]

We can see that the model has three layers that allow access for at least three kinds of users: business users, developers and administrators. All three layers must be equipped with the proper front-end user interface. While developers

(programmers) and system administrators can be treated as IT professionals, the business users may not be included in that group.

If we consider the typical manufacturing process in the context of ubiquitous product lifecycle, we can extract the following main processes: product identification, technology development, manufacturer(s) selection and contract execution supervising. The standard business deal usually includes two parts: the customer and the manufacturer (or service provider). The customer needs to manufacture a certain product. Firstly, this product should be well described with drawings and text information. Description of the product should encompass such items as: the kind of material, dimensions, weight, destiny etc. The number of required pieces of information should allow developing technology of given product.

Another step is just technology developing. Usually this job is performed by engineers who have experience and deep knowledge about manufacturing processes within their specialization. Yet, it seems that current level of information technologies is high enough to realize this process fully automatically. After the technology is developed the technological route should be known. It allows precisely describing the sorted set of machines and workstations that must be used to manufacture the required product. If the product is complex it can be difficult to find a production plant that has all the necessary machines and workstations ready to process the particular order in a due time. Such situation may require to conduct searching of proper machines and work stations among many different potential manufacturers.

In common business reality the individual manufacturing customers usually constantly cooperates with still the same set of tested manufacturers. Because of that they save time that it would have to be spent on searching and they keep the proper level of quality. But they can loss economy. Without searching through the market the customer can't obtain the fresh information about cheaper and faster offers. The number of new manufacturers is still growing. The old machines are replaced by ne new ones. Without the regular performed research the customer doesn't know if recently, the more proper way of manufacturing its product has been appeared.

In this point we can clearly realize the great importance of Internet of things concept. Let's consider the SaaS platform that on-line integrates a number of machines (mostly CNC manufacturing centers) and additionally gives at least 2-week's schedule of each connected machine. The manufacturers that have in their disposal some CNC machines equipped with Wi-Fi adapters or RJ-45 connectors would register to the SaaS Internet portal. The portal should collect detailed information from new registered manufacturer about the machines that it have. Apart from this, the portal should offer a smart and agile, easily deployed and easy to use MRP/ERP system with access through a common web browser (e.g. Internet Explorer, Firefox, Chrome etc.). Without standardized, integrated

MRP/ERP system it couldn't be possible to know the schedule of each machine. Scheduling is necessary for prediction of planned machine jobs, maintenance, overhauls etc. Still, there is an unsolved problem with unpredictable incidents and failures that cause repair necessity with unknown repair times. Yet, considering the low probability that such incident occurs, we can settle for emergency change of manufacturer.

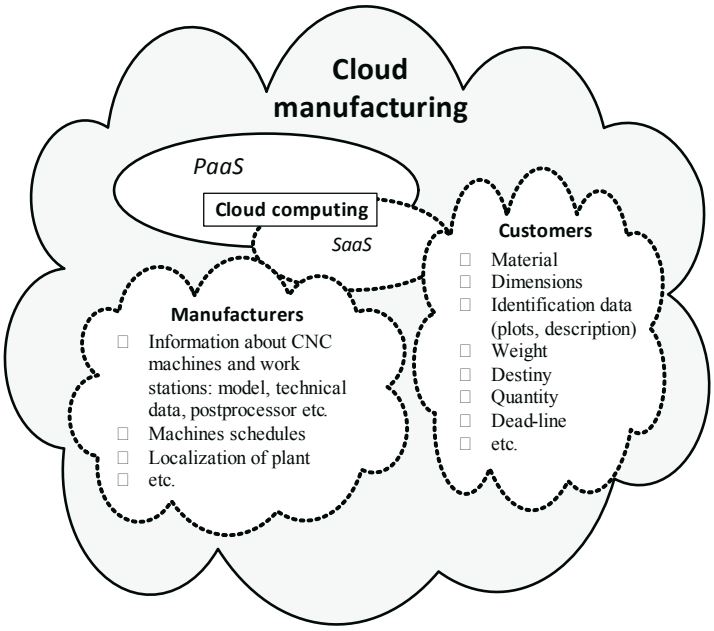

Fig. 2. Cloud manufacturing concept

The cloud manufacturing concepts assumes no software implementation in normal meaning. Yet, it doesn't mean that deploying take place at all. Actually, software implementation have to be performed but this process takes places not in corporate servers and workstations but in the PaaS layer of cloud computing. IT engineers together with PaaS administrators deploy suitable software as a service (SaaS) in such way that it is reachable by web browsers of workstations. Individual applications are localized in the cloud and can be reached independently from each place with many kinds of telecommunication equipment (PC, laptop, tablet, smartphone etc.). There is only one condition to get ability for participating in cloud manufacturing benefits – the user must have an Internet access via common web browser.

This process is generally one of the key elements, which draws attention to the management. This fact should not be surprising, since the quality and quantity of orders, impacts on a company's financial situation. Orders are also the basic measure of competitiveness in the market. Therefore, companies incur large

expenditures for the acquisition of new orders, and also to maintain existing customers. While keeping loyal customers is relatively simple and cheap (e.g. with CRM tools), gaining new customers and contracts is associated with a high organizational effort. These days, it became clear that cheap advertising campaigns such as mailings, flyers, and any other form of advertising that are not directed to a particular recipient, are ineffective. So far, the most effective method of acquiring new customers is personal contact made through sales representatives. However, this requires incurring large financial outlays. The question that can be asked is if the present level of penetration of new technologies (including Internet technologies) we can offer is an effective alternative. The concept of cloud manufacturing meets those expectations. All manufacturing companies integrated in the manufacturing cloud begin to function as a cohesive organization, forming a virtual company. Its main purpose and advantage (for manufacturers) is to reduce the cost of acquiring new manufacturing orders and / or services through the following virtues:

- Automatic selection of principals,
- Automatically use spare capacity (unused machines) of individual companies in the cloud integrated production
- Automatic, constant supply with the top adapted to a particular company orders,
- Automated planning, scheduling and the production processes monitoring,
- Reduction of costs associated with marketing, advertising, sales, etc.
- On the other hand, there are advantages of this approach that are important for potential customers, or for those who are looking for manufacturers of production orders precisely described by customers. The main advantages in terms of clients include:
- A guarantee to quickly find the best bid in terms of both economic (price/quality), as well as their short-term implementation,
- Full and timely information about the order processing run, which is especially important in case of unexpected problems.

3. Technical aspects of the implementation

Currently, the most common types of service models provided in cloud computing are: SaaS, PaaS and IaaS. Typically, these services are offered in standard interfaces such as web services, SOA or Representational State Transfer (REST).

Software-as-a-Service also occurs under the name of the AaaS (Application-as-a-Service). This term means that within the same public cloud many customers also use shared resources in form of both the output of a particular application and the database. For the above reasons, the SaaS model is also referred to as

Application Service Provider (ASP). On the market there have been already a number of suppliers of such services of which the most important are:

- NetSuite, which offers a complete system Including full-featured accounting, CRM, inventory, and ecommerce;
- Google Apps with Capable Online Productivity Suite that includes comprehensive suite of tools, and powerful real-time sharing and collaboration features.

An important factor in the SaaS model is effective integration with other applications. At the application level, important aspects are: scalability, performance, multi-availability, configurability, and resiliency.

As its name suggests, the Platform-as-a-Service provides a platform for developers on which is placed a complete development environment that allows performing all phases of application life cycle. In particular, they are the following processes: development, testing, implementation and hosting of advanced Internet applications as services provided by the cloud platform. Examples of such PaaS providers include Amazon EC2, Google App Engine, NetSuite, Daptiv, Bungee Labs, Coghead, Heroku, Rollbase, Microsoft Windows Azure and much more. The PaaS platform can offer a range of easily accessible services, which means that PaaS can support multiple applications on a single platform.

Model Infrastructure-as-a-Service is sometimes called the Hardware as a Service (Haas). IaaS represents a way of charge for use of this technology, based on the idea of frequency use payment system, which means that charges are strictly dependent on the intensity of use of the platform. This service is extremely useful for corporate users since it eliminates the need to invest in creating and managing their own systems. Another important advantage of IaaS is constant access to the latest versions of used software. The entrepreneur does not have to deal with the technical aspects of the realm of information technology that is used in the company, which allows to focus on core business and making money.

Tab. 1 Comparison of different cloud computing providers [9]

Provider	Pricing	Average Price / Month (US$)	SLA	Data-centers	Certifi-cations
	1	2	3	4	5
Amazon EC2	Pay-as-you-go or Year + Discount	80,81	99,95%	7	Yes
BitRefinery	Monthly	137	100%	1	Yes
GoDaddy	Monthly	39,99	99,90%	8	No
GoGrid	Pay-as-you-go or Monthly	273,6	100%	2	No
Hosting.com	Monthly	270	100%	4	Yes

NephoScale	Pay-as-you-go or Year + Discount	146	99,95%	1	No
OpSource	Pay-as-you-go or Monthly	87,6	100%	4	Yes
Rackspace	Pay-as-you-go	51,1	100%	9	Yes
ReliaCloud	Monthly	135,05	100%	2	Yes
Softlayer	Pay-as-you-go or Monthly	135,05	?	7	Yes
Terremark*	Pay-as-you-go	133,39	100%	9	Yes

Provider	Scale Up	Scale Out	Support	Monitoring	APIs	Free Tier
	6	7	8	9	10	11
Amazon EC2	No	Yes	Poor	Extensive	Extensive	Yes
BitRefinery	Yes	Yes	Extensive	Poor	None	No
GoDaddy	No	Yes	Extensive	Poor	None	No
GoGrid	Yes	Yes	Extensive	Poor	Average	No
Hosting.com	Yes	Yes	Extensive	Average	None	No
NephoScale	Yes	Yes	Average	Poor	Extensive	Yes
OpSource	Yes	Yes	Extensive	Average	Extensive	No
Rackspace	Yes	Yes	Extensive	Extensive	Extensive	No
ReliaCloud	No	Yes	Average	Poor	Average	No
Softlayer	No	Yes	Poor	Extensive	Extensive	No
Terremark*	Yes	Yes	Poor	Poor	Average	No

Provider	Oss	Instance Types	Data Transfer out (/GB)	Data Transfer in (/GB)
	12	13	14	15
Amazon EC2	9	12	0,12	0
BitRefinery	3	Configurable	0	0
GoDaddy	4	5	0	0
GoGrid	4	1	0,29	0
Hosting.com	3	Configurable	0	0
NephoScale	4	6	0,13	0
OpSource	4	Configurable	0,15	0
Rackspace	8	8	0,18	0
ReliaCloud	5	5	0,12	0
Softlayer	6	13	0,1	0
Terremark	5	Configurable	0,17	0,17

Source: http://tek.io/KGo3y5

Table 1 shows a comparison of cloud computing technology providers. Suppliers were compared in terms of fourteen of the following criteria [9]:

1. Pricing Plan – the more options provided, the better, but the pay-as-you-go model is the most interesting stand-alone option, because it allows precise usage control.
2. Average Monthly Price – estimated cost (USD) for a 1 CPU and 2GB RAM in cloud server, averaged over datacenters for companies with location-based pricing, and averaged over Windows/Linux servers. When available, hourly pricing was used, based on 730-hour months. Otherwise, monthly pricing was used. Data transfer costs are excluded.
3. Service Level Agreement (SLA) – the uptime SLA in percentage points.
4. Number of Datacenters – the number of available datacenters when cloud servers are deployed.
5. Certifications – (e.g. PCI or SAS 70) compliance and security-related certifications.
6. Scale Up – possibility of scaling up individual cloud server instances by adding e.g. more memory, extra CPUs, more storage space etc.
7. Scale Out – possibility of quick deploying new server instances.
8. Support – there are three-levels:
   - Poor – includes companies that only offer on-line forums for free and any other support must be paid
   - Average – includes companies that offer a free single type of support (either phone-based or on-line chat), in addition to forums
   - Extensive – includes companies in which the base price covers multiple support offerings.
9. Monitoring – 3-level scale:
   - Poor – no monitoring/alert solutions, requiring the deployment of third-party tools or that extra services are needed
   - Average – very simple integrated monitoring tools (few indicators without alerting)
   - Extensive – very full integrated monitoring tools offered included in price
10. APIs – Application Programming Interfaces to interact with the servers.
11. Free Tier – "free trial" tier that customers can use to test the service.
12. Supported operating systems – the number of supported operating systems.
13. Number of Instance Types – the number of different server configurations available. "Configurable", means that provider offers fully customizable servers.
14. Cost of Outbound Data Transfer – the cost (USD), for each GB of outbound data sent from the server. Zero means that given provider offers a per second (Mbps) connection for free.

15. Cost of Inbound Data Transfer – the same as mentioned above, but for inbound data.

4. Smart Cloud - evolution of Cloud Computing toward Cloud Manufacturing

The direction of development of modern IT service model assumes the use of such items as mobile computers, networked devices, interactive software, development of the organization by creating virtual task forces, as well as immediate access to a variety of network services. All the elements mentioned above can be realized under the concept of cloud computing using infrastructure solutions (IaaS), platform (PaaS), and sharing software (SaaS) in web browsers. Users are charged only for what they actually use as well as the time in which certain tools are used. There is no need to to pay for maintenance of computers and software which just do not need to be used in given period.

Although, the smart cloud model (enhanced cloud computing model) theoretically should meet all the requirements of business clients, there are still some shortcomings, which sources should generally be sought in the insufficient capacity of cloud service providers. Idea of smart cloud can be defined as a set of essential features that should characterize some offer related to cloud computing (no matter whether it's IaaS, PaaS or SaaS). There are ten key elements listed below that the smart cloud solutions should have [10]:

1. Smart Clouds should have modular structure by using Cloud-In-A-Box cells,
2. Smart Clouds should be secure,
3. Smart Clouds should provide Automated Management of Cloud Services,
4. Smart Clouds should meet needs of the real-time nature of business,
5. Smart Clouds should be available for business-critical services,
6. Smart Clouds should enable businesses with governance and control,
7. Smart Clouds should be provisioned rapidly by self-service,
8. Smart Clouds should manage the cloud environment,
9. Smart Clouds should transform the infrastructure,
10. Smart Clouds should integrate social collaboration solutions.

Integration vs. dispersal

Currently, the interoperability of cloud computing platforms is a major problem. On the market there are too many platforms, too much technology, too many areas of expertise, as well as many vendors, which cause serious problems in the coordination and administration of cloud applications. Therefore, intelligent cloud must create opportunities for interaction of individual services, as well

as service providers that can help users access the services they need, when they need, without having to go through the complicated process of provider selection. In a sense, it is the hardest step to overcome, because interoperability is not in the interest of all cloud providers.

From a technological point of view, there is a need for new regulations and improvements related to the standardization of services offered in the cloud. These regulations would improve interoperability, as well as to raise the level of administration services, as well as their access to the global network.

Intelligent cloud should be realized by entrepreneurs as a target schema evolution of information technology used by them. Regardless of whether entrepreneurs make their own private cloud, or they use services offered by brokers of cloud computing solutions, the primary goal always should be to satisfy the greatest number of needs and solve specific business problems. It is clear that not all the problems and needs of the enterprise can be met immediately after the use of the cloud model. In such case, any question that cannot be solved immediately should be recorded. Then, the company management should ensure development of a schedule that allows to be in a harmonious and organized to make the implementation of new services (cloud computing applications), so that all needs were met.

Intelligent services based on the concept of cloud computing are able to open new opportunities for business, such as the dynamic scalability of IT systems, optimizing maintenance costs throughout the IT sphere. At the same time, the concept of cloud manufacturing would allow companies to break down the barriers that exist between them and their customers, facilitating collaboration and simplify access to information. Finally, the intelligent cloud services appear to be an effective method of improving the interoperability of systems and business processes which in turn increases the efficiency of the organization and resistance to any kind of interference.

Cloud computing is a relatively new field. Manufacturing concept is an evolution of cloud idea dedicated to industry and business applications. Current problems that are associated with deploying companies in cloud computing technologies are the difficulties in implementation of physical business needs within cloud computing concept. A smart cloud technology is just beginning to be offered in the IT market, and therefore does not have multiple implementations in this field. Taking into account the dynamic growth of this idea, it is anticipated that in the short term the number of companies willing to consider the transition to cloud computing technologies will increase. Undoubtedly, in such businesses it will be much easier to adapt their processes to the concept of cloud manufacturing.

5. Cloud manufacturing as a part of Internet of things

Definition of "Internet of Things" (IoT) is difficult to formulate. It has still some fuzziness, and can be different depending on the beholder. Considering such aspects like functionality or central identity it seems to be right to define this concept as "things having identities and virtual personalities operating in smart spaces using intelligent interfaces to connect and communicate within social, environmental, and user contexts" [11]. A different possible definition could be formulated as e.g. interconnected objects having an active role in what might be called the Future Internet. It is obvious that IoT is the new important concept that develops with increasing levels of technology (Fig. 3).

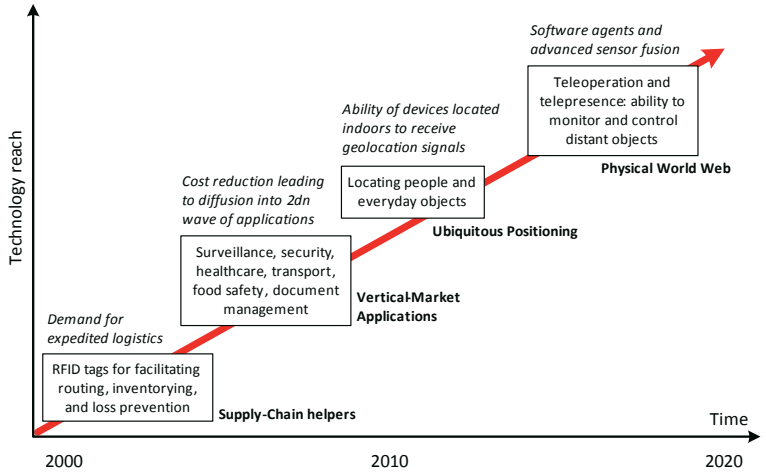

Fig. 3. Internet of Things - technology roadmap
Source: SRI Consulting Business Intelligence

Internet of things idea can be better improved when it is supported be the following enablers [11]:

- Energy – such issues like energy harvesting and low-power chipsets are important to the development of the IoT. Research and development in this area is a must. Especially, we need solutions for forthcoming autonomous wireless smart systems.
- Intelligence – such features as context awareness and inter-machine communication are important. Next significant aspects are the processing power and memory integration, the capacity of resisting harsh environments, and an affordable security.
- Communication – this aspect covers such aspects like new, smart multi frequency band antennas integrated on-chip and made of new materials.

