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CONTENTS

Henry Fayol, a Guru in Management

The French engineer Henry Fayol together with the American Frederick Taylor and the German Max Weber are the creators of General Management. Taylor has started scientific studies in order to set the ground in management, Fayol has defined the management activities and Weber demonstrated the importance of having a specialist in this area.

In his book „Administration Industrielle et Generale" written in 1916, H. Fayol clarified a range of aspects which are part of the contemporary management today. One hundred years after his book was written, one can notice that many of his ideas have become classic concepts in management.

Benefitting from a considerable experience in several companies' management, but also from his capacity to synthesize and generalize, Fayol has defined the management functions and its component activities, but also the companies' activities and functions. The changes that occurred in the meantime have no impact when it comes to his contribution to the management theory. Even though many researchers have tried to add new concepts or to underline the theory, his fundamental theory withstood time.

Fayol considered that a leader needs to be specialized in a certain field, but he/she also needs management training. He realized that in a company there are not only top managers, as it was commonly understood at that moment, but also middle managers and supervisors, all being more or less involved in the execution of the functions that he has defined: forecasting, organization, command, coordination and control. He also demonstrated the management studies need to be carried on in parallel with professional studies. Today, such training and studies are carried on in universities during the bachelor, master, MBA, post-university programs and also through vocational training institutes.

After the first World War, his book was translated into many languages and became known worldwide, being considered the Bible in forming the future managers and actually creating a current entitled Fayolism, as spread as Taylorism, both contributing to the structuring of contemporary management.

Fayol used to believe that management is needed in all types of organizations, a principle which today is known as industrial management, service organization management, public management, political management, NGO management, cultural management etc. He also built 14 principles that managers need to consider in their daily activities. He entitled them principles (as Daniel Wren noticed) to show that they don't need to be applied as they are stated, and they should be considered more as guidelines. The manager needs to consider the company's environment as this will influence the principle's implementation, so the principles need to be adjusted on a case by case basis. Through this approach, Fayol has anticipated the organizational contingency theory that emerged in 1969.

H. Fayol also demonstrated the importance of team work. At that time, only worker teams were known and for this kind of teams he had recommended self-training. Today, employees work in project teams, executive teams and ad-hoc teams. He also recommended the existence of strategic teams that need to be capable of assisting the managers and act on their behalf.

„Crisis and deadlocks when they occur have at least this advantage, that they force us to think."
Jawaharlal Nehru

After his ideas were spread, he started to have enthusiastic supporters, but also more or less severe critics. H. Mintzberg used to say about Fayol that he has not made a scientific study based on management activities and that he has only described his own experience. This is actually what happened, but as time has demonstrated, it was the experience that developed and completed the management knowledge base.

Sorin Ionescu
Editor in Chief

Economic Crisis Handling

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Abstract

The aim of this paper is to introduce the role of management for successful crisis handling. The paper discusses good practices for getting the organization in the position to handle crises: understanding the organization, creating a new mindset in the organization, knowing the consumers, forming a crisis team, rolling out a crisis communications plan. There are some considerations about the relationships between human resource management and entrepreneurship from different points of view, employing different empirical contexts for managing different types of crisis. The papers highlight different answers to key questions: how to respond if a vocal customer complaint suddenly went viral; how to respond to a brandjacking attack; how to create a mindset characterized by transparency, accountability, employee empowerment, planned spontaneity; how to listen to conversations unfolding on the social web about the companies' brands, and respond/employ proactive social support; how to draw up a social team charter to clarify roles and responsibilities and create an internal collaboration space for this team; how to develop a plan covering three important areas – process and culture (what/who needs to change), technologies and tools (what to use to achieve desired results), and key metrics (what to track).

Keywords: economic crisis, crisis communications, crisis team, key metrics.

„The crisis consists precisely in the fact that the old is dying and the new cannot be born."
Antonio Gramsci

Introduction

The neo-liberal economic model of the entire period after the Second World War is now finally found obsolete by many around the world; it causes prevailing of one-sidedness over holistic decision-making

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and action, including the international, national and local politics with very dangerous consequences, such as the current global social, economic, and environmental crisis. Systems theory and cybernetics have offered holism of approach for the wholeness of outcomes for close to seven decades; nowadays the United Nations, European Union and ISO do it with their new concept of social responsibility (ISO 2010; EU 2011). The market alone has not proved to be able to rebalance crucial consequences of human one-sidedness, neither have governments alone (Robison, 2009).

Many countries around the world face severe economic and social difficulties; important economic sectors are in crises, leading to high unemployment and budget deficits (e.g. in Greece, Ireland, Portugal, Slovenia, Croatia, Spain, USA etc). With tight financial funds, severe restrictions were applied in many companies, institutes, and public organizations in the most vital parts: investments, education, research, development, and health care; such short-term thinking will result in the blocking of innovativeness, loss of markets and in uneconomic behavior.

Since late 2008, a global recession has affected the entire European economy to a greater detriment in some countries than in others. This major crisis is characterized by various systemic imbalances and was triggered by the outbreak of the banking crisis of 2007–2008. After a slight recovery in 2010–2011, the European crisis continues. This economic crisis and the related social impact on employment and the labor market are changing the world of work in European countries. Although not all European countries have experienced the same level of economic downturn or state financial problems, the crisis is having consequences for European working conditions.

Working conditions refer to conditions in which work is performed and comprises the work environment and the time, place and organization of work. They constitute the traditional subject of labor law and

are regulated by all of its various sources: legislation, collective agreements, works rules, the contract of employment, and custom and practice. Nowadays, as perception of the concept moves towards the incorporation of additional factors and parameters which affect the employee psychosomatically, a broader definition of the term is being accepted, also including the economic dimension and its effects on the living conditions (environmental problems connected with the work environment) and the social roles of employees (female employment) (Bispinck *et al*., 2010).

A crisis is the ultimate unplanned activity and the ultimate test for managers. In a time of crisis, conventional management practices are inadequate and ways of responding are usually insufficient. Few circumstances test a company's reputation or competency as severely as a crisis. Whether the impact is immediate or sustained over months and years, a crisis affects stakeholders within and outside of a company. Customers cancel orders, employees raise questions, directors are questioned, shareholders get antsy, competitors sense opportunity, governments and regulators come controlling, interest groups prepare for attacking. Some of the techniques for managing a crisis may appeal the conventional notions of planning, testing and execution. Preparation and sound judgment are critical for survival.

By definition, a crisis is a period of difficulty and constraint. While the crisis can be a threat to many, it can also be a turning point, an opportunity to serve new unmet needs in new ways (Branicki and Agyei, 2015). The present times are hosting many different – often intersecting – crises: the global economic crisis, the healthcare crisis, the energy/ natural resources crisis, the education crisis, the crises on multiple fronts in the developing world, the leadership and management crises, the crises involving broken business models in many industries, such as automobiles, newspapers, pharmaceuticals etc. Some crises may be cyclical,

while others may manifest for a long time. Even if some of these crises are resolved or mitigated, most of them will continue to play a key role in the business environment in the coming decades. It is critical to learn how to spot, and even take advantage of, value – creating opportunities in the midst of a crisis, and to translate the insight into profitable new ventures, entrepreneurial initiatives or innovations. Companies, entrepreneurs and managers who excel at such crisis – led entrepreneurship will operate from a position of competitive advantage in the business environment.

Experimental

The credibility and reputation of organizations are heavily influenced by the perception of their responses during crisis situations. There are few common elements to most definitions of crisis: a threat to the organization, the element of surprise, the short decision time, the need for change. Management crisis consists of methods used to respond to both the reality and perception of crises, establishing metrics to define what scenarios constitute a crisis and should consequently trigger the necessary response mechanisms and communication that occur within the response phase of crisis management (Robison, 2009). The response to the crisis in a timely fashion is a challenge in businesses also, and it implies the open and consistent communication throughout the hierarchy to contribute to a successful crisis communication process. There are different types of crisis (Figure 1): natural disasters, malevolence, technical breakdowns, human breakdowns, challenges, mega-damage, organizational misdeeds, workplace violence, and rumors (Vap, 2011):

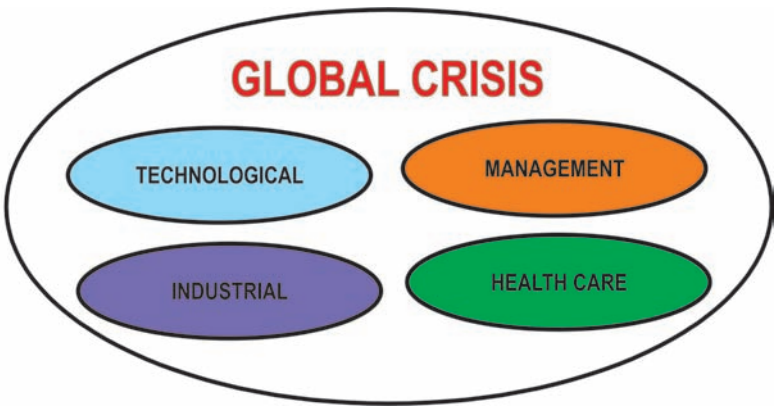

Figure 1 – *General Crisis*

For the present research, the most interesting types of crises are technological crises and organizational misdeeds. The technological crisis is caused by human application of science and technology. The problems appear when technology becomes complex and something goes wrong in the system as a whole (technological breakdown). When management takes actions, that will harm or place stakeholders at risk, the organizational misdeeds crisis occur (Hammerich and Lewis, 2013). The specific organizational misdeeds are skewed management values, crises of deception, and crises of management misconduct. Some examples of issues that faced companies in recent years and escalated into crises and possible managerial actions for them are presented in Table 1:

