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Tel: (+40)21-312.97.82

Fax: (+40)21-312.97.83

E-mail: editura@niculescu.ro

Internet: www.niculescu.ro



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# The Way to Efficiency

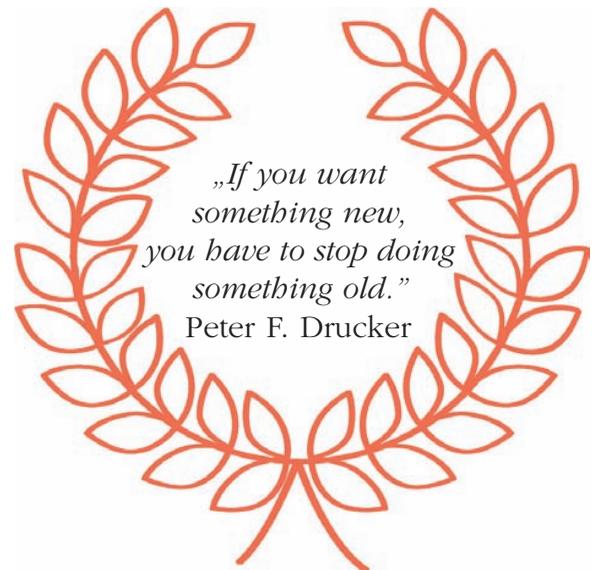
What was considered a good management technique years ago may be considered a poor or even counterproductive management technique today. The New Knowledge Economy of Rampant Change and Rapid Globalization require a new Management model capable to face with challenges for the 21<sup>st</sup> Century (Peter Drucker): a systematic and organized method for obtaining information about the context of the business in the economy, its market and its pool of competitors; integration of what was once several procedures (e.g. value analysis, process analysis, quality management and costing into a single analysis).

Management strategies and techniques change over time largely because of businesses themselves and the societies that they operate in change as well.

Surprisingly, scholars have paid little attention to the process of management innovation. London Business School (Julian Birkinshaw and Michael Mol), identified 175 significant management innovations from 1900 to 2000 which were evaluated after three dimensions: Was it a marked departure from previous management practices? Did it confer a competitive advantage on the pioneering company or companies? And could it be found in some form in organizations today? Considering these criteria, here are a dozen of the most noteworthy innovations: Scientific management (time and motion studies); Cost accounting and variance analysis; The commercial research laboratory (the industrialization of science); ROI analysis and capital budgeting; Brand management; Large-scale project management; Divisionalization; Leadership development; Industry consortia (multicompany collaborative structures); Radical decentralization (self-organization); Formalized strategic analysis; Employee-driven problem solving. Important innovations that didn't quite make this list include Skunk Works, account management, business process re-engineering, and employee stock ownership plans.

The last decade of the 20th century brought to the fore other new managerial methods: Six Sigma, Knowledge Management, Business Intelligence.

Innovation in management is based on the interdependence between the various management schools that have emerged and developed in various geographical areas characterized by different cultures, technologies and business models. Following are several modern management techniques that are currently being used successfully ([www.mbaknol.com](http://www.mbaknol.com)).





**Disaster Recovery Plan** (DRP) helps to identify threats to an existing business and it also provides guidance on how to deal with the occurrence of events such as terrorism, fire, earthquake and flood.

**Guerilla Marketing** which was coined by the great marketer Jay Conrad Levinson was created originally as an unconventional system of promotions that relies on time, energy and imagination.

**Hierarchy of Effects Model** is another widely used model in marketing management that attempts to explain consumer decision making process.

**Spiral of Silence theory**, elaborated by Elizabeth Noelle-Neumann, analyses and demonstrates how interpersonal communication and media operate together in the development of public opinion.

**Cost control techniques** consist of those actions necessary to assure that the business operations are focused on attaining established objectives goals and plans.

**Outsourcing of training and development activities** means comprehensive end-to-end outsourcing from the management of the training function to the design, delivery and reporting.

**Bowman's Strategy Clock** is a model used in marketing to analyses the competitive position of a company in comparison to the offerings of competitors.

**Asbridge portfolio matrix** is a strategic tool used to evaluate the attractiveness of potential acquisition target or existing business to the parent.

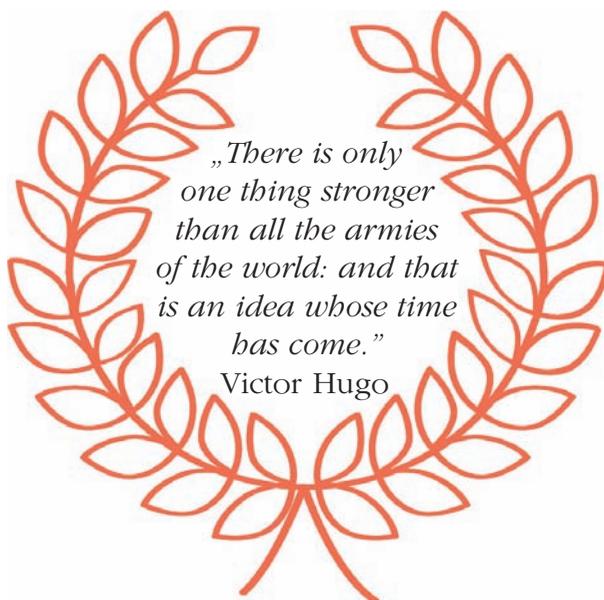
**Fitzgerald and Moon's Building Block Model** suggests the solution of performance measurement problems in service industries and can be applied to other manufacturing and retail businesses to evaluate business performance too.

**Role of Leadership in Organizations.** *What is that differentiating successful organization from the rest in this competitive world? It is effective and dynamic leadership.*

The future keeps us a lot of surprises about managerial methods and techniques. The influence of the introduction of IT and the structural changes of companies due to the globalization process oblige managers to find new solutions to solve the new problems they are facing.

Innovation is not just a technique. It involves a long process of transition from the idea to its use. „Above all, innovation is not invention. It is a term of economics rather than technology. Non-technological innovations – social or economic innovations – are at least as important as technological ones.” (Peter Drucker). And as you can see, companies are boasting not only new products but also new management methods.

*Florin Dănălache*  
Senior Editor



# Innovation in Business Models

**Valentin-Andrei Mănescu (1), Gheorghe Militaru (2), Massimo Pollifroni (3)**

(1) Webecom Bucharest, Romania, (2) University POLITEHNICA of Bucharest, Romania,

(3) University of Turin, Italy

Abstract

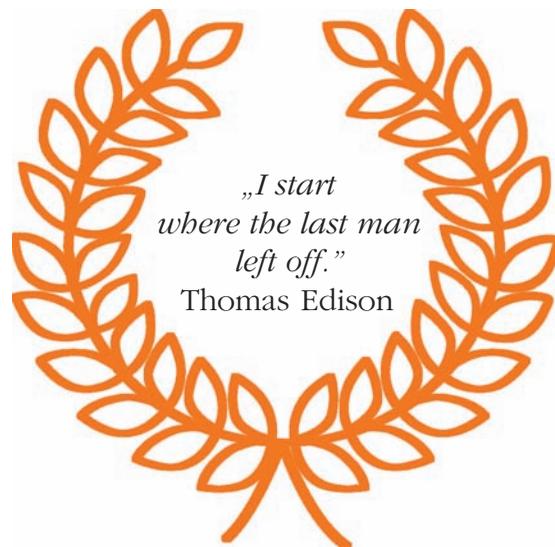
*The objective of this article is to identify the opportunities created by the fast-growing businesses analysed by the specialists. The innovation in entrepreneurship industry and the dynamics of the business ecosystem generated a high volume of ideas, models and commerce techniques. Because of this, the entrepreneurship community needs a synthesis for identifying the real opportunities offered by the consumerism wave and high-speed communication. This study is an information source for those ones who wants to choose a specific business niche and those ones who wish to develop their business models to the actual needs of the customers. This study is addressed to top managers and also to a variety of specialist. The specialist from many industries could learn fast and develop their solutions to be adapted to the actual needs, expanding on others industries. Our contribution to this study will be to identify the most attractive business sectors at this moment and to analyse them from a practical point of view. Using this study, entrepreneurs could transfer business innovation from a high competitive market to those ones which could grow fast.*

**Keywords:** new business models,  
technologic entrepreneurship,  
digital economy

## Introduction

Because the concept of „business model” is something abstract, the specialized press and the scientific community can define exactly at this moment the term with a unique, exact and unanimously accepted definition.

The definition of the business model was constantly improved by economics specialists. In this research, we will try to find





which are the industries with a higher growth are and how entrepreneurs can use a business model and identify a niche for having success in their's activity. In the actual society of business, it's very hard to be convinced that the decision to invest in a market niche or use a specific business model has the chance to be a profitable business, but we can observe that fast growing companies have the resources which can fulfil the key part for expanding, hiring new employs or extending to new markets.

The rest of the paper is organized as follows. In the next section, we will provide a brief overview on how is defined the business model concept, because it's necessary to see how this model can conduct the companies to success. Because we analysed a large set of fast growing companies, in the second section we will present the formulas used to calculate the indicators on every industry sectors. On the third section, we will analyse the results obtained and at the end we will offer a discussion and our conclusions.

## Theoretical Framework

Timmers defines the business model like architecture for a product, a service or the informational flux that includes business actors and their roles for describing the potential personal benefits and the income sources (Timmers, 1998). Two years later, in the scientific medium a new definition of the same term was proposed. An operation business model it's the logic core for creating value. Since the organization competes for customers and resources, a high-performance business model highlights distinctive activities and has an approach that helps the company win new customers, employees, investors, and deliver profitable products and services. As the organization competes for customers and resources, a high-performance business model highlights distinctive activities and an approach that helps the company to win: attract customers, employees and investors, as well as deliver profitable products and services (Linder & Cantrell, 2000). Two new definitions were developed in 2001. Afuah and Tucci believes that a business model is the method by which a company builds and uses resources to provide customers with greater value than competitors and generates profit. The business model details how a business earns money and how it plans to do it in the long run. The model helps the company to have a sustainable competitive edge and perform better than long-term rivals (Afuah & Tucci, 2001).

A more synthetic definition was designed by Amit and Zott, a business model outlines the design of transactional content, structures and governs to generate value by exploiting business opportunities (Amit & Zott, 2001). Another approach is represented by the four components representing

a business model diagram: client interface, central strategy, strategic resources and network value. Thus, the customer interface includes supply and support, information and research, the dynamics of relationships with them and the price structure. The core strategy includes the business mission, the product and market objectives, and the basis for differentiation. Strategic resources include key competencies, strategic assets, and key processes. The value of the network is determined by suppliers, partners, and coalitions. These basic components are connected by 3 other components that facilitate the operation: customer benefits setting up business activities and company boundaries (Hamel, 2000). In 2002, Chesbrough and Rosenbloom proposed a new perspective. A business model provides a system that takes over the technological characteristics and potential contributions, and then converts them to consumers and the market in capital inflows. The business model is designed as a device that mediates technological development and economic value creation. It communicates how a company generates revenue by specifying its position in the value chain (Chesbrough & Rosenbloom, 2002).

In 2004, Rappa believes that a business model is a way of doing business. All business models indicate what a company is doing to create value and how it is placed against the top and bottom partners in the value chain and the type of commitment they have with consumers to generate value (Rappa, 2004). Another approach is developed in 2006, exemplifying a business model by comparison with a heart. Just like a heart, a business model has two important functions, creating and capturing value. The first function defines a series of activities that will give rise to a new product or service, in a way that generates net

worth through various activities. The second function captures the value of a portion of these activities to develop a model (Chesbrough & Rosenbloom, 2002).

Al-Debei *et al.* considers the business model as an abstract representation of an organization, the business model includes financial arrangements designed and developed by the organization for present and future which the organization offers now or in the future (Al-Debei *et al.*, 2008). A new proposal for defining is that it states that a business model, from the point of view of the authors, is made up of interchangeable elements that put together can create and deliver value. Value creation is considered to be the most important (Johnson *et al.*, 2011).

Harvard Business Review publishes an article about business models in 2015. Andrea Ovans, senior editor of this publication, sums up in the article „What is a Business Model?“ Several important views on international business models. Thus, several views have been taken on this abstract concept, called the „business model“. The business model refers to the activities a company undertakes to do and what the company is not willing to do (Ovans, 2005). These business model issues have

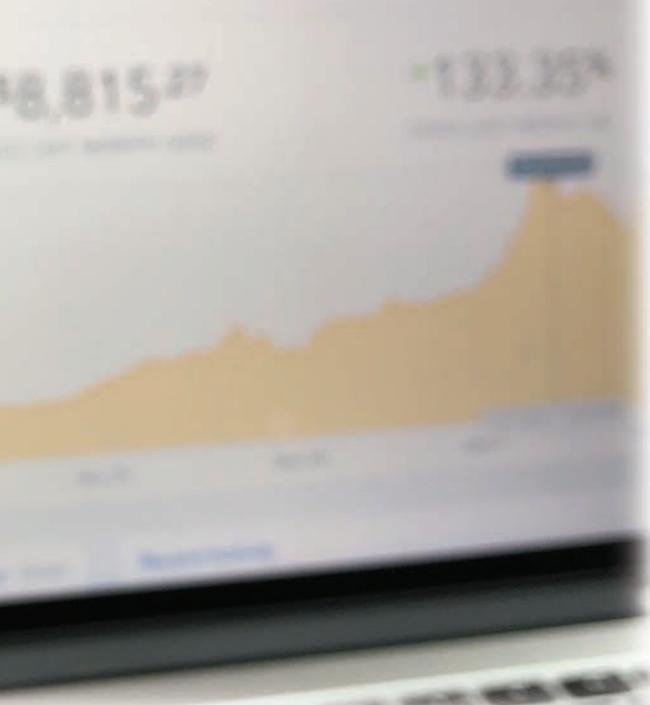


been published in the Harvard Business Review to substantiate the definition of a strategy. Harvard Business Review analyses the methods by which a company can re-define its strategy to highlight competitive advantages and sustainability, as market dynamics and technology dynamics are demanding productivity growth even at that time, quality and speed to drive profitability and win a competitive position. In defining the strategy, Michael E. Porter mentions a specific approach to managers focusing on critical business activities in exemplary companies, to leaders who want to make clear choices in the same companies that companies follow (Porter, 1996). The difference in approach and separation of leadership in an organization, mentioned by Michael E. Porter, denotes a more exacting specialization of management staff on two different levels. The first level relates to maintaining activity and achieving profit constantly, and the second level is where the leaders are found to be created and the strategy is improved in order to maintain the competitive organization in the medium term (Porter, 1996).

To have a viable business model, every business is needed to generate value and generate revenue. Barnes *et al.* describes the evolution of the term proposition of value, starting from the notion of a single selling proposition. This has led to companies being reoriented to explain to consumers the benefits of the product instead of the product's facilities. Experts believe the benefit arises when the facility solves a consumer problem (Barnes *et al.*, 2009). The original term was defined by Bower and Garda in 1985, which discusses the realization of promises of satisfaction (Bower & Garda, 1985). Lanning and Michaels built on this foundation consulting tools focused on creating value propositions. The value



proposition was then defined as a statement of benefits to a group of consumers at a price they want to pay (Lanning & Michaels, 1998). Simon Jelly *et al.* analysed these definitions and considered that value should be felt at all levels of dialogue between the organization and customers, then lead to the creation and development of offers and solutions. The approach must be coherent and consistent across the company's website, aimed at all business customers, in communications to different segments of customers or industry sectors, and to every individual working in the organization. The current approach was called the value proposition stack (Simmon *et al.*, 2017). The value stack proposition highlights how decision-making (embracing current operations, HR, IT, marketing, and sales) supports the consumer value proposition, industry value proposition, central propositions, and major customer issues. Because of these definitions, which deploy the business model concept it's clear that every business model is unique, even if all of them has some common characteristics.



## Research Method

The case study will consist in obtaining with the help of public database some industries where a new business can have a good opportunity, analysing the fastest growing companies from Europe. For the case study we will use the online database of Financial Times named „The complete list of Europe’s fastest growing companies”. This database contains the top growing companies around Europe. The ranking was made selecting the companies with revenue at least €100,000 in December 2012 and at least €1.5 million generated in 2015. All the companies included in the study are independent and have activity in one of the 31 European countries. All the companies are from Austria, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Monaco, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, United Kingdom. The authors mention that the company

growth rates are based on the revenue figures submitted by the companies in the respective national currency. For better comparability in the ranking the revenue figures were converted into euros. The average exchange rate for the financial year indicated by the company was used for this purpose. The compound annual growth rate (CAGR) was calculated with the formula with no. 1 (Stabe *et al.*, 2017).

$$(\text{Revenue 2015/Revenue 2012})^{(1/3)} - 1 = \text{CAGR (1)}$$

The absolute growth between 2012 and 2015 was calculated with the formula no. 2 (Stabe *et al.*, 2017), using the revenue from the first and last year of analysis.

$$(\text{Revenue 2015/Revenue 2012}) - 1 = \text{Growth rate (2)}$$

Because many business models can be described with many details, we will prefer making an analysis of the business sectors which are more attractive for entrepreneurs and after this to identify to most successful economy sectors in the period 2012-2015. The numbers obtained from this experiment could be used for choosing the industry where a new business can establish and grow in a few years.

First, we took the database and eliminate all the companies which don’t have a number of employees declared, because we need to eliminate all the data which can affect our study. After we had a clean database we analysed the data and obtained the results which can tell us in what industry are the most successful fast-growing businesses around the Europe, presented in Figure 1. This can be used for entrepreneurs to see which is the industry where they can invest for making a successful start-up. For making the research we used the Financial Times database, which includes the top of fast growing

companies (Stabe *et al.*, 2017). The formula used for determining the companies which grew fast is formula no.3, which explains how much is the acceleration of every company between the time interval used for analysis.

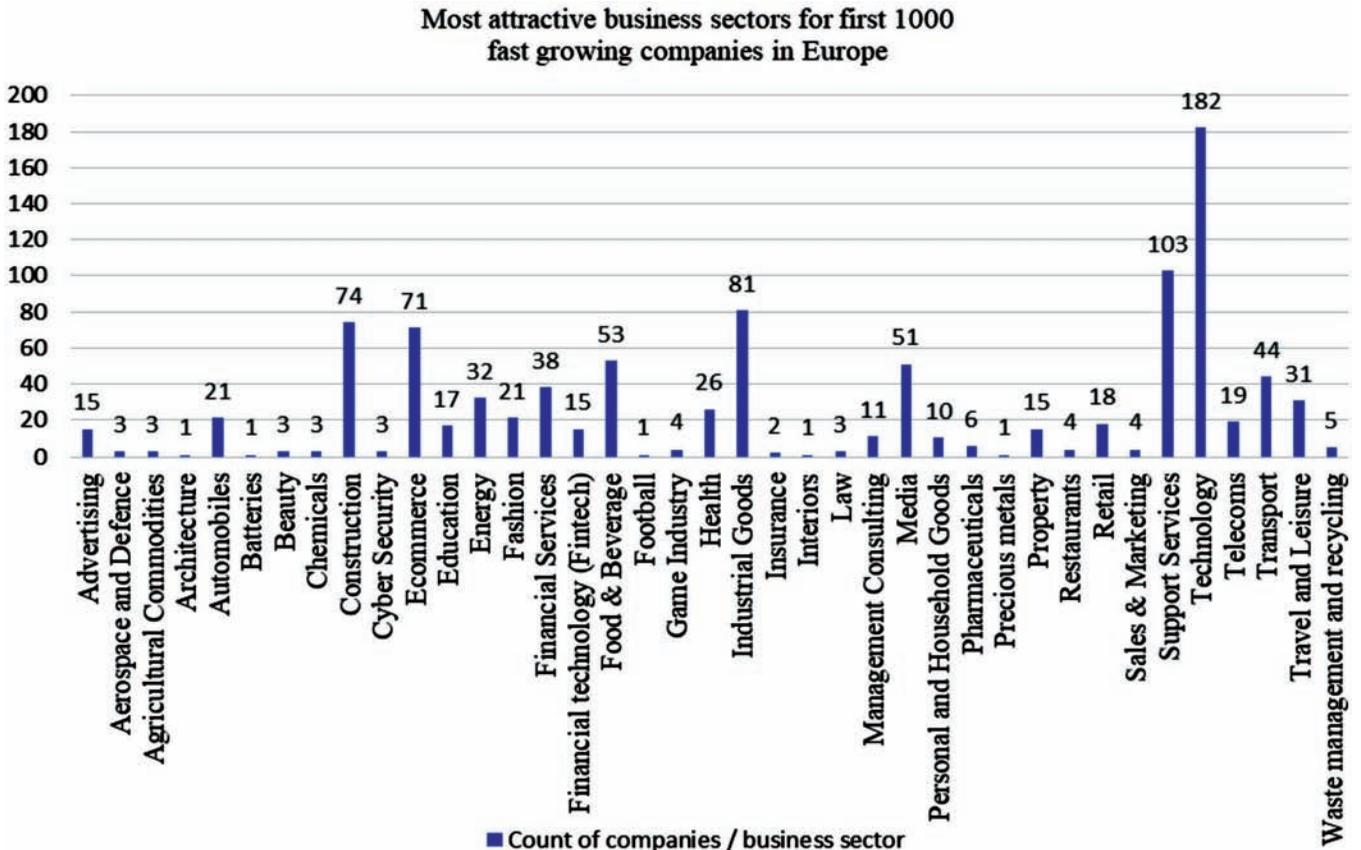
$$\text{Rate} = \text{Average growth rate/CAGR (3)}$$

For identifying the industries with the best growth, we made an average on every business sector, finding the number of companies listed in top 1000 companies from Europe, average number of employees and

revenue and also the indicators presented above. In the next part, we will present our research results and also our average results for all industries because is important to have some references to compare one industry with the companies listed in the top.