On-chip antennas must be optimized for size, cost and efficiency.

- Integration – it covers smart devices placed into packaging, or better, into the products themselves. It allows a significant cost saving and increase the eco-friendliness of products.
- Interoperability – it is a must that two or more different devices would be interoperable, even if they are not following the same standard.
- Standards – open standards are key enablers for the success of the Internet of things. It is necessary for any kind of machine to machine communication.
- Manufacturing – manufacturing challenges must be convincingly solved. Especially such matters as reducing costs of one tag to less than one cent per tag should be considered. The production volumes must reach extremely high, while the impact of the production process on the environment should be minimalized.

The main barriers of IoT are:

- Governance – the problem is an absence of governance. Without an authority a truly global "internet of things" seems to be impossible. Today, there is not a universal numbering system. For example: EPC Global and Ubiquitous ID are two different, non-compatible ways of identifying objects. There is a threat that those both standards start competing over the global market.
- Privacy and Security - there is a need to develop a solution that would be able to provide privacy and security of the customers. This is especially sensitive matter in case of RFID in the context of people identification.

6. Conclusions

The concept of cloud manufacturing is one of many proposals that fall into the next phase of development of the idea of cloud computing. While cloud computing is mainly focused on aspects of strict information which includes such phenomena like physical liquidation of corporate IT departments and shift them to the cloud, cloud manufacturing involves adapting the idea of cloud computing to the implementation of common processes related to product life cycle. In this context, the cloud is a part of the manufacturing philosophy of internet of things through which in the future it will be possible to monitor and track the position of distant objects. This fact obviously requires the development in miniaturization technology, energy (especially in the context of battery power small mobile devices), intelligence equipment, communication, integration, etc. The development of fields mentioned above will result in the need for appropriate formal and legal regulations, especially in the field of standardization and data protection (privacy).

To make the concept of cloud production has been implemented effectively becoming a common tool used by a large group of business users additional conditions must be met. The issue of cloud computing adaptation to demands of industry and manufacturing sphere was formulated as a set of certain specific characteristics that should have a cloud computing model. This model is known as the smart cloud, and it is like the internet of things concurrent in terms of number of functional requirements within the idea of cloud manufacturing. The pace of development of methods and information technology in the modern world is so big that it seems that other spheres of life (such as manufacturing and services) are not able to match this. Therefore, there is a pressure to find suitable methods for use of the latest discoveries in the field of IT to adaption and their effective use in other areas of business. Cloud manufacturing meets these challenges.

Chmura produkcyjna jako nowa koncepcja przemysłu

Streszczenie

W artykule zaprezentowano innowacyjne podejście do tematyki integracji procesów produkcyjnych. Pomysł opiera się na koncepcji przepływu informacji w modelu SaaS (Software as a Service), jednak omawiana koncepcja nie ogranicza się jedynie do sfery zarządzania informacją. Metodologia Cloud Manufacturing (Chmura Produkcyjna) polega na opracowaniu kompleksowej aplikacji internetowej, integrującej w sposób częściowo lub całkowicie automatyczny następujące procesy:

- proces składania zamówień, w którym zleceniodawca, za pomocą interaktywnego formularza internetowego, wprowadza szczegóły zamówienia części do wykonania (parametryczna charakterystyka części, ilość, najpóźniejszy dopuszczalny termin realizacji itd.),
- proces ofertowania polegający na tym, że zamówienie trafia do odpowiednich przedsiębiorstw, które potencjalnie są w stanie je zrealizować. Dobór potencjalnych wykonawców odbywa się z uwzględnieniem informacji o posiadanych maszynach, lokalizacji geograficznej wykonawcy itp. Ww. część procesu realizowana jest w sposób całkowicie automatyczny. Potencjalni wykonawcy akceptują lub odrzucają zapytania ofertowe. W przypadku akceptacji, podają termin realizacji i cenę. Ta część procesu wymaga ingerencji osoby fizycznej,
- proces wyboru najkorzystniejszej oferty, w którym zleceniodawca z listy ofert wybiera ofertę najkorzystniejszą,
- proces śledzenia realizacji zamówienia od momentu jego akceptacji (zawarcia umowy) do momentu potwierdzenia przez zleceniodawcę odbioru wyrobu gotowego.

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Modules supporting engineering design in CAD systems

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Keywords:
engineering design, CAD software, calculation module, chain transmission

Summary
Analytical calculations of basic parameters of the various gears and sprockets are complicated and very laborious. Labor intensive and are at high risk of committing an error of calculation, which may lead to the design and manufacture of transmission error. In addition, the constructor requires considerable experience and theoretical knowledge, access to different standards in order to find a suitable computational scheme and read the various coefficients. Accuracy of results is also dependent on reading the charts of these factors and is based on experience, the accuracy is higher. After the basic conditions and the calculation performed in the initial calculation tests should be performed. In the case of a negative result should be analytical calculations performed from the beginning by changing the initial conditions which in fact leads to the beginning of the calculation. In order to facilitate development and expedite the implementation of CAD programs are equipped with modules supporting the design of typical structural elements, so that the process is simplified. These modules allow you to perform calculations on the basis of the input parameters. Their adjustment is held enter the initial conditions, and the program itself by a built-algorithm calculates the basic parameters and automatically performs the calculation tests. So keep the designer controls the process and be informed about the correctness of their calculations. The modules for design calculated values are presented in a very convenient report, which we can join the project. Same element is generated and we can use it to build an assembly, and to create technical documentation, or after loading the program generates the numeric code on the machine tool can perform a finished product.

Introduction

The rapid development of technology and growing consumer demand for quality, innovation and speed the introduction of new products to market while reducing pressure on prices, increasing durability and reliability forcing structural engineers to use advanced computer-aided design. Therefore, the leading CAD software vendors introduce newer and more advanced modules to support the

design of typical machine parts. It may be noted that this trend is growing and now the programs allow a lot of fairly sophisticated calculations of bands such as various types of gears, cams, springs, bands, etc. Using these solutions by engineers provides many benefits such as relieving the designer of the work and not creative, the designer's work is more on the business concept and leads to greater efficiency in its work. Quite an extensive field support programs such as CAD design, which can be seen in recent times is the incorporation by vendors of advanced MES modules. They allow to carry out reliable research yet in the sphere of the project. With digital simulation methods, we can carry out analysis of the impact of individual structural elements of the quality of the machine also in conditions of extreme loads even at the design stage, without having to build costly prototypes and conduct bench research or service. This enables us to significantly reduce design errors, which are discovered only during the manufacture or use are expensive to repair, and adversely affect the image and confidence in the company.

Typical modules supporting engineering design in CAD systems

Functional design is a much broader approach to conventional mechanical systems in relation to traditional lodging units with individual parts. With advanced wizards shafts, bolted connections, gears, springs, and other designer does not need to deal with such issues as the size of the teeth on gears and profiles and shapes of coils in worm gears. In extended dialogs designer can conveniently (with a graphical preview, in the context of deposit) selected the appropriate sizes of individual elements of a letter sized normative (or the user database), to maintain proper bond between them, and also convert selected elements for such a transfer, appropriate charges, which provide calculators wizards built into the individual. The modules contain sets of supporting design calculations mechanical engineering industry, an integrated modeling environment part (Part) and the environment for the creation of (Assembly). A very important feature is that each module after checking calculations, is generated parametric model of a component, which is then inserted into the team. With this tool builder has the opportunity to design a typical mechanical components such as shafts, cams, gears, helical and bevel, worm gears, sprockets, and tension springs, pulleys, beams, columns (Fig. 1).

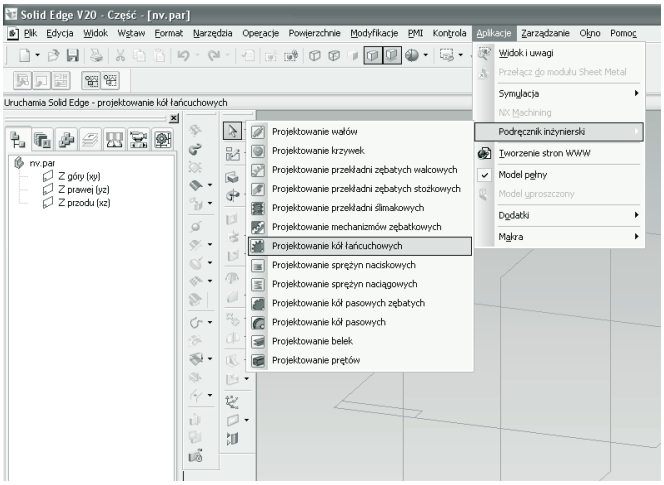


Figure 1 The modules support the design of typical machine parts in Solid Edge V20

To generate a typical worship according to the type most often given basic design parameters generated element, and virtually the program automatically performs the calculation of basic parameters as well as calculation tests and the results can be written in a convenient form as a report. At the same time we can generate graphical elements and use them to build the assembly. The use of generators for design significantly reduces development time, allows for quick conversion of the different versions of the solutions, minimizes the possibility of computational error, does not require a variety of tables, rules, patterns of computing. The most common modules for design CAD programs include:

- calculation module for generating stepped shafts. (Fig. 2) The user specifies how many sections usually will consist of the shaft, cross type, diameter and length of the shaft, the groove dimensions, determine the support for the shaft, the number of forces, the assignment of forces to a particular section, radial and axial forces, bending moments and working capital. After determining the conditions of the support shaft is possible to perform calculations. The results are shown by the graph. You can select a value for the plot, such as: shear forces, bending moments, bending, torsion, plane, on which you want to see results (XY or XZ plane, the sum). A very important feature of the module is able to check the calculations on any section of the shaft.
- a module for generating computational cams. (Fig. 2) The user shall include the radius of pitch circle, the width of the cam, the radius rod, the width of the pusher shaft diameter and length, and eccentricity. After the calculations are given parameters of the cam limit - the maximum values for velocity, acceleration, accelerate growth, pressure angle, the strength of the

pusher, normal force, torque and pressure. The graph shows the course of displacement, velocity, acceleration, and acceleration of the second degree.

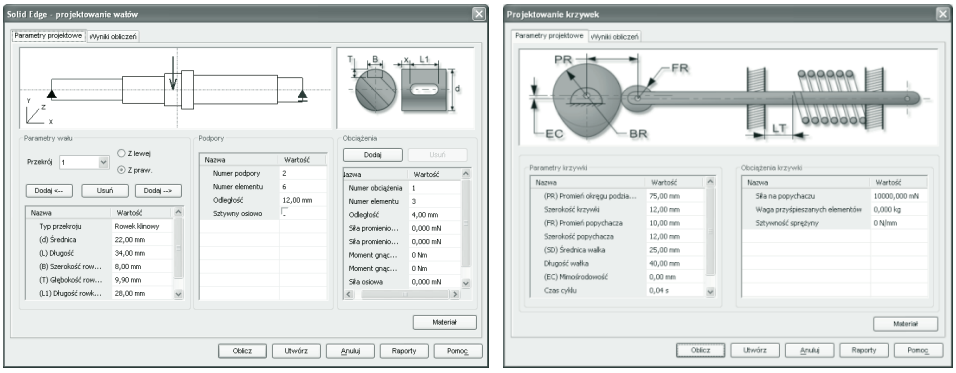


Figure 2 Solid Edge - modules supporting design of shafts and cams

- calculation module for generating helical gears. The user specifies the type of meshing, the resulting geometric parameters of the method for calculating the strength, correction, load calculation, applied correction, type of strength calculations, the width of the wreath. Then load the gear, specifying ratio, and inclination angle contact tooth line, the direction of inclination of the tooth line, etc. To calculate the user sets the gear mounting hole diameter, crown width, power, speed, efficiency. After the calculations are displayed real value ratios, the number of teeth, power and speed. These are the permissible stresses and factor of safety, types and values of forces acting on the gears during operation and the basic dimensions of the wheel and shaft timing - basic diameter, outside diameter, diameter of the treads, and more.

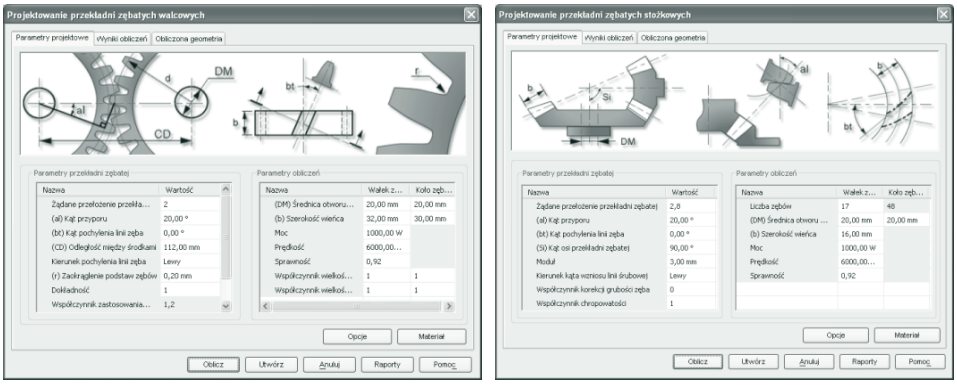


Figure 3 Solid Edge - modules supporting the design of gears cylindrical and conical

- calculation module for generating bevel gearing, worm gears, chain gears and rack mechanisms. (Fig. 3) Create and calculation is similar to the helical gear.
- calculation module for generating pressure springs. (Fig. 4) The user specifies the type of load, diameter, design criteria and dimensions of the spring and then establishes design parameters such as wire diameter, number of active coils, the outer diameter, length without load, preload, applied load, safety factor, the direction the coil winding process and the completion of the spring.
- calculation module to generate tension spring. (Fig. 4) How to create and implement the calculation is similar to that for compression spring. The user sets the input parameters for the dimensions of the team, the safety factor, the direction of the coil winding process and the type of hitch.

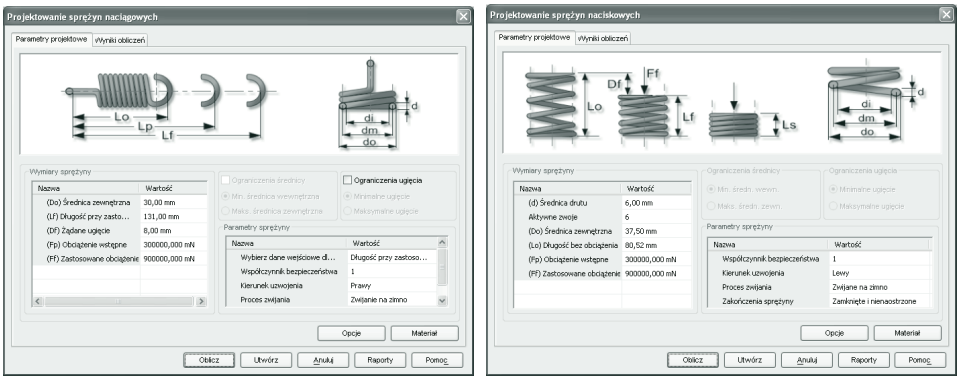


Figure 4 Solid Edge - modules supporting the design of springs tension and compression spring

- calculation module for generating timing pulleys. (Fig. 5) The user sets the input parameters such as: design criteria, the calculation of the load - may choose to calculate about: power, torque or speed. Sets the cross-section, the number of pulleys, speed, torque, efficiency, factor conditions, the number of teeth on the pulley, and mounting hole diameter ratio. As with the toothed pulley calculation module for generating sets of pulleys user input parameters, then: the groove profile, section, number of lanes, torque, speed, efficiency, slip lane, the coefficient of working conditions, pitch circle diameter, the diameter of the mounting hole and the ratio between the wheels.

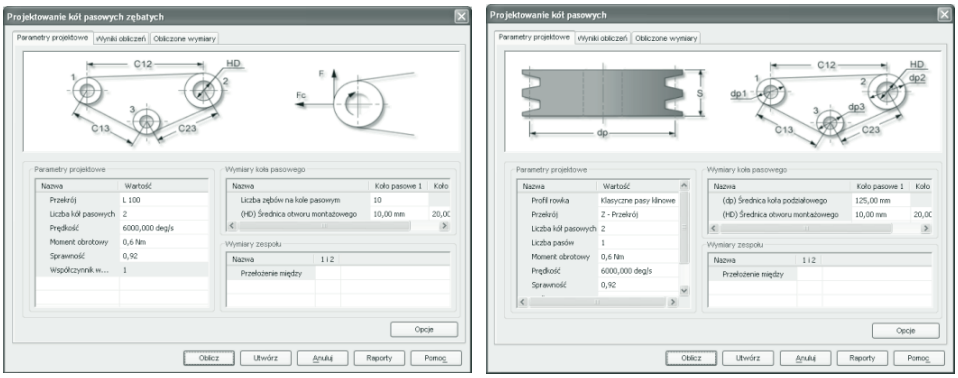


Figure 5 Solid Edge - modules supporting the design of pulleys gears and pulleys wedge

- calculation module to generate beams. (Fig. 6) The user enters the design parameters such as cross-sectional profile - there are most commonly used engineering profiles, the length of the beam, the beam size depend on the selected profile, the amount of support (1 or 2), the distance between the supports, bracing and reinforcing beams, number of loads (max.15), the distance between the charges in the beam, the value of radial and axial forces and bending moment and rotation. However, in the calculation module to generate a straight bars (columns), the user establishes design criteria, type of cut, length and diameter of the rod (column) and the maximum axial force. If the profile is empty given the dimensions of the cutout

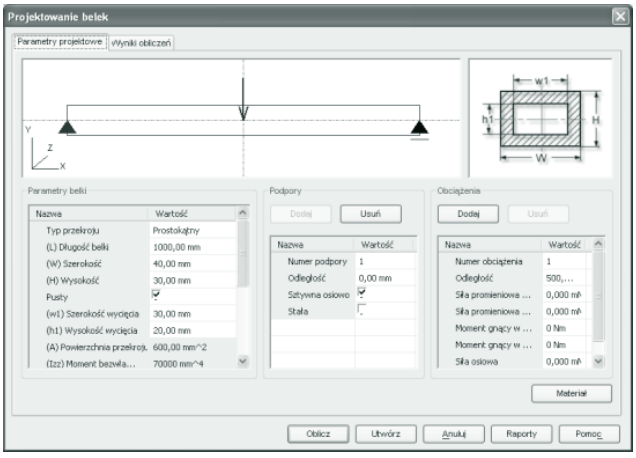


Figure 6 Solid Edge - modules supporting the design of beams and simple bars

Calculations of the chain transmission with using module supporting design

Module supporting design chain gear wheels enables a simple and easy to calculate the basic parameters such as transmission power, torque and gear ratio, as well as basic sizes of the sprockets, which in a convenient form are presented in the report you can print out and attach the documentation. In addition, calculations are carried out simultaneously viewing and if they do not fulfill the conditions of endurance displays messages informing you of this. The program automatically generates a solid model that can be used directly for the final submission of the whole structure as well as read to the CAM program and generate code for numerical machine tool.