Table 1 – *Issues that companies faced in recent years and that escalated into crises*

Type of Crisis	Explanation	Managerial action	Tools
Process disruption	A transformation of the work processes and work practices.	Reviewing the business process to determine bottlenecks, identify problem areas, and outline a new process with revised forms.	Implementing automated workflow application to improve, standardize, and shorten the product development process.
Strategy v. competition: being „outplayed"	The competition had a better strategy and „outplayed" the organization.	Maintaining creativity and managerial informality defocused on the mundane challenges in the core business. Executing well the right strategy.	A good strategy has to be accompanied by a good action plan.
The effect of traits on poor execution	The company evolves to maturity with only a few winners of similar size. Consequently, exœcuting well is the key to staying competitive.	Not assuming that the work practices that were successful in the home market will be successful in the new market. Identifying leaders with the appropriate personal competencies to guide the company's effort to success.	Considering the corporate culture as a lens through which one should analyze a company and its performance. Building different attitudes to employee empowerment and involvement.
Change of leadership	The founders of the company and their family-related successors have a deep and often permanent influence on the success and embedded values of the organization.	If a company is to exist beyond the founders, ultimately it will need to change from a founder to a managerial regime. Managing the transition to a managerial regime is a key responsibility for the board of any family or founder-led business that transgresses national borders – and it can never be taken lightly.	Defining reporting lines and apportioning responsibilities.
Technology disruption	In an effort to avoid the „tyranny of success and maintain their competitive position in the face of innovation, managers are focusing on „disruptive technologies", new technologies that may improve their competitive position.	At every technological transition point, old players are left behind and new emerge, though sometimes it can take decades for such a transition to take place. Monitoring the outside technology landscape in the company's industry.	Developing tools to identify technologies that can address the current customers' drivers better than the company's own technology. Using planning frameworks that consider the leverage of need – not just its importance – and that take into account technology maturity and substitution.

Success – the success crisis	That fact that success can lead to the disaster has been known for centuries. In essence, once a company believes in its own infallibility, it risks closing its eyes to external threats.	Picone *et al.* (2014) indicate an overconfident pride and arrogance that is associated with a lack of humility, though not always with the lack of knowledge.	Controlling for measure and diminishing the overestimation of: abilities, outcomes, and the probability of success; precision in own beliefs; placement of own performance; confidence in R&D performance.
Navigating a transformation point	As a company rushes from embryonic innovation to being a mature company, it will face a transition point that will require it to fundamentally change.	Predicting the severity of the next transition point is a key responsibility for the management and the board. Avoiding the instinctive response („we will handle it when we get there").	Implementing tools of the digital era. Web 2.0 companies need to go to maturity in a few short years to be successful, and some even speak about companies needing to be „born global" (Kai, 2013).
Time – if you don't move forwards you move backward	Economic theory dictates that returns will revert to normal over time. A new product may start out, but ultimately competition will ensure that returns revert to normal.	Creating new market situations to ensure competition and innovation.	Changing the marketing strategy for offering to the shareholders a higher return on their investment through patent protection.

No matter what sort of crisis the company is dealing with, the identification of the crisis managers in the organization is a critical way to help ensure that the company can face adversities (Zaman and Georgescu, 2009). The more the human resources can prepare, build confidence in the company's leaders and train them in key leadership principles, the more effectively the company can transition out of the crisis.

A crisis doesn't have to be unexpected. A company that is merging or acquiring another company or that is going through a planned change in leadership is vulnerable to crises. If something changes, company managers need to be ready to spring into action. Organizations might also get indications or warnings that a crisis is possible, and make preparations for something specific (Kai, 2013).

Staying focused on the customers in a crisis can be a predictor of whether they will stay loyal when the crisis is over. In this case, it's not only the executive team who needs to have this crisis competency. There will always be people who need directions in a crisis, either because they are unprepared for the magnitude of the crisis, or they are injured or in shock. A crisis clarifies where people stand, and in many cases, managers will have to stand alone. This also means stepping outside of what's comfortable or usual or expected, and it can be a chance for people to be noticed. Finding the people whose

goals and motivations align to those of the organization's is important in order to identify potential crisis „soldiers".

However, the management of crisis implies the following steps (Picone *et. al*, 2014):

- Understand the organization – key questions could include: how would the organization respond if a vocal customer complaint suddenly went viral? How would the organization respond to a brandjacking attack?
- Create a new business mindset in the organization – characterized by transparency, accountability, employee empowerment, and planned spontaneity.
- Know the customers.
- Form a crisis team – a successful strategy must cross the boundaries of departments and hierarchy because customers expect a seamless experience. Build a cross-functional team and draw up a social team charter to clarify roles and responsibilities and create an internal collaboration space for this team.
- Roll out a social crisis communications plan – the plan needs to think through three areas – process and culture (what/who needs to change), technologies and tools (what to use to get there), and key metrics (what to track).

Results

Since the core of every crisis type resolution is the science of management and innovation, the research and development processes investigates the business behavior after the crisis, the capacity to recover the loss. The research results boost the world knowledge database and help to select the best managerial actions and to create new tools which respond to both expectations and challenges of the consumers. The 2008 crisis and the period of instability and stagnation that ensued came with an increase in poverty across the EU. In the Member States most severely hit by the crisis in particular, the prospects for the most vulnerable parts of the population were a serious source of concern.

During the last years, studies, research and development processes was trying to present the main causes and characteristics of the crisis, with special attention to its impact on Romania, which has witnessed a severe economic downturn in the first half of 2009, registering a sharp decline in industrial production, construction sector, exports and also in the lending activity. In the first months of 2009 the gross domestic product (GDP) of Romania fell by 2.6% compared to the fourth quarter of 2008 (adjusted data taking into account the seasonal variations) and by 6.4% compared to the first quarter of 2008 (data not adjusted). The second quarter of 2009 saw another decline of GDP, by 1.1% compared to the previous quarter and by 8.8% compared to the same period of 2008.

Hence, according to the technical definition, Romania has entered recession in 2009.

In the first seven months of 2009, the industrial production decreased by 9.6% compared to the same period of the previous year (Table 2). On sections, a decline of 10.8% has been recorded both in the extractive industry and in manufacturing. On industry groups, the most severe production drop was in intermediate goods (–15.3%) and durable consumer goods (–17.4%):

Table 2 – *Indexes of industrial production in Romania (%)*

	August 2009 as compared with:		Jan-Aug. 2009/ Jan-Aug. 2008
	July 2009	August 2008	
Industry – total	84.2	94.7	90.9
• on sections:			
Extractive Industry	103.5	84.4	88.5
Manufacturing	81.5	92.9	89.6
• on industry groups:			
Intermediate goods	93.9	94.1	85.9
Capital goods	62.4	91.8	93.1
Durable consumer goods	95.7	93.2	83.4
Nondurable consumer goods	88.4	89.8	90.8
Energy industry	100.9	107.1	98.3

(Source: National Institute of Statistics, Press Release no 205, 7 October 2009)

The economic results obtained by Romania speak for themselves: the real GDP growth in 2013 grew by 3.5% due to a strong export performance was driven by a robust industrial output and an abundant harvest. Growth was forecast to decelerate in 2014 to 2.3%, before slightly recovering to 2.5% in 2015. It was projected to remain above potential over the forecasted horizon, reflecting improved confidence and more supportive international conditions, but also the payoff of product and labor market reforms implemented under the financial support programs. Growth drivers were expected to gradually switch from (net) exports to domestic demand over the forecast horizon. To demonstrate the ability of Romanian businesses to recover losses due to the crisis, Table 3 presents the main features of country forecast for Romania.

In spite of good results, the fear factor that is projected to suffocate the Romanian economy in the next period is the foreign debt crisis. The government has carelessly accepted more than 36 billion dollars as credit, leading the private and state debt of Romania to reach the immense sum of 95 billion dollars, if the government will no longer accept new loans (Center for Political Science and Diplomacy (2015).