## Results

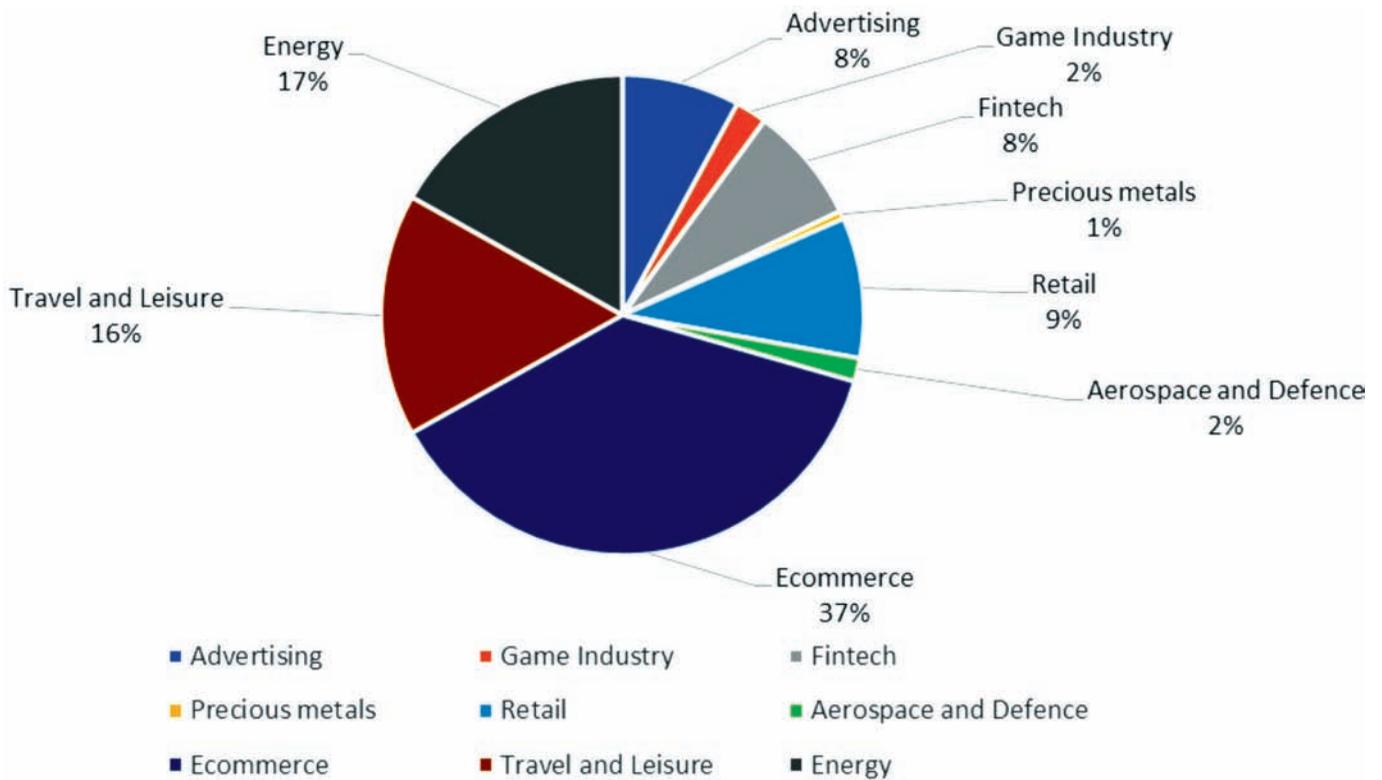
Our results will be presented below, we will start with Figure 1 where we can see which are the most popular sectors for fast growing companies in the last 3 years.



**Figure 1** – *Most attractive business sectors in Europe*  
(Source: Stabe *et al.*, 2017)

For identifying the most 10 attractive business sectors, we analysed the best performing sectors with the help of the CAGR formula, which help us to explain how much a company business increased in a

period, in our case the period was 3 years (2012-2015), period analysed in the database (Stabe *et al.*, 2017) and presented in figure 2 and table 1.



**Figure 2** – Share of fast growing companies by sector  
(Source: Stabe *et al.*, 2017)

**Table 1** – The best ten fast growing business sectors

Sector	Average of Revenue Growth (2012-2015)	Average CAGR 2012-2015	Average Revenue 2015	Average Employees	Average Revenue/Employee	Number of companies
Advertising	2095%	133%	13,523,067	76.60	228,310	15
Game Industry	1299%	118.08%	56,955,000	123.25	463,137	4
Fintech	1167%	108.36%	24,718,000	85.47	592,588	15
Precious metals	520%	83.70%	9,154,000	5.00	1,830,800	1
Retail	546%	78.09%	8,933,889	26.28	548,330	18
Aerospace and Defence	576%	76.40%	11,235,000	169.67	527,287	3
Ecommerce	621%	75.93%	66,623,803	254.76	415,904	71
Travel and Leisure	653%	75.26%	125,268,645	234.32	570,099	31
Energy	607%	74.87%	109,470,906	134.91	967,518	32

(Source: Stabe *et al.*, 2017)

For all the business sectors, the results are:

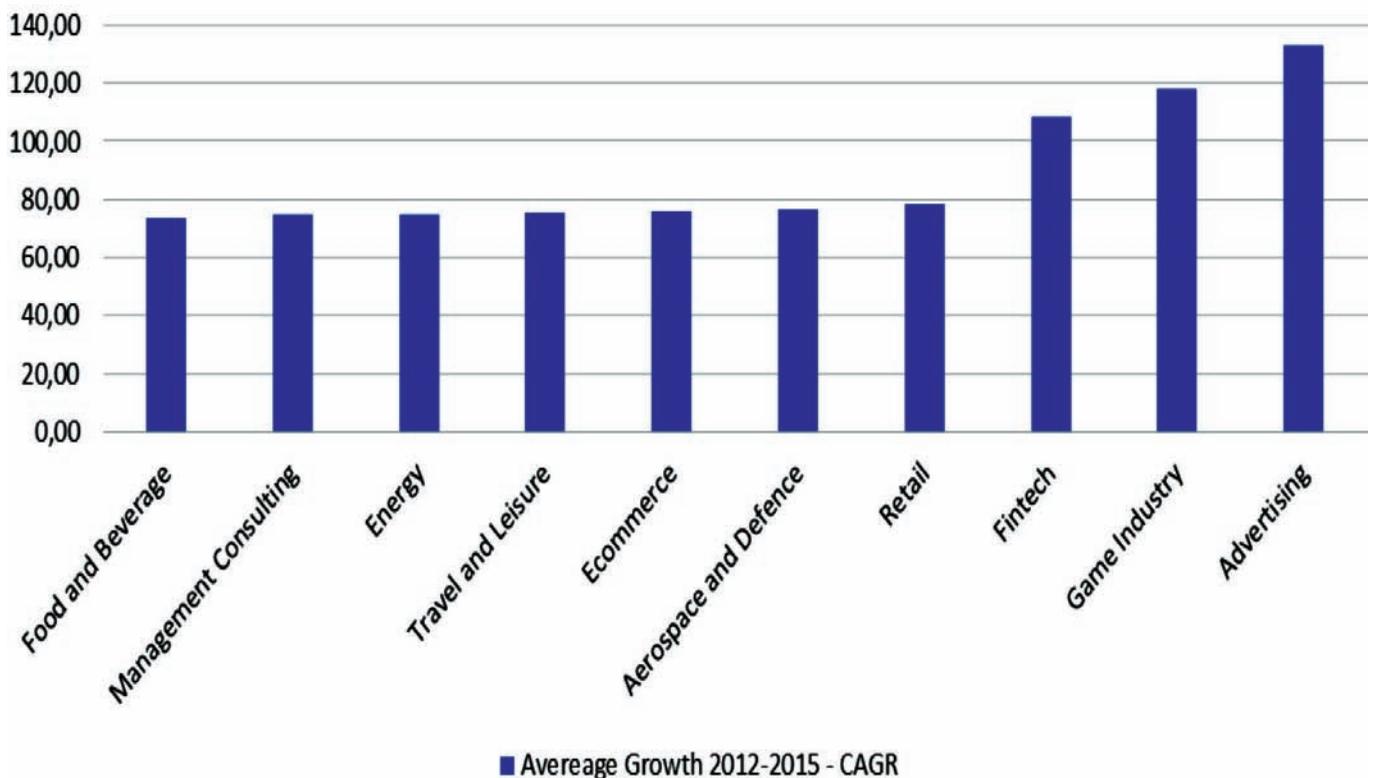
- Average of Revenue Growth (2012-2015) = 460%,
- Average CAGR 2012-2015 = 61%,
- Average revenue in 2015 = 32,721,266 €,
- Average employees = 108.58,
- Average revenue/employee = 2,251,092 €.

For obtaining some conclusion about other factors which can determine the factors which can determine a company to be fast growing, we tried to apply some regression analysis to the whole data set, trying to consider the number of employees as an important factor for having a revenue. All the tests have failed because of

a high standard error rate. This situation was generated probably because some of the business models included in the study have a bigger revenue selling services/products with a small value-added rate and others have smaller revenue per employ but have a bigger profit from supplying services. Going to the next step, we observed that in our research the database used had some differences in some industry between average revenue growth (2012/2015) and the CAGR growth (2012/2015).

We obtained the top 10 industries, where companies from Europe had a very good evolution starting from year 2012 until 2015. In figure 3 and table 2 we will see the industries which have a good evolution over time.

### Business sectors with best average growth 2012-2015 by CAGR



**Figure 3** – Most attractive business sectors with fast growing of revenue

(Source: Stabe *et al.*, 2017)

**Table 2** – Most attractive business sector with fast growing of revenue

Sector	Average of Revenue Growth (2012-2015)	Average CAGR 2012-2015	Rate Growth / CAGR	Average Revenue 2015	Average Employees	Average Revenue / Employee (Euro / 2015)	Number of companies
Advertising	2095%	133%	15.72	13,523,067	76.60	228,310	15
Game Industry	1299%	118.0800%	11.00	56,955,000	123.25	463,137	4
Fintech	1167%	108.3600%	10.77	24,718,000	85.47	592,588	15
Management Consulting	814%	74.4500%	10.93	37,846,091	84.46	343,485	11
Food and Beverage	794%	73.3100%	10.83	27,202,377	85.09	59,219,926	53
Travel and Leisure	653%	75.2600%	8.68	125,268,645	234.32	570,099	31
Ecommerce	621%	75.9300%	8.18	66,623,803	254.76	415,904	71
Energy	607%	74.8700%	8.11	109,470,906	134.91	967,518	32
Aerospace and Defence	576%	76.400%	7.54	11,235,000	169.67	527,287	3
Retail	546%	78.0900%	6.99	8,933,889	26.28	548,330	18

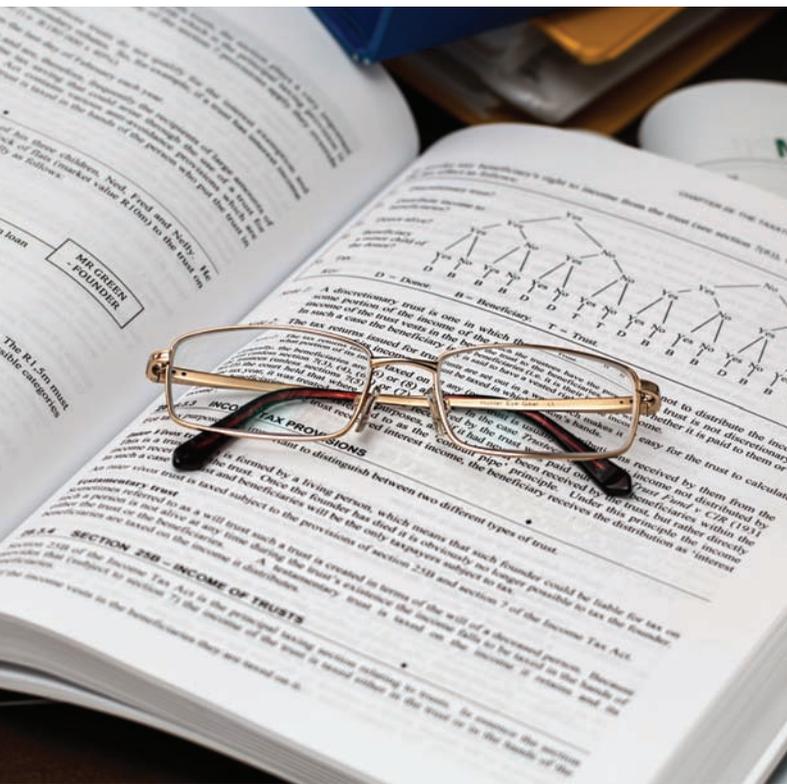
(Source: Stabe, *et al.*, 2017)

## Discussion

As we presented, the inclusion criteria are important for having a reliable list of companies, with a minimum revenue in the period of 2012-2015 and an independent activity. Martin Stabe *et al.* mentions that innovative and fast-growing companies are the driving force of the European economy in the 21st century. They generate jobs and sustain Europe's competitiveness. Seventy-eight of the companies on the list are based in London, making the British capital a hub for innovation and commerce in the EU even as the UK prepares to leave the bloc. Paris is second with 45 companies, followed by Milan with 34 and 32 in Berlin (Stabe, *et al.*, 2017).

In Table 1 we identified the best 10 fast growing business sectors, which include: advertising, game industry, financial technology, precious metals, aerospace and defence, ecommerce, travel, leisure and energy. Those business sectors had the best average revenue growth and the best

CAGR rate in 2012-2015. If we compare them to Table 2, we will see here the precious metals sector (represented by just one company from top 1000) disappeared and was replaced by the food and beverage category. Also, we can observe that the growth/CAGR rate changed the order and we can consider the most attractive business sectors are those 10, where we have a good ratio between these two factors. From the same table, we can observe that the food and beverage sectors has the biggest revenue per employee and in that sector, are many companies from top 1000. In the same report, we can also see that ecommerce sector has the biggest numbers of companies and the employees average is 3 times bigger than the food and beverage sector. Also, we can observe that average employees in the top fast-growing companies is between 26.28 and 254.76, maybe was expected that some companies to have more employees. The average employees number in the whole top is 136 people, this a low rate, conducting as to the idea that all companies from the top



trending industries we can observe that the top includes a big variety of business sectors, some of them existing for hundreds of years (for example food and beverage, travel and leisure, energy) and the others being new and appearing in the last decades (game industry, financial technology or ecommerce). For all companies, the revenue is important for growing the business but we couldn't find a pattern/correlation between the revenue and the number of employees or the growth rate. We had 5 business sectors (precious metals, football, architecture, interiors, batteries) which had just one company listed and it's interesting to see that from a top off 1000 companies, distributed on 40 sectors, there are 5 sectors which have just one company.

On the other hand, we expected to see on this analysis that the fast-growing companies are very young, but after making an average of the founding year we discovered that average founding year was 2004. Also, we calculated the median, and the median of the top 1000 companies with a fast grow is 2008. These results can conduct as to the idea that most of the company included in the study are not so young, as we expected. Even if the data are exact and the Financial Times editors made their best for creating that set of data which we processed for identifying the most attractive sectors of the fast-growing businesses, for us it will be better to analyse by adding other information about these companies. If we could obtain sensible financial data like the cost with the employees, value of the payed taxes and the cost with the providers of products and services, we could have a better picture of how the most competitive business models succeed in the European market.

are SME (small and medium enterprises). In the top there are 11 companies which just 1 employee and a few companies with more than 1000 employees. The company from the top with the highest employees number is Zalando which had 9987 employees in 2015. The company activates in the ecommerce domain and has the rank 640. As we sawed, most of the fast-growing companies are in United Kingdom but have activity in many countries, for example, Zalando has online stores in 15 countries from Europe.

We can split industries in two main categories, by the type of goods expected to be delivered, tangible good or intangible good/services. The tangible goods sector will include food and beverage, energy, ecommerce, aerospace and Defence and Retail. The second category, which will include the intangible good or services can include advertising, game industry, financial technology, management consulting, travel and leisure. As a first picture of

## Conclusions

Observing how the entrepreneurship and the business models are defined and seeing the results of the fast-growing companies in Europe we have some conclusions which can help some entrepreneurs to identify the best industry to start a business or were to invest hoping that they will have a good rate from their funding activities. From our point of view is better to invest in a new idea, even if the risk is higher, because a good and fresh business model can attract more customers. When investing in a business first of all we need to see that the key success factors from that industry are corresponding with the business model and if the business model has some key indicators for monitoring the performance. All this study was made to explain how a business model can be defined, how it works and which are the winners when competing with rivalry for being in the top of the list.

It's important to know that every company included in the list has some characteristics necessary to be better than the rivals: selling more products or services and also having a team which can make things to go faster. We were surprised to see in the top 3 fast growing sectors the advertising, game industry and financial technology. These are industries with a big value added and also can grow fast because they can replicate their products/services fast and with less money, so the top is driven by the companies who are working with intangibles goods, practically they use human resources more than the raw materials.

We can't conclude with an exact decision on which is the most fast-growing business sector for the future, but we can



think about the most attractive sectors and we can see how the companies included in the research are developing their activities, their presence in the market and the visibility comparing with other rivals.

Depending on the analysed sector of European economy, we should make a quality analyse for every sector. This is the solution for discovering new opportunities. From my opinion, the number of companies included in every sector can give us some information about the concurrence. For example, a sector where are less than five companies can tell us that is very hard to make a viable business model or that the opportunity is still on the market. In a sector like food and beverage or e-commerce will be many competitors and every new start-up needs a performant and innovative business model to extend and go to the breakeven point.

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# The Use of Performance Management Systems

**Olivia Doina Negoită**

University POLITEHNICA of Bucharest, Romania

Abstract

*Performance management consists of a set of objectives with that each employee can be measured. It also refers to learning and development for higher performance in the workplace. Each employee should be motivated to improve the skills, abilities, competencies, development and delivery of results. In this research paper, the author aims at presenting the benefits obtained by a company from applying a performance management system. For the analysis, the author chose to use a qualitative approach by interviewing several human resources managers from Romanian companies regarding their experience with such systems.*

**Keywords:** performance management systems, human resources management

## Introduction

Performance management, also known as the shortened version as PM, contains a series of actions performed which ensure that goals are thoroughly being achieved in an effective and efficient manner. Performance management focuses on the performance of an organization, for example, a department, employee, or even processes of developing a new product or service. (Otley, 1999, p. 363-382). PM can also be viewed as a process by which organizations can concentrate and focus their resources, systems, and employees on strategic objectives and/or priorities. The Components of a Performance Management System, are a set of practices oriented to put in place an effective system of management aimed at performance.





Further will be presented some of the possible components of a Performance Management System with the mention that for achieving such a system applying all the below is not explicitly mandatory. A system is effective if it achieves its goals with the utmost efficiency and if it accomplishes that with only a select few components then it does not mean it is not effective. A *performance management* system includes and may not be limited to the following practices:

1. Develop clear job descriptions using an employee recruitment plan that identifies the selection team;
2. Recruit potential employees and select the most qualified to participate in interviews onsite;
3. Conduct interviews to narrow down your pool of candidates;
4. Hold multiple additional meetings, as needed, to get to know your candidates' strengths, weaknesses, and abilities to contribute what you need. Use potential employee testing and assignments where they make sense for the position that you are filling;

5. Select appropriate people using a comprehensive employee selection process to identify the most qualified candidate who has the best cultural fit and job fit that you need;
6. Offer your selected candidate the job and negotiate the terms and conditions of employment including salary, benefits, paid time off, and other organizational perks;
7. Welcome the new employee to your organization;
8. Provide effective new employee orientation, assign a mentor, and integrate your new employee into the organization and its culture;
9. Negotiate requirements and accomplishment-based performance standards, outcomes, and measures between the employee and his or her new manager;
10. Provide ongoing education and training as needed;
11. Provide on-going coaching and feedback;
12. Conduct quarterly performance development planning discussions;
13. Design effective compensation and recognition systems that reward people for their ongoing contributions;
14. Provide promotional/career development opportunities including lateral moves, transfers, and job shadowing for staff;
15. Assist with exit interviews to understand WHY valued employees leave the organization.

## Areas of Application

This type of management can be applied also within varied domains such as Information Technology, Business, Operational areas or Marketing.

### **Performance Management in IT.**

An information technology implementation of performance management methods is usually referred to as IT performance management. This includes the so-called Application Performance Management. IT performance management is the supervision of an organization's information technology (IT) infrastructure to ensure that key performance indicators (KPIs), service levels and budgets are in compliance with the organization's goals. The term encompasses purchasing decisions, the standardization of IT equipment and guidance on capital and human resources. IT performance encompasses areas such as general system performance, server virtualization and cloud management, application performance monitoring (APM), network management and automation (or self-learning) management. Performance management tools are especially necessary as more aspects of an IT environment become virtualized and more complex.

**Performance Management in Business.** The business performance management approach focuses on the overall company's situation, as opposed to focusing on individual business areas. The goal is to increase the overall performance of the company. This implies an alignment of strategic and operational objectives and activities to control a company's performance. The goal is to give those in charge a tool to determine and control the current position of the company. What is needed is the determination of a suitable, as far as a possible risk-adjusted performance measure (performance management) as a measure of success, which can be derived from a scale of results (for example the expected value of the profit) and a risk measure (for example standard deviation of the profit). Value-based management



concepts often use economic value-added or directly company value as a performance measure. The aggregated risk scope is usually recorded using the risk-adjusted cost of capital.

**Operational Performance management.** Operational performance management is the alignment of different business lines within a company to improve the common business goal. This is achieved by optimizing the operational processes of the business units. In manufacturing, OPM software integrates and analyzes data from a variety of plant sources and translates raw data feeds into actionable information. The data is packaged as exception reports and key performance indicator (KPI) dashboards so that the information can be viewed in context. OPM software allows manufacturers to establish links „between operations KPIs and critical business metrics. As a result, they gain insight into everything from asset utilization to machine uptime and plant-floor productivity while also monitoring energy usage, uncovering the cause of quality problems, and ensuring consistent production across multiple lines (Somashekar, 2014).

**Performance Management in Marketing.** Marketing performance management is a specialization of performance management in marketing. It focuses on marketing performance, effectiveness and their return on investment. Marketing performance management (MPM) encompasses the technologies and services for solutions that support marketing's ability to gain access to insights, analyze data, make predictions, and optimize marketing programs, campaigns, and resources. At the foundational level, MPM includes a data repository, BI tools, and analytical workbenches. At the strategic level, MPM provides role-based access to information and KPIs through dashboards, visualization, point-and-click analysis, modeling, simulation, and optimization.

### Case Study

During the qualitative research study, the author interviewed several human resources managers from Romanian companies, trying to find out what performance management systems they use and

how effective are they. The experience of the respondents helps the author built the characteristics of an effective manager.

The first responsibility of a manager that wants to be effective is to achieve results. This is one of the most important concepts related to being a manager. This means that worrying about the team members don't come first. The first responsibility is to deliver whatever results the organization expects. For many managers, this creates a problem. There aren't many managers that can name their top five key results that they owe their organization this year. The only way a manager can do that is if he or she has quantified goals in numbers and percentages.

The problem regarding not having clearly delineated responsibilities is that there isn't an intelligent choice to make about where to focus. If goals seem difficult to list, then the manager should ask their boss what is expected of him or her. A lot of managers fear such a conversation, thinking that if there are no measures, they can't be used against them, but that type of thinking is shortsighted. There



are always measures, and even if the manager doesn't know them, they can still be used against him or her. Their boss is privately and subjectively evaluating them.

Results come first. Managers who produce great results have more successful careers than those who produce average results, but it mustn't be forgotten the fact that when the purposes justify the ways for managers, the problem occurs with workers who report to them.