After running the program window will appear, which according to their size of the input select the input design conditions. (Fig. 7) In this case the task was well-known distance from the axis of the wheels and the number of teeth each wheel so the design was based on the distance between the centers of the wheels and the number of teeth each wheel. Torque was unknown because the program calculates it assuming that the number of links in the chain may be even or odd. (Fig. 8)

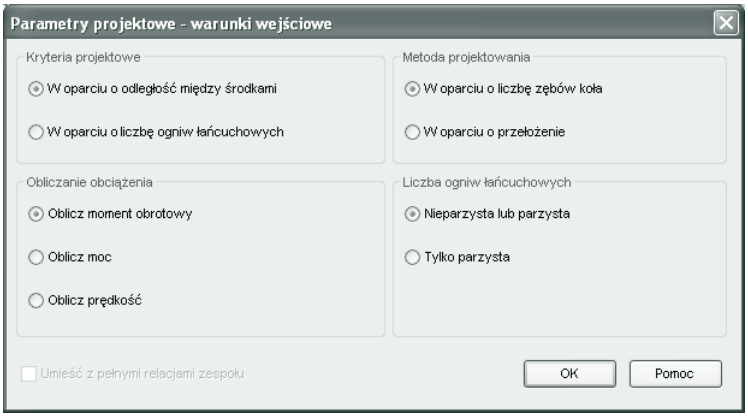


Figure 7 Design parameters - the input conditionS

The next tab „Design parameters “choose the type of chain, chain, the number of drop-down lists in accordance with Polish Standards. (Fig. 9) We also give the following design parameters such as power, efficiency, number of gears, speed, number of teeth on each wheel, the distance between the axles, and selects the coefficient of working conditions.

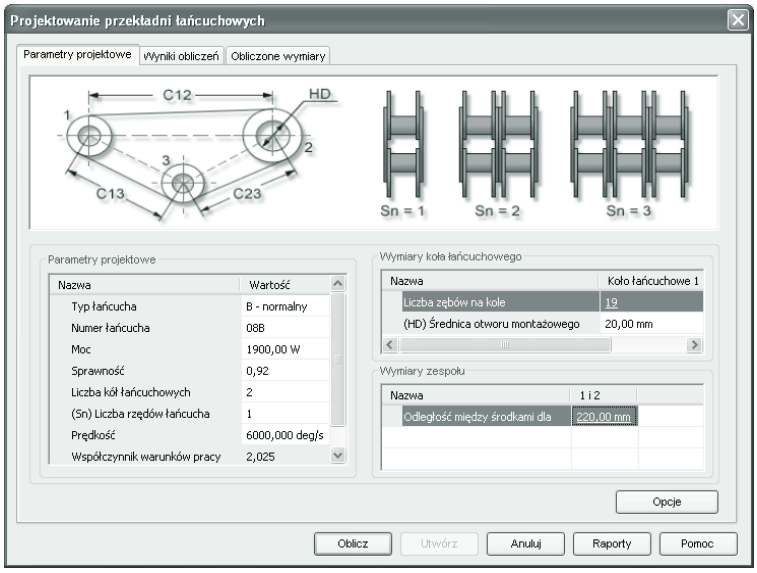
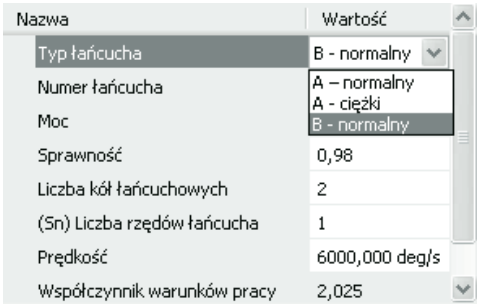


Figure 8 The window: ”Design of chain transmission”- the choice of design parameters

a)



b)

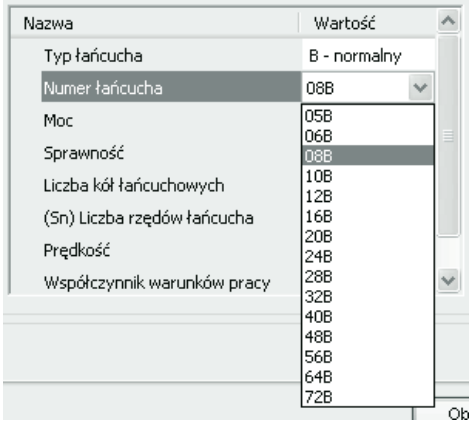


Figure 9 a) Select the type of chain, b) Selection of the chain number

For determining the coefficient of working conditions in an easy program to specify its value in just a few tabs and a breakdown of active and passive wheel. Coefficient varies automatically depending on the selected operating conditions. We have the following options, quiet running, low load, medium impact, high impact load. If the project is used for both small load on the wheels, as a chain transmission working conditions are not difficult. (Fig. 10)

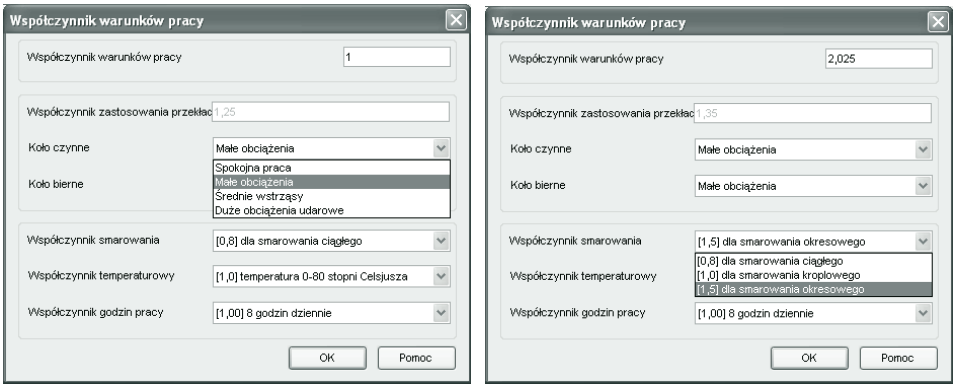


Figure 10 Selection coefficients of working conditions due to load and lubrication

Then we must choose the lubrication factor. We can choose the following options from the drop-down list: 0.8 for continuous lubrication, 1 for lubrication drip and 1.5 for periodic lubrication. In the case of the draft gear lubrication will take place periodically chosen because a factor of 1.5.

The next stage of determining the coefficient of working conditions is to determine the temperature coefficient. Depending on the temperature we have to choose transmission coefficient of 1 for a temperature of 0-80 Celsius degrees, 1.1 for temperatures of 80-150 Celsius degrees, 1.2 for the temperature of 150-250 Celsius degrees. For the calculation of the coefficient is selected 1.

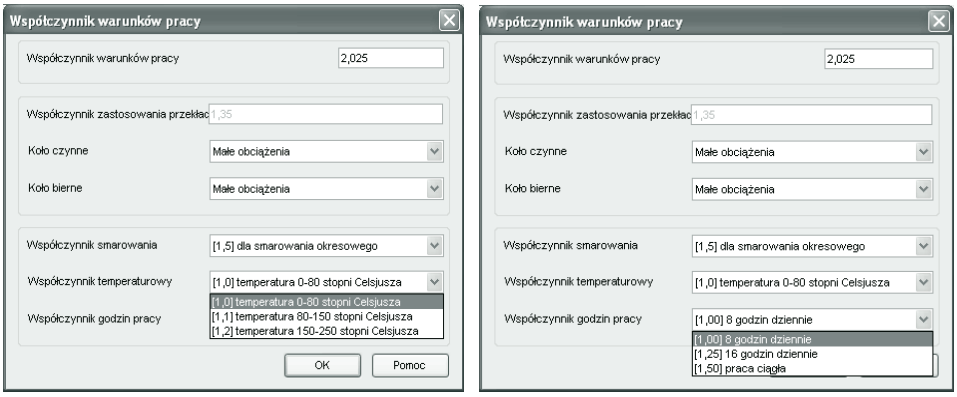


Figure 11 Selection coefficients of working conditions due to temperature and time

The final factor determining the working conditions of the transmission is a factor working hours. We have three options: 1 for 8 hours, 1.25 for 16 hours, 1.50 for continuous operation. For the calculation of the coefficient is selected 1 (Fig. 11) After considering all the conditions ultimately coefficient is equal to 2.025. After administration of the basic parameters of the transmission and the

„calculate” button is selected, appears next tab. Results of the calculations of basic parameters such as transmission torque, wheel diameters of the subdivision, the individual forces acting on the chain, as well as safety factors are calculated.

A very important thing is to control the strength. In this case, the chain has been chosen properly and meets the conditions of strength for the assumed input parameters which is signalized „success “and is able to move to the next stages of design. If you exceed the limit values of the strength program is indicated by the inscription „failure “and is a warning message and return to the original tab, which gives the input parameters for the correction.

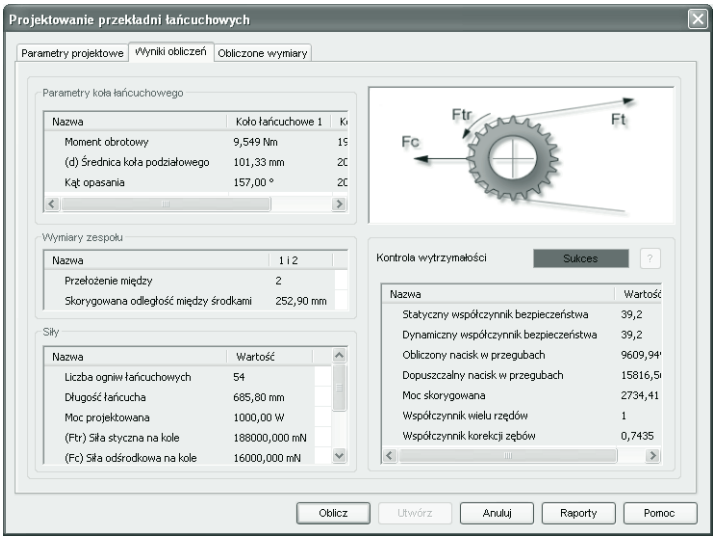


Figure 12 Design of a chain transmission - window of „calculation results”

On the program displays the calculated dimensions of the basic dimensions of the maximum and minimum sprockets, tooth size, as well as a string. It is not very comfortable due to the limited use of windows and sliding bars to see all the dimensions of the move so much easier to create a report with the possibility to save to disk, print and join the project as technical documentation. Very helpful is a sketch of the numbers at the top of the window. The selected symbols are there size and can easily get an idea of what the symbol means a particular dimension. (Fig. 12)

Analytical calculations of basic parameters of the various gears and sprockets are complicated and very laborious. Labor intensive and are at high risk of committing an error of calculation, which may lead to the design and manufacture of transmission error. In addition, the constructor requires considerable experience and theoretical knowledge, access to different standards in order to find a suitable computational scheme and read the various coefficients. Accuracy of results is

also dependent on reading the charts of these factors and is based on experience, the accuracy is higher. After the basic conditions and the calculation performed in the initial calculation tests should be performed. In the case of a negative result should be analytical calculations performed from the beginning by changing the initial conditions which in fact leads to the beginning of the calculation.

In order to facilitate development and expedite the implementation of CAD programs are equipped with modules supporting the design of typical structural elements, so that the process is simplified. These modules allow you to perform calculations on the basis of the input parameters. Their adjustment is held enter the initial conditions, and the program itself by a built-algorithm calculates the basic parameters and automatically performs the calculation tests. So keep the constructor is controlled and informed about the correctness of their calculations. The modules for design calculated values are presented in a very convenient report, which we can join the project. Same parts is generated and we can use it to build an assembly, and to create technical documentation, or after loading the program generates the numeric code on the machine tool can perform the finished item. Comparing the results of the basic parameters of the chain gear obtained through the analytical results according to Polish Standard PN-64/M-84100 module with the results of, „sprockets design" contained in the Solid Edg V20, we can conclude that the main, the most important are identical in value. All measurements agree to hundredths of a millimeter. The differences appear when these parameters, which depend on the coefficients by hand-picked from the graphs in the standards. Their reading is dependent on the individual ability of the reader. For example, the static tension chain - F_d depends on the ratio takes into account the operating conditions f_2. According to Polish Standard for the working conditions of this coefficient is $f_2 = 2$, while the module that supports the design, the program with similar operating conditions adopted value $f_2 = 2.025$, resulting in static tension chain - F_d for different values of 0.018 N. It is so little difference that it has no significant effect. In conclusion, in the case of transmission chain, calculated by means of modules included in Solid Edge V20 results are reliable and consistent with the Polish Standard. (Fig. 13)

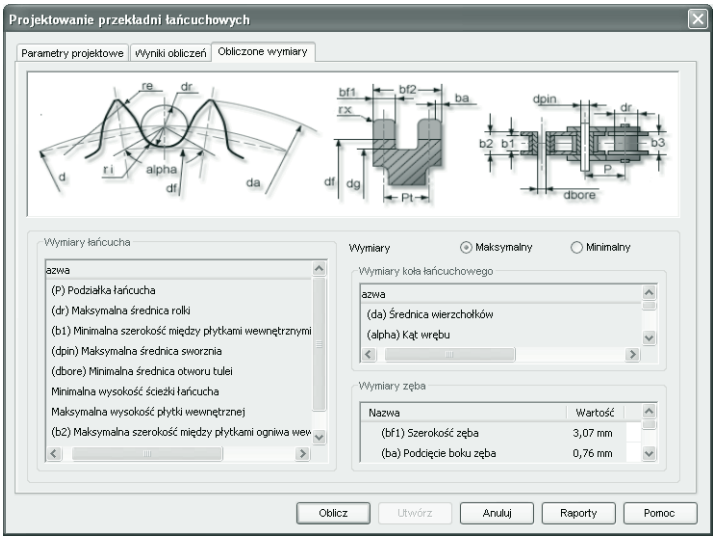


Figure 13 Design of a chain transmission - window „dimensions calculated”

The program also provides the basis of the calculated parameters in a way to automatically generate a solid model of the wheel, who, as the finished part can join the general assembly. (Figure 14, Figure 15) Is also able to write, and execute on the basis of drawing of the module „Draft “, it can also be transported to the CAM and generate code for machine tool numerical processing. Such co-operation facilitates the design of programs and significantly reduces design and manufacture.

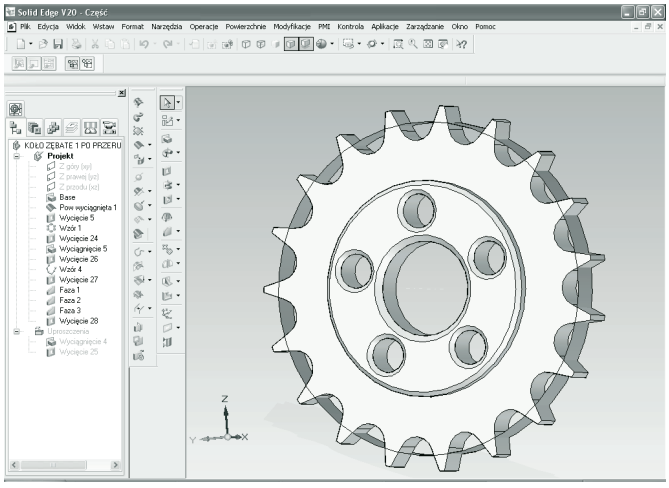


Figure 14 Generated sprocket 1 by the program Solid Edge

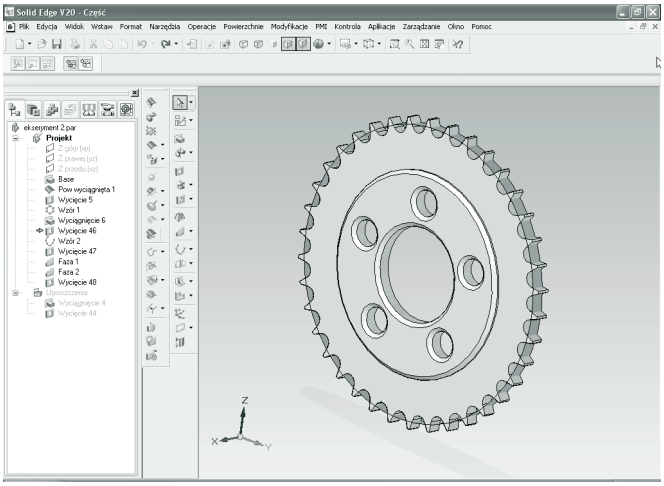


Figure 15 Generated sprocket 2 by the program Solid Edge

Moduły wspomagające projektowanie inżynierskie w systemach CAD

Streszczenie

Czołowi producenci oprogramowania typu CAD wprowadzają coraz nowsze i bardziej zaawansowane moduły wspomagające projektowanie typowych zespołów części maszyn. Projektowanie funkcjonalne oznacza znacznie szersze podejście do tworzenia typowych układów elementów mechanicznych w stosunku do tradycyjnego składania zespołów z pojedynczych części. Moduły wspomagające projektowanie zawierają zestawy obliczeń inżynierskich z branży mechanicznej, zintegrowane ze środowiskiem modelowania części (Part) oraz ze środowiskiem tworzenia zespołów (Assembly). Bardzo istotną cechą jest to, że w każdym module po sprawdzeniu obliczeń, zostaje wygenerowany parametryczny model danego elementu, który następnie jest wstawiany do zespołu. Przy pomocy tego narzędzia konstruktor ma możliwość zaprojektowania typowych elementów mechanicznych takich jak: wały, krzywki, przekładnie zębate walcowe i stożkowe, przekładnie ślimakowe, koła łańcuchowe, sprężyny naciskowe i naciągowe, koła pasowe, belki, kolumny. Takie moduły umożliwiają przeprowadzenie obliczeń na podstawie posiadanych parametrów wejściowych. Ich ustawianie polega na wpisaniu posiadanych warunków początkowych, a program sam według wbudowanego algorytmu wykonuje obliczenia podstawowych parametrów jak i automatycznie przeprowadza obliczenia sprawdzające. Dlatego na bieżąco konstruktor kontroluje proces i jest informowany o poprawności swoich obliczeń.