Despite the warning of similar cases like Greece, Spain and Ireland, Romania is accepting new loans from International Monetary Fund, loans that are not invested in developing and modernizing the economy, but in salaries and pensions. This consumer invested loans at extortionate interest rates, will suffocate completely the Romanian ailing and failed economy. Another gloomy factor is the unemployment: with a rate of registered unemployment of more than 15% of the active population and with another 15% percent of the population already left out of the governmental

Table 3 – *The main features of country forecast for Romania*

Main features of country forecast – ROMANIA								
bn RON Curr. prices	%GDP	94-09	2010	2011	2012	2013	2014	2015
GDP 586.7	100.0	3.2	-1.1	2.2	0.7	3.5	2.3	2.6
Private Consumption 372.9	63.6	5.7	-0.3	1.1	1.1	0.9	1.5	2.6
Public Consumption 89.0	15.2	0.8	-4.7	0.2	1.7	-1.5	1.8	1.6
Gross fixed capital formation 154.3	26.3	7.0	-1.8	7.3	4.9	-2.7	3.4	4.5
Of which: equipment 59.8	10.2	7.8	-19.1	23.6	4.1	-2.0	3.5	3.5
Export (goods and services) 238.5	40.6	10.2	13.2	10.3	-3.0	13.6	6.7	4.2
Imports (goods & sevices) 266.1	45.4	12.3	11.1	10.0	-0.9	2.9	6.0	7.3
GNI (GDP deflator) 576.2	98.2	3.2	-1.0	2.1	0.2	2.5	2.3	2.4
Contribution to GDP growth: Domestic demand		6.1	-1.5	2.7	2.9	-0.4	2.1	2.9
Inventories		-0.9	0.4	-0.1	-1.4	-0.3	0.0	0.0
Net Exports		-1.9	0.0	-0.5	-0.8	4.2	0.2	-0.5
Employment		-2.1	-0.3	-0.8	1.3	0.2	0.4	0.7
Unemployment rate (a)		6.4	7.3	7.4	7.0	7.2	7.2	7.1
Compensation of employees/head		43.3	-3.3	-4.1	8.3	6.8	6.4	4.6
Unit labor costs whole economy		35.9	-2.4	-6.8	9.0	2.4	3.4	2.7
Real unit labor cost		-0.3	-7.7	-10.4	4.2	-1.2	0.7	-0.1
Saving rate of households (b)		-	-3.8	-7.0	-6.2	-6.9	-6.1	-6.3
GDP deflator		36.3	5.7	4.2	4.6	3.4	2.7	2.7
Harmonised index of consumer prices		-	6.1	5.8	3.4	3.2	2.4	3.4
Terms of trade goods		2.1	1.0	2.6	3.2	-0.3	-0.7	-0.1
Trade balance (c)		-7.5	-6.3	-5.6	-5.6	-2.4	-2.5	-2.9

(Source: European Economic Forecast – Winter 2014)

unemployment aid, Romania tops many EU member countries with a real unemployment figure of more than 30% of the population. This figure must be put in perspective with more that 70% of the population below the poverty line and the full picture of the economic meltdown and social tragedy could be analyzed. Romania economy is still in crises and no plans for a future development had been adopted.

Discussions

The conclusion of the present research is that in Romania the crisis is not over by far, but has entered a more difficult phase that will affect the financial and banking system and economic fundaments. The economic crisis will continue until 2017 at the earliest, and experience a coming back cycle that will last until 2025. This decade will be, without a doubt, the lost decade of Romania, but if the necessary measures are not rapidly taken to re-establish the control on the economic decline, the Romanian economy will not recover not even in 2025.

In these conditions, significant attention has to be paid to the small and medium-sized enterprises (SMEs), the only ones capable of being flexible enough to successfully face the challenges of the new forms of crises. The SMEs sector is the most important in the Romanian economy and concurrently the only sector that can determine the economic recovery, entrepreneurs

being the key to the recovery. Stimulating the SMEs potential contributes to securing the growth of resources in times of difficulty. To help spur economic growth, the government from Bucharest should further take measures to improve the business environment for entrepreneurs, such as tax-exempted reinvested profit, which is one of the most important development levers, and lower taxation of labor. In order to support the SME sector in Romania, it is imperative for the state to pay its debts (over EUR 1.5 billion so far), to invest in the infrastructure, encourage absorption of European funds and the normalization of crediting. Moreover, the business environment needs a stable fiscal framework to encourage investment and to attract European and world money.

Romania needs very good, highly trained and experienced managers capable to successfully face the challenges of the crises. The current economic crisis is having an undeniable influence on human resource management, in particular when it comes to staff training. But does the new climate constitute a threat or an opportunity for the HR departments? Like any period of upheaval, once the opportunities are weighed up against the threats, this crisis will generate some extraordinary challenges for the academic staff in universities and for the HR managers in companies, and will provide a chance to discover new, cutting-edge training technologies.

In a strained economic context, the pressure to keep tight control of teaching and training costs is greater than ever. Even so, it cannot be allowed that it overshadows the need to develop staff's skills, which remain crucial to ensure competitiveness and performance in today's aggressive markets. The complicated equation – to spend less and train more – can

be solved by using e-learning technologies, as an important alternative to face-to-face, instructor-led training. Unavoidably, more traditional training approaches demand a high transport and accommodation budget. E-learning is free of such constraints. The employee, who often learns without moving from his or her usual desktop computer, is involved in defining the training schedule and takes responsibility for the way training time is managed. On the other hand, traditional teaching benefits from the capacity to transfer competencies that cannot be transferred through e-learning. A powerful education system has to be developed, which is capable of attaining the following objectives:

- Identify the emerging entrepreneurship and innovation opportunities arising from different types of crises (chosen by the students' teams);
- Build expertise in various domains: an industry (possibly also a function or an area) and the elements associated with a crisis that affect the industry/ function/ geography, as well as the knowledge of a company;
- Develop a disciplined approach to converting the opportunity spotting to a value-creating business model and developing a general business plan;

- Understand the risks and challenges and develop approaches to managing them;
- Develop a network of peers, alumni, entrepreneurs, venture capitalists, and industry leaders who can assist in times of crises.

Conclusions

In this paper, the authors investigated how the management can improve the position of companies and the overall economy during crises, and prepare the economy for future economic growth.

The research analyzed some helpful good practices to handle crises. Some of these considerations referred to the influence of human resources on the management of general crises: industrial, technological, health care, and managerial. Furthermore, a brief evolution of crisis is presented, together with the limits and their resolution by the management of companies. The paper also analyzes the issues faced by companies in recent years, which then escalated into crises. It was offered a guide with explanations, managerial actions and tools to solve different types of possible crises. The final considerations of the article present the macroeconomic developments in Romania in order to highlight the influence of the crises on economic performance in the last five years.

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„The crisis of today is the joke of tomorrow."
H.G. Wells

The Trustworthiness of Data in Smart Homes

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Abstract

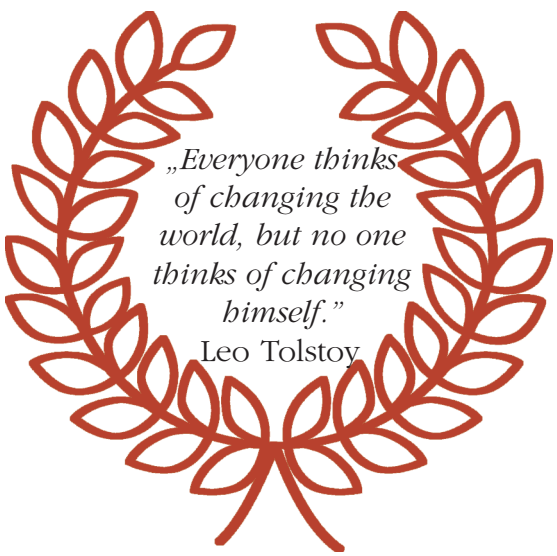
In this paper, the authors offer the first insight into some answers of the question „how can data, information or knowledge be trusted" – especially in the context of measuring trustworthiness. The topic of smart home security is a very good research environment for this question. Building on this research environment, the authors made some investigations concerning the measurement of trustworthiness of data.

Keywords: data, IT, information, smart-home, security

Introduction

We want to give an insight into the topic of the trustworthiness of data, information and knowledge, and how can this be measured. This issue is closely related to the usage of smart-home systems because the communication of security – related devices of these systems must happen in a trusted manner. Every area of application of technology in nowadays life is confronted with questions like „Am I secure?" and „Can I give my personal details without being worried about my privacy?"

All the more important, the question of security and trustworthiness comes into account when people want to secure their personal homes. Smart-home systems can assist when managing homes and they can provide a high level of comfort (managing e.g. heating or lighting from your workplace, etc.), also when improving the home



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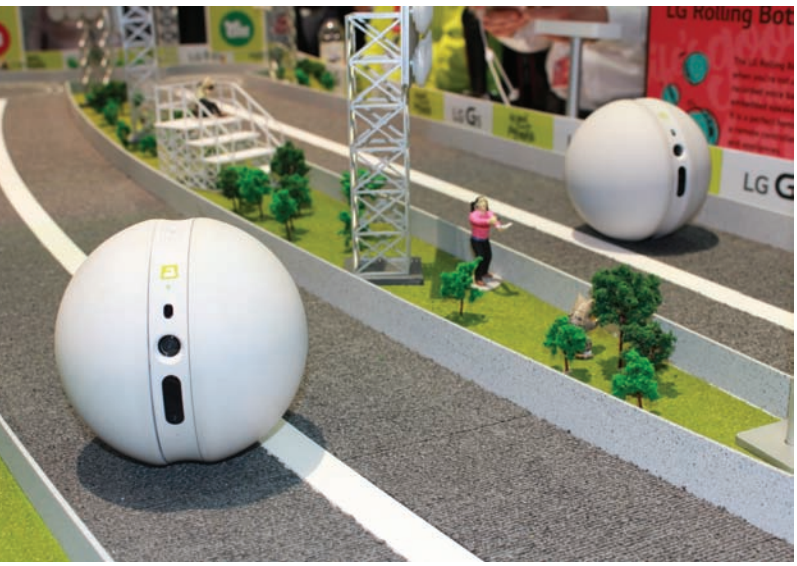

security (locking specific areas, establishing alarm systems, video surveillance etc.).

Most of these systems (whether the comfortable assistance or the managing of security), provide their services via mobile applications or via web pages and they try to make the access of their systems very easy – most of the time on the expense of the security. The services and systems are often accessible without any complicated permissions, biometric or authentication procedures. In this case, the self-complacency of the users of „everything works intentionally" can cause high-security impacts, due to the fact that most of the users do not know anything about IT security.