All the interviews also mentioned the importance of negotiating across cultural barriers in a global trade environment. Negotiators should find a balance between their personal interests and objectives and the counterparts' goals and expectations and find the best negotiation strategies in order to obtain the desired output in a win-win agreement. Multiculturalism should be seen as an advantage for creating strong connections between organizations from different cultures, using pleasant conversations while building trust. It is recommended for a negotiator to be exposed to as many different cultures as possible, in order to gain experience and to be able to find opportunities for integrative deals based on cultural differences. The ideas presented in this paper are useful for both the academic researchers and for the companies' representatives, that want to assure the desired negotiation outcomes. (Ioanid, 2014, p. 5)

The second responsibility as a manager is to retain their people. Effectively managed modern organizations now measure retention in addition to results when they are evaluating a manager. It is intended to be a brake against an unrelenting results focus. They want to ensure that a manager's team members don't leave the organization. Replacing employees is expensive. When someone leaves, there appears a



problem with the work plan, the cost of interviewing counting in both money and time, the probability to pay a higher salary in case of a replacement, also the time and cost to train the new employee, and the cost of less productivity by the new employee until that person can match the quality and quantity of work of the person who has left. Therefore, for today's manager is not enough to get results.

The four critical behaviours that an effective manager engages in to produce results and retain team members are the following: To get know the people; To communicate about performance; To ask for more; To push work down. When asked what they focus on when they meet to review the talent and results of their managers, the retention of employees is always at the heart of the discussion. Thus, managers who do all of the above, almost fulfil their responsibilities better than other managers do and they can be rated as effective managers.



## Conclusion

In conclusion, any company could obtain higher benefits if they would implement an effective performance system that motivates employees to do their best and also that offers a fair reward system so that all process would be transparent.

## Acknowledgement

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# Introducing Work Cells in Cadastral Services

**Radu-Florian Belloiu (1), Cezar Scarlat (2), Cristian Niculescu (2)**

(1) Geoagri Cadastru Bucharest, Romania, (2) University POLITEHNICA of Bucharest, Romania

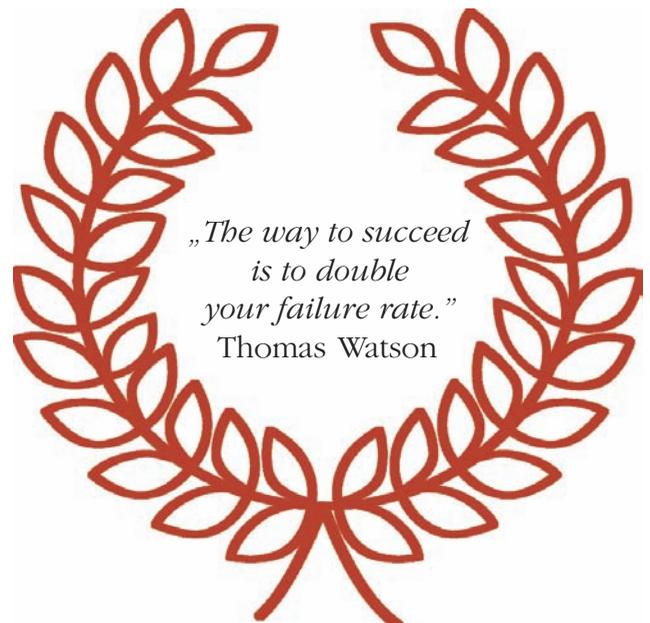
Abstract

*In a very competitive market like the cadastral services market is in Romania every step towards obtaining and maintaining a durable competitive advantage is a battle on its own. Modern management tools and methodologies are being used in that direction. The current study presents one part of the Lean transformation of a cadastral services company, the introduction of work cells in the process of composing the cadastral file. The study started with an analysis of the process and proposed a major restructuring by implementing work cells. Based on a thorough understanding of the layout and the workload for each process step, this initiative transformed the process and improved its output. The result was a significant increase in the volume of cadastral files with the same workforce.*

**Keywords:** lean, cadaster services, work cells

## Introduction

Cadastral services in Romania are of great importance due to several characteristics of the land market. First of all, the process of nationalized property retrocession after the 1989 Romanian revolution was poorly implemented and, in fact, is not complete even after 25 years. Second, only a small fraction of properties in Romania is registered in the land book; a report from July 2017 issued by the National Agency for Cadaster and Land Registration showed that only 25% of the total properties in Romania are registered in the land book (ANCPI, 2017). Third, under Romanian law, all real estate transactions are valid only if the properties are registered in





## Similar Studies

Even if Lean has a proven record in the manufacturing world, its use in the service sector is still gaining momentum. Several studies tackled lean implementation in services. Making the transition from manufacturing to service, Hasle studies how Lean implementation is supported by the employees (Hasle, 2014). DeBusk proposes that support services in a company implementing Lean need to also be Lean in order to take full benefits (DeBusk, 2015).

Hicks *et al.* study how Lean can be used in order to better design workflows in healthcare organizations (Hicks *et al.*, 2015). Abdelhadi also studies how Lean affects the healthcare industry, with a distinct focus on reducing lead time, identifying, and using bottlenecks in the process (Abdelhadi, 2015). Wang *et al.* examine the medical process from the waiting time perspective. Studying an emergency department, they propose a radical transformation by optimizing workflows and tasks with a clear goal of reducing waiting time for patients (Wang *et al.*, 2015).

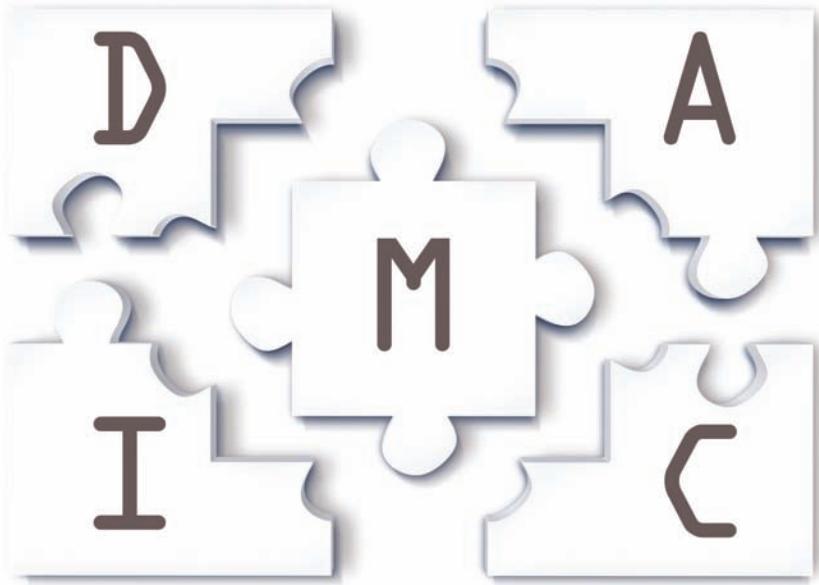
Bateman *et al.* study how Lean was implemented in the British Ministry of Defence Tornado project (Bateman, *et al.*, 2014). In public services, Barraza *et al.* study the effect of Lean and Kaizen implementation in Spanish local municipality councils (Barraza, *et al.*, 2009). Also in public services, Agbodzakey and McCue examine the need for using Lean principles in public acquisitions (Agbodzakey & McCue, 2015).

Other than its application in administration and healthcare industry, not much literature is dedicated to Lean use for other service industries, cadaster services included.

the land book; the public notary requires the land book registration documents in order to validate the transaction. Last but not least, there is growing interest from local and foreign investors in buying real estate in Romania.

Taking all these facts into consideration, the market for cadastral services in Romania is a very dynamic and competitive one. The key success factor for any company trying to compete in this market is the speed of delivery.

The research was performed in a Romanian company, founded in 2010, that has been providing cadastral services mainly for agricultural land. Due to the competitiveness of the market, the company management implemented several measures in order to reach success. At the strategic level, a key process indicators control matrix was implemented (Iorga, 2013), (Iorga & Scarlat, 2012). This enabled the organization to transform its process from an unstructured to a structured and stable one. On this base, the management team was assigned the task of speeding the business process. Lean was the methodology chosen. This research covers the period implementation of work cells in the process of composing the cadastral file for the agricultural land registration. The goal of this endeavor was to increase the output of cadastral files by at least 10%.



## Lean Process

Lean is an operational methodology that has at its core waste reduction. Fujio Cho, the Toyota CEO, defined waste as „anything other than the minimum amount of equipment, materials, parts, space, and worker’s time, which are absolutely essential to add value to the product” (Suzaki, 1987). Lean emerged as a necessity for the Japanese companies ruined by the Second World War. Pressed by the lack of resources these companies transformed their problems into opportunities, raising their methods almost at philosophy status. Toyota was the company that made this approach known to the entire world, when in the '80 it started to conquer the American automobile market. The Toyota Production System (TPS) was the name by which the company promoted its approach.

The first companies that felt Toyota’s power were the Big Three from Detroit. Not being able to neglect the Japanese offensive, they started to look at what made Toyota so competitive. What resulted was Just in Time (JIT) or Lean (Womack & Jones, 2003).

**1. Lean principles.** Lean proposes a set of basic principles (Womack & Jones, 2003) aimed at reaching the goal – waste reduction.

**Lead time reduction.** In a globalized market, in which the customers have access to information and to a multitude of suppliers for the products or services they need, the delivery time is crucial. The ideal case from the customer’s point of view is to get his/her product straight away. Thus, the lead time reduction is essential for on-time delivery or for delivery faster than competitors. In the cadastral service sector speed is as important as price, from the customer’s point of view. This, corroborated by the phenomenon of cost reduction, leads to a need to reduce lead times.

**Inventory reduction.** Although for an average person, inventories might look like a good thing, in fact they are one of the worst things for an organization. Some of the effects of large inventories are: Block money (materials, work hours, etc.); Can get lost or stolen; Can get damaged; Can become obsolete; Take up space; Hide defects. Even if it is harder to spot inventory in a servicing company, it exists and its effects are the same. For example, cadastral files that are not filled in with the Cadastral Office as soon as they are ready to represent inventory.

**Synchronization with the customer’s rate of demand.** The Voice of the Customer (VOC) needs to be seen as the trigger for the entire business process. This is even of greater importance in the case of service providers, because of the intangible nature of services, the need for customer involvement, and the impossibility of storing to compensate the demand variability. Besides the speed of execution, customers have personal priorities

regarding cadastral services. For example, if a customer has more land plots that need cadaster, he may want to prioritize the larger plots.

**Using the pull system to control the process.** The entire process is controlled by pulling the product from the end up to the beginning. The customer demand rate is the trigger that sets the rhythm. Every process step gets its pieces pulled by the subsequent step and in turn pulls the pieces from the preceding step. This system ensures that work in progress is minimal. On the other hand any stoppage in one step makes the entire process to stop.

In cadaster services, this can be used in order to minimize inventories. For example, if cadastral measurements are not needed at one point, it is not efficient to take them just because they will be used in the future.

**Lot size reduction.** Lead time is influenced by the operable lot size. The smaller the lot sizes the shorter the lead time. The ideal scenario is „one piece flow” meaning that the lot size is one. Also, with smaller lot sizes work in progress is kept to a minimum. In most cases reducing lot sizes generate the need for a reduction in set-up times. If a process produces several types of products, then the time needed to set-up the machines becomes an important

factor in determining lead time. In cadastral services, large lot sizes affect the response time from the Cadastral Offices, by greatly reducing it.

**Right the first time.** The cost induced by poor quality can greatly influence an organization. The ideal is „zero defects”. Even if zero is not possible, the goal is to have stable and robust processes with very few defects. This means balancing the costs incurred by quality. On one side there are the costs of control, comprising prevention and appraisal costs, on the other there are the costs of the failure of control comprising internal failure costs and external failure costs. Beside the internal failure costs that affect overall profitability, every external failure means additional costs incurred for rework, including additional taxes that the customer might enforce the service provider to pay.

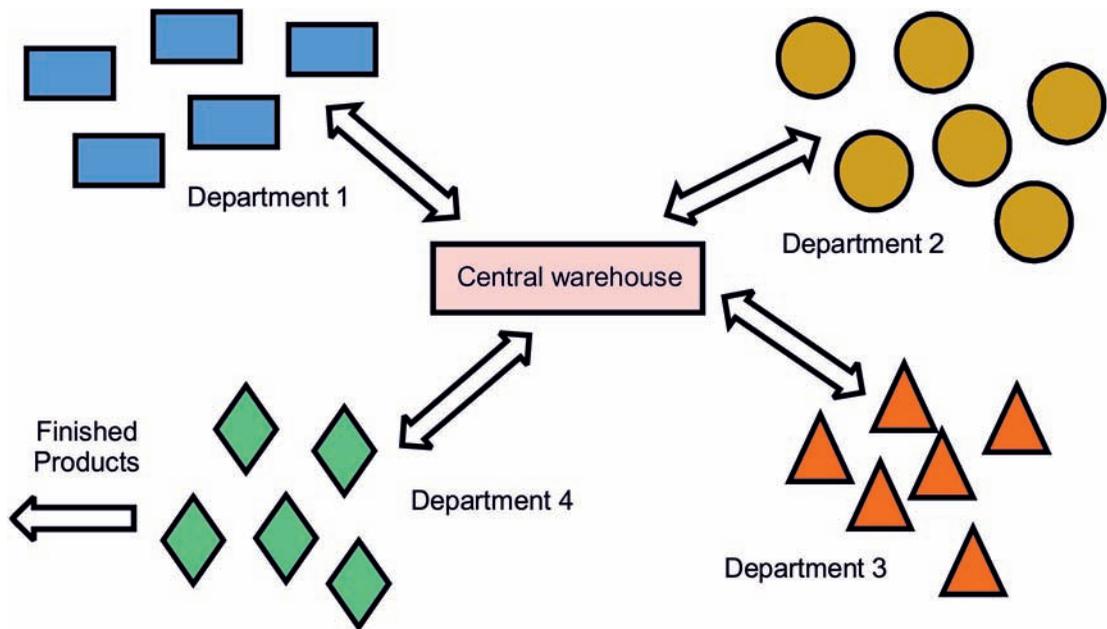
**Work cell introduction.** The main benefits of redesigning the process using work cells are: Reduced material transportation from one process step to another; Quick feedback; Improved team work; Reduced work in progress; Improved visual control.

**No non value added activities.** It is one of the most important actions taken and also one of the most sensitive because in most cases it means restructuring and reallocation of resources. The goal is to

have a process that has only value-added steps, and minimal waste.

As in production, every now necessary process step in a cadastral servicing company affects the speed of the process.

**2. Introducing work cells.** One of the core concepts in Lean is redesigning the process flows by introducing work cells. In the classical layout, from the production era, the activities were grouped by the type of machine that performed the activity, in departments. An example of such layout is presented in Figure 1.



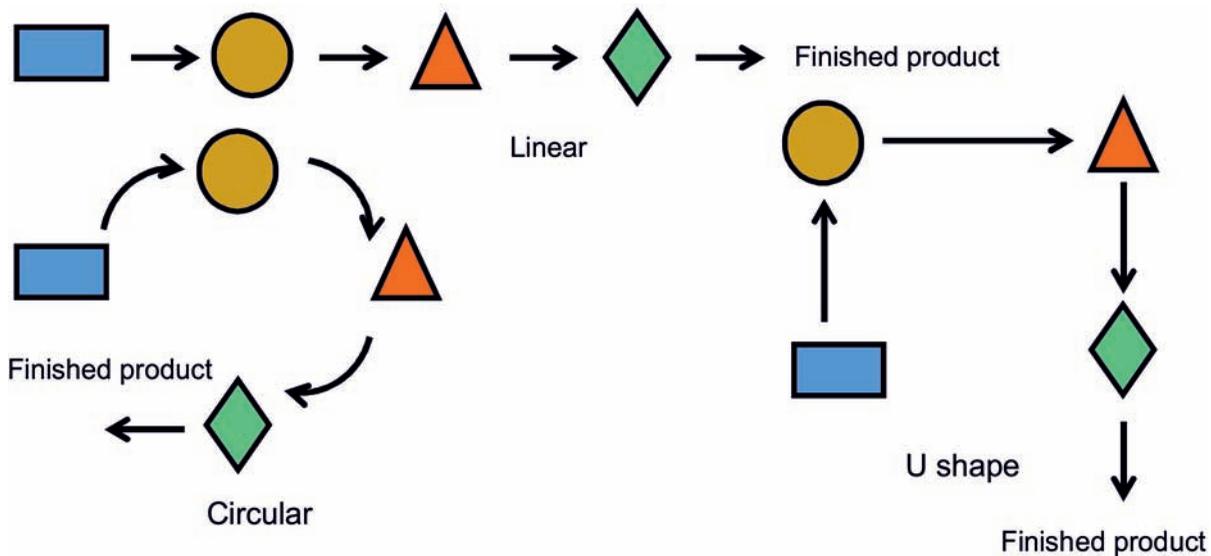
**Figure 1** – Example of classical layout by type of activity  
(Source: adapted after Black & Hunter, 2003)

In order to streamline the process, Lean proposes a radical redesign of the process by introducing work cells. This practically means building „mini-factories” inside the factory, capable of delivering subassemblies of finished products with great flexibility. Thus, the work cell needs to comprise all the machines needed to produce the sub-assembly or finished product. The work cell type may vary according to necessity.

In this example, the machines or equipment that performed the same type of operation were grouped into departments, represented by the same type of units. All necessary elements (raw materials, parts, subassemblies) were sent to and taken from a central warehouse that controlled material release and works in progress management. One of the major drawbacks of this type of layout is that it generates large work in progress, making the process inflexible to changes – spec modifications, change in demand or change in delivery time.

Some basic work cell layouts are presented in Figure 2.

All work cells, no matter the layout, bring the following advantages: Reduce transportation of material; Reduce work in progress; Reduce motion of people involved in the process; Reduce worker waiting time; Reduce overproduction; Reduce over processing; Reduce defects.



**Figure 2** – Example of work cell layouts  
 (Source: adapted after Black & Hunter, 2003)

More than these, work cells can bring advantages when a process is producing different product families. Although the basic fabrication steps may be similar, two or more product families have different characteristics. These differences generate more variability in the process than in the case of only one product being produced, due to multiple set ups, device changes, etc. Work cells can bring value to the process by virtue of specialization. If each product family had a dedicated work cell with specialized personnel, variability would be reduced.

**3. Work cells in services.** Even if Lean was born as an industrial initiative, it has since brought value to the service industry. Major improvements were obtained in the banking sector from the derived synergies of Lean and Six Sigma implementation (Sunder, 2016) and by investigating Lean benefits and risks (Gong & Janssen, 2015). This is also true in the case of work cells. Taking into consideration the differences between goods and services, the advantages of Lean can be seen in Table 1 (Maaseidvaag, n.d.).

**Table 1** – Work cell benefits in goods versus services

Goods	Services
Reduce transportation of material	Reduce transportation of information
Reduce work in progress	Reduce the number of customers waiting
Reduce motion of people involved in the process	Reduce motion of people and customers involved in the process
Reduce worker waiting time	Reduce worker and customer waiting time
Reduce overproduction	Not applicable
Reduce over processing	Reduce lost customer needs
Reduce defects	Reduce defects

## Introducing Work Cells

The research continued previous studies made by Iorga regarding introducing a key process indicators control matrix, in order to transform the process from an unstructured one to a stable and mature process (Iorga & Scarlat, 2012, Iorga, 2013). After reaching the stable and mature stage, the process was performing at a high level. However, as the company's profitability was dependent on output volume, further improvements were needed in order to increase it.

The case study concentrated on evaluating the impact of introducing work cells in the back-office part of the activity, the

drawing up of the cadastral file. One of the major indicators for the company's management was the output volume in a time unit. The goal was to increase the output by at least 10% by redesigning the process.

**1. The process.** The process is presented in Figure 3. This study concentrated only on the activities performed by the cadaster engineers and did not take into consideration the activities performed by the field team. For the ease in representation, the following acronyms were used: C – plot contour, R – plot record, PP – parceling plan, PIT – parcel frame plan, PAD – parcel placement and demarcation plan.

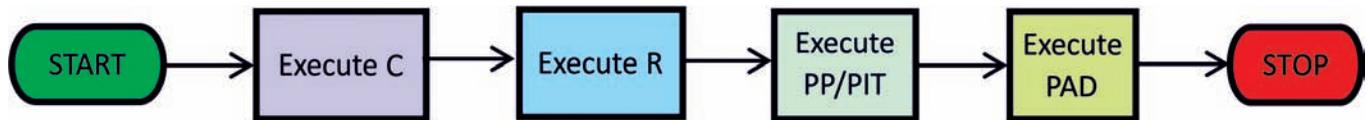


Figure 3 – Process map

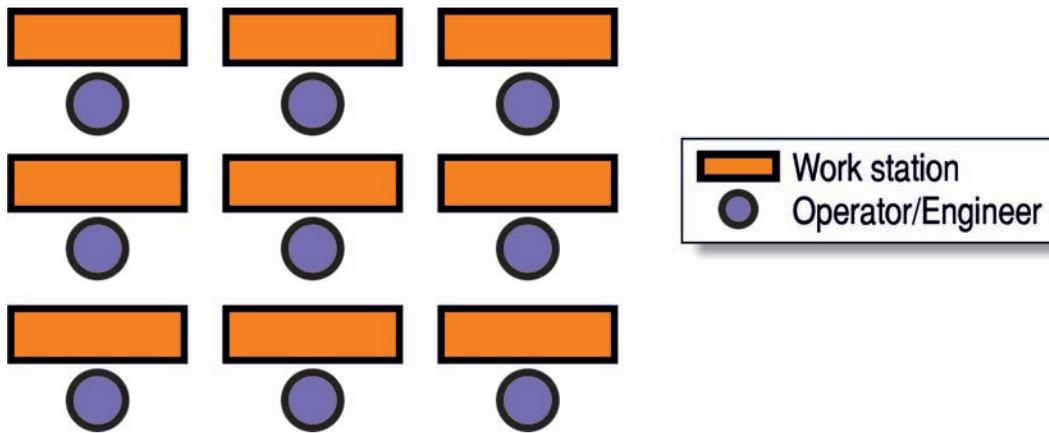
The main process steps in the process were:

- Execute C – the engineer identifies the parcel position on the map inside the agricultural plot and draws the plot contour
- Execute R – the engineer compounds the plot record, by listing all the land-owners in the plot of interest according to position and neighbors
- Execute PP/PIT – according to each county characteristic, the engineer adds to the already drawn contour the specific cadastral elements (grid, distances, measurements, etc.)
- Execute PAD – the engineer draws the parcel placement and demarcation plan based on the parceling plan or the parcel frame plan.

Before the redesign project started, each of the nine engineers involved in the process, executed all the process steps described in Figure 3. All the engineers were trained and had the knowledge and abilities to execute all the process steps. However, each of them excelled at some steps and had difficulties with others.

Although the entire process of cadaster and land book registration is a service providing one, the studied part has all the characteristics of an industrial one. Thus, the physical layout of work stations is important due to communication needs. In the initial setting, in which each engineer executed all the process steps, the physical layout is described in Figure 4.

Because all the process steps are performed by the same operator, the layout is a classical one that does not encourage communication.



**Figure 4** – *Initial layout*

**2. Process Redesign.** The restructuring started with a work load analysis. For an entire week the engineers were monitored

and all the process steps identified in Figure 3 were timed. The average values are presented in Table 2.