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Influence of atmospheric temperature changes on the thermal stability of the technical chamber

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dr hab. Świć Antoni, prof PL

Summary
Presents a method of modeling heat transfer through the walls of chamber with the help of technical electrical analogy - RC terminal network. Determined temperature runs on the inner surfaces of technical chamber, depending on the atmospheric temperature variations and desired temperatures inside the room with the program of Modelica.

Keywords
heat transfer, modeling of thermal processes, thermal stability of the technical chamber

1. Introduction

The widening of the current even more than in the seventies years of last century, the energy crisis in all countries of the world leads to ever greater efforts to deliver energy savings, and thus, requires the use of more energy-efficient techniques and technologies. These savings are also required from small businesses and non-productive institutions. Much of the energy consumed is a constant set temperature in thermal chambers, both technical and in the processes of heating, cooling and air conditioning. Under the name thermal chamber will understand the technical components of the room for the storage of food products, cold storage facilities and related them to the food industry, where there are no windows or there is only minimal glass surface area to follow-up chamber.

It is well known that changes in air temperature are inherently dynamic - they have the same periodicity as the associated variable component of daily and pulse, monthly or yearly.

Therefore designing several layers (as single-layer, there is no practical barrier) of wall of the chamber as well as the technical object, the dynamics of the atmospheric temperature changes into account, because it has a significant impact on energy saving for chillers or heating spaces of storages food industry.

2. Model of heat transfer through the wall of the chamber technical

Modern technologies of heat used in the fruit stores currently under actual building construction for fruits and vegetables, provide adequate thermal insulation baffles thermal chambers as well as to reduce the rate of biochemical and physiological

processes leading to aging and there ripened stored food products. This limitation is achieved by keeping in a refrigeration sufficiently low temperature, low oxygen, and by a nitrogen content in the atmosphere inside the cooler. The balance of heat - energy storage of fruits and vegetables allows you to select a suitable design of the cooling chamber, depending on the factors affecting the total cost of storage.

Description of the process of heat transfer by thermal baffle chamber technology was presented with a mathematical - physically model performing physical and dynamic chamber. In this model, the chamber wall heat technology is treated as a linear element lumped in which case it is possible to modeling using the analogy of electricity (four-pole RC). By analogy with electrical heat transfer through the baffle chamber will receive technical support matrix equation (1) allowing it to describe any wall build of n - layers. As a result, in conjunction with the equation of balance of energy contained in a chamber in the operational form - as a function of a complex variable "p", we obtain the system of equations with three unknowns, which will allow us to obtain the corresponding transmittances needed in the process of automatic control.

$$\left[\Delta T_i \quad \Delta\Phi_i\right] = \left[\Delta T_a \quad \Delta\Phi_a\right] \begin{bmatrix} 1 & 0 \\ -R_i & 1 \end{bmatrix} \begin{bmatrix} 1 & -pC_n \\ 0 & 1 \end{bmatrix} \ldots \quad \ldots \begin{bmatrix} 1 & -pC_n \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ -R_{n+1} & 1 \end{bmatrix}$$

$$\Delta T_i = \Delta T_a[p^2R_2R_3C_1C_2 + p(R_2C_1 + R_3C_1 + R_3C_2) + 1] - \Delta\Phi_a[p^2R_1R_2R_3C_1C_2 + p(R_1R_2C_1 + R_1R_3C_1 + R_1R_3C_2 + R_2R_3C_2) + R_v]$$

$$\Delta\Phi_i = \Delta T_a[p^2R_2C_1C_2 + p(C_1 + C_2)] + \Delta\Phi_a[p^2R_1R_2C_1C_2 + p(R_1C_1 + R_2C_2 + R_1C_2) + 1]$$

$$\Delta T_a = \Delta T_i(p_*T_m + 1) - \Delta\Phi_iR_ik_z$$

Based on these equations, we obtain for example, three-tiered barrier equations defining the temperatures and heat fluxes, which will determine the transfer of heat through the wall of the technical chamber.

To reflect the analytical solutions of plastic mathematical model - a physical barrier for heat transfer through the model of a computer program was used, which is a language for modeling physical systems.

3. Waveforms of internal temperature of the chamber passes through upon a program of the Modelica

Models in Modelica are made up of groups representing limited subsystems. Combined form a complex hierarchical model with each level creates a growing area of the physical process.

Modelica allows the user to build their own groups of libraries. It is also possible to use ready-made libraries contained in an integrated package of Dymola. We can use these libraries, provides an easy way to model many physical phenomena, which can be used in technical education. The finished library, we can change the size of the initial process and the quantities characterizing the model. You can import the Dymola data used for simulation and image files. The results can be analyzed using graphical tools. Additionally included in the libraries of models have the documentation handy, allowing you to quickly get acquainted with their purpose, structure, and the equations describing them. Heat flow is described by one-dimensional models purchased items.

The following graphs show the behavior of the dynamics of temperature changes on the surface of the inner wall of the refrigerator, depending on the material used for its construction. Assumed typical atmospheric temperature change in the spring - autumn, assuming maintaining the temperature inside the chamber at the level of + 1.5 0C. The analysis covered the typical building materials used for construction such as cold rooms full of red brick, polystyrene, polyurethane, and the so-called "sandwich" - ready insulating module. This is a plate made of polystyrene or polyurethane layer with a thickness of 0, 2 m or 0, 1 m and with steel plates 0,55 mm thickness on both sides of the insulation panel. On the outer surface of the division was introduced in the form of sinusoidal forcing variable-temperature 24-hour period and amplitude of the outdoor temperature to 20 degrees Celsius – a maximum of 25 ^{0}C and a minimum of 5 ^{0}C . Depending on the desired values on the inner surface of the septum, we can get an image of a visible change in temperature of phase shift and a very clear its suppression.

On the following graphs show the graphic image of setting the temperature on the surface of the inner chamber due to other forcing functions, such as: step change atmospheric temperature. Frequently we have a situation, in fact, in the case of the emergence or disappearance of solar radiation on the outer walls of the chamber at partial cloudy sky. These graphs show the effect of temperature changes of atmospheric dynamics on the inner surface of the chamber while maintaining the chamber temperature suitable for the storage of apples, which is about + 1,5 ^{0}C.

3.1. Sinusoidal forcing

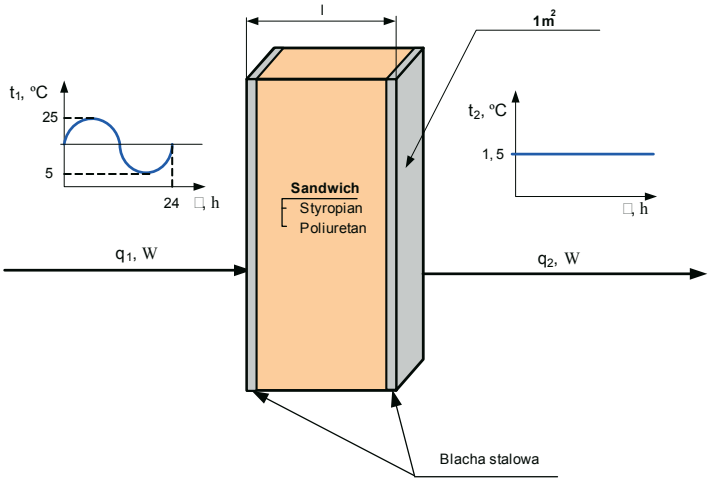


Fig. 1. Conceptual model for heat transfer through the wall

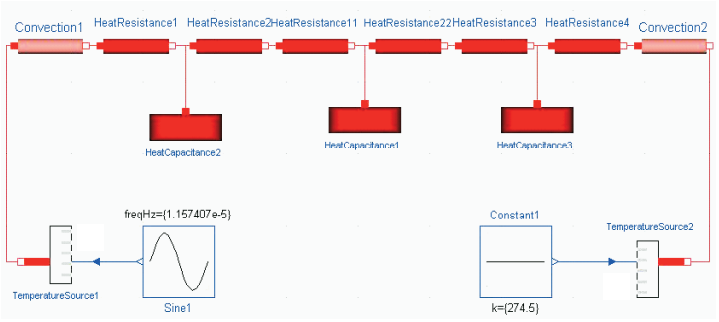
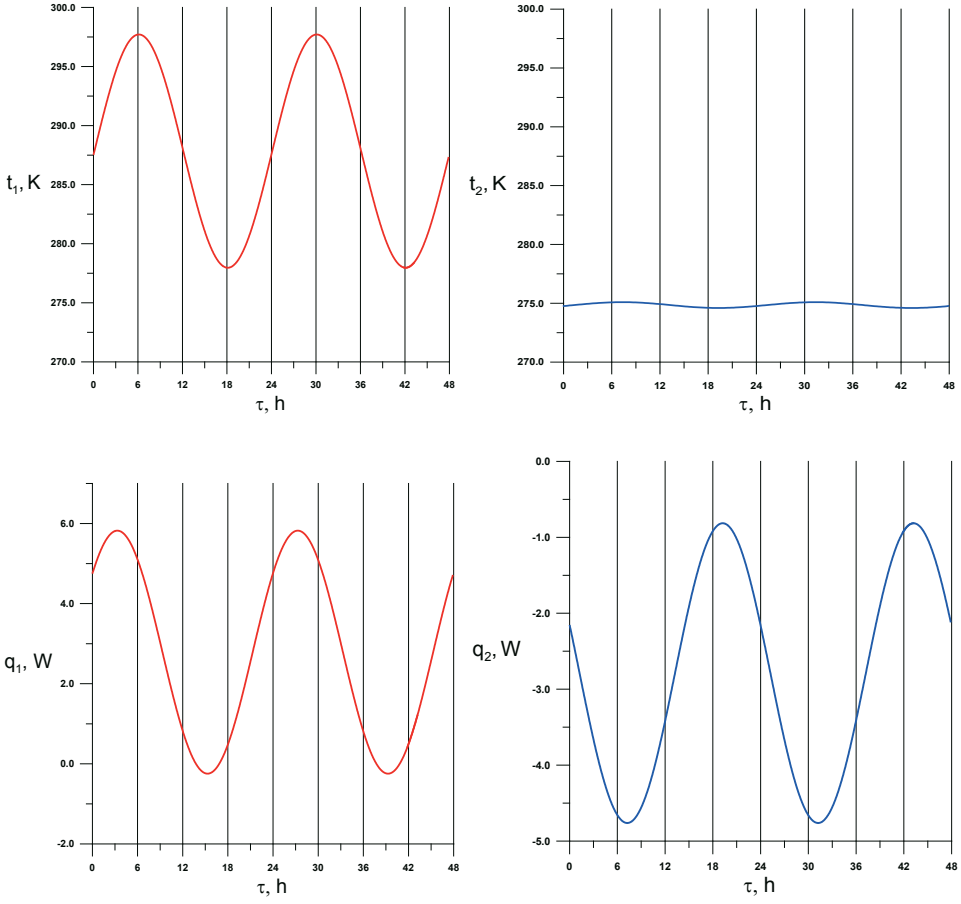
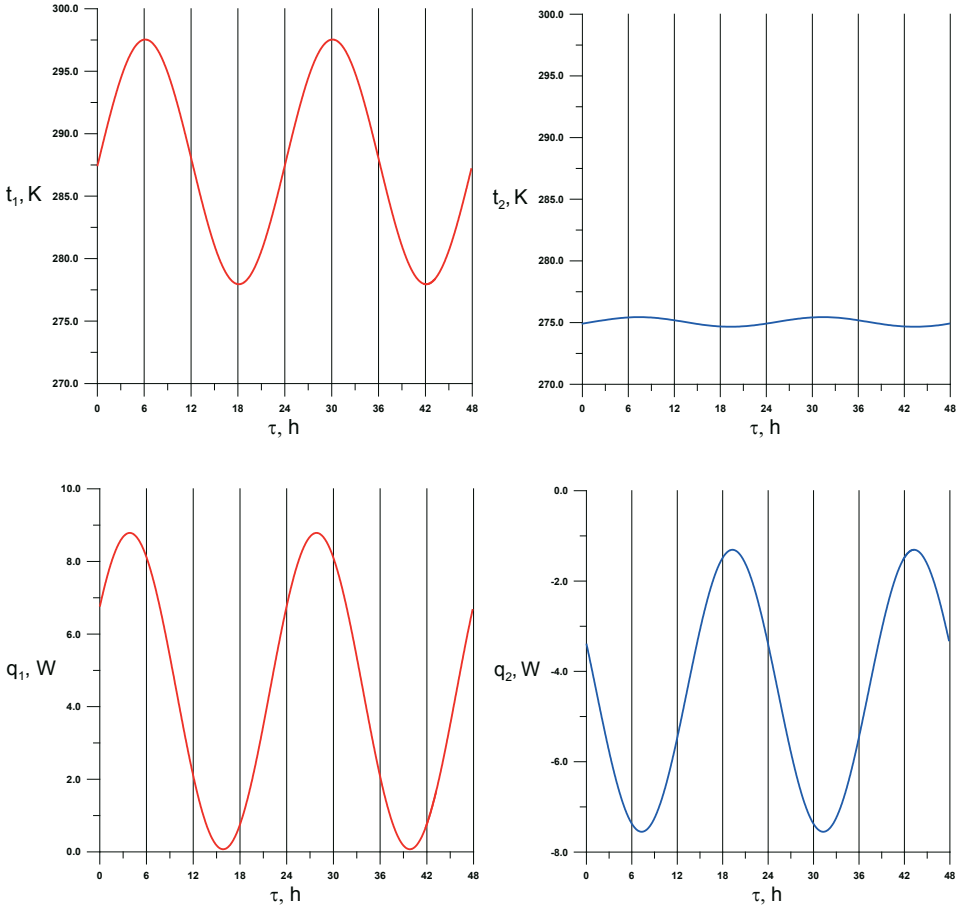


Fig. 2. Block diagram of the three layers wall – sandwich

Sandwich (styropian) l=0,2 m



Sandwich (poliuretan) l=0.1 m



3.2. Step – signal forcing

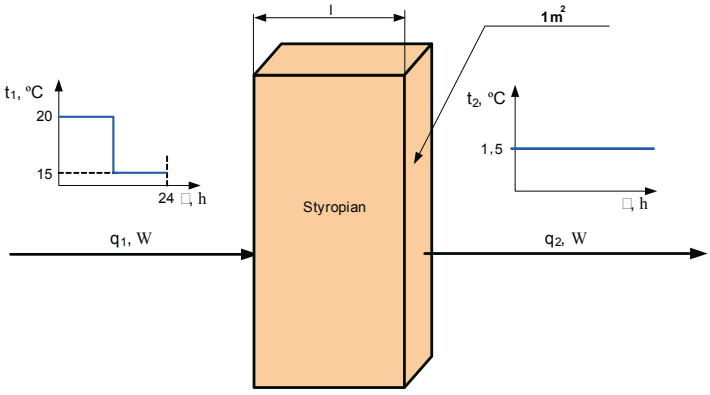


Fig. 3. Schematic of heat transfer through the wall

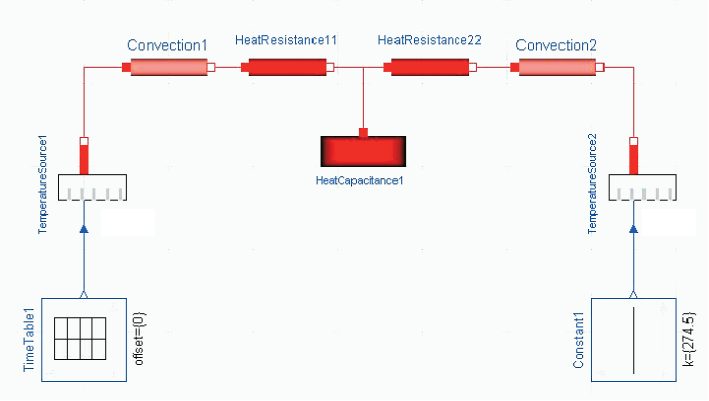
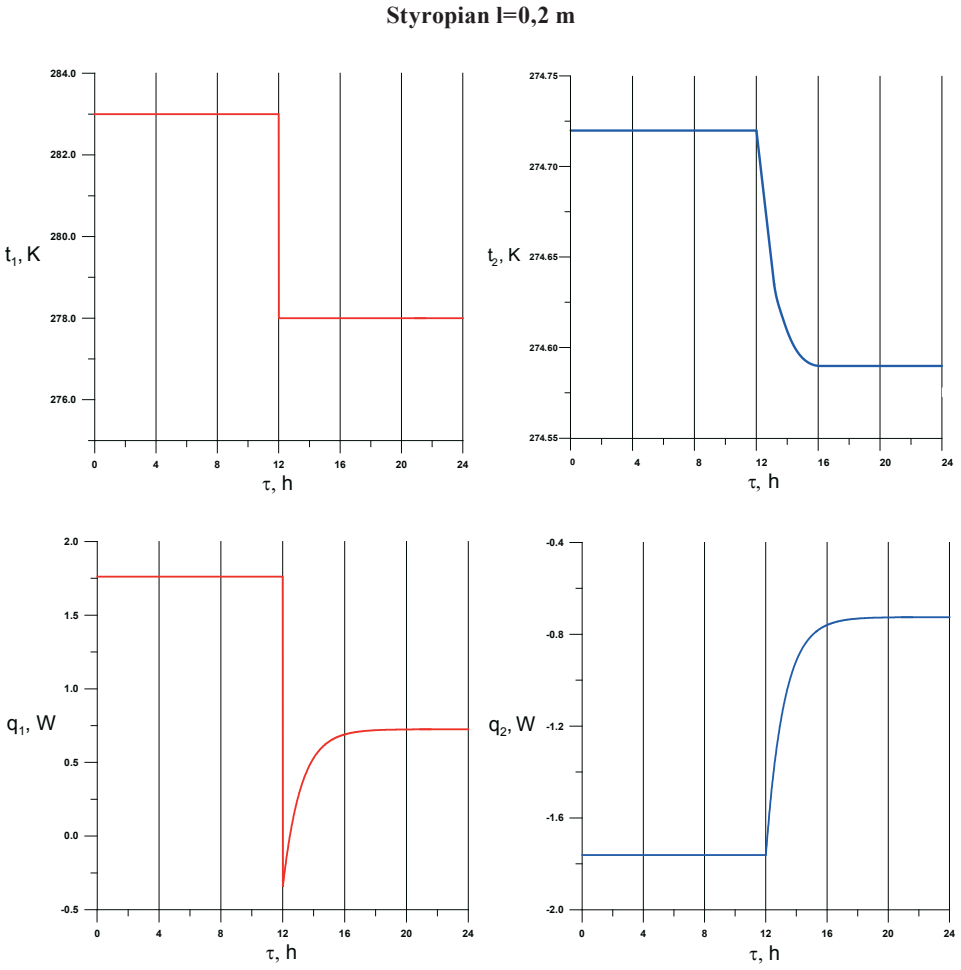


Fig. 4. Block diagram of a single-layer walls



4. Conslusion

The model and method of solving the problem of heat transfer through the wall of technical thermal spaces by the analogy of electricity – obtained from four – pol RC and compute method to solve this problem using the Modelica program. Obtained using computer simulation waveforms temperatures both at the input and the output of thermal barrier outer chamber confirm the results obtained, in fact, during the study and recording of temperature and heat flux.