This paper also approaches the trustworthiness concerning the internal behavior of smart-home systems – can we be sure, that the information (e.g. the signal from a video surveillance camera installed in front of the door) isn't compromised by anyone (e.g. an intruder who wants to commit burglary), for example with another video signal invisible to the house owner? One solution would be to ensure the information by adding some additional information on the video signal (like a clock or a display with the date, so the date and time is always visible), but a professional security system should not require such steps; it should provide trusted information every time in every condition.

After some important preliminaries (description of important terms and keywords), the authors focus on the importance of secure smart homes. In Section 4, the article investigates some projects in a related work field which also approach smart-homes security, and in Section 5 is shown a first classification of what trusted data/ information/ knowledge should be. The paper closes with conclusions and some suggestions for further research.

Preliminaries

Before going into detail by explaining models and suggestions, some terms need to be defined, in order to provide an easier understanding: data, information, knowledge and smart homes.

Definition of terms

There is no general and common understanding of knowledge and knowledge management. It always depends on the specific domain in which the conception of knowledge is understood. Within the context of organizations and IT, before studying knowledge management or knowledge processing systems in more detail, there are typically three central terms to analyze: data, information and knowledge. For these terms, either their definitions or the distinction between them are common ground.

Data: is most of the time a discrete set of objects or facts. It is the raw material for the creation of information. Today data is typically stored in IT systems, distinguished by quantitative and/or qualitative

measures. In general, more data is not always the best option. For example, „24122015" is data.

Information: Compared to data, information itself consists of data elements, but information adds a meaning to this data. Information is usually stored as data. For example, „24-12-2015 which is a date", is information.

Knowledge: is one step further than information. It is obtained from knowers (people who put together or link information) which link information and data to something higher. For example, „24-12-2015 is more than a date, it is Christmas" – this is knowledge. Another example for some extended/ linked knowledge could be: „On Christmas, I should buy some presents for my family" (without discussing anticipated behaviors or manners).

Knowledge Management: This term refers to the usage of knowledge and getting higher levels of knowledge and benefits through combining the intellectual assets. Scholars distinguish between explicit and tacit knowledge: while explicit knowledge is written, tacit knowledge is the personal know-how. The effort of managing knowledge usually can bring improvements in almost all fields of usage.

Knowledge Processing: Managing knowledge needs some additional activities to get the different knowledge bases together: one needs to process data, information and knowledge. One can process knowledge by connecting human knowledge and networking (this is a chaotic form of knowledge processing) and one can store knowledge in databases (which have a much higher usable capacity than the human brain) and use technical networking (this is systematic information and knowledge processing) (Skyrme, 1998).

Description of Smart Homes

With the development of embedded systems, electronic appliances have built-in functions inside that help them automatically execute their tasks according to their pre-defined programs and user preferences. For instance, a washing machine does a series of actions to wash laundry in the mode of color type and at the temperature about 30 degrees Celsius, or an advanced air-conditioner with the built-in thermostat manages itself to switch on or off according to the temperature of the room. These machines give automation to humans' daily housework and form the concept of home automation.

Nevertheless, a smart home is a further step from home automation and Internet of Things. It does not only hold various electric and electronic devices, but also have a control system in charge of them. In other words, this term describes a house where appliances are connected and communicate to one another in order to properly react to humans' activities or their related living environments.

For instance, lights will be automatically turned on at a suitable bright level when

they detect whether there is human movement. Or when one leaves home, lights will be automatically turned off, doors and windows are closed, and the intruder system is activated. Besides, Aldrich (2003) defines a smart home as „a residence equipped with computing and information technology which anticipates and responds to the needs of the occupants, working to promote their comfort, convenience, security and entertainment through the management of technology within the home and connections to the world beyond". Other than self-connections and a centralized control system, these smart homes devices can also be remotely controlled by end-users with suitable applications that can be not only installed in private devices like smartphones, laptops, or a personal digital assistant but can also be accessed through web-based services.

As a consequence, the emergence of smart homes brings not only comfort and convenience but also a meaningful goal to human beings, especially for the elderly, convalescent, disabled people and those who have special needs or have difficulties in household tasks as well. Within the context of smart homes, their living would be different towards a better quality of life. For example, one's health conditions can be monitored by the surveillance sensors and cameras, so that an alarm will be triggered to call for help in case of are any emergencies. Or in the case of saving energy, the smart homes adjust the amount of electrical power to devices when they are active or cut the power off when they are not used. To briefly sum up, smart-homes, together with modern technologies, are playing a significant role supporting our daily lives, and they deserve our attention as well as our promotion to be further developed.

The Meaning of Trust

The question of „How can we trust anything/anybody?" is discussed since the beginning of mankind, but what does this topic mean in context to today's technology age and especially for the information technology?

Usually, we highly trust man-made technology – from cars to airplanes, from computers and buildings to space shuttles. As long as they work properly, most of the time we don't even think about (not) trusting them. Only in case, they stop working in their normal behavior the question of trust comes up. The trust in IT systems is becoming even more important, as people today rely on IT more than ever before. Besides the usage of IT in every aspect of our lives, special treatment has to be applied to the Internet. Everybody is online (most of the time), and the trust in Internet content is a crucial matter. When talking about this, the concerned information is not the one which is retrieved or read on websites, but the download of files: everybody trusts a „Download Button" by clicking it, but nobody knows what

is really behind this mechanism. You make yourself highly vulnerable, when downloading content from the Internet to your computer, because you never know, what is really inside a file (just one example: malware).

According to Rosseau *et al.* (1998), the three main types of trust are **(1)** trusting beliefs, **(2)** trusting intentions, and **(3)** trusting behaviors, and these three types are connected to each other:

(1) *Trusting beliefs* mean a secure conviction that the other party has favorable attributes (such as benevolence, integrity, and competence), strong enough to create trusting intentions.

(2) *Trusting intentions* mean a secure, committed willingness to depend on upon or to become vulnerable to the other party in specific ways, strong enough to create trusting behaviors.

(3) *Trusting behaviors* mean assuring actions that demonstrate that one does, in fact, depend on or rely upon the other party instead of oneself or on controls.

Each of these generic trust types can be applied to trust in IT. Trusting IT – behavior means that one securely depends or relies on the technology instead of trying to control the technology" (McKnight, 2005). Another point of view is the similarity of trusting people and trusting technology, especially information technology, where the main difference lies in the application of trust in a specific area: *„The major difference between trust in people and trust in IT lies in the applicability of specific trusting beliefs. People and technologies have both similar and different attributes, and those similarities and differences define which trusting beliefs apply. [...] With trust in people, one trusts a morally capable and volitional human; with trust in IT, one trusts a human-created artifact with a limited range of behaviors that lacks both the will and moral agency. [...] Because technology lacks moral agency, trust in technology necessarily reflects beliefs about technology's capability rather than its will or its motives. [...] Trust in information technology has several interesting implications. First, trust in IT should influence the use or the adoption of technology. Unless one trusts a software product to reliably fill one's needs, why would one adopt it? Second, trust in IT is a general assessment of the technology that probably affects other IT perceptions, such as the relative advantage or usefulness of the technology. Thus, it may influence beliefs and attitudes that affect the intentions to use technology. Trust in technology is built the same way as trust in people"* (McKnight, 2005). Another very interesting publication about the trust in information sources is given by (Hertzum *et al.*, 2002). They compared the notion of trust between people and virtual agents, based on two empirical studies. The respondents were software engineers and users of e-commerce systems.

Security Smart-Home Systems

Although smart-home systems have been developing due to the development of modern technologies, smart-home security has not yet received much awareness in either industry or academia. Among a few of the authors, Balasubramanian and Cellatoglu (2010) presented some guidelines for home security concerns in their work. The authors consider some problems of home security such as fire and intruder alerts, regulating visitor entry and threats from the Internet. Besides, commercial products and services for smart-home security are also available in the market (Arlo, 2015; Cocoon, 2015; Loxone, 2015; SmartHome, 2015; SmartThings, 2015).

Nevertheless, these products or services mostly provide surveillance devices like cameras, sensors, and related applications to monitor a house, rather than a whole security solution in smart-home systems. There are still more security issues that would form key points in building such systems, and the goal of secure smart-home systems is not only to protect one's home, but also keep other properties inside the home secure (ADT Authorized Home Security Company, 2014). Firstly, the security demands for smart-home systems originate from practical needs. Instant warnings and alerts are switched on when unwanted accidents happen. Secondly, security is an essential factor that paves the way for the development of smart-home systems. For instance, automatic processes activated by smart-home systems should not be misused or interfered by attackers. One would be uncomfortable to enjoy what smart-home systems can offer, once he or she has to take those risks.

The two main aspects of a secure smart-home system are:

(1) *Emergency reactions* – indicate that a secure smart-home system should be able to effectively deal with emergency cases, such as fire, intruders or residents of the house are in urgent needs, to name a few;

(2) *Self-protection* implies that a secure smart-home system should be able to protect itself, as well as its sub-components such as electronic and electrical devices, applications, related software and firmware, from possible attacks. For instance, it should be impossible to allow intruders disable the alarm systems or violate user privacy. Consequently, a secure smart-home system should achieve two essential characteristics known as confidentiality and integrity.