**Table 2** – *Process steps average duration*

Process step	Average duration (hours)
Execute C	2
Execute R	2
Execute PP/PIT	2
Execute PAD	1

More observations were made during the monitoring week:

- The plot contour (C) and plot record (R) were dependent on one another; thus, the decision was taken that these two steps were to be executed by one operator
- The parceling plan (PP)/parcel frame plan (PIT) and the parcel placement and demarcation plan (PAD) were dependent on one another; thus, the decision was taken that these two steps were to be executed by one operator.

Taking into consideration the average duration and the process dependencies, the work cell characteristics were defined:

- The 9 engineers will form 3 work cells of 3 engineers each
- The same engineer will execute the plot contour (C) and plot record (R)
- The same engineer will execute the parceling plan (PP)/parcel frame plan (PIT) and the parcel placement and demarcation plan (PAD)
- From the three work cell members, two will execute C and R and the third PP/PIT and PAD
- Because the first two operators will finish the assigned work faster than the third operator, one of them will cross to PP/PIT and PAD execution when the work in progress exceeds 5 files.

These characteristics induced the need for a change in the physical layout. The

new proposed layout is presented in Figure 5.

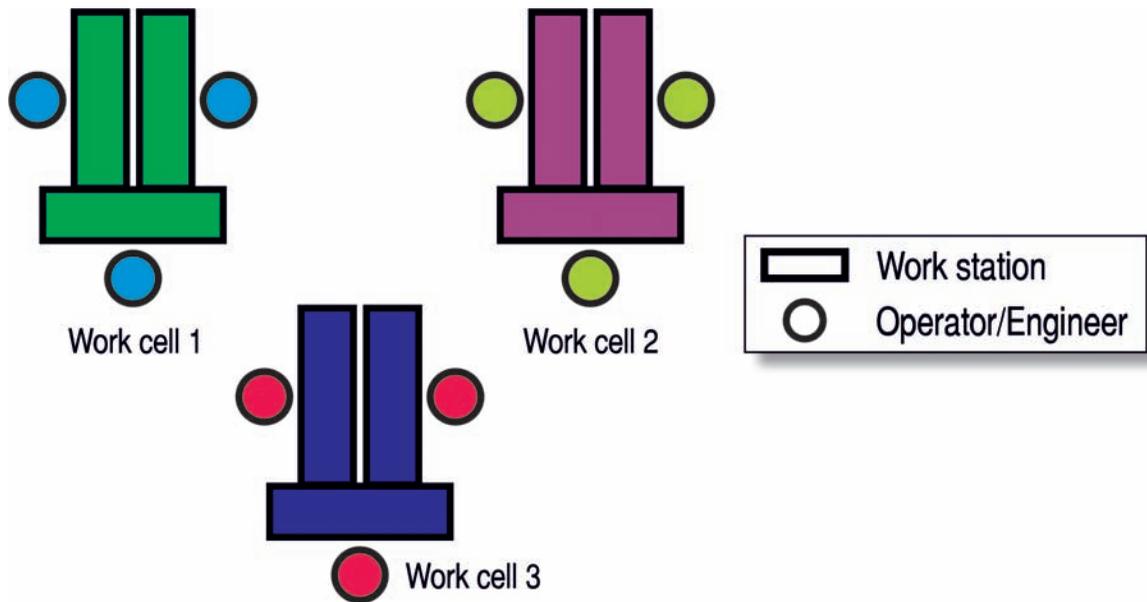


Figure 5 – Work cell layout

**3. Results.** In order to best compare the processes (before and after work cell introduction) the outcome was measured

for 12 months before and after the introduction of the work cells. The results are presented in Figure 6.

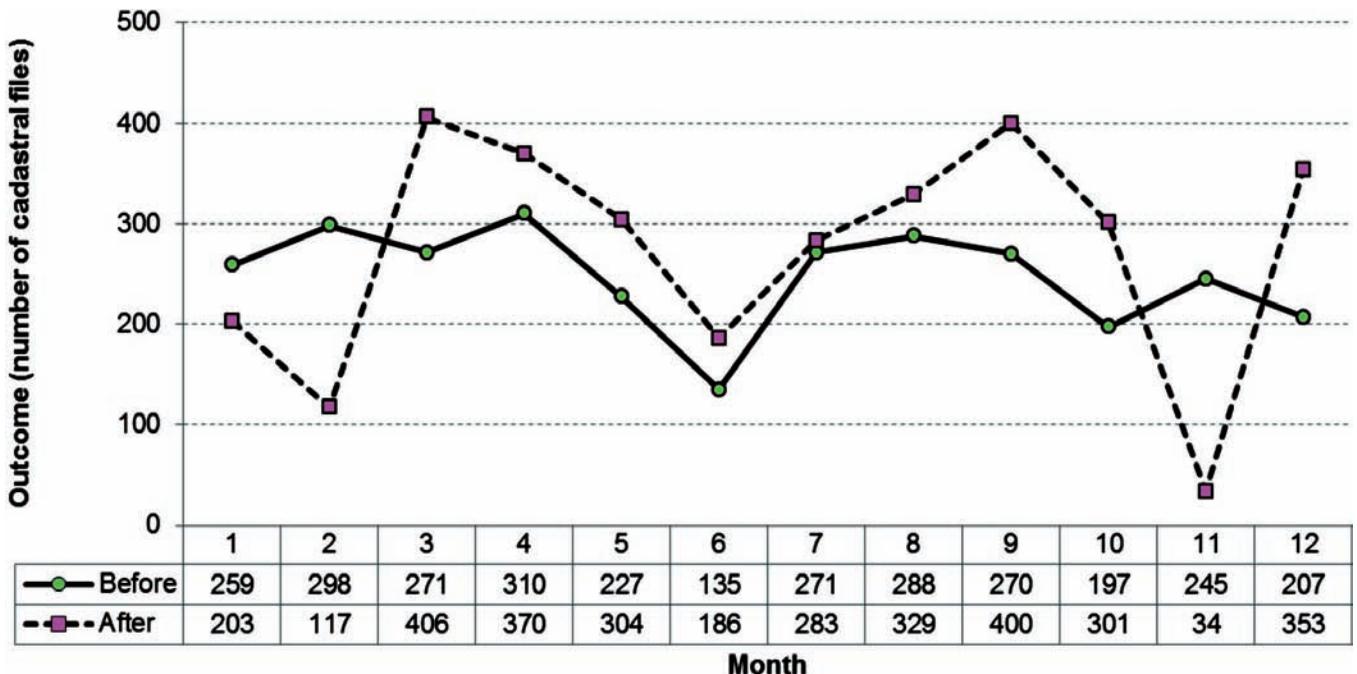


Figure 6 – Outcome comparison

Comparing the process outcome after the work cell introduction with the previous one, it can be observed that:

- There is an increase of 10% in the average monthly output, from 248 to 273 files;
- In the first two months after work cell introduction the results were significantly lower than the same month in the previous year; this can be explained by the operators needing some time to adjust to the changes in the process;
- The result in the 11<sup>th</sup> month (from 245 to 34 files; a decrease of almost 90%) was due to change in regulations.

## Conclusions

Taking into consideration the 10% increase in output by redesigning the process, it can be concluded that work cell

introduction can be very useful also in servicing companies.

However, like the two months post-implementation show, before any change some training should be provided, tailored to the industry specifics if the process cannot be interrupted.

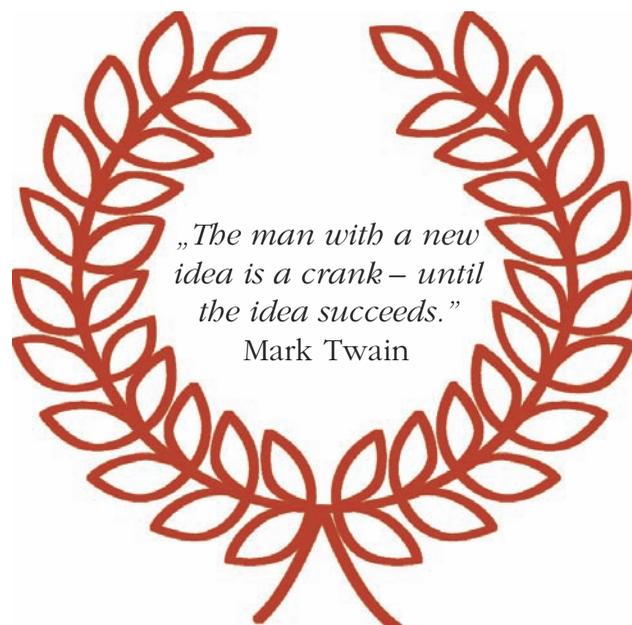
This study presents a success story for work cell implementation in a cadaster servicing company. Implementing a radical process change, as work cell introduction is, can generate real benefits for service companies.

This paper does not analyze the effects of work cell introduction on other important business indicators like quality, personnel morale and communication with the field teams. These can be further study subjects. Also, another subject can be the effect of work cell introduction on making the process more responsive to major external change.

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# A Systematic Approach of Innovation Management

**Titu-Marius Băjenescu**

La Conversion, Switzerland

**Abstract**

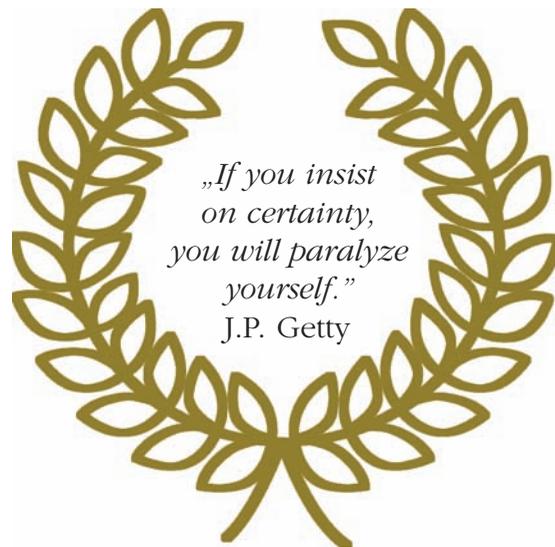
*Innovation is work rather than genius; innovation is the work of knowing rather than doing. Essential is a commitment to the systematic practice of innovation. Management must establish the right roles and processes, set clear goals and relevant measures, and review progress at every step. To be effective, an innovation has to be simple, and it has to be focused. Effective innovations start small. Innovation can be systematically managed – if one knows where and how to look.*

**Keywords:** design, innovation, innovation strategies, technology management

## **Introduction**

We begin with some facts briefly mentioned in a recent report of European Commission in 2015: „Companies that had introduced at least one innovation since January 2012 were asked what proportion of their 2014 turnover was invested in innovation activities. These companies are most likely to have invested between one and five percent (36%), although 18% invested less than 1%. The same proportion (18%) invested at least 6% – although most of these companies invested six to ten percent, rather than higher proportions.”

Since the impact of design is higher when it is culturally embedded (Warwick Business School and Design Council, 2013), supporting the more effective use of design within these businesses represents a significant opportunity to improve their performance and, therefore, to accelerate the economic growth.



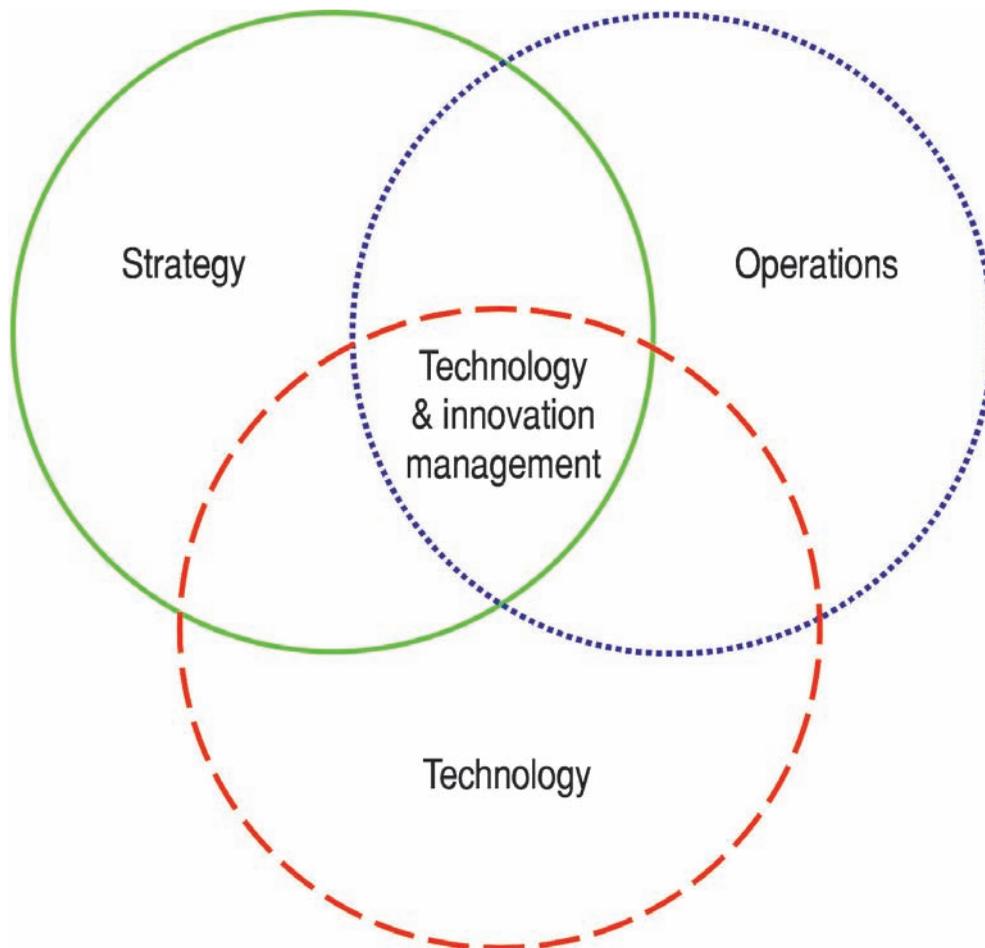
The current competitive imperative is the development of a science and innovation culture; this identifies that the real engines of competitiveness and economic success remain science, innovation, technology, education and entrepreneurship. An essential part of developing the science and technology base for sustained competitive advantage is to build the organizations capacity to manage innovation successfully.

## Innovation Management

Technology and innovation management is at the intersection of strategy,

technology and operations (Figure 1). It provides executives with the understanding of how the technology works in the innovation process and enables them to make sound business decisions. Successful innovation is inherently multifunctional and matches a profound understanding of user needs and wants to distinctive technical competence. Innovation management is the implementation of management techniques and devices designed to create the most favorable conditions for the development of concrete innovations.

The ability to manage the generation of scientific and technical knowledge and



**Figure 1** – *Strategy, operations and technology determine at their intersection the management of technology and innovation*

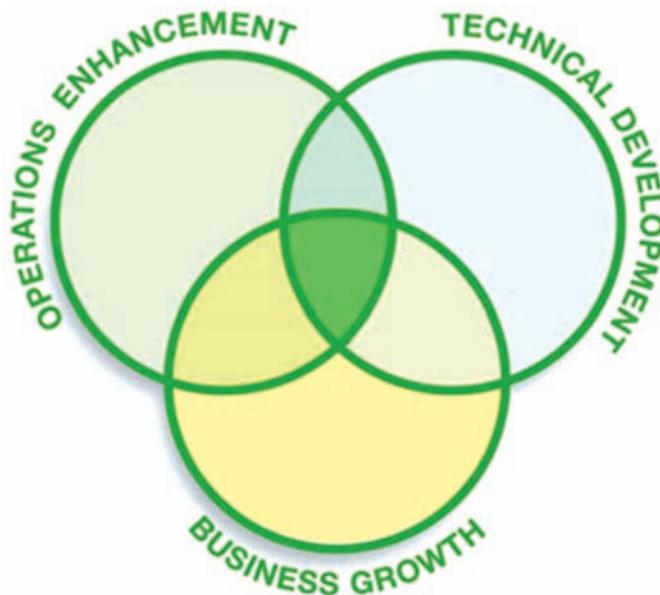
its successful commercialization by existing and new firms will be critical to realizing ambitious objectives. Innovation is critical for each company; no company can stand still under the pressure of competition and rising customer expectations. To survive, the company must constantly reduce costs, enhance quality, increase responsiveness offering new and improved products and services.

Design-driven innovations do not come from the market; they create new markets. They push radical new meanings. The design is making sense of things. Steve Jobs said: „Most people make the mistake of thinking design is what it looks like. People think it’s this veneer – that the designers are handed this box and told, ‘Make it look good!’ That’s not what we think the design is. It’s not just what it looks like and feels like. The design is how it works.” (Walker, 2003).

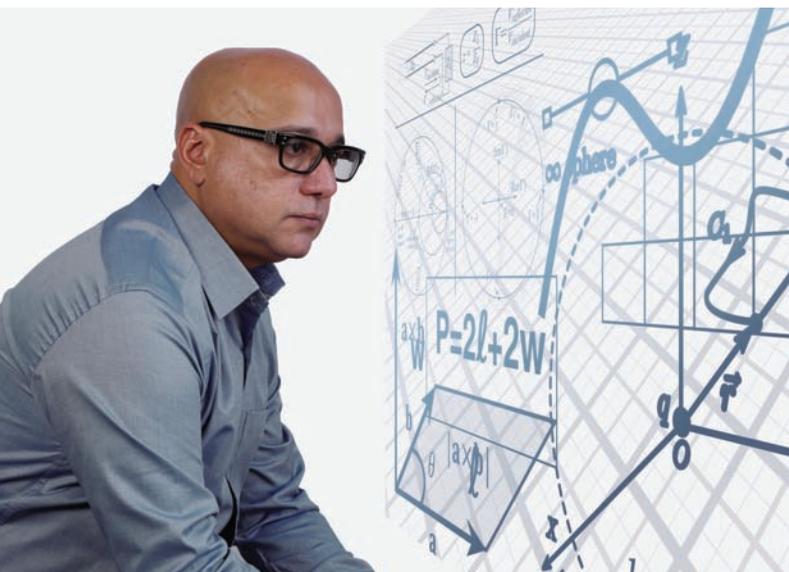
Design-led companies have outperformed the S&P 500 over the past 10 years by an extraordinary 219%, according to a 2014 assessment by the Design Manage-

ment Institute (Naiman). Design thinking is at the core of effective strategy development and organizational change. „Design thinking can be described as a discipline that uses the designer’s sensibility and methods to match people’s needs with what is technologically feasible and what a viable business strategy can convert into customer value and market opportunity” (Brown, 2008). „Design thinking has much to offer a business world in which most management ideas and best practices are freely available to be copied and exploited. Leaders now look to innovation as a principal source of differentiation and competitive advantage; they would do well to incorporate design thinking into all phases of the process.” (Brown, 2008).

The idea of innovation, particularly technological innovation, has a kind of aura around it. The technologies don’t come to a halt, they simply move on, seeking out other places where they race ahead. Technical development, business growth and operations enhancement are each critical elements of a growing business (Figure 2).



**Figure 2** – *Critical elements of a growing business*



## A Holistic View of Innovation

The term, innovation, dates from the 16th century, and is derived from the Latin, innovations, „to renew or change,” from in – „into” and Novus – „new.” In today’s business environment, to innovate is essential for survival; constantly evolving technologies and market dynamics ensure that stasis or inertia is certain to result in obsolescence.

The first and seminal definition of innovation was proposed by Schumpeter (1934). He associated it with economic development and recognized it as a new combination of productive resources. His work defined five specific cases: the introduction of new products, new production methods, exploration of new markets, conquering of new sources of supply and new ways of organizing a business. Since then, the conception of innovation has evolved significantly. During the 1950s, innovation was considered to be a discrete development resulting from studies carried out by isolated researchers. Nowadays, innovation is no longer conceived as a specific result of individual actions, but more as the following:

The American Department of Trade and Industry (DTI) describes innovation as the successful exploitation of new ideas. ‘Innovation... is generally understood as the introduction of a new thing or method... Innovation is the embodiment, combination or synthesis of knowledge in original, relevant, valued new products, processes or services.’ (Luecke and Katz, 2003).

„All innovation begins with creative ideas... we define innovation as the successful implementation of creative ideas within an organization. In this view, creativity by individuals and teams is a starting point for innovation; the first is a necessary but not sufficient condition for the second.” (Amabile et al., 1996).

The latest editions of the Oslo Manual (2005) and the Frascati Manual (2004) have brought into consideration a holistic view of innovation.

„An innovation can be a new product or service, a new production process technology, a new structure or administrative system, or a new plan or program pertaining to organizational members. Since this definition accommodates different forms of innovation, it allows us to minimize the possibility of selection biases rooted in definition issues.” (Damanpour, 1991)

It would be easier to understand innovation as an entrepreneurial process evolving into a connection with scientific research, learning, market conditions and economy, if we take into account the historic examples of inventors who took a step further and proceeded to the commercial promotion of their inventions, become i.e. innovative entrepreneurs.

Innovation generates high profitability. It has a cost but it has the peculiarity of being a fixed cost, the cost of developing a new good being independent, in the first order of the quantity produced. The

innovative company must therefore be able to compensate for its innovation expenses when it sells its new good. This is why rent is not only a motivation for innovation, but also a necessary condition.

Research has shown that innovation can be risky and that failure is the most likely outcome of, for example, product innovations (Cooper, 2001).

*Innovation is a must: innovate or die.*

## The Innovation Cycle

The innovation cycle describes the activities involved in taking an innovative product or service to the marketplace. In essence, there are two aspects to this:

1. Developing the innovative product or service.
2. Building the business to market the product or service.

Table 1 provides an example of a typical innovation cycle with activities at each stage:

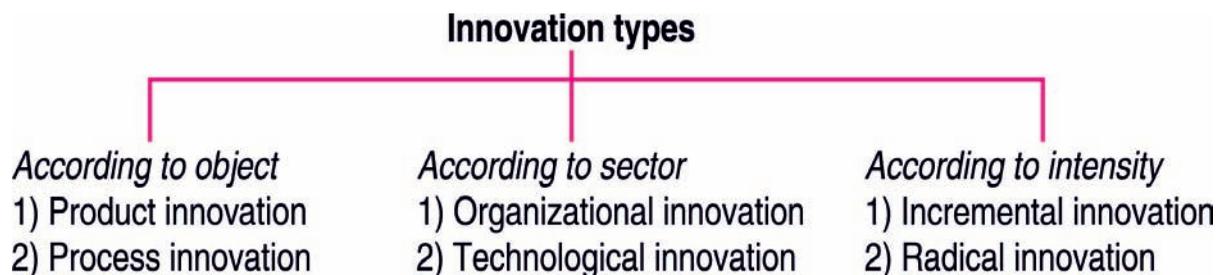
**Table 1** – Typical innovation cycle with activities at each stage

Stage	Description	Typical activities
1	Ideas	Identify a market opportunity
2	Resources	Organize people, finance and facilities
3	Investigate	Research the possibilities
4	Patent	Protect the intellectual property
5	Design	Model and test it for users
6	Develop	Improve the technology
7	Develop	Start production
8	Sell	Advertise and inform people
9	Service	Communication with customers

(Source: AATSE 2007)

We distinguish five forms of innovation: (i) Technical innovation: which corresponds to new processes; (ii) Commercial innovation: new services, new sales techniques, new concepts; (iii) Organizational inno-

vation: networked enterprise, just in time, TQM; (iv) Social innovation: employee savings; (v) Financial innovation. As for the types of innovations, they are shown in Figure 3.