The model is useful for finding the functional to allow the optimization of construction of wall and use them to build the external walls and thus the construction of such fruit storage, warehouses or cold storages, will result in substantial savings in energy.

Taking into account the natural dynamics of temperature here the air should be incorporated into the in algorithm design multilayer external walls in technical thermal chambers, because it will move both controlled controlled phase shift and amplitude attenuation of the desired temperature inside the chamber , which is also beneficial to the saving of energy.

Wpływ zmian temperatury atmosferycznej na stabilność cieplną komory technicznej

Streszczenie

Przedstawiono metodę modelowania przenikania ciepła przez przegrodę komory technicznej przy pomocy analogii elektrycznej – czwórnika RC. Wyznaczono przebiegi temperatur na powierzchniach wewnętrznych komory technicznej w zależności od atmosferycznych zmian temperaturowych oraz pożądanych wartości temperatur wewnątrz pomieszczenia przy pomocy programu Modelica.

Słowa kluczowe: przepływ ciepła, modelowanie procesów cieplnych, stabilność cieplna komory technicznej.

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Specific features of planning and decision-making in family firms

dr inż. Elżbieta Małyszek

Keywords
Family firms, decision making, planning, family governance

Abstract
Family firms are usually defined as companies in which ownership and management are controlled by the family. In family firms, family and business systems overlap. It as a result gives them some unique opportunities but also raises a number of problems. This paper presents specific features of planning and decision-making in family businesses, identifying key issues and challenges for these processes. Genesis of arising problems, their consequences and ways of solving them are also presented. Effective planning and decision making in family businesses requires adequate attitudes of the family and a creation of family governance structures. The paper ends with an identification of the most important family institutions and documents, and then an indication of their role in increasing the efficiency of planning and decision making.

1. A family firm as a system

In the literature there is no uniform definition of a family business. Generally it can be defined as a firm in which a family controls ownership and management and aims to transfer them to the next generation. A family business is, therefore, any business in which a majority of ownership or control lies within the family, and in which two or more family members are directly involved [2].

The primary conceptual model of a family firm is the three-circle model, which views a family enterprise as a complex system made up of three overlapping subsystems: ownership, business, and family (Figure 1).

Each of the three sub-systems moves through a sequence of stages over time (Figure 2). For example, family business ownership moves from a Controlling Owner stage to Sibling Partnerships, and then to Cousin Consortiums, and the company itself changes from a Start-up through other stages to Maturity. Understanding of the stages of the family, the ownership, and the business development enhances knowledge of any family business. From the perspective of system dynamics, the periods of a change between stages (i.e. the transitions) are particularly interested. The transition periods are very important because they are the most critical and challenging moments in the development of family enterprises. Transitions are often periods of uncertainty when decision-makers feel most

anxious, because that is when the organization makes fundamental choices that will profoundly shape its future [4].

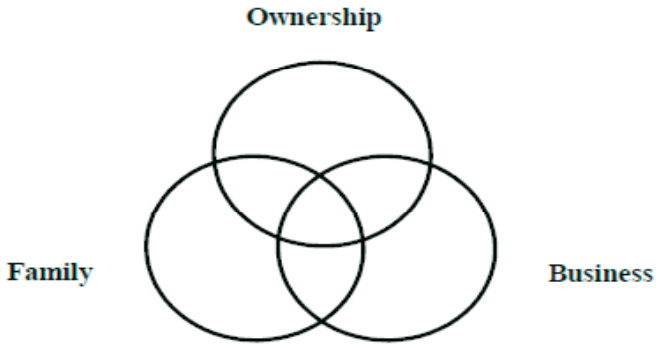

Figure 1. The Three-Circle Model [4]

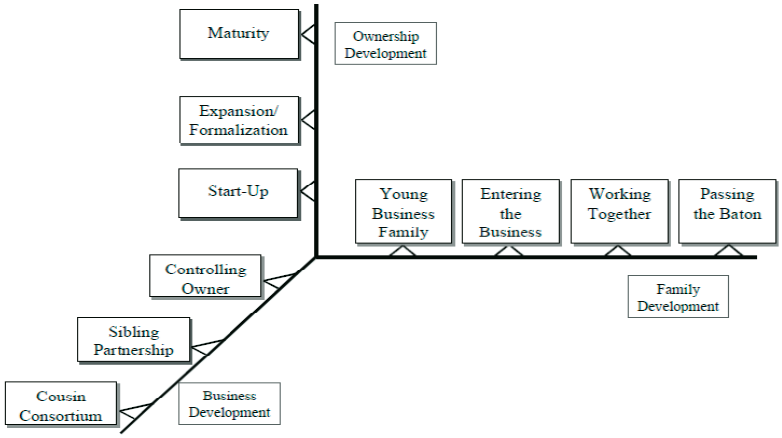

Figure 2. The Developmental Model [4]

The transitions are opportunities for reassessment of conducting business and fundamental changes. Tasks and decisions of transition periods are exploratory and strategic, while during periods of stability they are operational and tactical in nature. Understanding these differences is critical for effective management of a family enterprise over time [4].

The understanding of the complexity and dynamics of a family business is crucial for adequate planning and decision making. The family often is the critical variable which influences these processes. This impact caused the creation of a new perspective called familiness which describes unique, inseparable, and synergistic resources and capabilities emerging from the family involvement and interactions [9].

2. Conflicts of goals in family firms

Family members involved in the business are part of a family system and part of a work system. The family system is an emotional one, stressing relationships and rewarding loyalty with love and with care. Entry into this system is by birth, and membership and roles are permanent. In addition, families have their own style of communicating and resolving conflicts, which may be good for family situations but may not be the best ways to resolve business conflicts. Conversely, the business system is unemotional and contractually based. Entry is based on experience, expertise and potential. Membership is contingent upon performance, and performance is rewarded materially. Businesses also have their own communication, conflict resolution and decision making styles. The norms of the business system are easier to see and more standardized, while the norms of the family system are unique to each family, hidden and less obvious. However, the norms of the family system are deep and strong and can dominate the business system, causing all kinds of problems [2], [12].

Families and businesses have different approaches to decision making and planning, different styles of communication, their own rules, roles and requirements and therefore conflicts may occur. Conflicts arise when roles assumed in one system intrude on roles in the other (e.g. a conflict may arise between a parent and a child, between siblings or between a husband and a wife when their roles in the business system are carried over to the family system or conversely) or when there are conflicts of interest between the two systems (e.g. conflict may arise when siblings are rewarded equally regardless of their duties in the enterprise and achieved results or when incompetent family members are employed in relatively high positions in the firm ignoring the company's personnel needs but meeting the needs of the family loyalty). Whatever the cause, the conflict must be addressed and resolved to avoid and prevent more serious problems later [2].

Family expectations and business demands are not always in the conflict. The ideal situation is when the needs of both families and businesses are aligned. Unfortunately, there are many situations where the family makes decisions based on family goals, which can cause the business to suffer. In order to plan and make decisions efficiently, the needs and expectations of the two systems have to be balanced across five issues: control, capital, careers, connection, and culture (Figure 3). However, business families need to communicate and plan to address these five pivotal variables [12].

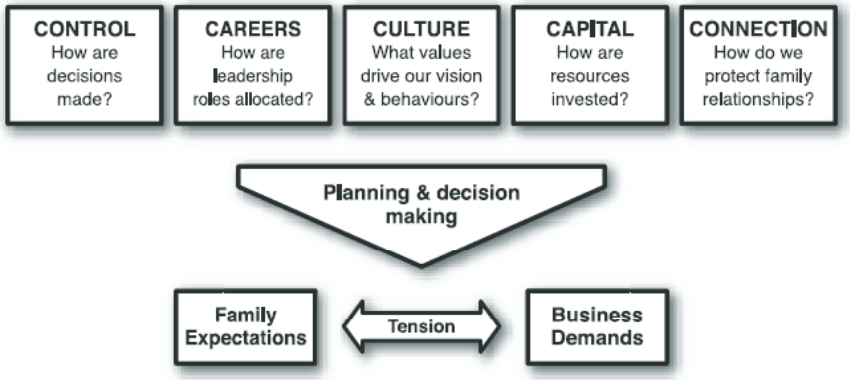

Figure 3. Globally five factors demand planning and governance to balance business demands and family expectations [12]

There are three steps which can take to manage conflict and stress in a family business: identifying issues that may cause conflict and stress, discussing these issues with the family, and devising policies to address them. These polices should meet the needs of both the family and the business. They should be developed as a part of the family strategic planning process. In this process it is necessary to create a mission statement for the business and for the family that allows setting aligned goals for the family firm. A developed strategy should accomplish these goals and formulate policies and procedures that control the family's involvement in the business [2].

To some extent, conflicts are inevitable in a family business – just as it is in any other kind of organizations. But the danger in a family business context is that the disagreement occurs not just between individuals who work together, but who share other aspects of their lives. For this reason, conflicts in family businesses can be far more pernicious and difficult to solve than in other companies. However, each conflict must be resolved properly because clear and shared objectives of the family and the business are essential for the family firm and are a key condition of its success [7].

3. Planning in family firms

3.1. Characteristics of planning

Functions of management include planning, organizing, staffing, directing, and controlling the ongoing operations of the business. Planning plays the most important role because it provides a roadmap for the other functions of management, especially in the long run. Adequate planning often allows the other functions to flow more smoothly, reducing the total management time needed to run the business. Planning can be divided into strategic, tactical and operational.

Successful firms pursue change continually, thus they must plan. The planning process can help to identify a competitive advantage of the firm, and help to devise specific strategies and tactics to capitalize on those advantages. Specifically, the planning process helps to: identify short and long term goals, inventory resources, analyze business performance, assess the environment and the potential, decide on actions and implement strategies. Given that tough individual management decisions must be made on a daily basis, the planning process provides information and the structure to assist in decision making. The process leads to a better understanding of all aspects of the business, especially the financial needs and interactions. In this respect, a well thought out business plan may improve the chances of success.

Although benefits of the business planning process are the widely recognized, many managers of family firms are reluctant to engage in the activity. One reason for this is that the overwhelming number of family businesses are small and micro enterprises in which the managers are too busy and do not have time for formal planning process (all available time is committed to the labor and control functions). The second main reason is a lack of appropriate skills because often managers small and micro enterprises have never seen formal business plans [6].

Family businesses are stereotypically known for conservative planning and organic expansion which could limit their growth compared to non-family enterprises. New business plans often come about as a result of changing family influences, an expression of a successor's interests or they are provided by sibling partners with opportunities to achieve their own goals or to obtain some distance from other family members. However, a positive phenomenon is that recently more and more family businesses are either acquiring or diversifying their businesses, not only to sustain their growth, but also to create wealth for and within the family, and to ultimately continue their business legacy [9], [13].

A formal plan, especially if it is written, can facilitate much needed communication, and help maintain focus, leading to a better understanding of the relationship between the business and the family. Formal planning meetings and review help to promote the healthy, open, shared decision making so often needed in the family enterprise. Additionally, a formal plan helps to clarify the roles that family members, partners, and employees play in the operation of the firm. Business roles that any particular family member can fill include legal management or labor. Family roles can include a combination of home maintenance, parenting, leisure, and social/community interaction and service [6], [13].

3.2. Strategic planning

From a strategic standpoint individual firms focus on cost leadership, differentiation or creating barriers to entry. Strategic planning is designed to create insights into the company and the environment in which the company operates.

It provides a systematic way of asking key business questions and often uses the well known SWOT (Strengths, Weaknesses, Opportunities, Threats) thought process to help managers prepare for the future, evaluate significant changes, or consider value added investment opportunities [6].

The strategic planning process involves five main steps: assessing a situation, developing a mission statement, setting objectives, developing strategies to meet objectives, and developing action steps to implement the strategy. A well-prepared strategic plan (usually a written document) spells out specific steps to improve customer satisfaction, increase profit, revitalize and prepare the company for challenges of market. The plan also states the chosen mission of the business, identifies the direction of future growth, and describes programs that can help to achieve that growth. It thus indicates ways in which the business can compete more effectively.

Strategic planning for family firms differs from planning for other types of companies largely because the family firm must incorporate family issues into its thinking. These issues are related to [2], [13]:

- the long-term personal and professional goals of family members,
- the family mission,
- the commitment of family members to operating and keeping the business,
- the vision of the firm in the future,
- the willingness of family members to participate in the management,
- the compensation, benefits and performance evaluation,
- the willingness of family members to build or maintain strong relationships, resolve conflicts and work for harmony of the family.

These issues affect the business strategy and should be resolved before strategic planning begins. Family concerns and preferences can influence the choice of the business strategy and often make the family reluctant to embrace more formal goal-oriented discussions and decisions. Further, family considerations can limit the strategic aggressiveness of the family firm [13].

Most family-owned businesses struggle to survive beyond a single generation. There are four basic reasons of this situation: a lack of viability of the business, a lack of planning, little desire on the owner's part to transfer the firm, and reluctance of offspring to join the firm. These factors make transferring a family business difficult, if not impossible. Therefore the formal planning process is especially important in the transition periods. There are four plans that make up the transition process: a business strategic plan (this plan allows each generation an opportunity to chart a course for the firm), a family strategic plan (this plan establishes policies for the family's role in the business and address all issues that are important to the family), a succession plan (this plan solves the problem of transferring ownership and management of the firm), and an estate plan (this plan

ensures that the family's estate goes primarily to your heirs rather than to taxes). By implementing these plans, it is possible to ensure the successful transfer of the business within the family hierarchy [2].

In the process of strategic planning, the family firm must consider two dimensions: a business and a family. This need represents a special challenge, because it means that the business and the family plans are highly interdependent. The family plan spells out long-term personal and professional goals for family members. The business plan requires the family to determine the extent of its commitment to the company. As a result, the family cannot separate strategic business planning from family strategic planning. It must undertake both issues in a connected and simultaneous way (Figure 4). The starting point for the beginning of the planning process is the family itself. The first step is for the family to establish its level of commitment to the future of the business and to planning as a way of securing this future (eg. willingness to sacrifice short-term material gains in order to invest money in the company, willingness to spend the time in order to build a business, willingness to work together etc.). The family's statement of commitment is a necessary first step, because the rest of the planning process flows from this commitment [13].

Family businesses need planning that provides rigor and consistency to drive their thinking, alignment and actions for both the family and the business. Such a planning is called Parallel Planning. The Parallel Planning model involves five steps driven by the family's values, because values shape vision, strategy, investment and governance (Figure 5). These five steps are the essence of the Parallel Planning Process. They provide focus and a unity of purpose, and align the family's commitment to the business with the business' potential to create value. These five steps are five parallel actions for the family and for the business that create strong alignment of the two systems, focusing financial and human capital toward a shared and mutually supportive vision.

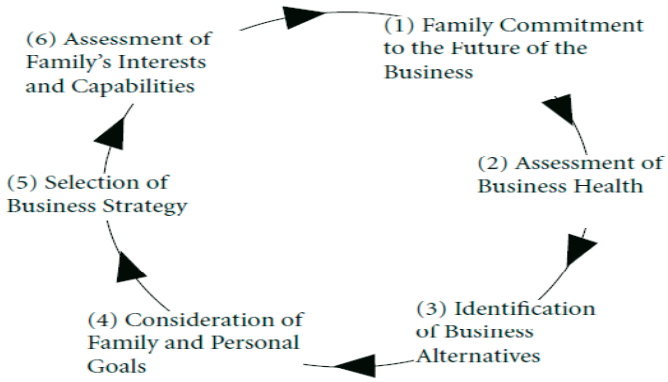

Figure 4. The Interdependence of Family and Business Planning [13]

In the family firms often there are different problems, such as uncertainty about succession or rivalries among family members. The Parallel Planning Process enables to resolve these problems but enthusiasm of the family members about the planning process is very important in taken activities. The advantage of the Parallel Planning Process is that it forces the family to consider its values and vision, at the same time as its members make decisions about their relationships with the business [12], [13].

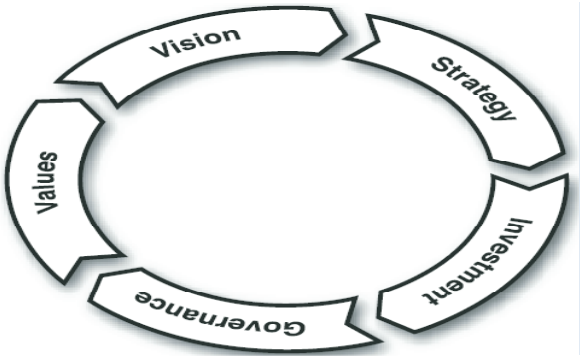

Figure 5. The five steps of the parallel planning process [12]

Strategic planning can help to strengthen the family enterprise and extend its lifespan. Family businesses often have sound strategies for their businesses, but planning for the families is mostly neglected or driven by conflicts that need to be resolved. Many business families do not appreciate the value of planning, or are afraid of the emotional minefields that such planning may expose [12].