In addition, a secure smart-home system should perform two levels of action taking in insecure contexts, as follows:

(1) *Passive mode*: responsible for notifying owners, end-users, or contacts in an emergency. When an intruder invades the house, the secure smart-home system triggers the alert and immediately sends emails about the case to its residents and/or calls the local police;

(2) *Active mode*: covers all the ways that a secure smart-home system reacts to the emergency, other than in passive mode. As an illustration, it will activate the fire extinguishing systems and turn off electricity in case of fire. Or it will capture videos and images when an intruder enters the flat and show real-time interactions from remote monitoring and control devices to end-users in case they are absent.

In short, vulnerabilities in a smart-home system come not only from intruders who want to illegally enter a house, but also from devices constituting the system themselves. To give a practical example of the latter, Jin and his team at the Black Hat tech session (Jin *et al.*, 2014) demonstrate their ability to remotely control a Nest Thermostat within 15 seconds. This demonstration raised a big warning that security in smart-home systems is not seriously considered.

Related Work

Smart Homes that use algorithms from data mining or artificial intelligence can only work well if they have enough data about the user. This data can be either provided by the user or generated by analyzing the environment (e.g. sensors, like light sensor, movement sensor etc.). Having such data circulating in a network opposes several security and trust issues.

A document produced by the security firm Kaspersky (Kaspersky, 2015) discusses a recent study on the security of access to Smart Home systems. The result of the study was that most systems lack security and can be easily hacked. The consecution of a hack can be the physical damage on the one hand, but also access to private data in the network on the other hand.

Robles *et al.* (2010) identified current security issues in a smart home system. Besides the description of the general architecture of a smart home, it also revealed various smart home components that produce data. Special attention is paid to the security of the data transport (e.g. when data is sent over a network). Also, access control is discussed as well as the usage of artificial intelligence technologies for detecting unknown persons.

An architecture for a middleware system for managing profiles in a smart-home environment is presented by Schaefer *et al.* (2006). The architecture is based on OSGi and contains components for managing security, profiles, devices etc. It distinguishes between various authenticators (e.g. username and password, face recognition). Also, it uses data mining and artificial intelligence in order to recognize the user. Mantas *et al.* (2010) present the current concept of a smart home and also details about the networking technology of the components. After a short description of existing threats for Smart Homes, a discussion is made about specific methods to handle these threats, like authentication, authorization, intrusion prevention and intrusion detection.

The survey done by Komninos *et al.* (2014) concentrates on electric smart grids and homes, but also has the same concerns about the security of classical smart-homes: confidentiality, integrity, availability, authenticity, authorization, non-repudiation. An overview of various risks and attack possibilities is given and a list of countermeasures is presented, which also contain techniques like encryption and data obfuscation.

A special data analytics framework for smart home systems is introduced by Chakravorty *et al.* (2013). The framework tries to maintain security & privacy in smart-homes without compromising the ability to analyze this data.

Conclusions

If the nature of risk is taken into account, trustworthiness has some important influencing factors like reliability, competence, discretion, integrity, empathy, and so on (Sheppard and Sherman, 1998). These factors have to be considered when talking or researching trust. The handling of trust and trustworthiness in the information technology sector is a field which covers the whole range of technology.

Future developments of the research in this field will continue focusing on the sector of information and knowledge processing systems, especially on how can a knowledge processing system be trusted, how can information in general be trusted, how can trust for information be computed or calculated, how to develop a representing scale for calculated values, and how can trust(worthiness) in a knowledge processing system be implement.

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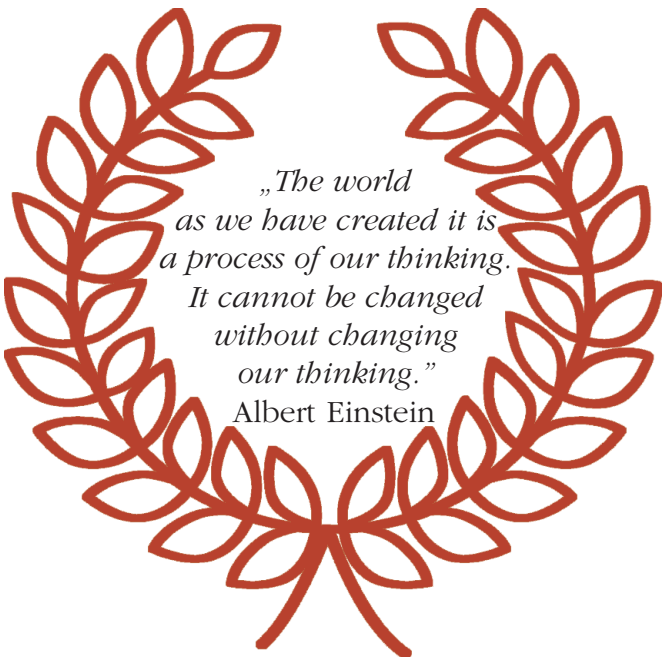

Changing the Organizations' Strategic System

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Abstract

The term «enterprise strategy» is used in most of the cases, but a company can have multiple strategies. The strategies build a «strategic system»; this implies the existence of non-randomly connections between the strategic options that are considered for each and every strategy. This article's purpose is to identify the strategy types that a company needs in order to operate, resulting strategic options, how to identify these options and what methods are used to evaluate strategies.

Keywords: strategic system, strategic options, strategic risk, strategy assessment

Introduction

In strategic management, several scholastic approaches concur, giving different interpretations for the word „strategy" (Thompson, 1986). For Ansoff (1965), Andrews (1971), the strategy is a rule by which objectives are transformed into activities, but for Porter (1980), or Mintzberg, the strategy is a plan. With regards to the reference area, Ansoff (1965) mentioned that the strategy relates to the market, while for Porter it refers to the entire environment. Andrews considers the strategy as having future impacts, but Mintzberg believes that strategy has only an evocative aspect.

In this paper, ***the strategy is a set of rules that relates to the environment, rules that are needed to achieve future goals.*** Based on these, the actions required to achieve company's goals (strategic plan) are determined. The strategy and its enforced

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rules must offer an overall perspective in order to be further personalized on a case by case scenarios (Carlzon, 1986). The rules enforced depend on a number of considered variables, called strategic degrees of freedom (SDF), showing the range in which a strategy can be modified (Ohmae, 1989). By respecting the system strategies it can be developed a strategic plan (Figure 1). In this figure (1) represents strategy, (2) represents the strategic plan, and (3) represents the activities of the strategic plan:

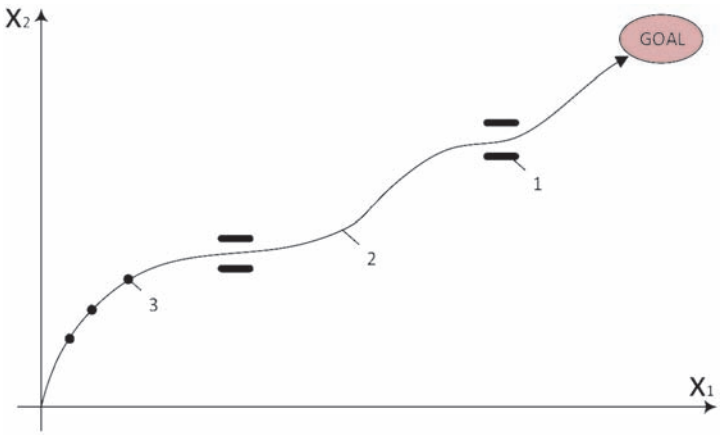

Figure 1 – *Strategy and the Strategic Plan*

Strategic Options

An enterprise has many strategies. Some of them resemble the ones assembled by competitors. Prahalad finds, after considering many companies, that they adopt a system of attack and retreat quite similar. What does not resemble, is the set of strategies, namely the strategic system. In fact, by strategy, it needs to be understood an assembly of strategies that form a strategic system.

The main strategies are classified as follows (Figure 2):

– corporate strategies (for all enterprise), which consist of the grand strategy (GS) and global strategies (GLS);
– competitive strategies (business) which consist of: marketing strategies (MkS) and pure strategies (PS).

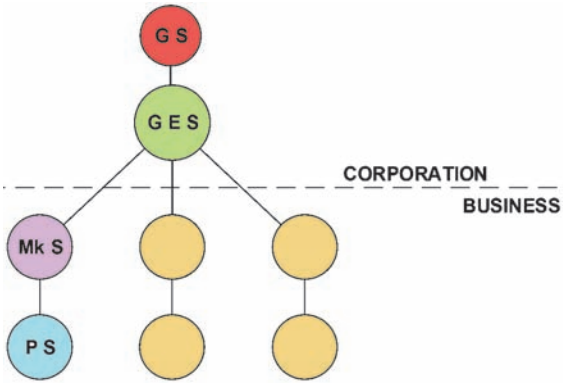

Figure 2 – *Strategic system*
(Source: Adapted from Coda, 1990)

In the global strategies (based on functions) economic strategies, social strategies, structural strategies, technical strategies and portfolio strategies are encountered. Among the competitive strategies, one can distinguish the product strategy, the promotion strategy, the pricing strategies, the distribution strategies and the support strategies. Pure strategies are based on activities (research, design, production etc.).