**Figure 3** – Innovations types

## Innovation Strategy

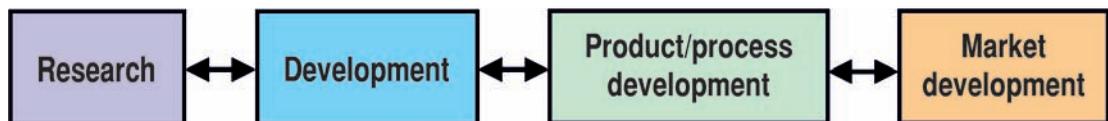
M Porter defines the strategy as „Performing different activities from rivals’ or performing similar activities in different ways” (Porter, 1996). According to Porter (1996), the strategy is the presence of a set of activities that will enable the firm to differentiate itself from its competitors and to maintain its competitive position.

Typically, the results of the research have shown that firms possessing an innovation strategy (IS) are more successful when compared with those that do not possess an IS (O’Regan, Ghobadian & Gallea, 2005). IS is a guide that makes firms think about why they innovate before attempting to make innovation. IS is composed of financial purposes and growth areas regarding a new good or service; it is the overall criteria providing a set of filters through which the notions of strategic roles and a new product or service should pass, thereby defining the strategic mission of new products or services.

According to Lendel and Varmus (2011), IS is determining strategies shape the ap-

proach to aims, methods and ways to enhance and improve the innovative potential of the firm. IS enables top management to follow the activities of their competitors, to reach customer market information, to use firm resources effectively and to make efficient investments in research and development (Oke, Walumbwa & Myers, 2012). These activities have been found to positively impact firm innovation performance (Verhees and Meulenbergh, 2004).

Innovation management is the process of managing innovations, that is, ideas, in organizations through the stages of the innovation cycle. Innovation management is driven by different knowledge-intensive organizations (KIOs) that build knowledge as their primary value-adding process. They can be defined as organizations where employees with a high degree of knowledge are critical to the primary function of the organization. They have relatively little financial capital but instead have as main assets the knowledge and competence of their personnel (Kipping & Engwall, 2002). Today’s basic model for innovation management is interactive (Figure 4).



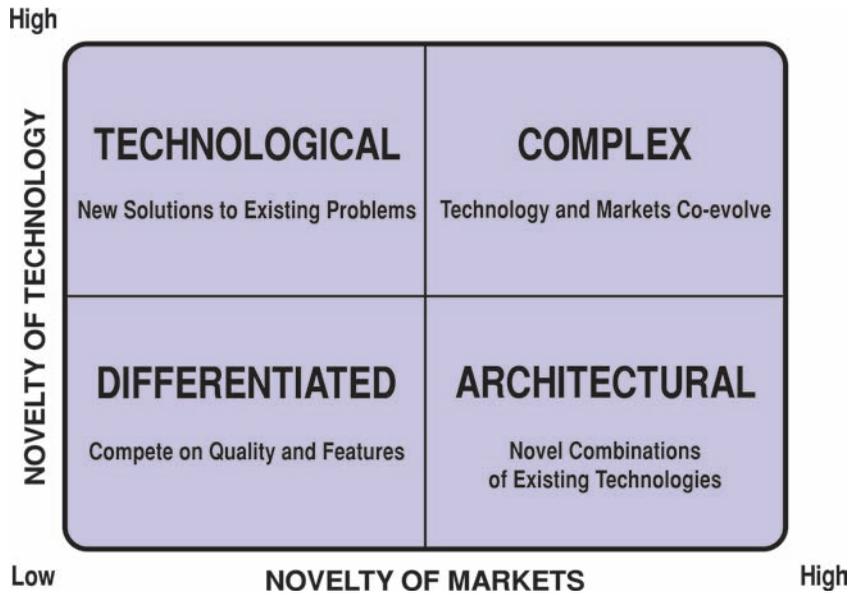
**Figure 4** – Today’s basic model for innovation management is interactive

Innovation management dimensions: (i) Process; (ii) organization structure; (iii) strategy; and (iv) people.

Tidd highlight that before applying standard marketing techniques, firms must have a clear idea of the maturity of the technologies and markets. They further propose a two-by-two matrix model (depicted in Figure 5) by which they study the correlation of technology maturity and market maturity.

In the case of complex products or services, according to Tidd *et al.* (2005), technology and markets co-evolve over time, since neither since they are poorly-defined or understood. They also contend that the buying process for such products is likely to be lengthy due to the difficulty of evaluating risk and subsequent implementation.

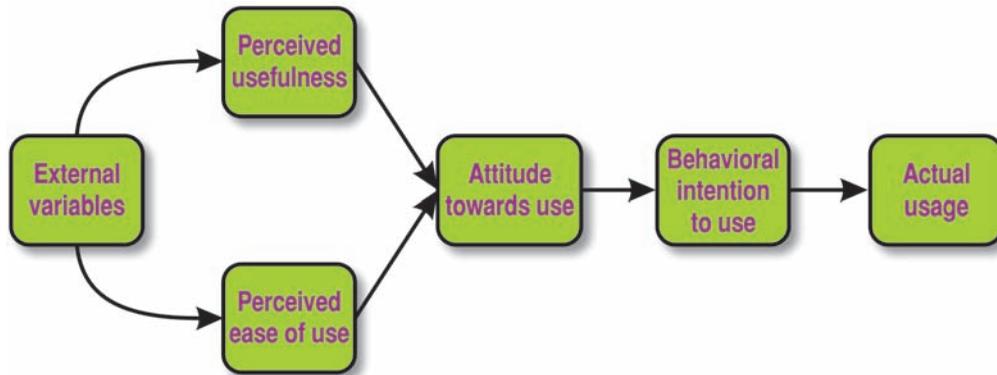
Developed in the information technology literature, the Technology Acceptance



**Figure 5** – Technological and market maturity correlation  
(Source: Tidd et al., 2005, p. 243)

Model (TAM) portrays user acceptance of information systems (Davis, 1986; Davis, 1989). The model, shown in Figure 6, provides a source for tracing the impact of external factors on internal beliefs, attitudes, and intentions. The original TAM consists

of perceived ease of use, perceived usefulness, attitude toward using, behavioral intention to use, and actual system use, where *perceived usefulness* and *perceived ease of use* are the two most important determinants for system use.



**Figure 6** – The Technology Acceptance Model  
(Source: Davis, 1986)

### Success of Innovation

The condition for the success of innovation are:

1) *The desire to develop an innovation* is essentially based on two approaches: staff mobilization and knowledge management

through marketing intelligence and technology watch.

Innovation management will therefore rely on a flexible organization to adapt to the upheavals associated with innovation and effective knowledge management.

This is known as Knowledge Management and Project Management.

Innovation is also a management tool in the personal development of employees, which makes it possible to make suggestions to the company's departments.

### 2) *Accept the risk*

The company that wants to take a competitive advantage must invest in research and development, in man and equipment. These investments represent significant costs for profitability that is sometimes unpredictable and not immediate. The conjuncture, the arrival of new competitors and sometimes reluctance to change make that even if the company comes first on the market after filing its patent and not having the results expected.

3) *Find financing and support for innovation.* For this, the company can turn to the state and/or have its own means of financing.

Innovative business creators face a recurring difficulty in collecting, organizing and interpreting the means and then the effects of innovation. This is due in particular to the mass of information manipulated, the difficulty in articulating the reasoning in the face of scenarios which can be abundant.

## Conclusion

An important and useful way to consider the process of innovation is an exercise in the management and reduction of uncertainty. The greater the changes introduced, the greater the uncertainty not only about technical performance but also about the market response and the ability of the organization to absorb and utilize the requisite changes effectively. The strong correlation between the amount of change and



the degree of uncertainty has important implications for the nature of appropriate innovation under various states of knowledge and the various points in the life cycle of a given product (Klein and Rosenberg, 1986).

Innovation is a multi-faceted concept that not only concerns technology but also user experience and how innovations are used. It entails work on applications, business models, and design. Marketing should also be involved as a way to analyze customer experience and the ways they use innovations (Manceau, 2011).

Information and license management play a key role in managing innovation under strategic management view of systematic planning of innovation. Regarding future perspectives, the era of open innovation has just begun; even small and medium-sized enterprises (SMEs) are opening their innovation processes; technology development is taking place in collaborations as a result of complex technologies and a combination of technological developments and know-how (Gassman *et al.*).

Innovation is a primary goal for many organizations today; executives understand



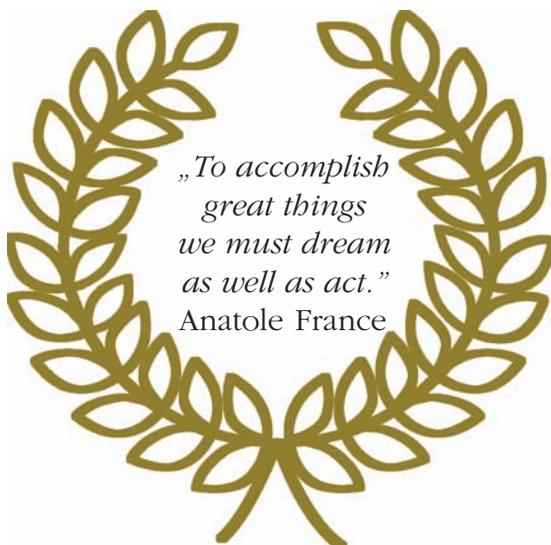
how important innovation is to achieving a sustainable strategic advantage in the 21st century. Yet, realizing innovative ideas eludes many of them, often through ineffective diffusion practices. Research indicates that most companies are able to actualize less than one in five promising ideas.

Firms must accept the inevitability of change by valuing innovation even above past success; one of management's most essential roles is to find a balance between supporting new and established innovations.

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# Algorithms for Data and Process Mining

**Maha Zayoud (1), Yehia Kotb (1), Sorin Ionescu (2)**

(1) American University of The Middle East, Kuwait, (2) University POLITEHNICA of Bucharest, Romania

Abstract

*This paper introduces a problem based classification for mining algorithms. Proposed classification specifies which algorithm is more suitable for the solution of which type of problems. It covers the most spectrum of issues and problems related to data mining starting from data preparation, to actual mining, to result in interpretation and ending with result verification. Result verification is the process of verifying the correctness and consistency of the knowledge generated out of mining. The differences between data and process mining paradigms are highlighted and discussed in this paper. An explanation of well-known algorithms for data and process mining is presented, these algorithms are influential to the research community.*

**Keywords:** process mining; data mining; big data; business process management; management information systems.

## Introduction

General management and management information systems (MIS) are the starting points to discuss the meanings of data and process mining, where the management in general is defined as a process which is designed to ensure the cooperation, participation, intervention and involvement of others in the effective achievement of a given or determined objective (Ananda, Guroe, 1977). The need for good processes in any organization appeared between 1965 and 1975, which leads to automate the functions of any organization.

A business process is defined as a collection of interrelated tasks, performed to



achieve a business outcome which is a chain of tasks from purchasing to manufacturing to selling and delivering. A business process can be divided into two kind operational which is related to the core business and management which includes the IS and strategic decisions (Oddy et al., 2009, pp. 20-150). The correlation between the management information systems and the mining techniques is the knowledge extracted from data that is recorded by information system applied in an organization (Weijters et al. 2006).

## Mining Techniques

A literature research shows that are used the following techniques, the methods used by them, the applications made and the level of analysis.

**Data mining.** It is data or knowledge discovery, it is the process of analyzing data from different perspectives and summarizing it into useful information that can be used to increase revenue, cuts costs, or both. The challenge of using data mining is to find correlations or patterns among large data sets in order to convert these connections into information which is powerful for any organization's performance as mentioned. Since data is not of same nature, hence data mining techniques are categorized into categories such as text mining, and reality mining, etc. While reality mining is the collection and analysis of machine-sensed environmental data pertaining to human social behavior, with the goal of identifying predictable patterns of behavior. Reality Mining is using Big Data to conduct research and analyze how people interact with technology every day to build systems that allow for a positive change from the individual to the global community.



Data mining consists of five major methods: Extract, transform, and load transaction data onto the data warehouse system, Store and manage the data in a multidimensional database system, Provide data access to business analysts and information technology professionals, Analyze the data by application software, Present the data in a useful format, such as a graph or table. Data mining is used today by companies with a strong consumer focus – retail, financial, communication, and marketing organizations.

**Text mining.** It is the extraction of useful information from text data, it is also known as text data mining or knowledge discovery from textual databases. It is challenging issue to find accurate knowledge of text documents to help users to find what they want. Text mining used four methods: Term Based Method (TBM), Phrase Based Method (PBM), Concept Based Method (CBM), and Pattern Taxonomy Method (PTM). Text Mining is used for emerging



accurate picture of what people do and for social networks. Reality mining is used for detection algorithms, community structure of the communication network, graph analysis.

**Big data.** Another important and hot topic related to mining techniques nowadays is big data. It is the ability to store and manipulate a huge amount of data sets that relational databases and other database models like object oriented databases cannot handle in real time or in any timely manner due to the huge size and complexity of those datasets. Big data used seven methods: Association rule learning, Classification tree analysis, and Genetic algorithms, Machine learning, Regression analysis, Sentiment analysis, Social network analysis. Big data has applications for numbers entered into cell phones, addresses entered into GPS devices, websites, online purchases, ATM transactions, any other activity that leaves a digital trail, and social networks.

Big data is used for the process of examining large data sets containing a variety of data types. There are many tools to analyze the big data that can improve the services provided.

**Process mining** is the knowledge extracted from event logs that are recorded by an information system applied to an organization (Weijters et al. 2006). Even though information systems help get event logs, these logs are rarely used to analyze the underlying processes. Hence, the mining techniques aim to develop and discover the process based on information extracted from event logs (Weijters et al. 2006). It is a result of merging data mining and business process management. Process mining has application of process mining methodology to the audit trails of

applications, such as text understanding, electronic information is only available in the form of free natural-language documents rather than structured databases, search engine, text categorization, summarization, and topic detection.

Text Mining is used for information retrieval, exploratory analysis, concept extraction, summarization, categorization, sentiment analysis, content management, ontology management.

**Reality mining.** It is the collection and analysis of machine-sensed environmental data pertaining to human social behavior, with the goal of identifying predictable patterns of behavior. Reality Mining is using Big Data to conduct research and analyze how people interact with technology every day to build systems that allow for a positive change from the individual to the global community. Reality Mining also deals with data exhaust. Reality mining is used for wireless devices such as mobile phones and GPS systems providing a more

a workflow management system, the transaction logs of an enterprise resource planning system, or the electronic patient records in a hospital can result in models describing processes, organizations, and products. Specialized data-mining algorithms are applied to event log datasets in order to identify trends.

Table 1 compares briefly between data and process mining with respect to different aspects. Data mining is a method that detects, analyzes and discovers data. It has no direct link with the business processes. While process mining discovers, controls, and improves the actual business processes based on data gained from in-

formation systems implemented in an industry. By analyzing data derived from the IT systems that support the processes, process mining gives a true, end-to-end view of how business processes operate (Wu, 2008). Data mining analyzes static information which is data that is available at the time of analysis. Process mining, on the other hand, looks at how data is actually created. Process mining techniques also allow users to generate processes dynamically based on most recent data. Process mining can even provide a real-time view of business processes through a live feed (Wu, 2008).

**Table 1** – Comparison between data mining and process mining

Method	Business process direct link	Business process operation	Static information	Dynamic processes	Concerns with hidden data	Result manipulations
Data Mining	x	x	√	X	√	limited
Process mining	√	End- to end view	X	√	x	√

(X – means not applicable and √ means applicable)

## Data Mining Algorithms

The techniques of data mining are implemented in various domains to give meaning to available data. This section identifies some of the most influential algorithms that have been widely used in data mining community. The IEEE International Conference on Data Mining (ICDM, <http://www.cs.uvm.edu/~icdm/>) identified the top 10 algorithms in data mining. This section presents these top 10 data mining algorithms which are: C4.5, k-Means, SVM, Apriori, EM, PageRank, AdaBoost, kNN, Naive Bayes, and CART (Wu et al., 2008).

Frequent pattern is the building blocks for finding associations rules that discover

the interesting relationship between frequent items in a database which has important applications in market basket analysis (Goyal, Jain, 2016). The most important subfield of data mining is frequent pattern mining (Agrawal, Srikant, 1994), from many years. A different number of frequent pattern mining algorithms have been proposed to extract meaningful information from uncertain data. While dealing with uncertain data U-Apriori, UF-growth, UFP-growth, UH-mine, PUF-growth, TPC-growth algorithm are examples of existing frequent pattern mining algorithms, which utilize different approaches to mine frequent pattern (Goyal, Jain, 2016). The results of the algorithms may differ from the uncertain

database when compared to the precise database due to the inclusion of probability value. The algorithms: U-Apriori, UF-growth, UFP-growth, UH-mine, and PUF-growth, TPC-growth algorithm are extensions for the top 10 algorithms mentioned.

**Algorithm C4.5** utilize tree-based algorithms. Advantages: It is not restricted to considering binary tests. It allows tests with two or more outcomes. At each point in the tree-growing, the test with the best criteria is greedily chosen. Disadvantages: missing values cannot be associated with any outcome of the decision test. Applications: clinical decision making, manufacturing, document analysis, bioinformatics, spatial data, modeling geographic information systems.

**Algorithm k-means** utilize clustering algorithm. Advantages: it is simple to implement and run, relatively fast, easy to adapt, and common in practice. Disadvantages: initializing the set of cluster representatives can lead to very different clusters, even on the same dataset, a poor initialization can lead to very poor clusters, choosing the optimal value of  $k$  may be difficult,  $k$ -means will falter whenever the data is not well described by a superposition of reasonably separated spherical Gaussian distributions. Applications: semi supervised learning, streaming data, textual data.

**Algorithm SVM** is based on statistical learning theory. Advantages: the most robust and accurate methods in all well-known data mining algorithms. Disadvantages: it does not sufficiently use the prior data distribution information within classes when data are not labeled, supervised learning is not possible, and an unsupervised learning approach is required. Applications: helpful in text and hypertext categorization, applied in the biological and



other sciences, hand-written characters can be recognized using SVM, classification of images can also be performed using SVMs.

**Algorithm Apriori** breadth first search algorithm. Advantages: fundamental and easy to implement. Disadvantages: suffers from a number of inefficiencies or trade-offs, which have spawned other algorithms, candidate generation generates large numbers of subsets, bottom-up subset exploration. Applications: used when collections of items bought by customers, or details of a website frequentation.

**Algorithm EM** utilize distribution-based clustering algorithm. Advantages: numerical stability, the simplicity of implementation and reliable global convergence, general-purpose method with attractive properties. Disadvantages: slow for complex problems and can place a significant load on computational resources, it has limited capacity for modeling high dimensional data, it requires the user to specify the number of components, and the choice of appropriate initial parameter values can have a significant effect on the quality of the model. Applications: used to model

heterogeneity in cluster analysis and pattern recognition contexts iterative, ideally used in medical image reconstruction.

**Algorithm PageRank** utilize the best known link-based ranking algorithm. Advantages: it outputs a probability distribution used to represent the likelihood that a person randomly clicking on links will arrive at any particular page. PageRank can be calculated for collections of documents of any size. Disadvantages: the PageRank computations require several passes, called „iterations”, through the collection to adjust approximate PageRank values to more closely reflect the theoretical true value. Applications: used to rank websites in their search engine results.

**Algorithm AdaBoost** is a machine learning meta-algorithm. Advantages: it may be easier by starting from a general boosting procedure, most influential one. Disadvantages: a major downside is that losing the simple interpretability of classification trees. The final classifier is a weighted sum of trees, which cannot necessarily be represented by a single tree. Computation is also more difficult. Applications: generates a sequence of hypotheses and combines them with weights, which can be regarded as an additive weighted combination helpful in face detection.

**Algorithm kNN** (k-Nearest Neighbors) is nearest-neighbor classification method, a non-parametric method. Advantages: simplest and rather trivial classifiers are the Rote classifier of KNN. Disadvantages: it

does not learn anything from the training data and simply uses the training data itself for classification. Applications: works well on basic recognition problems. An example of a typical computer vision computation pipeline for face recognition.

**Algorithm Naive Bayes** utilize probabilistic classifiers based on applying Bayes' theorem with strong (naive) independence assumptions between the features. Advantages: the Naive Bayesian model is easy to build useful for very large datasets. Disadvantages: having no occurrences of a class label and a certain attribute value together or given Naive-Bayes' conditional independence assumption, when all the probabilities are multiplied will lead to getting zero and this will affect the posterior probability estimate. Applications: used for classification problems like specifying the gender based on some attributes.

**Algorithm CART** uses a decision tree. Advantages: it is nonparametric and therefore does not rely on data belonging to a particular type of distribution. It is not significantly impacted by outliers in the input variables. Minimizes the probability that important structure in the data set will be overlooked by stopping too soon. CART incorporates both testing with a test data set and cross-validation to assess the goodness of fit more accurately. The CART can use the same variables more than once in different parts of the tree. This capability can uncover complex interdependencies between sets of variables. Disadvantages: the

model is a step function, not a continuous score might take a large tree to get a good lift, instability of the model structure. The CART does a poor job of modeling linear structure. Applications: the resulting classification tree can be an input for decision making.

## Process Mining Algorithms

The use of information systems has been rapidly growing, in companies of all kinds and sizes. New systems are moving from supporting single functionality towards a business processes orientation. In Computer Science, a new research area is emerging, called Process Mining, which provides algorithms, techniques and tools to improve those processes and systems that are used to put them into action. An ideal process mining algorithm analyzes the log, identifies all the process instances, and tries to define some relations among activities (Van der Aalst et al., 2009). Once all relations are available, it is possible to combine them in order to construct the mined model. To illustrate the general idea of process mining; many other algorithms have been designed and implemented, using different approaches and starting from different assumptions. However, even if several approaches are available, many important problems are still unresolved. Some of them are presented in (Van der Aalst et al., 2004), and here the most important ones:

- Some process models may have the same activity appearing several times, in different positions.
- Many times, logs report a lot of data not used by mining algorithms (e.g., detailed timing information, such as distinguishing the starting from the finishing time of an event). This information, however, can be used, by mining algorithms, to improve the accuracy of mined models.
- Current mining algorithms do not perform a „holistic mining” of different perspectives, coming from different sources: for example, not only the control-flow but also a social network with the interactions between the activity originators (creating a global process description).
- Dealing with noise and incompleteness: „noise” identifies uncommon behavior that should not be described in the mined model; „incompleteness” represents the lack of some information required for performing the mining task. Almost all business logs are affected by these two problems, and Process Mining algorithms are not always able to properly deal with them;
- Visualization of mining results: present the results of Process Mining in a way that people can gain insights into the process.
- While many process mining algorithms have been proposed recently, there does not exist a widely-accepted benchmark to evaluate and compare these process mining algorithms.