3.3. Tactical and operational planning

Tactical plans are developed to translate the strategic plan into action. The focus should be on specifics [6]:

- What needs to be done?
- Who is responsible?
- Where will the task be done?
- How will the task be done?
- When is the task to be accomplished?

The tactical plan provides guidelines for operational planning. The operational planning requires that managers do the best use of available resources to achieve the goals. To make effective operational plans managers should analyze following issues [6]:

Physical resource inventory in order to provide a descriptive inventory of the

resources available to the business. It includes a description of all resources available and evaluates the productive capacity. It may be useful to discuss restrictions and to seek opportunities of improvements.

Human resource inventory in order to provide a description of labor needs, and a description of how those needs will be filled. Specific skill demands should be addressed and the workforce (including family) should be evaluated in terms of motivation, organizational and analytical skills, innovation, problem solving ability, leadership skills, experience, technical proficiency, commitment to the business, time availability, and attitudes toward risk. The idea is to think about the team that is available, and how to capitalize on the strengths of each individual to accomplish the various tasks of the business.

Production plan in order to provide a description of the general practices and methods used in production. Most production plans are general and focus on anything that is unique about the way primary products are produced, where supplies are purchased, or how the product is stored and shipped.

Tactical and operational planning in family firms is very similar to these processes in non-family firms, but there are some specific aspects. These relate to the specific characteristics of the family firm, which on the one hand equip it in a number of unique capabilities, on the other hand cause a number of problems.

A unique feature of family businesses is the potential for exchange of resources between family and business systems and flexible source of finance capital, and flexible family labor force. Family members often unite during difficult financial times and help the firm (e.g. they invest their personal savings in the company, offer free work or a temporary reduction / postponement of salaries) [1]. In addition, family members employed in the enterprise are a very flexible labor in terms of the work conditions and they often adapt their lifestyles to the needs of the company [10]. These features essentially contribute to the ability of creating alternative tactical and operational plans.

Managers of family businesses often base on trust to the employees and rely less on formal written policy. In conjunction with the typical flat organizational structure this enables to make decisions and develop operational plans faster. However, on the other hand, this often results in a lack of formalization and informal business practices, which in turn causes the variability of operation and a lack of statistical data for rational decision making and planning. In combination with the frequent a lack of market research, a lack of adequate training and qualifications and inadequate human resources management (e.g. a lack of appropriate incentive systems, the reluctance to hire qualified and costly external staff) this is an important obstacle to creating effective tactical and operational plans [10].

Large problems in the family system, which translate into difficulties in planning are also nepotism (it is manifested by a sense of obligation to hire in the company of all family members regardless of their qualifications and skills), the

lack of professionalism (it is reflected in the avoidance of difficult discussions and making decisions more influenced by emotional than rational grounds), and the patriarchal family style (it is reflected in ignoring suggestions of the younger generation when making decisions and planning). Consequently, these problems may lead to the formation of ineffective tactical and operational plans [14].

However, the main problem is a relatively high susceptibility of family firms to conflicts, which can lead to poor planning and decision making (decisions and plans can be made based more on emotional than rational grounds) or even a lack of ability to plan and make decisions (the differences of opinion between conflicting parties may be so large, that no decision or no plan is not accepted). There are three types of conflicts which arise in family businesses: (1) a goals conflict (it is related to the goals of the company and family members), (2) a process conflict (it is related to the allocation of work and responsibility) and (3) a personal conflict (it is characterized by anger, anger, resentment, contempt, worry and sadness). A moderate presence of goals and process conflicts can lead to better decision making and planning, but conflicts in the relationship are always destructive and can cause a complete lack of firm productivity [1].

4. A decision making process

Fast decision making is not only necessary but also plays a crucial role to ensure speed and efficiency in responding to market opportunities. The capability of the manager, his behavior, the way he thinks and the way he makes his decision in using and leveraging on the available resources, does impact the organization performance.

Decision making is a nonlinear, recursive process which requires right information, an identification of alternatives and choice criteria. Every decision is made within a decision environment, which is defined as a collection of information, alternatives, values, and preferences available at the time of the decision. Decisions are made within this constrained environment and time [8].

The decision making process is described by seven elements, comprising three central phases (identification, development and selection), three sets of supporting routines (decision control, decision communication and political) and a set of dynamic factors (interrupt, scheduling delays, timing delays and speedups, feedback delays, comprehension cycles and failure recycles). The general model describes the interrelationships among them. According the general model, there are three decision stimuli: opportunities (voluntary decisions to improve a secure position), crises (decision responses to intense pressures) and problems (decision responses to unsatisfactory situations) [9].

The decision making process is influenced by various factors which can be divided into three main groups: cultural (they refer to the ethnic or country cultural

influences), environmental (they refer to the externalities of the economy, region, country etc.), and industrial (they refer to the specific factors related to the industry or industries of the business group). The uniqueness of family business makes that two additional types of influence factors must be taken into consideration: a family life stage (this refers to the generation and development of the family and business) and a family involvement (this refers to the role family members play in ownership and or management of the group) [9].

Specific family factors influence the decision making process more than any other factors. Family decision-making should provide an environment where the family works towards common goals. Unfortunately, some members of the family often work towards individual goals that may be in conflict with family goals. Therefore business decisions can be made in following styles: autocratic (it is used for routine decisions where others don't feel a need to be involved), democratic (it is used for large group decision making, or where consensus or collaborative decision making is inappropriate or fail), consensus (it is used for decisions where facts can be used to outline pros and cons), and collaborative (it is used for making major business decisions which require the support of everyone involved to be successful) [5].

In most family firms, there is the autocratic style and decisions are made by the founder (i.e. the father or the mother), and no one questions his decisions. The decision making process is therefore controlled by the family patriarch that makes decisions under the influence his experiences, abilities, knowledge, personal values and emotions. Economic conditions in the decision-making process are important but unfortunately often become secondary and disrupt the rationality of made decisions [9]. In addition, the autocratic style of decision-making can cause dissatisfaction and frustration of other family members, and thus cause conflicts and weaken the family's social capital. In the result the efficiency of the firm may deteriorate and even it may lead to the firm's collapse.

5. Family management

In order to implement better practices of decision making and planning at the levels of the enterprise and the family, family members should gather under one or more organized structures. These structures strengthen communication within the family and between the family and its business and as a result they provide opportunities for family members to network and discuss issues related to the business and the family, and this in turn leads to better decision making and planning. Main types of the structures are Family Business Meeting, Family Assembly and Family Council. Depending on the stages of the family company's development, families might consider establishing other structures, such as Family Office, Education Committee, Share Redemption Committee and Career

Planning Committee [11].

The family should work effectively as a team, therefore Family Business Meetings are very important. Most families underestimate the importance of regular meetings which provide the best way for making important business decisions and planning. The successful Family Business Meetings should be conducted in a business environment (i.e. family members should sit around a table or in a circle, all interruptions and interferences should be minimized) and on a regular schedule (i.e. holding regular meetings should become a habit, and in emergency situations should be held additional meetings). They should have a prepared agenda (i.e. an agenda should be prepared before the meeting and its copy should be forwarded to each member, the agenda gives the meeting structure and keeps the discussion focused on the important topics) and all the needed materials should be prepared in advance (i.e. the materials on important decisions such as financial materials, information on proposed capital expenditures or growth plans etc.). The meetings should be recorded because formal minutes of the meeting provide a record of what topics were discussed and what decisions were made. This is very important in order to avoid disputes in the future. Properly structured Family Business Meetings can be used to focus family teamwork on important business decisions [5].

Family Assembly and Family Council are more formalized structures. They play a very important role in resolving family conflicts. These family institutions can manage relations between family members who work for the family business and those who are only owners and rely on dividend income from the success of the company (these two groups may have diverging interests and varying degrees of access to company information, which may lead to an atmosphere of distrust in the family). The family institutions can mull over the important family issues and develop policies on how dividends are determined and distributed to make sure that the family is satisfied in ways that are not detrimental to the success of the business. Openly discussing contentious issues is often the fastest way toward finding a solution acceptable to all concerned parties [11].

The family management structures and institutions require a certain degree of formalization if they are to function well in order to plan and make decisions efficiently. As families adopt policies on the family's approach to manage the business, they should formalize these efforts with documents that will differ depending on their life cycle stage. Typically, in the earlier stages when the firm is managed by the founder or his/her children, many aspects of the family and the business management are informal. Any efforts to formalize relate mostly to the business itself. First attempts at written policies usually are brief documents that state a general family vision and mission with respect to the company. The next level of formalization comes with the need to develop a family employment policy. This becomes more apparent when the company reaches the sibling partnership stage. The family employment policy sets clear rules on terms and conditions

of family employment within the firm [11].

The written employment policy is one of the family protocols which family businesses make to prevent conflicts and maintain the family unity. The family protocols include not only policies regarding the family members involvement in the business but also mechanisms created to implement these protocols. The mechanisms aim at ensuring efficient rules of planning and decision making in the family as well as in the business [3]. The document covering all of the family protocols and polices is commonly called a family constitution. This document expresses the family's principles regarding the family commitment to core values, vision, and mission of the business. It often defines the roles, compositions, and functions of family institutions and the business management bodies [11].

6. Summary

The changing business environment increases the need for more comprehensive planning of business activities and making of efficient decisions. These processes are difficult, and specific features of family firms make them even more complex. In family firms, some factors not found in nonfamily firms must be taken into consideration. These factors are related to the intermingling and interdependence of two different systems: the family system and the business system. As a result, the need of more thoughtful and inclusive planning processes for the family and the business is the challenge for many family firms.

Reasons for failures of family firms may be inherent both in the family system or the business system as well as in the lack of compatibility between these two systems, especially in terms of their objectives. Shared objectives of the family and the business are essential for the family firm and are a key condition of its success. To achieve this, the entire family should develop a vision statement that defines both why it is committed to the business as well as the business future. By sharing priorities and goals, and the contribution each family member can make to the business, the family can work as a good team. Therefore, a shared vision has a very large positive impact on processes of decision-making and planning.

In family firms, families are critical variables in the processes of decision making and planning. An appropriate use of unique and synergistic resources emerging from the family involvement in the business is especially important. This requires the unity of the family and its involvement in planning and decision making processes. The family must work as a good team and that is why it is necessary to manage of the family in a appropriate way. Properly structured family documents, family institutions and business meetings can be very helpful in order to achieve the good family team when making important business decisions. However, the commitment made by all family members during the planning process is the key ingredient for business continuity and success.

Specyfika planowania i podejmowania decyzji w firmach rodzinnych

Streszczenie
Firmy rodzinne są najczęściej definiowane jako przedsiębiorstwa, w których własność i zarządzanie pozostają w rękach rodziny. W firmach rodzinnych systemy rodziny i biznesu wzajemnie się przenikają, co w rezultacie daje im pewne unikalne możliwości, ale także wywołuje szereg problemów. Niniejsza praca prezentuje specyfikę planowania i podejmowania decyzji w firmach rodzinnych, identyfikując najważniejsze problemy i wyzwania dla tych procesów. Przedstawiona jest również geneza powstających problemów, ich konsekwencje oraz sposoby ich rozwiązywania. Skuteczne planowanie i podejmowanie decyzji w firmach rodzinnych wymaga odpowiednich postaw rodziny oraz utworzenia struktur i instytucji nadzoru rodzinnego. Praca kończy się zatem wskazaniem najważniejszych instytucji i dokumentów rodzinnych, a następnie identyfikacją ich roli w zwiększaniu efektywności planowania i podejmowania decyzji.

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Project management in public administration

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Keywords
project, project management, public administration

Abstract
Project management used in public administration faces many difficulties in the application of project management methodologies in a somewhat rigid administrative structures, such as offices, ranging from municipal offices, and ending with the provincial offices. Similar difficulties facing the implementation of projects in the institutions subordinated to the public (schools, hospitals). Of course, every project is unique and much depends on the specific persons supervising him, responsible for its implementation, and implementing it. However, there are several factors in common, they can be distinguished in the implementation of a large number of projects in public administration or its subsidiaries. In this publication we present the most important project management methodologies and will be shown the main difficulty how each of these methodologies encountered in the implementation of projects in public administration.

1. Project management as a discipline management

The history of project management as one of the areas of management science is not long. This science has identified in the U.S. in the sixties, when appreciated thinking and action task forces. At that time, there were created the matrix structure of the enterprise, which has been identified in project teams. There have been developed various methods of project management. These were the methods developed by the Project Management Institute, method of PRINCE2 ®, and methodology Project Cycle Management (PCM).

2. Characteristics of the different methodologies for project management

2.1 PMI

Project Management Institute is a non-profit organization acting on behalf of project management. While the PMBOK ® Guide (A Guide to Project Management Body of Knowledge) is a set of standards, solutions and practices in project management, which were collected and published by members of the PMI

(Project Management Institute). PMBOK ® Guide is not just a collection of the best, the generally recognized practices, but also a set of ethical principles, which should comply with the project manager, This is the first formalized methodology for project management developed in 1987. From that moment the idea of professional project manager. PMBoK ® Guide is still the most common and most capacious in the project management methodology. In the United States of America standard PMBOK ® Guide is approved by the American National Standards Institute (ANSI) as a national standard for project management. PMBoK ® Guide is the basis for developing corporate project management methodology. The content standard is composed of nine major areas of knowledge:

1. Project integration management,
2. Management of scope,
3. Cost management,
4. Time management
5. Quality management,
6. Human resources management,
7. Communications management,
8. Risk management,
9. Order management.

Project management is the methodology PMBoK ® Guide, this is the application of skills, knowledge, tools and techniques in carrying out the design requirements in the following processes: initiating, planning, execution, monitoring and closure of the project.

Application of the methodology PMBoK ® Guide brings several advantages:

- for each process are set out in detail the input information, output information, tools and techniques used to process them,
- methodology is accurate, and its use to efficiently manage the project
- a key factor in the success of the project is experienced and competent manager, who can choose the most appropriate processes for a specific project,
- Project Manager has selected techniques on areas: scope, time, cost, quality and risk.

Centralization and hierarchical in management in the public sector is contrary to the methodology of project management. In the public sector slowly, but still there are changes for the better. PM methodology is no longer in the public sector knowledge unknown. There are many examples of agencies that are planning to use or apply a project approach to improving management - conclude representatives from IBM Poland. This is evident also in interest of trainings and software packages to help them, such as IBM Rational Portfolio Manager. In the PMI Warsaw Chapter, Poland is currently registered with about 250 certified in this methodology managers from nearly 100 Polish organizations, but none of them represents the public sector.

On the other hand, in the project methodology of the project is carried out with funds from European funds. European pressure on professionalism is an additional motivating factor for changing the model of public management and the Polish administration. It is difficult to determine the real extent of the demand for highly qualified staff dedicated to project management. Many, especially smaller administrative units are not realized during the year a number of projects and it will never realize to necessarily have to have the staff project manager with the certificate. Therefore, there were presented the idea of training and organizing a number of managers certified in project management, who specialized in the public sector and government and could be hired according to need by the public administration and local government.

Often underlined the differences of quality and conditions in the management between the public sector and business. These differences are also found in the application of PM. It is emphasized that due to the nature of management of public funds - one of the first questions for project managers dealing with the public sector, is how PM can help them effectively manage the finances, which are allocated to the implementation of projects. Project managers conclude that often there are situations when there are important performance indicators, but the utilization of all available resources in the period. If we would not have spent the money we lose them. In the public sector, you cannot optimize the project portfolio.

It happens that in the offices are selected for implementation only those projects that have a chance to complete in a given year and fit in the budget. Especially in the second half of the year in public administration is used just such a criterion for selection of projects. Other criteria in project management, and time management and resource management are considered less important. Therefore, the demand to maintain the assumed level of flexibility in the assessment and settlement projects, which is the foundation of methodical organization choosing to use PM, is difficult to realize in the public sector. Using project management methods in business and public sector shows some similarities. In both sectors there are strengths and weaknesses of the use of the method and there are similar dilemmas. The first is the choice of project manager, who can be a person from the organization ordering the project and outside the organization.

The project manager coming from the organization better knows the needs and requirements of the project. Manager outside the organization is more focused on the achievement of desired objectives of the project, is not involved in the relationship between employees of organizations, because he does not know them. Another problem is the employment of staff implementing the project in the public and private sectors. In the situation more comfortable are public sector employees, where the employee returns usually on the previously held post after the project is completed. In business, often the employee returns to the company, but may be employed for another job. This situation badly affects the efficiency of

staff seconded to the project. However, in both sectors are similar factors affecting the success of the project and these are: the involvement of the project team, a well-defined requirements and project management support.

2.2. PRINCE2®

PRINCE2® is a project management approach based on processes. They can easily fit into your organization. PRINCE2® is the recommended standard in the European Union. It is a methodology developed specifically for the public administration, but is also used in private companies. PRINCE2® is a recommended standard, implemented by all the structures of NATO.

The PRINCE2® methodology contains the a set of best practices, included in a complete, coherent system of processes, techniques and components. This methodology has been specially created for the public administration, then thoroughly tested in action. Has been confirmed the unique usefulness and effectiveness of the method. Using this methodology, employees do not need to have the entrepreneur spirit that projects were implemented with success. Using the rules of the method greatly increases the chances of success of the project, as well as to obtain the intended benefits of the project within a certain time, budget and quality.

The implementation of PRINCE2® provides managers control over decision making and spending money, and most importantly, directs the project team for a specific, pre-approved purpose of the project. In this way the project management less absorbs of managers.

PRINCE2® contains a set of rules of conduct in the form of processes that always occur in the project. It explains exactly how the project started, implement and complete.

PRINCE2® components are sometimes called as project success factors, they contain patterns of activities as risk management, control changes. An important element of the methodology is clear description of roles and responsibilities, by this methodology is appreciated by project managers.

The team members and suppliers outside the organization should follow a few simple and effective rules of conduct.