A strategy should provide answers to questions like the following (Lynch 2002):

– how should the enterprise react to changes from the environment, what to do when customer needs or market conditions are changing, which are the opportunities to be exploited, how to avoid external threats, how to determine the business mix of activities;
– how should the resources be allocated? Allocation of financial, human, material resources is crucial. For these reasons, clear criteria for allocating them are necessary;
– how to act in the market. Decisions making about customer satisfaction, increased competition, promotion of

certain products etc. is essential to the enterprise;
– how to act within an enterprise environment. Shares are set so that the whole organization is involved.
– how to align goals and economic efficiency through ownership, coordination or contractual arrangements and find a balance between hierarchical control and incentives. The final aim is to reach performance and a high standard of moral conduct.

It is observed that new business models are developing along emergent strategies, and not along the strategies developed during a certain period of time.

The set of strategies forms a pyramid structure corresponding to the enterprise structure. Every manager knows the strategies that are enforced at his hierarchy level: supervisors – pure strategies, middle managers – competitive strategies, top managers – global strategies and the general manager or the owner (chairman of the board) – the grand strategy. Moreover, Sun Tze, one of the great military strategists in China, mentioned that everyone can notice the tactic used by a conqueror (kill, burn, etc.), but few understand its strategy of deriving tactics. This strategy is characterized by a degree of transparency. Unlike the vision, mission and policy, which must be known by stakeholders, the strategy is in most cases unknown to the outsiders. Another difference from the other components of the managerial philosophy, is its oral characteristic; the strategy is written only in a few cases. Unlike philosophy statement prepared by the Board of Directors, which is a reflection the vision of the owners (shareholders), the strategic system is developed by the managers.

For each strategy, there are some typical ranges, entitled strategic options that companies choose to apply. Such options are:

- for portfolio strategies: business entry (strike, fructification, focus, market making), keeping the business (diversification, differentiation), withdrawal from the business (sale, liquidation);
- for structural strategies: concentration, splitting, delamination, internationalization;
- for technical strategies: specialization, integration;
- for economic strategies: maintenance, growth, recovery.
- for social strategies: consensus confrontation.

When the new „theories of the firm" replaced the deductivist axioms of the neoclassical theory and explored new ideas on the nature and the scope of enterprises (Williamson, 1985, Williamson, 1981, Holmström and Tirole, 1989), new elements shape the enterprises behavior, their governance perspective and their strategic options. Economies of scale, assets specificity, product differentiation, externalities, asymmetric distribution of information among actors, theoretic industrial organization game – all of these phenomena may create many possible solutions and equilibria as well. This new economic thinking

posits that entrepreneurial actions may alter the market forces and dynamic enterprises may change their strategies or structure due to the changes of the internal and external environment. Therefore, enterprises can use a number of global (corporate) and competitive strategies, depending on their mission and goals, the situation and the available resources.

The strategic models may be summarized as follows:

Creating the market share is a strategy identified by Chandler (1962) and theorized for over a hundred years. Many companies are successful because they build their market.

Focusing involves an orientation towards new potential costumers (blue ocean), or to a group of customers to be served better.

Diversification means widening the range of manufactured products. It can be concentrated if production processes are similar, or divergent when using the different processes.

Differentiation means market segmentation and maintenance of a segment. Differentiation refers to products and is achieved through their characteristics.

Concentration creates a mono-business and it brings a constant advantage of reducing costs.

Division leads to new partitions (based on product or geographical reasons). By splitting it occurs the multi-businesses.

Downsizing is a structural strategy for the elimination of hierarchical levels.

Internationalization leads to transnational business arising from the globalization of markets. The internationalization of economic activity takes place outside the state where the registered office is, for import of resources, product sales, and service charges.

Specialization means to focus on the product, technology or technological operations. As a consequence, the product range or the number of markets is reduced.

Outsourcing is carried out for the production of complex products, for the production of parts or for carrying out the technological operations.

Integration imposes control over another company that may be upstream or downstream of the object that has the same activity.

The Quality Strategy. For the quality assurance, several approaches can be considered, such as sectoral strategies (focusing on training, construction, testing, improvement, guarantee), or quality control (focus on forecasting, organizing, directing, coordinating, control) or synergistic strategies (total quality) (Ionescu, 1997).

Consolidation refers to the previous positive experience, which preserves the businesses valued attained so far.

The Internal development requires the creation of new production facilities, construction of buildings, purchase of equipment, staffing.

The expansion is done in the home country or outside it.

The enterprise recovery is introducing measures to ensure the survival of the company when environmental conditions change. It involves activity restriction, consolidation and expansion.

The defensive strategy is designed to reduce the risk of loss. They may involve the divestitures of obsolete factories, product lines, marginal businesses or retrenchments to reduce costs.

The Strategic Thinking

Strategies are intuited by organization's top managers, which express some vague intention, but the analysis is conducted by the planning department. Originally, strategic departments were created, but in recent years they were disbanded. Planning departments' tasks are to analyze and identify possible strategies, to devise plans and to develop special projects.

The analysis involves a strategic thinking which is called „strategic logic". This reasoning is necessary to achieve the objectives. Strategic thinking is complex, integrative, comprehensive and analyzes everything according to the environmental changes and the existing flows. Strategic thinking requires creativity and a proper assessment of alternatives. Strategic thinking must be integrated to the long-term and short-term needs. From the strategic analysis follows an outline of the strategic system. Strategic thinking precedes strategic actions. Strategic (managerial) thinking is not similar to scientific judgment. Strategic thinking is simultaneous to the action, not a separate, successive steps which require a break during work. Strategic thinking must be innovative, systemic and practical.

In most cases, people think using models that have been formed over time as a result of education or their own efforts to understand the world (Brătianu, 2004). The thinking is composed of a set of knowledge, inference rules (knowledge exploitation process), a set of values (moral, religious, economic, legal, aesthetic) used for decision making.

It was found that there is a retrospective thinking and prospective thinking. Retrospective thinking requires a search of models, linking events that apparently are not correlated, the discovery of metaphors and theories that help to understand the future. In this category falls the conservative thinking (which considers that the environment does not change, hence there is no time variable, as it uses a static model) and the deterministic thinking (which considers that the phenomena occur in the same environmental conditions, the system is under control, and it uses a dynamic model).

Prospective thinking identifies variables involved in the process, develops forecasts,

defines decision rules and establishes the strategic system. In this category is also included the statistical thinking (which considers that the phenomena of reality are random and that entropic models should be used).

The following types of models were used until now in the development of a strategy:

1) *Static Models* – such as the SWOT model and the linear model;
2) *Dynamic Models* – which incorporate time, enable change and recognize that there are forces of change (e.g. the structuralism model or the Norman model). *The structuralism model* takes into account the environment and the results contemplated in the present time, and then the resulting management actions (tactics). It further elaborates on the structure and strategy. This creates a successful relationship between the structure and the strategy. Then the strategy is implemented, which influences tactics and results. *The Norman model* shows mainly a top – down approach and the analysis results allow the review of the strategy by the objectives.
3) *Entropic Models* – a state that change is irreversible and a new equilibrium can be established, although the business environment is in continuous change. In this category falls the OPERA model and the prospective model. *The OPERA model* considers the special restrictions that must be taken into account when defining the strategy which derives from the managerial philosophy, the external environment, the culture and the existing structures. *The prospective model* (Ten Haven, 2008) shows that the number of variants is a normal distribution, starting from the company's vision, current and desired competitive position, the global scenario, and the in-depth scenario.

H. Mintzberg found that the popular perception sees the strategist as a visionary dictating brilliant strategy (Mintzberg, 1984). Sometimes it is so, but usually the strategist seeks models. The strategy is a result of a logical process.

Strategy formulation process is not found in all companies, many strategies being improvised. The strategy is developed taking into account the economic imperatives (profitability, survival, growth); owners' will (expressed in the philosophy of the organization); vocation (tradition); market opportunities and constraints; resources (can be an advantage or not); ambitions.

Organizations create their first outline strategy based on vision, mission and policy defined by managers and then the resulting analyses are developed into theoretical strategies for solving problems.

The analysis uses reliable data. But there is also interpretable data, to which only managers have access. Managers also have tacit knowledge. For these reasons, the theoretical strategy is reviewed by managers and the deliberate strategy appears further on.

Strategy formulation involves both the theoretical analysis of the external environment and the internal environment analysis. On this basis, one can know the current position and future position of the company, further on resulting the targets that need to be achieved. As shown, studying the environment and the market conditions is particularly important in developing a competitive strategy proposals (Segal-Horn, 2001). Critical success factors (KFS) such as added value, competitive advantage and resources are being considered. Each option has its own strategic KFS and enterprises have to consider whether these factors are being possessed by the enterprise. The theoretical strategy is developed based on the strategic objectives formulated in the mission and based on options set out in the strategic analysis. It is a bottom – up approach (Ries, 1997). If it does not contribute to delivering tactical results, then it is wrong. Clausewitz and Machiavelli recommended this approach, as it takes account of the reality dimension.

G. Hamel (2008) believes that managers do not consume more than 3% of their time to build a conception of the future. For strategic thinking, managers need to forget the successful experiences, because the environment is changing and change is needed. When they are developed, some strategies seem good, some poor, but if they give positive results, all are appreciated.

J.B. Quinn (1980) said that the strategy is developed in small, regressive and logical steps. He called this process „logical incrementalism" (Christensen, 2010). Emerging strategies result from the manager's' reaction to problems that arise and trends that were not known when developing a deliberative strategy.