As a result, it can be difficult to choose a suitable process mining algorithm for a given enterprise or application domain. For instance, process mining algorithms are used to mine business process models using process logs. The mined models will then be compared against the original process models of the enterprise for conformance checking, or to discover more efficient, streamlined business process models. However, since different process mining algorithms have different properties, being able to select the most appropriate process mining algorithm i.e. the one that produces mined models that are semantically similar to the original models and structurally equal to or better than the original models, for the models from a given enterprise is

a big advantage while recent research and software prototypes have attempted to provide such an evaluation framework e.g. (Scholkopf et al., 1999), (Scholkopf et al., 1997), empirically evaluating all available process mining algorithms against the business models provided by a given enterprise is usually computationally expensive and time consuming.

Process mining algorithms being compared in Table 2 of this paper are:  $\alpha$  algorithm (Cristianini, Shawe-Taylor, 2000), genetic algorithm, heuristics miner (Duda et al., 2001) and region miner. Without loss of generality, these four algorithms represent the four most popular classes of business process mining algorithms (Wang et al., 2013).

**Table 2** – Comparison between basic process mining algorithms

Algorithm	Advantages	Disadvantages	Method
<b><math>\alpha</math> algorithm</b>	<ol style="list-style-type: none"> <li>1. It is aimed at reconstructing causality from a set of sequences of events.</li> <li>2. It is good from a scientific perspective.</li> <li>3. It handles concurrency in processes.</li> </ol>	<ol style="list-style-type: none"> <li>1. It is almost never the right choice for real-life logs, it gives a poor result.</li> <li>2. It does not consider the frequency of traces in the log.</li> <li>3. It is unable to handle 'noise' in the event log (log without error).</li> </ol>	<ol style="list-style-type: none"> <li>1. It gets the set of tasks</li> <li>2. Infer the ordering relations.</li> <li>3. Build the net based on inferred relations.</li> <li>4. Output the net.</li> </ol>
<b>Genetic algorithm</b>	It designed to mining noisy and incomplete event logs.	It is not easy to represent processes properly in a genetic setting.	<ol style="list-style-type: none"> <li>1. It uses causal matrix as a representation for individuals.</li> <li>2. It is adaptive search method that tries to mimic the process of evolution.</li> </ol>
<b>Heuristics miner</b>	<ol style="list-style-type: none"> <li>1. It suitable for many real-life logs.</li> <li>2. It can be converted to other types of process models, such as a Petri net for further analysis in ProM.</li> </ol>	<ol style="list-style-type: none"> <li>1. The events should be dependent on the log to find the process model.</li> <li>2. It uses techniques which are less sensitive to noise and the incompleteness of logs</li> </ol>	<ol style="list-style-type: none"> <li>1. It is closely following the alpha algorithm and considers the order of the events within a case.</li> <li>2. It constructs a dependency graph.</li> </ol>
<b>Region miner</b>	<ol style="list-style-type: none"> <li>1. It is the first algorithm to directly address the problems of large numbers of activities and highly unstructured behavior logs.</li> <li>2. It is explicitly showing causality, concurrency and conflicts between transitions.</li> </ol>	Its complexity is in general quite high in comparison with other method.	<ol style="list-style-type: none"> <li>1. It is one of the younger process discovery algorithms.</li> <li>2. It is a state-based model</li> <li>3. It establishes a connection between transitions systems and Petri nets through so called net synthesis.</li> </ol>

As a summary to this section, to generate a process model that is an abstract representation of the process log is not a simple task, and many organizations more than one algorithm need to be used in order to improve the performance.

## Petri Nets

Petri Nets, is a mathematical process representation proposed in 1962 by Carl Adam Petri, constitute a graphical language for the representation of a process. In particular, a Petri Net is a bipartite graph, and helpful to explain the process and its events logs as graph and math notations where two types of nodes can be defined: transitions and places. Typically, transitions represent activities that can be executed,

and places represent states (intermediate or final) that the process can reach. Edges, always directed, must connect a place and a transition, so an edge is not allowed to connect two places or two transitions. Each place can contain a certain number of tokens and the distribution of the tokens on the network is called „marking”. In a Petri Net is shown in figure 1; circles represent places, squares represent transitions, and tokens are represented by black dots in the place. Petri Nets have been studied in depth from many points of view: from their clear semantic to a certain number of possible extensions (such as time, colour).

Figure 1 represents an example of Petri net building blocks for the three basic routing constructs that are used when modeling business processes.

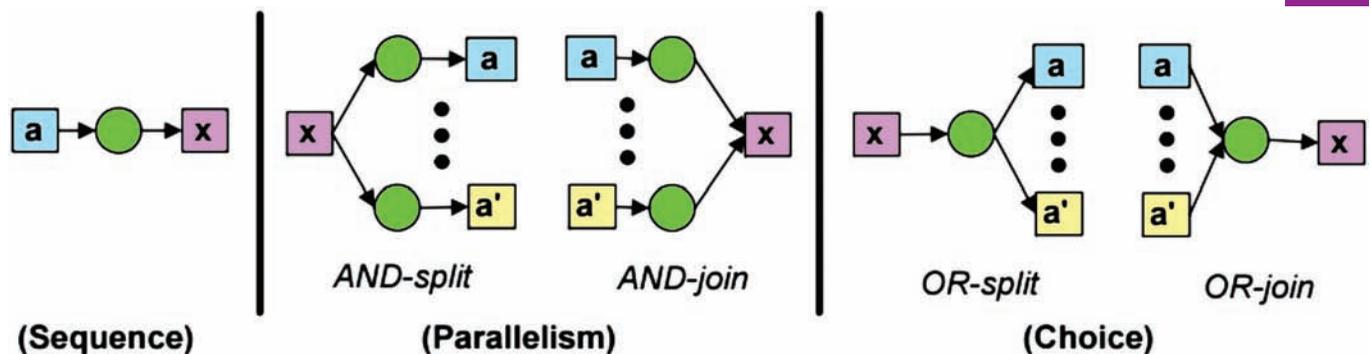


Figure 1 – Petri net example

## Application of Process Mining in Healthcare Sector

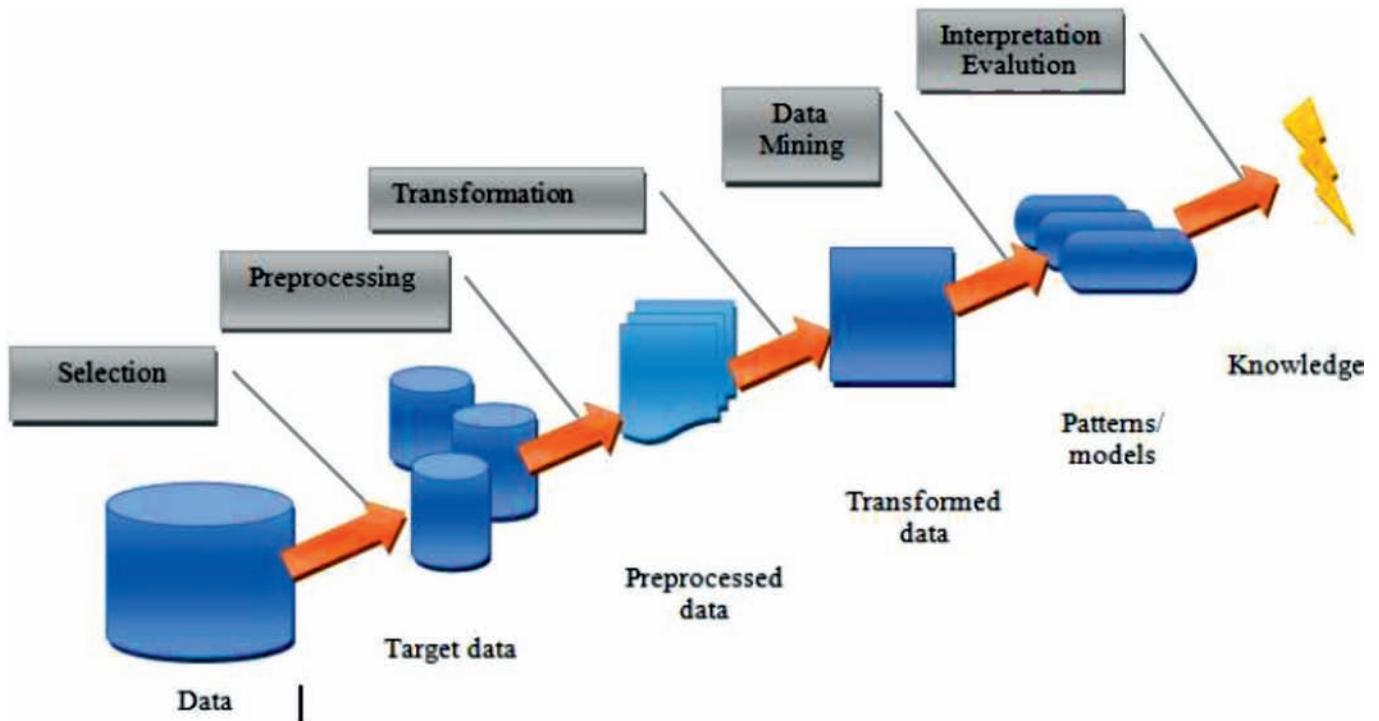
The most popular application of data mining is healthcare because the health sector is rich with information and data mining has become a necessity. Healthcare organizations generate and collect large volumes of information on a daily basis. The huge demand on the information in healthcare sectors encourages the automation of data and the deployment of data and process mining in addition to

the knowledge that help bring some interesting patterns which means eliminating manual tasks and easy data extraction directly from electronic records, electronic transfer system that will secure medical records, save lives and reduce the cost of medical services as well as enabling early detection of infectious diseases on the basis of advanced data collection.

The interesting part in healthcare sectors is the need of implementing different analysis techniques like Knowledge Discovery

(KDD) which is a process that allows automatic scanning of high volume data in order to find useful patterns that can be considered knowledge about data as shown in Figure 2. The analysis methods can be improved based on the discovered knowledge, and data mining process can be further enhanced, new data can be selected or subsequently processed, and new data sources can be integrated in order to get different results corresponding to (Zaiane, 1999). This is the process of converting low level information into knowledge of high level. Therefore, KDD is a non-trivial extraction of implicit information, previously unknown and potentially useful data

is in the database. Although data mining and KDD are often treated as equivalent, in essence, data mining is an important step in the KDD process. Knowledge discovery process involves the use of the database, along with any selection, pre-processing, sub-sampling and transformation; application of data mining methods to enumerate the models; evaluation of the data mining product to identify subsets listed models representing knowledge. Data mining component knowledge discovery process refers to algorithmic means by which patterns are extracted and listed from the available data (Fayyad et al., 1996).



**Figure 2** – *Knowledge discovery process*  
(Source Ionuț, 2015)

## Conclusion

There are a variety of mining techniques where each one is used for the specific manner and it has advantages and disadvantages. Data mining is used for dealing

with data while the process mining comes at the higher level of any organization that has its own data and event logs. Process mining improves business in terms of productivity and cost reduction which gives



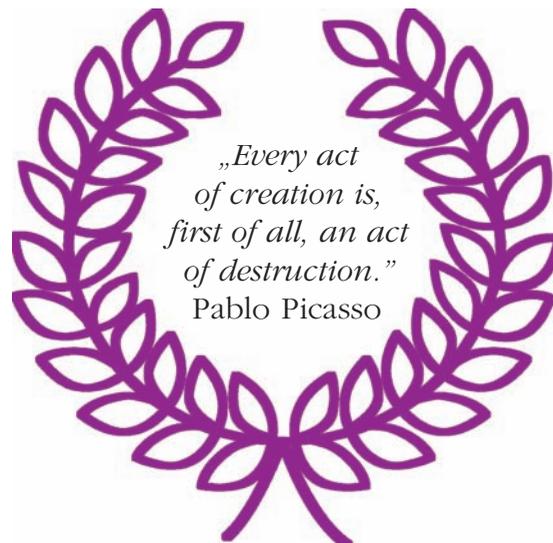
researchers and business planners more motivations to work on discovering and enhancing its methods. The future work is to study existed event logs from any organization, hospital for example, and get the dependencies between these events, by applying one of the learning algorithms

and reinforcement learning approach which will give the ability to learn the cooperative behavior between multiple events from multiple units. After that, Optimization techniques should be implemented to study the process and analyze it in order to ensure a valid model for better performance.

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# Modeling Processes to Meet Organisational Objectives

**Bogdan Fleacă (1), Monika Jakubiak (2)**

(1) University POLITEHNICA of Bucharest, Romania, (2) Maria Curie-Skłodowska University, Lublin, Poland

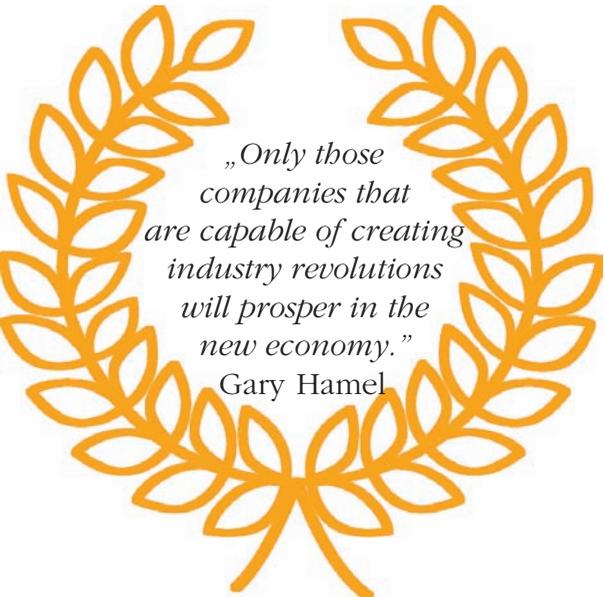
Abstract

*Achieving organizational goals at department level is critical to build a well-defined structure to help achieve desired and anticipated business results. The structure captures the process model proposed and developed in this paper and presents the methodology of modelling the process of implementing commercial activities. Also, the essential quality features necessary to be used in this type of structure are presented. The paper is limited to the commercial function of the organization, regardless of its type, size or operating sector. From all processes linked to this function, the authors present the planning phase. The paper presents the essential elements needed to create and develop commercial process planning, consisting in nominating the work areas with related responsibilities, to the way of using input variables, and in modelling output variables. The planning activities to develop commercial function are presented as a structured process with identified components which are interconnected and endowed with decision points. After ending the planning process, the follow continues with other necessary steps in terms of verifying the structure of the process model to be in line with the organization strategy and with the desired outcomes of the objectives, and of controlling step in which the management staff should collect information for the process adjustment or to changes the input variables.*

**Keywords:** business process management, process modelling, quality planning, commercial function

## Introduction

Competitiveness is and will be one of the main reasons why an industrial organization is constantly looking for solutions to improve its results. The permanent challenge



*„Only those  
companies that  
are capable of creating  
industry revolutions  
will prosper in the  
new economy.”*

Gary Hamel



of competitiveness and the principles used by all companies striving to perform better lead to a permanent market development.

Inside the companies, the departments are required to take account of the competitiveness principle because the sum of employees' performances leads to the performance of the entire organization. Also within departments, new approaches of the tools used, new processes models or improvements requirements must be identified in order to achieve superior results to the history, to outperform competitors and to achieve the intended objectives or to be closer to the prescribed values (Fusch, 2012, pp. 1-9).

The authors identified that the permanent endeavour needed to rise the quality of the performance level of the objectives requires on-going improvements of the way of implementing into reality by clearly defining the elements that participate in these activities, identifying and highlighting the links between them, and finally by a better identification and definition of process inputs and of the desired results to reduce the error rate of the results. This highlights the fact that a high degree of effectiveness of the objectives requires a process structure at least as effective as it can be achieved. (CA Technologies, 2015).

## Experimental Background

The authors of this research proposed and developed a process structure aiming to ensure a superior quality in fulfilling the organizational objectives. The proposed model consists of the process structure, the input elements to which the outputs are added, the connection between them and the quality characteristics. In this way, the scope of the paper covers the commercial function within a company and is limited to the cycle of the plan-do-check-act method from the management approach.

Planning management is rendered through the flow of activities that fits into the structure of the process being visualized by the succession of the components responsible for developing the process, the links between them, the decision points, and finally by the variables identified as inputs and outputs. Once the process model is designed to be implemented and passed through stages of testing and controlling, the valuable information need to be extracted from the feedback loops that are feeding again in the process inputs, process tuning and other activities.

## Research Results

A brief look at the organization of a company with core activities in the commercial area highlights the existence of the following departments, which are deemed by the experts as functions of the enterprise: logistics, marketing-trading, financial-accounting, and customer relations.

The commercial function split embedded within the marketing-commercial department, the main groups of activities are as follows:

- defining the products portfolios being available for selling purpose, with clear connection with the needs of

different clients types identified by the marketing department;

- maintaining the clients' database, as well as identifying potential customers and creating new clients or/and market segments;
- receiving, initiating, as well as increasing the number and the quality of orders.

These few main activities support the fulfillment of objectives related to these activities. Given the ongoing requirements for achieving organizational competitiveness as described at the beginning of the paper, these objectives are supposed to be the same at the level of the top ones. Consequently, their fulfillment requires a structure process being capable of leading to a solution with equally competitive results develop in figure 1. In this case, the competitiveness involves analyzing the participating elements, identifying new information that helps to achieve the objectives and identifying those qualities that ensure competitiveness at the expected level (Lendel, 2017, p. 615).

These phases necessary to increase the competitiveness of the organization are presented as a flow of complex activities and are considered as an essential structure for the achievement of the objectives. In order to create the structure of the planning management process (table 1), the five stages of the design will be modelled to implement the objectives of the commercial department in order to be made as closer as possible to what has been planned.

**Functional breakdown structure.** The authors described the algorithm used for modelling within the limit of the designed commercial function shown in figure 1. In this first step, the interested managers have the possibility to know the line of

assigned responsibility, the scope of them and also what kind of objectives they can accomplish. Through the functional breakdown structure, it may be observed the possible appearance of other areas that will be used only to extract information and not to induce the responsibility area of managers in the commercial department.

The implementation activities consist of analyzing the company processes, the operationalization of them and identifying only those processes which enter the area of influence of the commercial department. Consequently, the implementation of these processes generates the fulfillment of the objectives of the nominated department.



**Table 1** – *The structure of the planning management process to implement the objectives*

No.	Structure elements	Purpose of activity	How to achieving	Results
1	<b>Functional breakdown structure</b>	Clear delimitation of the functional – commercial area from the sum of functional areas of the company	Split the specific function of the company into its elements	Clear boundary of processes that perform within the commercial area
2	<b>S.I.P.O.C.</b>	Specific analyses of the components of the added value brought by processes for commercial department and nominalized contributors	Recognize the input and output variables, the series of activities, and the contributors	SIPOC chart for achieving goals for the commercial department and the quality indicators
3	<b>Flowchart</b>	Designing activities and subprocesses in order to achieve the objectives	Showing symbols and links of workflow in the implementation of the process	Flowchart of nominated departmental objectives
4	<b>Quality characteristics</b>	Defining the request for achieving the designing results of the goal creation process	Defining the necessary characteristics that can define the process outputs	Performance characteristics types
5	<b>Quality indicators</b>	Following progress in meeting the goals of the process	Assigning values for process indicators	Figures for performance indicators

**SIPOC structure.** A structure of elements that can represent other departments, sources of information and policies derived from the top management is called the SIPOC diagram – „Suppliers, Inputs, Processes, Outputs, Clients”. This was noted as the second step within the proposed algorithm and is designated in table 2.

The basis for defining SIPOC diagram consists on answering to the following main questions such as: What are the input and output variables of the process? What are the main process activities? Which are the main beneficiaries of the process output variables? Which are vendors for process input variables? Who want to receive the clients? What are the requirements of the clients of the process? (ACUITYINSTITUTE, 2016).

Responses can be found both inside and outside the company departments. The SIPOC diagram offers a progressive understanding of the analysis and modelling process as well as to identify the elements for improving work before the process finish.

At the operational level, all the suppliers and stakeholders needed to form the structure of the goal fulfilment process are identified in order to extract information that can improve the implementation and the qualitative characteristics of the process (Jeston, 2008, p. 271).

The supplier identification is based on information provided by top management, namely company policies and strategy, highlighting what is the departments or areas of interest that can contribute to meeting the goals. An important supplier can be identified as the company’s shareholders by information such as: the level of the value of the profits, the area of action and the strategy from where can be extracted data regarding the expectations of the shareholders, and also the degree to which the objectives must be met. We can discuss the value of the company’s turnover or profit together with the type of the result of the quality characterization. These may result from the analysis of customer’s types, the number of items, the types of products in the portfolio and the size of the portfolio.

Information of this type can also be provided by the marketing department or by third parties such as market research companies.

Fulfilling the proposed activities in order to achieve the objectives must also take into account the financial-accounting tuition, seen here as a supplier but also as a cus-

tomers since it provides the budget but also receives reports on how it was used. Beside this, it certifies the balanced use of costs and the benefits obtained through these balances all in accordance with the company's policies and strategy (Muenzel, 2014, p. 3924).

**Table 2** – SIPOC structure – participant's elements and types of information shown for designing outputs

Suppliers	Input	Process	Outputs	Customer
<ul style="list-style-type: none"> <li>• stockholders</li> <li>• general manager</li> <li>• commercial department</li> <li>• logistic department</li> <li>• marketing department</li> <li>• research company</li> <li>• financial department</li> </ul>	<ul style="list-style-type: none"> <li>• the profit value</li> <li>• general objectives, scope, strategy, values</li> <li>• databases organization customers</li> <li>• database organization articles</li> <li>• prices list</li> <li>• products strategies</li> <li>• market reports</li> <li>• budget approved</li> </ul>	<ul style="list-style-type: none"> <li>• designing and creating activity in order to achieving the commercial department objectives</li> </ul>	<ul style="list-style-type: none"> <li>• objectives outputs in terms of articles</li> <li>• objectives outputs in terms of values</li> <li>• objectives outputs in terms of customers</li> </ul>	<ul style="list-style-type: none"> <li>• general manager</li> <li>• commercial department staff</li> <li>• marketing department</li> <li>• financial department</li> </ul>

The types of results shown in table 2 defined the areas of features that need to be used to achieve the objectives. In this way, the areas of interest are specified for which the activities that are carried out in order to achieve the objectives must be concentrated.

Another type of results are referring to consumers, the way of targeting the customers segments and with what types of products and the value assigned on each type. This type of results is considered essentials at the level of importance because it is the one that ensures the value of the objectives and the organization's future in terms of competitiveness (Ionescu, 2013, pp. 96-120)

**Flowchart.** Phase 3 also called the flowchart tool succession of process activities that are previously described using Business Process Management (BPM) technology, provides a modeling approach that

enables the management of commercial department to transform the strategic decisions of the organization's into concrete action plans by determining elements in the SIPOC diagram and providing a synoptic view of the operational activity.