There are many benefits of PRINCE2®. These are:

- An organized and controlled the course of the project
- Strictly defined allocation of roles, responsibilities and duties
- Referring to the overarching objective of the project in the control
- Early warning of problems
- Good organizing of communication
- The involvement of top management of the project only in the most important issues
- Automatic control of deviations from the plan.

PRINCE2® was developed in 1996 as a general method for managing projects, whatever the branch of application. This method was created in the UK and has gained popularity around the world. It is the main but not excluding alternative methods of PMBOK® Guide, developed at the Institute PMI. The predecessor to PRINCE2® method is PROMPT (Project Resource Organisation Management Planning Technique)and this is methodology for IT projects, which was developed in 1975 by Simpact Systems Ltd. The methodology that was expanded to include quality management, and in 1983, under the name PROMPT II, the British introduced it in the public administration as a method of IT project management.

In 1989 it was published a new standard under the name - PRINCE (Project IN controlled Environments). This standard was developed by the UK government agency Central Computer and Telecommunications Agency (CCTA). It has been described as a set of best practices of project management. In 1996, the methodology has been upgraded, it is based on a process approach, adapted to the needs of any, not just IT projects, and published under the name of PRINCE2®.

PRINCE2® is a methodology that ensures control over the design process is flexible and its use is possible in any organization, in any type of projects, on projects of all sizes. It is scalable and can be customized for a specific project, its risks and values. This methodology is owned by the Government of Great Britain and updated by the Office of Government Commerce.

PRINCE2® methodology was improved in 2009. The changes were based on user reviews, and updates 170 organizations participated. The methodology has become more practical. There were introduced clearly defined rules under which you can easily determine whether the methodology is used in accordance with the assumptions. The methodology has also been given less bureaucratic and less imperative nature.

2.3. PCM (Project Cycle Management)

Project management PCM (Project Cycle Management), the Project Cycle Management was created in Europe and based on methods developed earlier in the USA. The immediate impetus of creation the method was seeking by the European Commission solutions that would allow distribution of EU funds in a transparent and logical way. This method would help improve the quality of projects and increase the effectiveness of aid to the people. The works on the method started in 1992 and the method was called Project Cycle Management (PCM). PCM is now the official methodology of the management of programs and projects that are implemented with the use of European funds.

The main objective of the methodology is improving of the management of external programs and projects of the European Union through an analysis of keys and terms of assistance.

The planning and implementation of projects is a cycle that begins with the agreed global strategy. Then arises the idea that was developed, implemented it in form of project, and eventually it evaluates. Project management cycle in accordance with the methodology PCM consists of the following phases:

- The programming phase is to define key issues and opportunities of the project, as well as the cooperation between the managers of European Union programs, and trying for a grant. The result of this phase should be the initial selection of projects and programs to be carried out which will contribute to social change, or improve the situation.
- The phase of identification is to verify all submitted projects for suitability of cost and effectiveness. Then, their selection is carried out in accordance with established criteria. For some projects are carried out additional analyzes, for demonstrating their purpose. There are referred the project scope, it size, and activities that should enter into its scope.
- The phase of evaluation involves of a detailed analysis of the idea and definition of the idea of project. Are carried out financial, technical, and environmental analysis, it is compiled the plan and schedule of activities and generate a logical framework. In this phase is developed preliminary financing plan, required in subsequent phases.
- The phase of funding, is to make a final decision on the financing of the project. There is compiled it is detailed scope of the project and its related costs.
- The phase of implementation is to implementing the project and its monitoring. It start all the procedures, allowing for efficient and effective conduct of the project, the technical, technical, financial and legal part.
- The evaluation phase consists in summing up the project and determine its outcome, relevance, effectiveness and sustainability. Plans are compared with results of project achieved . At the end of the project may be identified the need for subsequent projects.

Cycle phases is repeated and the cycle is characterized by several common elements:

- The identity of the most important decisions, needs and responsibilities in each phase,
- The progressive nature of the phases of the cycle, that is, each phase must be completed to the next could be completed successfully,
- Basing the cycle of the evaluation to be able to transfer experience from implemented projects to future projects or programs.

Tools of the PCM methodology:

I. stakeholder analysis
II. analysis of the problems with tree problems
III. analysis of the objectives and purposes of the tree

IV. strategy analysis
V. matrix (frame, array) logic.

Tools of the PCM methodology are formulated in of identification phase of the project and are evaluated in two stages:

- In the analysis phase, when is made an assessment of project partners, the choice of purposes, problems, strategies, activities in the project,
- In the planning phase, when is constructed a logical framework.

I. Stakeholder analysis

Stakeholder analysis is to an accurate description of the persons and institutions interested in the project and applies to both legal entities and individuals. It also applies to groups in which the project affect in a negative way. Using interview techniques, discussions and direct meetings are documented the interests of different social groups. The European Commission notes that during the stakeholder analysis is respected the principle of gender equality. Thanks to this the project is realized according to the best social and ethical standards.

Stakeholder analysis should be conducted with the following aspects:

- in terms of socio-economic characteristics,
- the interests, objectives, expectations,
- in terms of sensitivity to the issues associated with the project
- in terms of capacity, knowledge, experience,
- in terms of implications and conclusions for the project.

II. The analysis of the problems with tree of problems

It involves of the formulation of the main problems of the institutions that have to be solved by the project implementation. This analysis is related strictly with the analysis of stakeholders, and therefore any problem should be considered in the context of society. The problems cannot be solved without the consent or at least the social agreement. In this stage are referred all the negative aspects of the situation are established causal relationships between the existing problems. The analysis of the problem can be divided into the following steps:

1. The precise definition of the object of analysis and its structure.
2. The determination of the main problems faced by target groups.
3. The visualization of problems in the form of a diagram, called the problem tree to determine a cause-effect relationship between the problems.

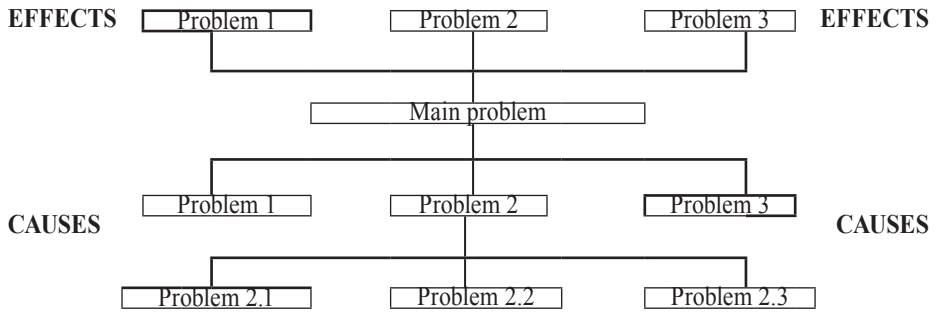

Fig. 1. The tree of problems
Source: http://www.skutecznyprojekt.pl/artykul.htm?AID=91; http://ec.europa.eu/europeaid/multimedia/publications/documents/tools/europeaid_adm_pcm_guidelines_2004_en.pdf, [15.05.2012].

III. Analysis of the objectives and purposes of the tree

Analysis of the objectives of the project shall be made after completion of the analysis of problems. It represents the positive aspects of the situation and the desired image in the future. It is the transformation of the existing problems to design objectives. As a result of this analysis are obtained comprehensive description of the situation, and it is possible to design a more practical tool, it is a tree purposes. Analysis of objectives is used in order to:

- description of the situation in the future when the problems will be solved,
- verification of the hierarchy of objectives,
- showing the relationship between resources, resources and products.

The construction of the tree purposes helps to identify of goals that are achieved in the project and those which are impossible, and unrealistic goals.

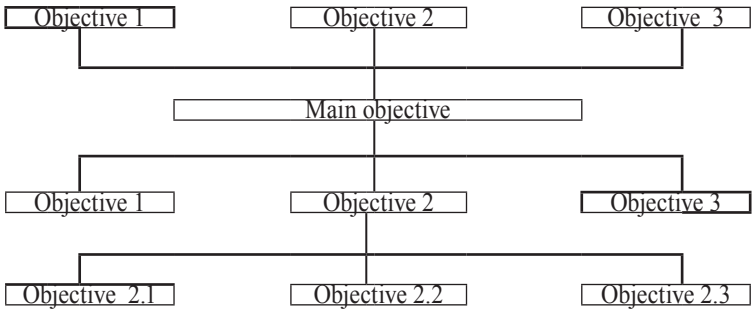

Fig. 2. The tree of objectives
Source: http://www.skutecznyprojekt.pl/artykul.htm?AID=91; http://ec.europa.eu/europeaid/ multimedia/publications/documents/tools/europeaid_adm_pcm_guidelines_2004_en.pdf, [15.05.2012].

IV. Strategy analysis

It consist to present solutions and methods which are necessary to achieve the objectives. At this stage, are made decisions about the project. Must be select an appropriate strategy and verify that priorities are also the priorities of the stakeholders of the project. Must be check whether the result of the project achieved the expected results and if you can solve the problem, which is the basis of the project, if appropriate action has been planned and if the budget corresponds to its scope and if the institution is unable to complete the project.

V. Matrix

The logical matrix is a tool for projects planning and was created for the United States Agency of International Development (USAID) in the late 60s of the twentieth century. The tool is implemented in the 90's to the PCM project management methodology and is now this is its most important element. The design matrix is quite simple. It is based on the methodology tools such as a tree of objectives or a tree of problems . The matrix is a standard tool that is used for the preparation, monitoring, implementation, evaluation of projects financed from the EU. The matrix is used to develop the overall project, the activities and the direct results.

Tab. 1. The logical matrix

	The intervention logic	The indicators	Sources of verification	The assumptions
The general objective				
The direct objective				
The results				
The activities				

Source: http://www.skutecznyprojekt.pl/artykul.htm?AID=91; http://ec.europa.eu/europeaid/ multimedia/publications/documents/tools/europeaid_adm_pcm_guidelines_2004_en.pdf, [15.05.2012].

The basis of the logical matrix is two logics: the logic of and horizontal logic.

The vertical logic is the relationship between the first and fourth columns of the matrix. It means functioning of the following principles:

1. The activities can start only when the preconditions are met.
2. If the action has been initiated and the assumptions are true at this level, the results will be achieved.
3. If the assumptions and the results are satisfied at this level, the immediate goal of the project will be achieved.

4. If the immediate goal of the project is achieved and the assumptions are satisfied at this level, they are prepared the basis for achieving the project objectives.

The vertical logic level refers to the measurable effects, and used resources described by the specification of key indicators, as well as sources from which they will be verified.

Properly constructed logical matrix is a tool that allows not only to formulate a specific project, together with its realistic objectives, but also allows you to perform the next steps, such as the schedule of activities in the project (Gantt chart), to assign resources to particular activities, and construct the project budget. In the implementation phase can efficiently manage the project, assess the progress of the project and make the correction.

The benefits of the public administration of the project management methodology by using the PCM

- Recommendation PCM method by the European Commission.
- This methodology is free and regularly updated (no license costs).
- Ability to use the methodology for preparing, evaluating, monitoring and controlling projects.
- Easy to use.
- The methodology corresponds to the construction of the grant application under various operational programs.
- The methodology is an integrated approach to the project, starting from the consultation of documents to the phase of the project realization.
- It can be an inspiration to new projects.
- Allows you to identify potential problems but also to identify areas of internal and external risks.
- It is the methodology commonly used by all entities that carry out projects in the European Union.

3. The specificity of project management in public administration

The modern state cannot function properly without a properly organized administration. Properly and smoothly functioning administration is essential to use the enormous resources available under the EU structural funds, which primarily has access public administration. Creating efficient and effective running of public administration can stimulate the development of districts, regions, and the whole country. In the public administration are increasingly being broken down, the resistance to the project management methodology. The changes in public administration are slowly and are not revolutionary and evolutionary nature.

It is common a centralistic management style based on the hierarchy. Project Management Institute has published a special supplement recognizing the specific characteristics of projects that are executed in public administration. In addition, it presented the definition of project management in public organizations in the division at the central, regional and local administration.

In 2002-2004 it was carried out the studies the Ministry of Internal Affairs and Administration order, and Malopolska School of Public Administration Cracow of University of Economics and a consortium of Canadian Urban Institute, under which were developed methods for improving of governance in public administration. The method was implemented in 33 pilot units. There was evaluated the use of management by projects in public institutions, particularly the ability to receive funds from the EU. This evaluation was negative. As a result of the evaluation were formulated postulates of systematic application of projects using public funds. There is no overall plan to prepare the institutions and organizations to effectively reception of European Union funds, as well as coordination of consulting and training. Participants are admitted without pre-selection in a random way, the level and quality of training is low and does not meet the minimum requirements.

During the training it does not apply to relevant material, based on practical experience. It is not done a proper analysis of training needs.

Units of local government, such as municipal and district governments, now change management task-based management . Based on research was found that management by projects is most often used by the departments of the administrative units involved in economic development or district municipality. These are usually the departments of economic development or infrastructure. Project management methodology is used for projects for the development of strategies, as well as specific of projects such as building or upgrading of infrastructure. The project includes the key elements of the planned tasks, its execution and evaluation.

A municipality that wants to obtain European funds to carry out its tasks is forced to develop a proposal in form of project. Because the EU funds are available for Polish organizations for several years, local government units are becoming more experienced in obtaining funds and managing them in the form of projects. Planning skills and project management among employees of these units increased. Many universities and institutions leading postgraduate trainings and courses in project management. They are often very specialized training. On the other hand increases the experience of local government units in project management because of the already completed projects.

Here are the European Union grants to projects in Poland and in particular provinces in the years 2004-2011.

Tab. 2. The European Union grants to projects in Poland and in particular provinces in the years 2004-2011

L.p.	Region	Number of grants	The contribution, mln zl	Value, mln zl	Contribution to the person, zl
1.	**Poland**	153 897	245 383, 1	435 891, 4	6 434
2.	**Lower Silesian Voivodeship**	8 242	16 954 ,2	31 628, 7	5 892
3.	**Kuyavian-Pomeranian Voivodeship**	9 064	10 093, 8	19 440, 5	4 881
4.	***Lublin Voivodeship***	*13 342*	*13 397, 5*	*22 3478, 0*	*6 197*
5.	**Lubusz Voivodeship**	3 925	5 744, 7	12 110, 2	5 693
6.	**Łódź Voivodeship**	10 966	13 132, 4	25 782, 0	5 152
7.	**Lesser Poland Voivodeship**	10 619	19 047, 4	33 401, 4	5 794
8.	**Masovian Voivodeship**	20 417	40 508, 4	73 022, 9	7 783
9.	**Opole Voivodeship**	4 650	4 838, 0	9 287, 8	4 683
10.	**Subcarpathian Voivodeship**	7 522	14 426, 5	28 885, 7	6 871
11.	**Podlaskie Voivodeship**	7 781	7 098, 4	13 105, 7	5 957
12.	**Pomeranian Voivodeship**	9 585	13 827, 6	25 515, 5	6 230
13.	**Silesian Voivodeship**	11 405	26 528, 7	45 667, 1	5 710
14.	**Świętokrzyskie Voivodeship**	6 844	8 341, 2	14 248, 8	6 553
15.	**Warmian-Masurian Voivodeship**	7 257	11 204, 4	18 854, 0	7 851
16.	**Greater Poland Voivodeship**	14 198	16 747, 2	30 273, 2	4 929
17.	**West Pomeranian Voivodeship**	7 244	10 985, 2	22 982, 3	6 488

Source: Own work based on http://www.mapadotacji.gov.pl/, [15.05.2012]. It is marked by italics Lublin province, and by gray colour are marked voivodeships which are the best and the worst according to the category (in the column).

In the years 2004-2011 Poland received almost 154 000 grants with value of 436 billion zlotys and 6.5 thousand zlotys own contribution per person. EU grants mean realization first of all infrastructure projects, that is, building roads, bridges, railways, airports and public buildings. Each of the regions and each of the provinces has its own characteristics. Throughout the country there are no good, as a European roads, no railways, and many regions have no airports.

The use of grants by each province varies greatly. The leader in receiving grants from the European Union is Masovian Voivodeship, due to the number of grants, the value, contribution and overall these own contributions per person.

The worst voivodeships because of the value, contribution and total these own contributions per person is Lubusz Voivodeship, and because of the number of grants is the Opole Voivodship. But we must remember that these are the smallest voivodeships and therefore its demand for these grants is smaller. The highest grants due to its own contributions received three voivodeships and they are, the aforementioned Masovian Voivodeship, Warmian-Masurian Voivodeships and Subcarpathian Voivodeships. Among the voivodeships with a medium level were: Podlaskie Voivodeship, West Pomeranian Voivodeship, Lower Silesian Voivodeship, Świętokrzyskie Voivodeship, Lesser Poland Voivodeship and Lublin Voivodeship. The other six voivodeships has a low level of grants due to its own contribution.

Our Lublin Voivodeship came out in this statement quite well, placing in third place due to the number of grants and the seventh due to its own contribution. Among the districts of the Lublin Voivodeship with the highest use of EU founds is pulawski district, the average bialski district, and the other districts have relatively low use of EU grants.

The use of EU grants by public administration units can only take place through projects. To modernize the infrastructure in their regions, local government units must develop and submit the relevant application as a project. If the application is properly developed a public entity receives funds for its implementation. Its implementation is also done as a project.

Also, the settlement is in the form of project. It is therefore important to have knowledge and skills in project management by civil servants.

Local authorities recognize the importance of having these skills and are more and more willing and more often direct their employees to specialized postgraduate courses and trainings in project management. The task of educational institutions, especially universities is the organization of studies, trainings and courses in this area. Only the universities have appropriately trained staff to conduct a studies at the appropriate professional level. Properly trained local staff can properly prepare and execute projects that will affect the improvement of living conditions in the region. This is an activity for our common good.

Zarządzanie projektami w instytucjach administracji publicznej

Streszczenie

Zarządzanie projektami stosowane w administracji publicznej napotyka na szereg trudności w aplikacji metodyk zarządzania projektami w nieco skostniałych strukturach administracji, jakimi są np. urzędy, począwszy od urzędów gminnych, a kończąc na urzędach wojewódzkich. Podobne trudności napotyka realizacja projektów w instytucjach podległych administracji publicznej (szkołach, szpitalach). Oczywiście każdy projekt jest niepowtarzalny i wiele zależy od konkretnych osób nadzorujących go, odpowiedzialnych za jego realizację i go realizujących. Jednak istnieje szereg czynników wspólnych, jakie można wyróżnić przy realizacji znacznej liczby projektów realizowanych w instytucjach administracji publicznej lub jej podległych. W publikacji niniejszej scharakteryzowane zostaną najważniejsze metodyki zarządzania projektami i pokazane będą najważniejsze trudności jaka każda w tych metodyk napotyka przy realizacji projektów w administracji publicznej.