Options for the Strategic System

Options that appear in the strategic system result from a multitude of analyses that can be done in an organization.

1. The analysis of the organization

- *General analysis* (PRIMO method – Personal, Resources, Innovations, Marketing, Operations):
  - – Concentration of resources on strategic objectives (achieved by convergence or by focusing);
  - – Accumulation of experience through extraction and loan solutions;
  - – The use of complementary resources, by combining and balancing;
  - – Resource conservation, by recycling, cooptation, defense;
  - – Resource recovery, by accelerating success.

- *Capability analysis:* specialization (if there is one competence) or diversification (when there are more competencies).
- *Culture analysis:* keeping the culture or changing it.
- *Stakeholder analysis:* meeting expectations, consensus, seeking confrontation.
- *Economic analysis:* strengthening, development or improvement.
- Portfolio analysis:
  - The BCG method:
    - for Stars – try turning them into profit providers (Cows) – it needs massive investments, invested cash coming from other businesses;
    - for Cows – protect the business as much as possible, taking advantage of the delay of others – it needs little investment;
    - for Cats – be quickly out of the business;
    - for Dogs – have a very rapid abandonment of their divestment.
  - The G.E. method:
    - Investment (growth, maintain position, selective development);
    - Viability (full, selective, immediate);
    - Divestments (reductions, withdrawals, abandonment).
  - The A.D.L method:
    - Natural development;
    - Selective development;
    - Reorientation, abandonment.

2. Environmental analysis

- *General analysis*: decentralization, deconcentration, concentration, division.
- *Industry analysis*: maintaining position, improved position, finding niches, withdrawal.
- *KFS analysis*: using K.F.S. or changing K.F.S. Options:
  - use K.F.S. to differentiate those who do not use them;
  - use K.F.S. better than other competitors;
  - overturning K.F.S. opponents that use them;
  - business innovation and setting new K.F.S.
- *Environmental factors analysis* PEST (PESTEL): market entering, expansion, internationalization.
- *Cultural environment analysis*: think locally and act locally; think locally and act globally.
- *Competitive forces analysis* (Porter)
  - to suppliers: cooperation, integration, partnership;
  - to direct competitors: product diversification, differentiation through quality;
  - to indirect competitors: profits, focus;
  - to new entrants: differentiation by price, quality, marketing channels;
  - to customers: competitive, complex generics.
- *Forces of change analysis*. Analyzed changes in:
  - innovation: developing new products, product diversification, business conversion;

– personal: new sources of recruitment, training for new occupations, HR development;
– consumer habits: diversification of production, product development;
– globalization of markets: adapting products to market, expanding markets;
– information: appropriate customer database, customer relationships;
– environmental: pollution prevention;
– local community needs: partnership proposals.

- *Ansoff analysis* (market – product couple): market penetration, product development, market development and diversification.
- *Type of market analysis:*
  – for the undifferentiated market – market positioning;
  – for the segmented market – segmentation;
  – enlargement – national market – domination;
  – expanding to global market – internationalization.

  The applied strategies are:
  – The follower strategy: segment consolidation;
  – The specialist strategy: crenel policy;
  – The leader strategy: maintaining the position;
  – The challenger strategy: aggressive strategy.

3. The analysis of competitiveness:

- *Competitors analysis:*
  – maintaining or reducing the market share;
  – responding aggressively by changing the marketing mix;
  – abandoning the market.
- *SWOT analysis:*
  – S-O: taking advantage of the opportunities (aggressive strategies; max – max);
  – W-O: exceeded weaknesses using the opportunities (reorienting strategies; min – max);
  – S-T: use strengths to avoid threats (diversification strategies; max – min);
  – W-T: avoid weaknesses and threats (defensive strategies; min – max).

Strategic System Assessment

A possible strategic system is evaluated to determine if it is applicable. It examines the logic of a strategy (Băcanu, 1999), the compliance with the environment, the existence risks, the time horizon, compliance with the components and capabilities of the organization, compliance with the organizational culture, compliance with the assumed social responsibilities.

The strategy should be realistic, taking into account the current and the future situation, and the resources that can be mobilized. The strategy should be distinct from competitors' strategy (Lynch, 2002), it should contain innovations to provide

a competitive advantage, it should use the advantages of the company benefits to the environment through the links it has with the stakeholders, it should be farsighted enough to propel the organization forward.

Strategy assessment is done by analyzing the aspects that determine the choice of a particular strategy: internal and external identification of the factors that influence the strategy, the analysis of opportunities and risks, strengths and weaknesses analysis, risk analysis, resource analysis, strategy objectives analysis, consistent with the policy. It examines whether there is compatibility with human resources, whether there is compatibility with the external environment, whether the social effects that occur are desired, whether the number of weak points is reduced, whether it lessens the risk. The evaluation of the strategies involves (Lynch, 2002): options assessment, opportunities assessment; profitability evaluation; the assessment of the risk.

The evaluation of strategic options relates to the chosen segment (products/ markets/ territory); opportunities and existing prohibitions; the main classes of strategies. *The generic product* is analyzed afterward: its specifications and its performance, the technology used, the necessary means of production, cost structure, services, prices, the product range that can be achieved. *Markets* are analyzed according to customer needs, accepted prices, products, distribution (the channels used), advertising. *The distribution territory* is interesting in terms of logistic costs and specific regulations. It should be assessed in addition the life cycle of products, markets and industries in which they are located and it should evaluate the effect of the phenomenon of learning. In the same manner, the strategies applied in each quadrant of the portfolio analysis (BCG, ADL, and GE) will be evaluated. Technological options are assessed as well (De Bono, 1980).

The evaluation of opportunities (Lynch, 2002) is done based on the consistency with the purpose (mission and objectives); environmental sustainability of the organization and its competitive advantage generated (SWOT); validity of the assumptions of each option; feasibility of the business restrictions, internal constraints (capacities, resources, culture, managers) and external constraints (competitors‘ reaction, the reaction of stakeholders) etc.

The evaluation of profitability is done analyzing the profit compared to invested capital. Businesses need more capital with increasing sales to fund claims, to pay off the stocks necessary for the activity. Indicators that are used are: the rate of capital used (Gross Profit/ Capital employed); the duration of recovery; the updated cash flow after tax. The recovery period is about seven years for a car project, three years for consumer goods, and 20-60 years for telecommunications infrastructure.

The evaluation of social responsibility is done analyzing the net (social and economic) value that the enterprise adds to society (Meznar, 1991). Economic performance and social responsibility are intimately

connected. Enterprises are institutions (Williamson, 1985) that generate „social goods" (employment, knowledge, community improvements, cultural resources etc.), as well as costs the society must bear (environmental pollution, employment discrimination, traffic congestion, and so on). The enterprise is „socially viable and responsible" when the degree or the value of the social goods it generates exceed the social costs it imposes. With this in mind, economic performance may dictate whether a firm is viable in the short run, but it is the combined social and economic performance which determines the long-term perception that the institution is appropriate or consistent with the moral foundations of the society and the reduction of social problems (Mintzberg, 1983, Alessandrini, 2013).

Risk assessment. The strategic system needs to be analyzed according to the risks that can occur. Risks may be appreciated if an economic, social, technological and political scenario is evaluated. The enterprise assumes most of the risk when they draw up strategies, presenting a risk for the future. A strategy leads to environmental, political, economic, technical and social risks.

Since 1953 P. Drucker noticed that in the preindustrial economy there was only the technical risk because what was produced would sell. Then the economic, financial, commercial risks and more recently social risks came. He said: „the biggest risk is not to risk". Strategic management outlined a separate chapter called risk management, which is basically a preventive risk approach. Risk management involves the design and implementation of a decision-making process regarding identifying acceptable risks and minimizing them.

The risk can be seen from two points of view: perspective (considering the potential risks and taking preventive measures) and operational (for a specific situation). Risk management includes the assessment and management of events (actions) that may affect the ability of the company to achieve the objectives set. The stages of risk management are:

1. Setting up the context by identifying internal and external risk factors;
2. Identification of risks arising in the physical environment and the economic environment due to social factors, political factors, internal factors of the enterprise;
3. Shaping the future through the scenario method;
4. Defining the average character of activity (uncertain, probabilistic, and hostile) and tool assessment;
5. Measuring the effects (catastrophic, major, minor, secondary);
6. Risk control (protection) requires a policy and plan of measures.

Sensitivity analysis determines the relationship between the variation of risk factors and the effective parameters.

Volatility analysis shows the scattering of random variable considered. For this, there can be used absolute average deviation, amplitude, standard deviation, range interquartile.

The vulnerability analysis is the susceptibility of the enterprise at risk (Coșea, 1997) and its approach to bankruptcy. It depends on the enterprise and the environment. Risk management must protect the assets of the undertaking, being an element of strategic planning. The vulnerability is a particular phase of any enterprise, phase in which the undertaking of an unwanted event affects the enterprise's vitality, pointing it towards bankruptcy. The vulnerability can be: structural (a management team age); functional (an unsatisfying organized department); conjectural (export in sensitive areas). The vulnerability of a company is the sum of partial existing vulnerabilities within the enterprise: legal, financial, human, technologic, and economic. It is most commonly measured in financial indicators as profitability, solvency, though any qualitative aspects must not be neglected.