The BPB technology offers a different approach to planning management highlighting the evolution of the process and ensuring crossing of all departments of the organization related to the implementation of the objectives, offering an integrated approach and exceeding the scope of commercial department. In addition, PBM offers useful elements that ensure monitoring and analysis of process characteristics by the ability to optimize activities in real time and even the whole process from start to end, rather than facilitating work and documents between commercial department members (Menken, 2009, p. 221).

**Quality characteristics.** According to the specialists in the field, the characteristics of a process in terms of quality, time and cost, are essential in order to understand and complete the process work. These areas of identification of quality indicators help complete the process with results in the organization's competitiveness.

The modalities for shaping and customizing these process characteristics are a decision responsibility for each organization. Each decisional agent has to select and define those dimensions that are relevant to the company's policy, strategy and objectives, and are in line with the available financial resources (Kaplan, 1992, p. 75).

**Table 3** – Description of the quality characteristics used to achieve the objectives

Quality characteristics		Quality indicators
Quality	Conceptual requirements	Acceptability of portfolio products
		Respecting sales strategy for distribution channels
Quality	Functional requirements	Monthly frequency of orders by type of customer / business
		The degree of achievement of monthly and quarterly targets
Time		Frequency of orders processed at work time
		Customer order picking cycle length
Charge		The cost of finalizing at least 10 orders made in eligible bills
		The amount of monthly salary costs for a commercial representative
		Total cost per order honoured

The Relevant features such as quality, time and cost need to be linked to each other to provide ways to use operational management as a means of integrating into actions required to achieve the goals towards increasing organizational competitiveness. In this way, the characteristics related to the commercial department are transformed into parameters as follows:

- Quality Parameters – Concentrate the conceptual, technical or functional requirements of input and output process variables;
- Time Parameters – Concentrate the calendar constraints into the sequence of activities in this process;
- Cost parameters – Concentrate the limit values designed for process activities.

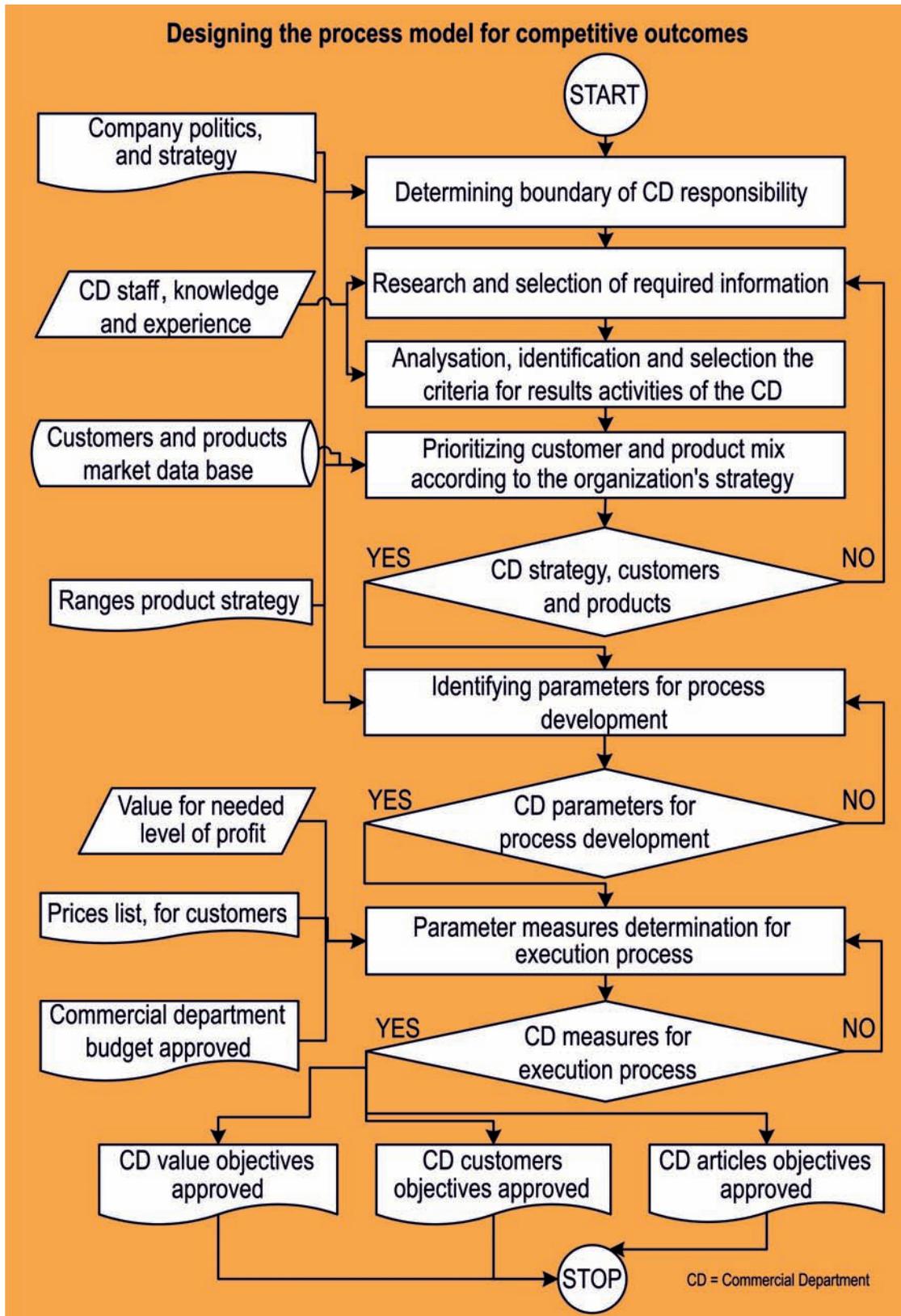
The listed parameters are split into elements that can be measured at the implementation level and may constitute the guidelines for achieving the organizational

objectives. In Table 3 the operational parameters used are extracted (Paesbrugge, 2017, p.171).

## Conclusions

This paper presents the structure necessary to achieve organizational objectives in the case of the commercial department, considering the ongoing requirement of increasing the competitiveness of the company. It has been proposed a useful model grounded on key elements for management planning that ensure the identification of those departments or entities that can provide relevant information, identifying types of information and identifying those activities that can lead to the goals assumed by the organization.

The process model provides a comprehensive correlation between the information items and the tracked results. The research indicates and explains the essential



**Figure 1** – Designed flowchart breakdown for achieving commercial objective



quality characteristics classified in three elements in order to track all the dimensions that characterize the company's competitiveness.

In order to achieve the planned objectives and the parameters indicated for the commercial department, it has been stressed the need to clearly highlight the components of the effort, the identification of the responsible entities, the identification of the input and output variables, all of them being included in the SIPOC diagram.

Also, the authors illustrated the essential elements of the structure necessary to

achieve the objectives and the proposed the process model embedding the entities participating and offering information, the sequences of the flow and the interactions of activities, with decision making points needed to highlight the quality of the results up to that point.

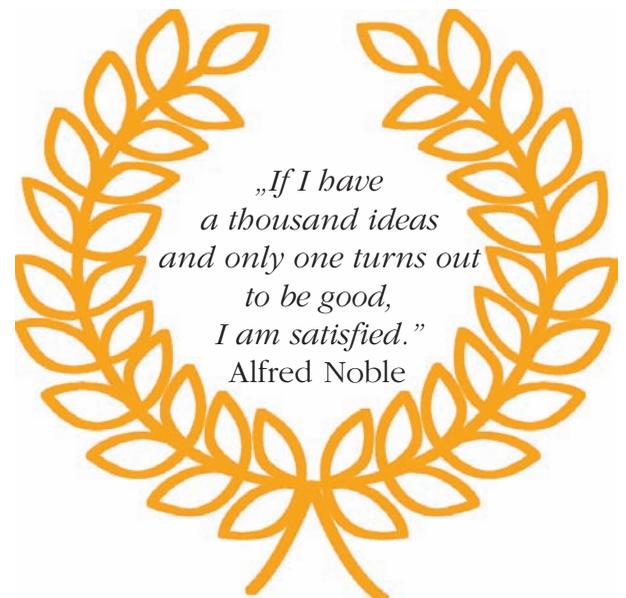
Finally, considering a deployed framework, the goal-building process can verify the proposed model with the help of the management of the commercial department by collecting the necessary information to improve the activities and, implicitly, the results of the activities.

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# Resistance of Changes Implementation

**Claudia Paula Fuiuoga, Costache Rusu**

„Gh. Asachi” Technical University of Iași, Romania

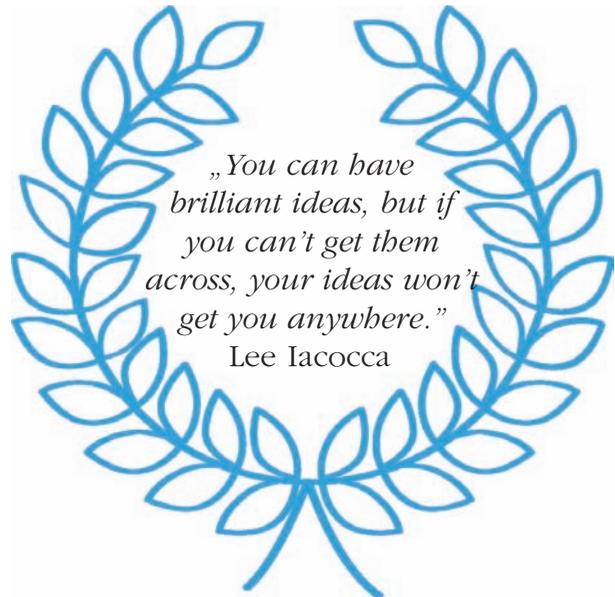
Abstract

*In the current context in which organizations need to face constant, simultaneous, and violent changes, resistance to change has become a big and continuous challenge for managers. Despite the efforts made in enterprises, this issue continues to create difficulties in practice, and the success rate of the change processes is still low. The purpose of the paper is to analyze the resistance to change in Romanian companies, as an obstacle to change implementation processes. In order to analyze this issue, a questionnaire was applied in companies from the north-east region of Romania. The article presents how managers need to consider the different dimensions of resistance to change, in order to overcome the employees' resistance in Romanian companies. The paper highlights the correlations between the specific dimensions of resistance to change in Romania. New solutions for overcome this phenomenon will be presented. Implications for the firms are important in terms of designing strategies to ensure successful change implementation in Romanian cultural and economic context.*

**Keywords:** organizational resistance to change, overcome resistance to change.

## Organizational Change

Resistance to change represent an issue to be treated professionally by the managers, so they can find the most appropriate methods to minimize and overcome the forces against change. Resistance to change is a common feature at all organizational levels (Rusu, 2003), being manifested both among employees (lack of vision, fear of the unknown, strategy misunderstanding, fear of new technologies, cultural considerations,



etc.) and among managers (the threat of losing power and control, overloading of tasks, limited resources, lack of skills, etc.) and among organizations (conservatism, fear of the unknown, predominance of the traditions, admiration for the current status etc.).

Many authors stress that the reasons for the failure of many change initiatives can be identified in resistance to change (Waddell, Sohal, 1998). Resistance to change brings costs and delays in change processes (Ansoff, 1990). which are difficult to predict, but should be taken into consideration. Resistance to change was also seen as a source of information, which is useful in the effort to learn how to develop a successful change process (Beer, 1990), (Goldstein, 1988), (Lawrence, 1954), (Piderit, 2000).

Zander (1950) defines as resistance to change „behavior intended to protect individuals from the effects of a real or imagined change”. Zaltman and Duncan (1977) describe resistance to change as „any action that serves to maintain the status, under a pressure of alteration of the status quo.” Folger and Skarlicki (1999) characterize the concept of resistance to change as the „behavior of employees that seeking to provoke, to undermine or oppose a resistive force, relying on assumptions, speeches or personal relationships”.

In 2000, Piderit argued that resistance to change is much more complex, so we should be talking about three distinct phases in the conceptualization of resistance: a cognitive state, an emotional one and behavior (Piderit, 2000). To make a prediction on the form that people can take resistance, Kotter and Schlesinger (2008) argue that managers should be aware of four common reasons why people exhibit resistance to change: the desire not to lose



something that has a certain value; misunderstanding change and its implications; belief that change does not make sense for the organization; and a low tolerance for change. The two authors also mention six ways to minimize and overcome resistance to change: education and communication; participation and involvement; facilitation and support; negotiation and consent; manipulation and co-optation; implicit or explicit coercion.

To overcome resistance to change difficulties and to implement changes in organizations, it should be considered another aspect which is extremely important: „cultural context” of organizational culture as a national culture (Huțu, 2003). National culture in Romania has a number of features that leadership should consider in developing strategies for change, namely: a high degree of conservatism, masculinity and high power distance, short-term orientation.

If practitioners managers will understand what is resistance to change, nature and sources that do occur within organizations,

its causes and types of manifestation, they will be able to address this phenomenon by acting on the causes and not the symptoms, thus increasing considerably chances to overcome it successfully, to obtain the active participation of the organization in the change process.

## Sources of Resistance

Pardo del Val and Martinez Fuentes Pardo (2003) divided sources of resistance to change into five groups, from the sources suggested by Rumelt (1995) Although Rumelt insists that inertia is a problem in the strategy formulation stage, as well as in the implementation stage, he did not distinguish the five sources of resistance groups, according to with the two mentioned stages. Pardo del Val and Fuentes Martinez introduced this distinction and suggest that the first three groups are sources of resistance to changes in strategy formulation stage, because they face factors that are complicating and analyzing the

situation and evaluate change alternative. The groups four and five are appropriate for implementing change stage, they become obstacles when change strategy is already formulated.

**Sources of resistance to change and inertia in the formulation strategy stage.** As regards the sources of resistance, change begins with the perception of its need. In other words, a wrong initial perception is the first barrier to change. The authors called the first group **perceptual distortions, interpretation barriers and vague strategic priorities**. These are including (Rumelt, 1995):

- Myopia or inability of the company to look to the future with clarity;
- Denial or refusal to accept any information that was not expected or desired;
- Perpetuation of ideas, meaning tend to keep present way of thinking, even if the situation has changed;
- Default assumptions that are not discussed due to their implicit character, that distorts, therefore, the reality;
- Communication barriers that lead to the distortion of information or to misinterpretation; and
- Silence in the organization, which limits the flow of information between individuals, who do not express their thoughts, which means that decisions are made without all the necessary information.

The second group of the main source of resistance to change is linked to **low motivation to change**. There are five basic sources (Rumelt, 1995):

- The direct cost of change;
- Costs of cannibalization, or, in other words change that brings a product's success can bring, at the same time, losses for other products, so that is required sorting of sacrifices;



- Comforts of cross-subsidies, because the need for change is compensated by high revenues without changing to another factor differently, so that is no real motivation for change;
- Earlier failures, which leaves a pessimistic picture for the future changes;
- Different interests of the employees and management, or employees' lack of motivation, which values change results weaker than managers do.

**Sources of resistance to change in the change implementation stage.** Implementation is the critical step in change decision and it's regularly used within the organization (Klein, Sorra, 1996). In this phase may be encountered other two groups of resistance. The first one is related to **political or cultural blockage of change**. These ones consist of:

- The climate for change implementation and the relationship between change values and organizational values, considering that a strong climate for implementation, when the relationship is negative, will generate resistance and opposition to change (Klein, Sorra, 1996), (Schalk, 1998);
- Departmental policies or resistance from those departments that will suffer from the implementation of change (Rumelt, 1995);
- Immeasurable beliefs or strong and definitive disagreements within the organizational groups about the nature of the problem and its alternative solutions accordingly (Rumelt, 1995), (Klein, Sorra, 1996), (Zeffane, 1996);
- Deeply rooted values and emotional loyalty (Kruger, 1996), (Nemeth, 1997), (Strebel, 1996);
- Omitting the social dimensions of change (Lawrence, 1954), (Schalk, 1998).

Finally, a set of **other sources** of resistance to change with different characteristics have been gathered together around the last group:

- Leadership lack of action, sometimes because leaders are afraid of uncertainty, sometimes because of the fear to change the status quo (Lawrence, 1954), (Schalk, 1998), (Rumelt, 1995).
- Incorporated outlines (Rumelt, 1995), (Starbuck, 1978);
- Collective action problems, relating notably to difficulty of determining who will make the first move or how to deal with „free riders” (Rumelt, 1995);
- Lack of capabilities needed to implement change (Rumelt, 1995);
- Cynicism (Reichers, 1997).

## Resistance to Change Diagnosis

Organizational change efforts often fall into a form of human resistance. Although all experienced managers are generally well aware of this fact, only a few of them





a serious obstacle in achieving the change plans, this phenomenon often involving total or partial failure of many organizational transformation efforts.

One of the well-known scale for measuring the resistance to change belongs to Shaul Oreg, who conducted, along with collaborators from 17 countries, the study „Resistance to Change Disposition: Measurement Equivalence year Link to Personal Values Across the 17 Nations” (Oreg, 2003). This study designed a measuring system of the resistance to change. The proposed scale measurement – RTC Scale – measures dispositional inclinations of individuals to oppose an organizational change. The scale can also be used to centralize the component to the change in resistance, which varies from individual to individual, as well as to predict certain specific reaction to certain changes.

The questionnaire designed by Oreg indicates four determinants of resistance to change:

**1. ROUTINE SEEKING (RS)** – a set of 5 items aimed the behavioral component of resistance to change, „the inclination of individuals to adopt routine”. They are: *I generally consider changes to be a negative thing; I'll take a routine day over a day full of unexpected events anytime; I like to do the same old things rather than try new and different ones; Whenever my life forms a stable routine, I look for ways to change it; and I'd rather be bored than surprised.*

**2. EMOTIONAL REACTION (ER)** – a set of 4 items targeting the affective component of resistance to change, „the amount of stress and anxiety generated by change”: *If I were to be informed that there's going to be a significant change regarding the way things are done at school, I would probably feel stressed; When I am informed of a change of plans, I tense up a bit; When*



*things don't go according to plans, it stresses me out; and If one of my professors changed the grading criteria, it would probably make me feel uncomfortable even if I thought I'd do just as well without having to do any extra work.*

**3. SHORT-TERM FOCUS (STF)** – a set of 4 items also entail an affective component of resistance to change, namely „the extent to which individuals are distracted by short-term inconvenience”: *Changing plans seems like a real hassle to me; Often, I feel a bit uncomfortable even about changes that may potentially improve my life; When someone pressures me to change something, I tend to resist it even if I think the change may ultimately benefit me; and I sometimes find myself avoiding changes that I know will be good for me.*

**4. COGNITIVE RIGIDITY (CR)** – a set of 4 items aimed at the cognitive component of the resistance to change, namely „the frequency and easiness with which individuals change their mind”. These are: *I often change my mind; I don't change*

*my mind easily; Once I've come to a conclusion, I'm not likely to change my mind; and My views are very consistent over time.*

The study conducted by Oreg and his collaborators were done in 17 countries, speaking 13 different languages. The authors argued that the validity of its transnationality was established by a replica of the questionnaire structure and with the partial proof of equivalence measurements. The scale had the same structure in all countries. Except for those two items consist of negatives, all items presented tasks invariant in different countries. The study results suggest that dispositional resistance to change bear equivalent meanings among nations, so that the scale can be used successfully in any country. The investigation of resistance to change in Romanian companies has used the four dimensions of the questionnaire Shaul Oreg.

**Data analysis.** A questionnaire is an assessment tool for measuring par excellence subjective opinions, so that has become needed the analysis of internal consistency (Cronbach – Alpha) for each of

the four dimensions of variable resistance to change. Alpha coefficient value 0.802 is quite high, so we can say that the scale will generate consistent results. Using Kolmogorov – Smirnov normality condition was checked and confirmed distribution variables.

In determining the intensity and the influence of links between the four variables (*routine seeking, emotional reaction, short-time focus and cognitive rigidity*), it was used Spearman correlation coefficient. Table 1 shows the results of calculations Spearman correlation coefficients between the four variables of research. Calculations needed to know to what extent they influence each other. Thus, one can see:

- All connections between variables are positive and proportionate. In other words, an increase in the variance of one variable implicitly leads to an increase in other variable involved in the correlation variance.
- There is a very intense connection between *routine seeking* and *short-term focus* – 0.808 in the range [0.7 to 0.9].

**Table 1** – Calculation of Spearman correlation coefficients between investigated dimensions

	ST_RS	ST_ER	ST_STF	ST_CR
Correlation Coefficient	1.000	.416**	.808**	.665**
ST_RS Sig. (2-tailed)	.	.000	.000	.000
N	168	168	168	168
Correlation Coefficient	.416**	1.000	.376**	.404**
ST_ER Sig. (2-tailed)	.000	.	.000	.000
Spearman's rho N	168	168	168	168
Correlation Coefficient	.808**	.376**	1.000	.513**
ST_STF Sig. (2-tailed)	.000	.000	.	.000
N	168	168	168	168
Correlation Coefficient	.665**	.404**	.513**	1.000
ST_CR Sig. (2-tailed)	.000	.000	.000	.
N	168	168	168	168

- There is high-intensity connection between the *routine seeking* and *cognitive rigidity* (0.665 within the range [0.5 to 0.7]) and between *routine seeking* and *short-time focus* (0.513 within the range [0.5 to 0.7]).
- There is moderate link between *emotional reactions* and *routine seeking* (0.416 within the range [0.3 to 0.5]), *short-term focus* and *emotional reactions* (0.376 within the range [0.3 to 0.5]), *emotional reactions* and *cognitive rigidity* (0.404 within the range [0.3 to 0.5]).

Following the calculations, we can rank the researched dimensions, according to the average scores obtained, while emphasizing the links between them.

According to research results presented in Table 2, it can be seen which are the main factors underlying the emergence of resistance to change phenomenon in Romanian companies.

Most importantly factor is *cognitive rigidity*. This was defined as the tendency to respond in absolute terms of language or excessive generalizations, in other words tendency to prefer the usage of terms such as „all”, „always”, „never” or „always” (Snider, Drakeford, 1968). Thus, the change

leaders will have to take into consideration this provision of employees, to expect reactions of change rejection, following the manifestation of that provision, and to use tools suited to overcome the resistance. Analysis of responses to the four items that define the *routine seeking* dimension revealed that respondents tend to declare clearly, from the start, that once they have formed an opinion, it remains unchanged.

The second factor as importance in determining the causes of resistance to change among employees in Romania is *routine seeking*. This is the tendency of individuals to appreciate and even to seek routine in the environment in which they operate, either personally or professionally. Therefore, change leaders will have to take into account this people’s natural preference for a typical day, according to the routine, instead of a full day of unexpected events. Whereas organizational change processes involve many behavioral changes, leaders must try to explain to employees the need to introduce change, the change plan, the new behaviors expected of them, the expected results, in order to make the process of change predictable for employees.