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New media technologies in marketing communication organization - advertisement and entertainment tools

dr inż. Joanna Wyrwisz

Keywords
marketing communication, new media technologies, advertainment, advergaming, product placement

Summary
The article presents some chosen modern tools of marketing communication considered as new media. The instruments characteristics as well as advantages and constrains of using them in promotional campaigns of goods and services. Advergaming, advertainment and product placement were discussed in details and the common feature of those tools is the integration of entertainment and advertising. New media are a very efficient form of promotion in the conditions of dynamically changing advertising market. Their strong point is a non-standard way of influencing and interacting with customers. A very high efficiency of promotion message that are broadcasted with the use of new media is connected with great possibility of drawing attention and reaching target groups.

1. Introduction

A mode of marketing communication between a company and the market, including information about the company, persuading consumer purchase behavior and revealing the company identity standards, is paramount in building competitive advantage of the company [14]. The current marketing communication has undergone serious changes induced by three significant factors. The first are changing consumers who in the world of networked technologies and wireless communication systems have unprecedented access to information and thus, are more informed and interact easier. Consequently, they have got a possibility not only to contact other consumers and exchange purchasing decisions online but they actually deliver marketing information as well. The second factor is a changing marketing strategy. Currently, mass marketing has been replaced with focused marketing programs designed to build closer relations in narrow micromarkets. Then the personalized offer is created to strictly tailor consumer needs, in terms of communication as well. And the third factor, profound changes in communication technology. [1] Traditional forms of commercial advertisements on radio or television have been taken over by more specialized and better oriented tools targeting selective groups of consumers to deliver more personalized message through interactive involvement. [1] Interactivity in marketing communication

enables a receiver exposed to a specific message content making a direct response, choosing interesting information, evaluating and putting questions. Therefore, interactivity facilitates deeper consumer engagement in the message perception which translates into its higher effectiveness and it turn, generates consumer`s intention to focus on the offer and the company itself. [13] New media tools in marketing communication are the promising solution for advertisers that in the situation of increasing commonality of zapping, advertising clutter and growing competitive pressure which challenge overall effectiveness of messages, search for new ways to reach consumers [8]. New marketing tools are positioned out of commercial break context and regular sites of emission. They stand in opposition to social media channels and, importantly, establish new forms of contacts, not infrequently with surprise elements, with a receiver to model him so that he becomes a link in the communication chain. [12]

2. Advertainment

Winning and holding attention of customer requires the development of well prepared message content, i.e. a lot more smarter than others, providing entertainment and with the intent of evoking strong emotions. The content must be interesting and useful enough to capture and keep a target consumer`s concentration upon it. With the purpose of breaking through the advertising clutter, some marketing tools can be employed that fuse advertising with entertainment and at the same time, reach consumers more efficiently and cause their deeper involvement [1]. Advertainment proves to be a current response to the changing preferences and predispositions of consumers in terms of marketing communication that satisfies the mentioned above conditions.

The term advertainment was coined as fusion of two words: advertising and entertainment. Kotler defines it as advertising message conveyed through entertainment content, not always directly linked with a product [1]. Advertainment as an innovative promotional tool, is of a highly interactive nature. Marketing communications are meant to mobilize consumers and encourage target activities and as result, induce desired persuasive impact. The concept behind it is mainly based on linking the brand name directly to an exiting moment of joy and entertainment. The goal of this form of advertizing is creating a positive and relaxing impression of the brand in the mind of the recipient and to experience this feeling repeatedly in a non-standard manner. Interactivity enables an advertainment passive receiver to become an active participant of promotional efforts, yet this activity does not necessarily affect the purchase decision. [6]

A product in the advertainment promotional practices is just a start and the excuse for having good fun. It outweighs the classical advertising as it does not involve straightforward display of a product and thus, does not annoy viewers with

obtrusive persuasion but can attract them by amusing marketing communications. The advertising messages are positioned in the entertainment medium so consumers are eager to interact, share and build deeper relationships, be an active participant. [17] This form of marketing communication aims at brand distinction over competition on the one hand and developing brand unique and origin image on the other. Advertainment is to provide pleasure and positive emotions, yet it may be considered hazardous in the extreme cases of too intensive engagement in interactivity – harassment (cognitive intrusion) [6].

Advertainment is usually based on the Internet, but its operations will get expanded into other domains. It is frequently integrated along with viral marketing techniques and can take the form of eye-catching wallpapers, screen savers, short films, graphics, animation [11]. A special feature of this marketing tool is a manner it affects a recipient at the defined situation when it intermingles with other marketing communications. Both, advertainment and product placement are grounded on persuasive communication incorporated into a plot. However, in the case of product placement, persuasion is interwoven with a plot while as for advertainment, a plot is developed to serve the needs of a given marketing communication and makes up its basic component. [11]

An example of successful advertainment application proved to be the advertising campaign of Marcel and Sony organized just before Christmas and making use of the advent calendar counting down the days remaining to Christmas Day. Then windows in one of the Sony Stores turned into a conventional advent calendar, they were to open one by day displaying the QR code scanned by smartphone owners to win gifts including, among others, TV sets, films, smartphones and promotional coupons. [15]

3. Advergaming

Advergaming or in-game advertising is another marketing communication medium that has gained popularity recently. At first, the video games were considered a type of advertainment but the growing interest made them classify as an individual marketing technique [6]. The essence of advergaming (advertising and game) is development of games featuring integrated brand message hosted on the Internet. Brand or product on-line message reaches the defined target recipients providing entertainment and amusement in the form of advergames. This marketing tool works best promoting the brands intended for young people. A game becomes a direct response to their interests. This target group includes specific receivers who reject the conventional promotional efforts but seek novelties at the market, in that new technologies, and willingly use their own communication systems. [6]

The apparent benefits of this new advertising medium are [16]:

- information about a new product or brand – a game used by brand owner to feature the company product, its advantages, applications. A player receives the information while gaming so it is not an intrusive message;
- creating and strengthening of positive brand image – player being involved in a game builds emotional connection to the advertised brand, spending pleasurable time he comes to like the brand and creates a positive image of the brand associated with relax and fun;
- increased familiarity of brand – consumers spend much more time with a product as compared the time they are exposed to a TV advertising clip. Besides, replayable nature of a game and logging onto game any time help ingrain brand or product name into player`s memory;
- supporting advertising campaigns – advergames are primarily used by large organizations in combination with regular promotional efforts. It aims to complete it, strengthen and more effectively ingrain into player`s memory.
- the basis for contests – interactive games serve as the basis for numerous contests. Chances of winning gifts is a strong stimulus to continue gaming and the longer user stays at the site of manufacturer the longer he is exposed to brand message;
- gathering users` data – users more willingly register their personal information on the site while logging onto advergame which can be further used in other advertising campaigns or direct advertising.

New communication way through advergaming is an indispensable element of an advertising campaign because of its high effectiveness in reaching a very targeted group. It proves to be a powerful tool in building brand awareness. Some other advantages of advergaming use include [5][16]:

- online games have free unlimited access to outlet markets and potential clients all over the world;
- games do not know age limits – player`s average age is 33 years so these are not teenagers aged 12-15 years who decide about game conditions and content but adult and educated receivers;
- no language or national barriers as handling games is easy and intuitive, no need for complicated manual attachment;
- online games provide longer contact of users with product image or brand compared to traditional advertising forms, both, internet and non-internet ones. Advergames attract player`s attention for a longer time, average 5 up to 35 minutes;
- games can use the benefits of viral marketing. A well prepared game with a catchy leading motive and ease of handling as well as possibility of comparing results with other players spreads in the network like a virus. The users recommend it and spend more and more time gaming, thus

in the case of ”branded” games they are exposed to longer contact with a promoted brand;
- effectiveness of advergaming is measurable as the number of gaming users is easily established just like the number of games completed or the exposure time to a game.

Table 1 summarizes types of advergames with examples.

Table 1. Types of advergames

Type	Example
Games for children	Colouring – Publishing Greg
Sports games	Game flash - Football 3 Styler for Radio RMFMAXXX
Logical games	Puzzle Super 5 for Programm 5 Portions At School
Racing games	Dirt Buster for Radio RMF MAXXX Maxxx Race for Radio RMF MAXXX
Arcade games	Arcade game for Marketing Investment Group Ltd. and brand Sizeer
Panel games	Competition on Facebook for Terma Bania Białka Tatrzańska
Contest games	Valentine competition for Terma Bania Białka Tatrzańska

Source: [20]

Effectiveness of this communication form has been confirmed by the researches. The studies of Massive Incorporated, a part of Microsoft, showed that advertising message positioned in games improved brand recognition and assessment. After the advergaming session, the players considered purchasing decisions of promoted product more frequently as well. Besides, the studies demonstrated that placing advertising content in a game affects recognition and evaluation of the communication itself. Irrespective of a promoted product category, it similarly motivates consumers to make buying decision. [18]

Gamers accept conveyed embedded communications as they are assumed to make the game more realistic and players do not feel the underlying commercial motives. Advertisers who are ready to implement this marketing tool should remember that advertising message placed in a game is expected to be innovative and as original as the game itself. [19]

4. Product placement

Product placement is a non-standard promotional tool that is becoming a common and important practice aiming to promote a brand and product. Recently, this marketing communication technique has been frequently used in the world of both, film industry and advertisement. The growing interest in product placement is associated with loss of prestige and inefficiency of channels that broadcast

traditional advertisement commercials. [10] It is defined as a marketing practice in advertising and promotion wherein products (often movie props playing a supporting role) of a given brand are incorporated into film scenography or TV shows so that their brand name is clearly visible [7]. J.S.V. Mas depicts product placement in a more broader way and defines it as the integration of products, commercial services or brands with audio-visual fiction in exchange for payment or co-operation in film promotion [10].

A term product placement used in the marketing literature and promotional practices has several equivalents in the Polish language [7]:

- product placing,
- product positioning,
- product location,
- product display,
- product incorporation,
- product presentation,
- product addition,
- product featuring,
- product insertion.

Since product placement is not explicitly mentioned as a part of promotion-mix tool and it is not obvious where it belongs to, it is sometimes referred to as public relations, advertising or a form of sponsorship marketing. However the most universal category proves to be integrated marketing communication.

This promotion form has a long history at the international market, while at the Polish market it has only gained popularity recently to emerge as an effective alternative for the tired advertising forms of the past, especially television commercials. The motion picture product placement started in the United States and dates back to the early 20-ties last century in film industry in Hollywood when the growing numbers of movie viewers clearly evidenced the changes in the consumer behavior. Movies were considered the perfect medium for promotion of consumption and it began to be used for this purpose, in particular for individual hygiene products and soap powders advertising (the term "soap opera" stems from such commercials). [10]

Product placement is a mechanism of inserting products or services of recognizable brands into the entertainment content to affect the recipients, who do not recognize the persuasive attempt of the advertising communication and to encourage their purchase behavior. Its primary objective is to build emotional bonds with the brand. The context of the embedded products is quite significant to achieve a desired brand image. Only few viewers realize that watching a film they experience its hidden nature, i.e. visual persuasion. Obviously, the influence of reference groups and opinion leaders in individual buying-decision making is remarkable. The film or series explicitly show the real benefits resulting from using

the brand and thus, encourage the consumer engagement in a natural way. [9]

The advertised product may be placed in [9]:

- feature film,
- TV show,
- TV programme,
- books,
- video,
- theatre play,
- radio play,
- music video,
- video game,
- song lyrics,
- reality show.

The technique of product placement use in the promotional campaigns brings a number of measurable marketing results which are important for the overall effectiveness of such operations. The main benefits of product placement tool offered to advertisers include [3][4]:

- credibility of marketing communication, actors through the physical handling a promoted product do not recommend it intrusively but use it in an ordinary way or are close to it;
- less aggressive promotion, an embedded product often makes the background with the hidden promotional intent, it acts as a natural prop perceived as true to real life;
- product is used realistically, opportunity for presenting its special features and actual use by actors as well as exposing unique virtues, e.g. fast cars;
- highly involved receivers, a movie viewer is focused on the film content and plot, does not get distracted and the received visual and auditory stimuli are enhanced in a dark cinema hall;
- positioning out of commercial breaks, boredom and indifference toward commercials as well as increased zapping behavior, the advertisers must deliver marketing communication through innovative ways different from old tired commercial breaks;
- ennoblement of a product linking it to famous actors, use of a positive image of film character to support product which starts being perceived as a film star as well;
- recipient`s profile, from advertisers` standpoint a movie viewer has an attractive profile as target customer, these are mainly young educated adults with average and higher income, searching novel products and active in leisure time;
- opportunity for promoting products whose advertisement is restricted

or prohibited, e.g. alcohol, prescription drugs;
- longevity in time, extended exposure period to marketing message related to the distribution of film which after the cinema release has home afterlife on DVD/Blu-Ray players and finally appears on television;
- supranational range of message reach, not infrequently it is international film distribution range;
- relatively cost-effective method, product placement is paid for once and a fee is often lower as compared to total cost of TV released commercial.

However, product placement marketing tool has also drawbacks and these most significant for campaign effectiveness are [4][3]:

- unpredictable number of recipients, it is challenging to predict movie or series popularity so low viewership should be taken into account in the case of underperform;
- possible negative impact of a movie, scene or character on an embedded product, a viewer transposes his positive or negative affective reactions to actor`s surrounding, in that placed products, therefore brand owners refuse to link their branded products to so called movie villains;
- product placement in a movie produced for movie audiences is a tool of decreased elasticity, limited possibilities for message differentiation arise in the case of placing the product which is differently branded at different markets or has different packaging designs;
- lack of full control over the final form of product placement, brand owner may have a lack of a proper control over the communications message of the product portrayed or incorporated into a scene or storyline;
- still few academic studies detailing product placement effectiveness, no significant research results or effectiveness measures of this promotional tool operation;
- possibility to disclose the hidden commercial intent of a placed marketing communication, no available information on deliberate product placing in movie may generate a feeling in viewers of being psychologically manipulated;
- product placement far in advance of movie production which takes much time so product packaging may get changed just like the brand marketing strategy, then placing technique will be ineffective;
- limitation in product placement opportunities, some movies offer less placement potential for some product categories so that it could be smoothly incorporated into the actual plot of movies or series (product integration);
- non-standard promotion conditions, associated with limited number of movie productions in the country and as a result, difficult matching up promoted brand with a suitable movie;

- not every film genre is effective product placement vehicle; comedy, action movie or social movie prove to be the most;
- favored and most often employed media for that purpose, while historic films or science fiction are debatable or just useless placement opportunities;
- lack of opportunities for full presentation of product, as the product is woven into the context of the story more detailed information on its price, components, availability cannot be provided;
- limited number of contacts with communication, the movie is watched only once most frequently, a viewer incidentally gets back to a film watched before.

This marketing communication tactic is also appreciated by movie producers for whom product placement is the key mechanism generating revenue to cover production costs. Besides, both the brand used as a product placement and the movie beneficiate from the publicity within the integrated marketing communication system through so called cross promotion. It is noteworthy that this marketing tool adds realism and authenticity to scenery in feature movies, enforces the personality of the characters and assists characterological identification. Still, social critics blame movie producers of film commercialization and brand products over -exposure which finally is dangerous for the film image itself that becomes just a marketing tool. Product placement in a movie or TV series may give rise to technical problems at the edit and post production process. Therefore, it needs high involvement of the screenplay writer, movie director and the companies placing their branded products in approving the final edit. How a product is integrated into the entertainment context depends on a type of promoted product, marketing communication intensity, featuring mode. [4] Table 2 presents product placement categories related to where the deliberate emphasis is laid on while portraying the product.

Considering the time when a movie or programme takes place [7]:

- historic placement – the situation when the action takes place in the past, the brand gains the appearance of long history and tradition and thus, reliability and solidity that have survived till the present day;
- future placement – the movie concerns the future and the product is perceived as modern and solid (a long-term inevitability is stressed).

Table 2. Product placement categories related to promoted product

Category (product-related)	Description
Generic placement	A certain category product is embedded without its brand identification as the product itself is so characteristic that widely recognizable
Brand placement	Identification of product brand or producer. The most often used PP form as it suits all the products bearing logos
Utility placement	Hands-on placement presenting product principle operation
Organization placement	Displayed names of organizations or intuitions (schools, hospitals, offices)
Corporate placement	Identified company`s name or logo
Location placement	Placement at precise geographical location (e.g. town or region)

Source: [7]

5. Resume

Cutting through promotional noise, advertising clutter and being distinctive need a new way of viewing marketing communication which should deliver full information concerning the brand and increase its recognition between consumers. [1] Advertainment, advergaming and product placement are the non-standard marketing communication tools that fuse advertising message with fun and good time or associate the brand with some entertainment forms. Their aim is to develop a non-intrusive and non-interruptive marketing message being an integral part of the entertainment.

Nowe media w komunikacji marketingowej organizacji – instrumenty reklamy i rozrywki

Streszczenie

W artykule przedstawione zostały wybrane nowoczesne narzędzia komunikacji marketingowej zaliczane do nowych mediów. Ujęto istotę instrumentów oraz korzyści i ograniczenia wykorzystania w kampaniach promocyjnych produktów i usług. W szczególności omówiono *advergaming* i *advertainment* oraz *product placement.* Cechą wspólną wybranych do opracowania instrumentów jest integracja reklamy i rozrywki. Nowe media stanowią skuteczną formę promocji w warunkach dynamicznie zmieniającego się rynku reklamowego. Natłok przekazów reklamowych, ich powszechność oraz obserwowalne uodpornienie się odbiorców na tradycyjne formy promocji wymuszają konieczność wykorzystywania

nowych rozwiązań. Ich mocną stroną jest niestandardowy sposób oddziaływania oraz możliwość interakcji z odbiorcami, w szczególności dzięki upowszechnieniu technologii Web 2.0. Wysoka efektywność komunikatów promocyjnych, których kanałem przekazu są nowe media związana jest z dużą możliwością zwrócenia uwagi oraz optymalnym dotarciem do grupy docelowej.

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