**Table 2** – *The average values and the values of Spearman correlation coefficient for the dimensions of resistance to change variable*

Hierarchy dimensions depending on total score	Total score (average)	Routine seeking	Emotional reaction	Short-time focus
Cognitive rigidity	12.52	.665	.404	.513
Routine seeking	11.79	1.000	.416	.808
Emotional reaction	11.43		1.000	.376
Short-time focus	9.12			1.000

*Emotional reactions* are the third factor that causes resistance to change among employees of Romanian companies. Emotional reactions are materialized into discom-

fort and stress-induced at the individual level by the processes of change. Organizational leaders should be aware that these feelings are natural and inevitable; therefore



the change strategies that they conceive should contain the ways in which the negative emotional reactions of employees will be welcome and exceeded.

*The short-time focus* is the last of the four dimensions whose influence on the resistance to change were investigated. This implies that individuals are more concerned with short-term inconveniences that change can bring, than the medium or long-term benefits. Responses from the research participants highlighted the fact that people perceive change as a dispute. Even if it brings an improvement in their life and the performance of the organization, the change makes employees feel pressure and discomfort. The better change leader understands these feelings and reactions, the more capable he will be to find levers to help him overcome these obstacles to change, so his chances to successfully complete the change effort are greater.

## Conclusion

Resistance to change is a common feature at all levels, it manifested both among employees (sighted, fear of the unknown, strategy misunderstanding, fear of new technologies, cultural considerations, etc.) and among managers (threat loss of power

and control, overloading of tasks, limited resources, lack of skills, etc.) and among organizations (conservatism, fear of the unknown, the predominance traditions, admiration for the current status etc.).

It is important to distinguish between causes and symptoms of resistance to change. Another aspect related to resistance to change is the tolerance for a change of an individual, which is defined (Kotter, Schlesinger, 2008) as the individual's fear of not being able to develop new skills and behaviors which are required under the new conditions created by change. Resistance to change occurs due to a violation of a set of personal values of employees, from the organization management.

The sources of resistance to change and inertia in organizations may be different, depending on the stage of the change process: whether it is in the process of drawing up the strategy or implementation phase of the strategy. The strategy phase composition, these sources can be distorted perceptions, interpretation barriers and vague strategic priorities, poor motivation or lack of creative response. In the implementation of change phase we can talk about the political or cultural blockage of change, etc.

The main methods of counteracting the resistance to change are described by Kotter and Schlesinger as: education and communication, participation and engagement, facilitation and support, negotiation and agreement, manipulation and co-optation, explicit and implicit coercion (Kotter and Schlesinger, 2008).

Managers can increase their chances of success in an organizational change effort through:

1. Conducting an analysis to identify current problems and forces that constitute the possible causes of the problems. This analysis should specify the current

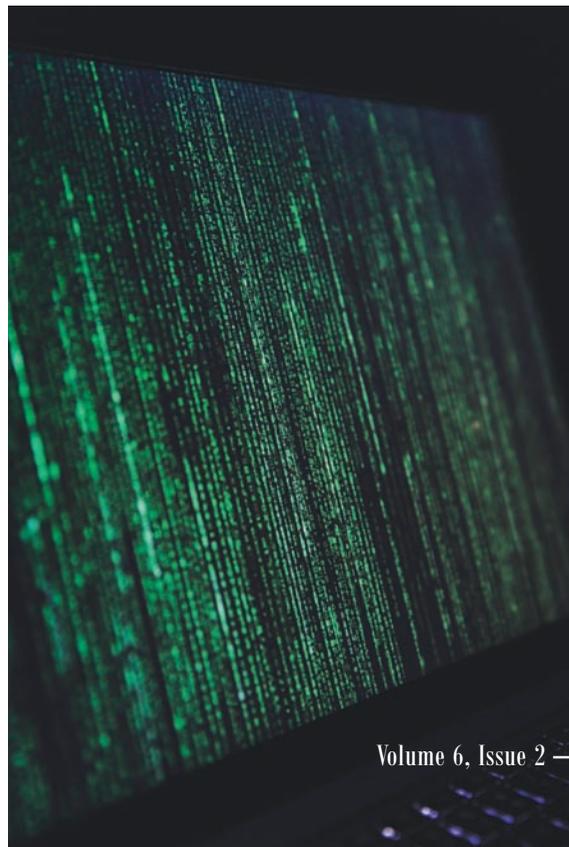
importance of the problems, the speed at which they must be addressed, if it is necessary to avoid further problems and the types of change that are generally needed.

2. Perform analysis for identifying the current situation, the relevant factors that produce the problems. This analysis should focus on the questions of those who might resist change, why, and how much; Who has the information needed for the design change and whose cooperation is essential for its implementation; and the positions of the other parties to the relevant originator in terms of power, reliability, normal ways of interaction and so on.
3. Perform an analysis of the relevant factors to produce the necessary changes. This analysis should focus on who might resist change, why, and how much; who has the information needed for the design change and whose cooperation is essential for its implementation; the positions of the other parties to the relevant initiator in terms of power, reliability, normal ways of interaction and so on.
4. Selection change strategy, based on the analysis above, which specifies the speed of change, the amount of pre-planned and the involvement of others. Based on the strategy it will choose specific tactics used at the individual and group level, those being internally consistent.
5. Monitoring the implementation process. No matter how well they were selected the initial strategy and tactics for change, something unexpected can occur at any time during implementation. Only through careful monitoring of the process leaders can identify timely the unexpected events and they can react intelligently to them.

6. Interpersonal skills are the key to using this analysis. But even the most outstanding interpersonal skills will not mask an unfortunate choice of strategy and tactics for change. And in a business world which is becoming more and more dynamic, the consequences of bad choices for implementing the change will be more severe.

Managers can increase their chances of success in an organizational change effort in understanding the phenomenon of resistance to change, then apply the methods, techniques and tools to counteract this phenomenon and to overcome the resistance of employees, both individually, group or the organization as a whole resistance.

Knowing the sources of resistance to change, causes and explanations of the psychological origin of this phenomenon, leaders will likely underpin those strategies to mitigate and overcome resistance barrier.





The most important factor of the resistance to change in Romanian companies is cognitive rigidity. The leader must intervene here, to show all his skills and competencies to explain the need for change and persuade employees to accept and to give their support to the process of change. This mission can be extremely difficult as cognitive rigidity has its roots in human personality and is difficult to overcome. Therefore, it is more important that the

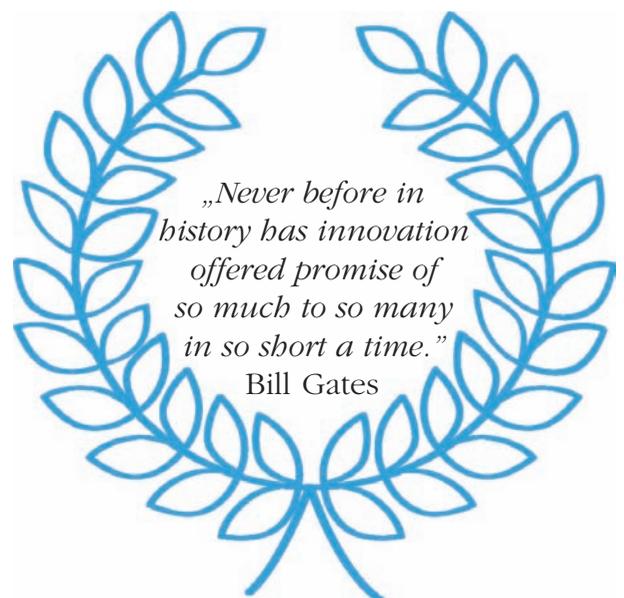
leaders know the importance of this factor in the general phenomenon of resistance to change.

Also, change leaders must consider two other aspects of resistance to change: the routine seeking and emotional reactions. Those two factors have significant scores in research, manifesting itself at a high level among employees of Romanian companies. Finally, it should be taken into account their short-time focus.

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# Transfer of Innovations to the Private Sector

**Diana Mura Badea (1), Mihaela Guda (2), Valentina Băjenaru (1),  
Dumitru Vlad (1), Florin Teodor Tănăsescu (3)**

(1) INCD-MTM Bucharest, Romania, (2) Ministry of Research and Innovation Bucharest, Romania,  
(3) Romanian Electrotechnical Committee Bucharest, Romania

Abstract

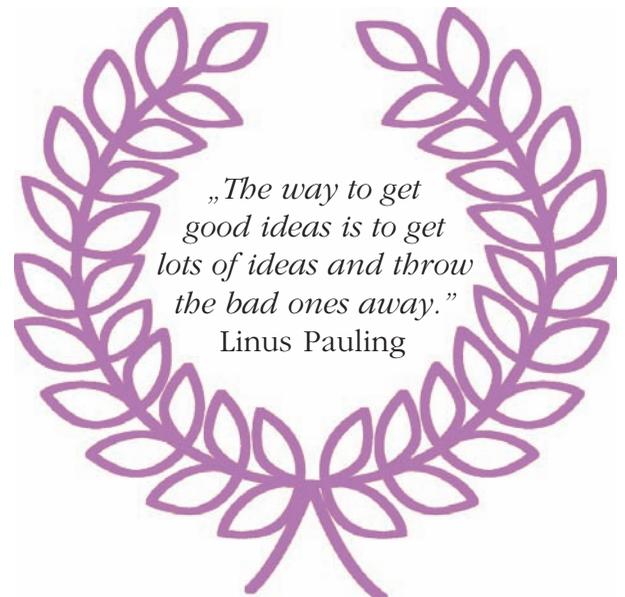
*This paper presents the way in which the research results of a national RDI institute can be transferred to stakeholder companies. Informal transfer of knowledge, jointly prepared scientific works, access to laboratories intensify due to the fact that these actions often take place as a result of past collaborations or in the hope of future ones. Companies in Romania are interested in the transfer of certain research results, but they do not have the necessary financial resources to buy the researcher's industrial property rights, nor the funds required to prepare for production and release of a product on the market.*

**Keywords:** technology transfer, research

## Introduction

There is a consensus in the Romanian society that technical progress can only be achieved by innovation and technology transfer of results from public scientific researches financed from government funds, which leads to an increased technical/economic potential of a company, thus increasing its chances to participate successfully in international exchanges. SMEs in Romania are interested in the research activity, taking part in research programmes along with institutes and universities that address certain themes, the results of which solve some of the company's problems.

Informal transfer of knowledge, jointly prepared scientific works, access to laboratories intensify due to the fact that these





actions often take place as a result of past collaborations or in the hope of future ones. Companies in Romania are interested in the transfer of certain research results, but they do not have the necessary financial resources to buy the researcher's industrial property rights, nor the funds required to prepare for production and release of a product on the market.

The competition from foreign companies on the domestic market has determined Romanian companies to modernise their products to be competitive and, at the same time, to have access to markets abroad. If this interest of Romanian companies in transfer exists, stimulating tools must be found for companies to be able to benefit of profitable loans, access to public/private capital funds, tax exemptions, state funding of some preliminary phases of Transfer, market surveys. Equally, measures will need to be established to stimulate the interest of multinationals in Romania to finance innovation activities according to the company profile or to use Romanian patents that are applicable here. Currently, there are few examples of this kind, such companies working with the research centres of the parent company.

## Results of Technology Transfer

The study of technology transfer actions shows that the main results are as follows:

**1. Technology Transfer creates new jobs and staff skills.** Technology Transfer of certain public research results to companies comes along with increased company competitiveness and, consequently, increased number of jobs. The establishment of spin-offs and start-ups based on marketing of patents is a new possibility to increase the number of jobs. New jobs will also be created due to the services that may develop as a consequence of results transfer: market prospecting, benchmarking, services, vocational training etc. The high technical level of such patents also leads to an increased professional level of employees, acquiring new technical abilities, higher technical training that allows industrial mobility.

**2. Incentives for the researcher who transfers a result and for the company that uses it.** Unfortunately, neither the researcher, not the company are encouraged to transfer and to receive incentives. Therefore, it is necessary to create rights for the two partners of the transfer, moral and financial incentives to increase the interest in promoting transfer. The state must not be excluded from the transfer of the research results to be financed from public funds and cannot be indifferent to what happens to the money spent.

The researcher has a moral responsibility for the research result for which s/he was paid, and likewise, the company has the same responsibility to resist competition, to strengthen its position on the market and to ensure the stability of the workforce. This paper proposes the creation of a new transfer mechanism, including development of specialised entities with transfer-related financial, legal and organisational power, with training in intellectual property issues to ensure the stimulation

of the two partners in promoting technology transfer.

**3. Transferring more results means bringing more money for development in the financial circuit.** Although there is general consensus on the importance of research and its impact on the development of society, the Americans were the first to understand the importance of results transfer, both in terms of programming adoption and of the needs to recover incurred expenses.

Manhattan Project was the most obvious, then Silicon Valley (Abramson, 1997).

If until 1980 the property right belonged to the inventor and transfer was made by its own weak efforts, ever since the issue of applying the industrial property right has been revolutionised in the sense that it was decided that institutions that had access to government funds should use the obtained results themselves, market them, organise specialised bodies and share the obtained benefits between the inventor and the institution (Law 83, 2014).

Although apparently the state was at loss since it did not sell the patent/result, by the taxes charged on the productions made

by this Transfer, the amounts received by the state were much higher! It is also the reason why the paper presents the proposed technology transfer model and the organisation of such entities, resulting both in an accelerated transfer and a possibility to „return” to the budget a large amount of the expenses incurred with innovation.

**4. Foreign companies should be co-interested in the Technology Transfer of certain Romanian research results.**

A solution could be to stimulate greater participation of these companies in National Research Programmes to solve their problems and other problems of interest, thus creating the framework of future transfer or collaboration with the research sector in projects when they receive Romanian state aid.

**5. A model of research results dissemination in the mechatronic field to economic agents.**

The development of an adequate model to transfer the results of the researches conducted by National Institute of Research and Development in Mechatronics and Measurement Technique (INCD-MTM) to the mechatronic and industrial sector must consider several important aspects starting first of all from the necessity to avoid the negative sides existing in the current system. The main idea is that any system we may envisage, it must take into consideration:

- The specificity of our country (even if we intend to take some structural elements from certain high-performing European systems );
- To use as much as possible the structure existing in the country in which funds and a lot of work have been invested;
- To bring pertinent amendments to improve and supplement the attributions of the institutions that will join the system,



required to perform high-quality transfer activities;

- The economy and industry development direction of our country to enable correct dissemination to those sectors and subfields that will be developed, a situation that we find in the strategy of high-performing systems in countries like Germany, USA, France etc. in which their economy sectors considered in the process of development are precisely outlined (Fraser, 2000);
- To reinstate and improve the structural and institutional relations with some institutions that greatly contribute to supporting and performing technology transfer activities (OSIM, Chambers of Commerce, Local governments, Regional and national development agencies, SME Board);
- Observance of European methodologies, in particular those that ensure better knowledge and extensive information between the sector that transfers the technologies and the economic and industrial sector, especially those related to patents, licences, models, trade names, drawings etc.;
- Supplementing the necessary staff and continuing vocational training thereof in all the units of the technology transfer system;
- The reactivation of programmes to implement projects of institutional construction and technology services and to ensure proper financing;
- The need to finance technology transfer activities since such funding is currently inexistent, and if existing, it is supported from other means and with funds that do not ensure a substantive development of the issue. Such funding is necessary and mandatory since transferring entities need the funds to patent,



licence and perform technology transfer activities, and the enterprises (existing or newly established) that use them need financing in order to buy the licences to start production with the new technology and to start earning money.

The proposed model involves a new vision and also a new approach based on the elements of the system existing in our country – ReNITT (National Network of Innovation and Technology Transfer) which can be structurally improved by some amendments, new attributions and improvement of those existing in their structure, from state financial aid of TT and from the own resources of the TT Centre, as a result of commercialising TT, as well as a revival of the activities provided in their operational status at different parameters. (In all countries in which Technology Transfer is consolidated, the preparation process of some TT, certain phases, are financially supported by the state) (Fraser, 2000).

## The Technology Transfer Centre

It is a very important entity in the ReNITT structure, with actual participation in the process of RD results dissemination to the



economy and the industry. We must emphasize once again that the entire transfer activity is coordinated, monitored and adjusted by ReNITT system via the Technology Transfer Centres (TTC). These centres operate in Universities and National RD Institutions (Bauer, 2010).

The Technology Transfer Centre can include the following:

- National and international members from the industry, research, academic environment, political representatives;
- Training team for the staff of the strategic partner and for the TTC staff financed through national funding mechanisms.

Depending of the requirements of each transfer stage, the TT Centre forms work teams that comprise a TTC representative, the holder of the technology (project, patent, exclusive rights etc.), specialists with training and expertise corresponding to the requirements of the stage, temporarily employed throughout the stage (stages) or the activity for which they were co-opted. Examples of such work teams could be: team that prepares the business plan, team that

prepares the market analysis (market survey); team that uses the technology; team that trains the staff etc.

The training activities will consider the building and strengthening of staff skills through specific programmes, such as: Top and middle management; Technology training; Science and Business; Marketing Research; Customer Relations Management etc.

The attributions of these Transfer Centres ensure coordination and completion of all technology transfer stages, with the help of: ReNITT Management, Institutions and central bodies (Ministry of Research and Innovation, Ministry of Economy, Ministry of Education, Ministry of Labour, Regional Development Agencies, Chambers of Commerce, National Board of SMEs, OSIM etc.), **Entities** attached thereto (Universities, RD Institutes), **Specialists** in the field of the technology to be transferred, temporarily co-opted throughout the transfer stage (stages) or activity, **Technology Designer** (holder of the project, patent, property right), **Partner (partners)** chosen to use the technology (INCD-MTM, 2015).

In order to perform their attributions, the Technology Transfer Centres have operational and structural independence have at least 3 employees, but they can also form multidisciplinary teams whose members must have at least 10 years of seniority in the field, in order to perform an activity with maximum output, they must not deal with more than two themes of technology transfer (ASRO, 2013).

Thus, with this structural design, the technology transfer mechanism and all the undertakings required in the transfer activity flow take place between the two important players: The Technology Transfer Centre, seconded in particular by the Technology Designer and supported by the entities listed above, as party that transfers the technology and The strategic partner chosen, as party that receives the technology.

The development of an adequate model to transfer the research results to the economic and industrial sector must consider several important aspects starting first of all from the necessity to avoid the negative sides existing in the current system (ASRO, 2013).

The main idea is that any system we may envisage, it must take into consideration:

- The specificity of our country (even if we intend to take some structural elements from certain high-performing European systems) (Reid et al., 2010).
- To use as much as possible the structure existing in the country in which funds and a lot of work have been invested;
- To bring pertinent amendments to improve and supplement the attributions of the institutions that will join the system, required to perform high-quality transfer activities;
- The economy and industry development direction of our country to enable correct

dissemination to those sectors and sub-fields that will be developed, a situation that we find in the strategy of high-performing systems in countries like Germany, USA, France etc. in which their economy sectors considered in the process of development are precisely outlined;

- To reinstate and improve the structural and institutional relations with some institutions that greatly contribute to supporting and performing technology transfer activities (OSIM, Chambers of Commerce, Local governments, Regional and national development agencies, SME Board);
- Observance of European methodologies, in particular those that ensure better knowledge and more extensive information between the sector that transfers the technologies and the economic and industrial sector, especially those related to patents, licences, models, tradenames, drawings etc.;
- Supplementing the necessary staff and continuing vocational training thereof in all the units of the technology transfer system;



- The reactivation of programmes to implement projects of institutional construction and technology services and to ensure proper financing;
- The need to finance technology transfer activities since such funding is currently inexistent. Such funding is necessary and mandatory since transferring entities need the funds to patent, licence and perform technology transfer activities, and the enterprises (existing or newly established) that use them need financing in order to buy the licences to start production with the new technology and to start earning money.

The pre-feasibility study proposes a pilot model involving a new vision and also a new approach based on the elements of the system existing in our country – ReNITT – which can be structurally improved by some amendments, new attributions and improvement of those existing in their structure, as well as a revival of the activities provided in their operational status at different parameters.

With regard to ReNITT, this network preserves its current structural organisation, however with *coordination at central level and specialised entities* according to their specific attributions (Technology Information Centres, Technology Transfer Centres, science and technology parks, technology and business incubators). These entities are implemented, as before, in universities, specialised RD institutes, various other RD entities, innovative SMEs etc.

However, the structure of these entities must be revised and reorganised, especially the structure of the Technology Transfer Centres with a view to provide them with professionally and numerically adequate staff, which will ensure continuous, correct and qualitative operation.



It is painful to acknowledge this, but Technology Transfer of results from researches financed from public funds has rather a „voluntary” character, as the entity that receives public funds for research does not have an obligation and a responsibility to account for its contractual obligations. The TT Centres created in National Institutes or Universities are poorly sized in terms of their obligations (marketing, market surveys, intellectual property, legislation), have insufficient staff, since the funds for these activities come from other (reduced) resourced, the positive results – if any – owing to certain institute leaders with farsightedness. Effective operation of these TTCs will greatly depend on the concept that Romania will promote for Romania, the TT financing and efficiency, the legislation and the coercive/stimulating measures to be taken.

Among the most obvious weaknesses, the following must be pointed out:



- The funds allocated to innovation are insufficient. There are no funds for technology transfer activities. In many cases

the physical infrastructures for RD in laboratories are not demanded and, consequently, they do not have a concrete utility.

- No ability of the TT centres of the ReNITT network to identify, centralise and forward TT demands to SMEs, local, regional or foreign centres.
- Inexistence of a data bank to record projects, patents and licences.
- Poor cooperation between the public and the private sectors.
- Low percentage of valorised patents. Results of projects, patents, inventions and licences are mostly theoretical and inapplicable. No knowledge of the direction of development by economic and industrial sectors.
- Limited development of the industrial sector of SMEs and their technology level.
- Insufficient or very slow pace in the development of vocational training and management programmes.

## Conclusions

INCDMTM, by its Technology Transfer Centre – CRTTC INCDMTM – pays special attention to the transfer of the results of scientific researches financed by the State, development of Companies and their increased competitiveness by High-Tech products specific to mechatronics, which is a priority of European research.

Technology Transfer (TT) is the process by which the knowledge, products and technologies developed by public researches financed by the state are transmitted to companies to accelerate their progress and increase their competitiveness.

The purpose of TT is to support the economy and to offer companies the opportunity to become as competitive as possible. Companies increase their competitiveness and economic strength, and research institutions acquire scientific strength and have the possibility to attract new funds for research and development (ASRO, 2013).

Successful Technology Transfer implies that the two partners, the Company and the Public Institution join their forces to transfer a research result that may lead to the welfare of the society, their good collaboration depending on the efficiency of the transfer.

Technology Transfer does not mean just selling a patent; it comes along with all that scientific research can offer to a company: knowledge transfer, staff training, training sessions, joint projects and activities, access to laboratories and innovation platforms,

technical assistance and services. Technology Transfer takes place within entities specialised in TT that are established within the public research institute (INCDMTM or University), an entity with or without legal status, specialised in transfer, marketing and



industrial property matters, and sized to perform a series of activities that will be documented in its organisation and operation regulations.

The implementation of a Transfer of knowledge usually takes place according

to a certain TT scheme, but there can be also some specific phases for a certain application.



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