Conclusions

The paper chooses from the numerous definitions used in the literature the one defining the strategy as a set of rules according to which a firm is a lead through the environment. Then it shows that there are a lot of strategies, each presenting different variations which are the strategic options. Their choice is made on the basis of the strategic analysis. It shows that managers sense certain options, which are further on analyzed by applying certain models which seem to be quite simple. For this reason, for the strategy to be successful, the paper indicates that risk assessment should be carried out, which first requires the development of an environmental scenario.

„When you're finished changing, you're finished."
Benjamin Franklin

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Academic – Industry Collaboration

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Abstract

The main contribution of this article lies in the demonstration of real academic – industry collaboration in the field of Software Quality Assurance. This collaboration between universities and business is showed on the example of the Software Quality Assurance Competence Centre (SQA CC) which is a part of the Faculty of Informatics and Statistics at the University of Economics in Prague since 2012. First, the importance of academic – industry collaboration is outlined. Then, the Software Quality Assurance Competence Centre is introduced. To demonstrate services and core activities provided by the competence centre, two successful projects implemented by the SQA CC are presented. The aim of the REGAN (REGression ANalysis) project was to evaluate the possibility of regression testing automation. The methodology for assessing the suitability of regression testing automation together with a method of estimating the labor intensity of automated testing implementation was developed during this project. The second project is the development of an Integrated Testing Tool that interconnects test management with bug reporting and functional and performance testing. Finally, the main areas that are specific to the competence centre management and contribute to its demanding nature are identified and further discussed in the lessons learned.

Keywords: academic – industry collaboration, quality assurance software, competence centre, testing

Introduction

Practical software development starts to focus on the issue of quality in software development as a way of gaining a competitive advantage (Osterweil, 1996; Orso and Rothermel, 2014). Moreoever, Jones and Bonsignour (2011) identify potential cost savings in achieving high quality when developing a software product.

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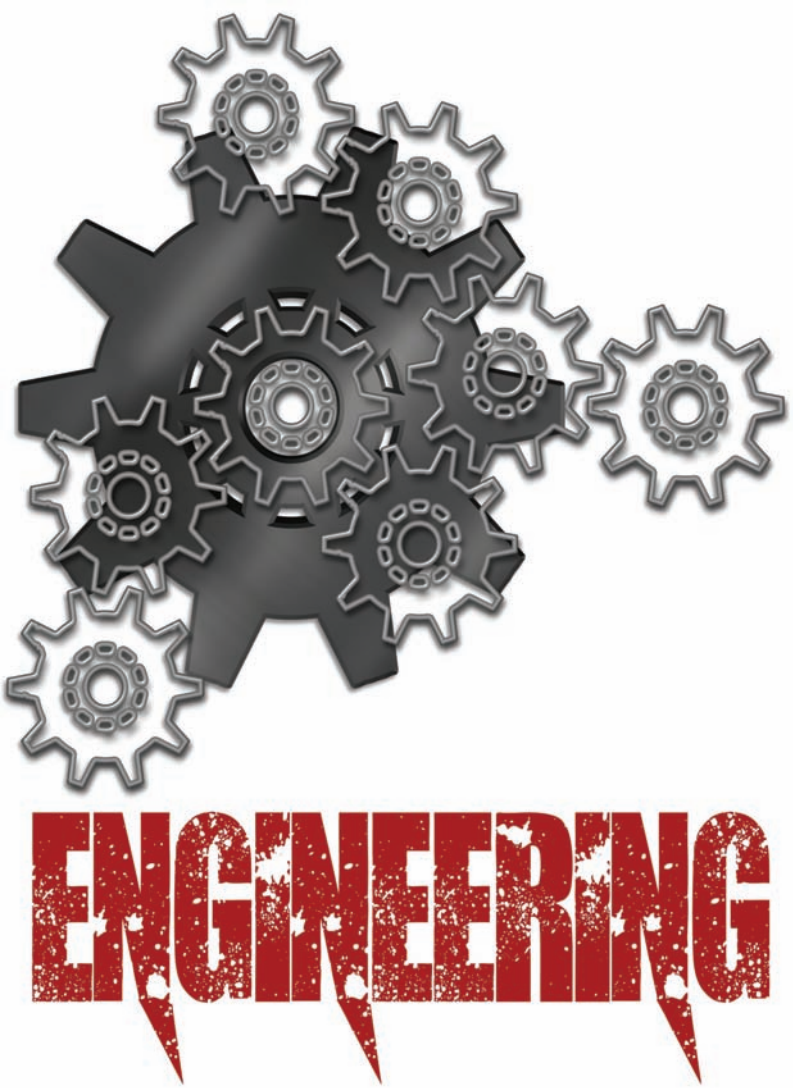
The traditional approach to quality, which insists on complete, testable and consistent requirements, traceability to design, code and test cases and heavyweight documentation becomes obsolete. Agility is needed instead, due the demand for continuous and rapid results in a world of continuously changing business decisions (Winter *et al.,* 2011).

With an increasing role of the quality software, the issue of human resources becomes an important success factor. However, according to the research focused on the level of testing and quality management in software companies in the Czech Republic (Havlickova, 2012) employees had a very low level of understanding of basic software quality concepts. The research also pointed out a low availability of structured training on quality management and testing aimed at particular employees. This lack of training and education on quality management within software companies presents an opportunity for universities to engage in practice and provide expert guidance in this field. On the other hand, the collaboration in developing applied solutions provides the universities with an insight in the practical business world and helps them to enrich the course syllabus with real life situations, and also better prepare the students for their future career.

The aim of this article is to show the possibilities of academic-industry collaboration in the field of Software Quality Assurance (SQA) and present lessons gained from such collaborations. The article is organized as follows. First, the importance of academic-industry collaboration is outlined. Then, the Software Quality Assurance Competence Centre (SQA CC) is introduced. To demonstrate services and core activities provided by the competence centre at the University of Economics, two successful projects implemented by the SQA CC are presented. Finally, lessons learned gained from the implemented projects are discussed.

Academic-Industry Requirements Alignment

An academic – industry collaboration is a strategic necessity in today's turbulent economy as it addresses the human capital, as well as the knowledge challenges that practitioners and academics face (Mandviwalla *et al.*, 2015).



According to the research conducted in Australia (Pilgrim, 2013), there are tensions between universities and industry regarding the design of curriculum for ICT degree programs. Universities focus on developing key knowledge foundations, rather than particular ICT skills. Employers are then dissatisfied with graduates' understanding of business processes, project management and communications skills. „The main skills that industry requires from newly hired persons are: teamwork, testing and evaluating capabilities, effective communication skills, quality measurement, and process improvement" (Pilgrim, 2013).

Various surveys focused on the requirements of business practice on ICT managers and their coverage by ICT curricula were undertaken also in the Czech Republic. Based on a comparison between the 2006 and 2010 surveys, a substantial improvement in agreement between the requirements of companies' practices and the knowledge offered by university graduates was declared (Doucek, Maryska and Novotny, 2014). Comparing the requirements on ICT knowledge between small and medium enterprises, it was found out that small enterprises have larger requirements on ICT knowledge than medium enterprises, which on the contrary have higher requirements on „non-ICT" knowledge (Nedomova, Doucek and Maryska, 2013).

However, the Software Quality Assurance knowledge domain is not explicitly covered in these surveys, nor is the role of the Quality engineer or Tester. To meet the growing needs of practice in the area of software quality and testing, it is necessary to empower the students with adequate knowledge and skills. According to Rusu *et al.* (2009) „…many of the skills that students are expected to have can only be learned by doing. These include interacting with real customers with tight deadlines and budgets but high expectations, and being able to work effectively in an almost exclusively team – oriented environment with increasingly complex team structures and compositions". Eldh and Punnekkat (2012) reach similar conclusions as they state that „students are taught the theory of different processes, but often lack real work experience to understand their differences, the nuances and the impact that has on the work product – the software systems".

A suitable way how to enable students to participate in practical projects is the

collaboration among industry and academia. There is a significant amount of research that shows the importance of such collaboration (Wohlin, 2013), presents its benefits (Lee, 2000), challenges (Runeson, Minör and Svenér, 2014) and gained experience (Bucar and Rojec, 2015).

SQA Competence Centre

This section introduces the foundations and core activities of the Software Quality Assurance Competence Centre (SQA CC) that was established in 2012 at the Faculty of Informatics and Statistics, in the University of Economics in Prague. The aim of this competence centre is to provide companies with expert advice and guidance in planning and implementation of software quality management processes, especially testing.

The SQA Competence Centre has currently over 30 members. These include Ph.D. students, students of bachelor's and master's program of Informatics and Information technologies. Students have the possibility to participate in real and practical business and research projects during their studies and thus gain valuable experience. Moreover, students have the opportunity to attend internal training courses and workshops and develop their knowledge and skills. SQA Competence Centre collaborates especially with the following companies: Ness Czech, Hewlett-Packard, Trask Solutions, IBM Czech Republic, Tesena, T-Mobile Czech Republic, MSD.

The SQA Competence Centre offers services in the field of quality management, which include know-how and special skills that are not usually available in the practice. These include: automated functional testing using commercial and open source tools, performance testing, integration testing, mobile application testing, testing methodology implementation, testing tools integration.

These areas are in compliance with the concerns stated by Engström and Runeson (2010) based on a recent survey of regression testing practices and challenges pointed out by Orso and Rothermel (2014).

Two examples of projects that were carried out within the SQA Competence Centre illustrate concrete examples of academic-industry collaboration.

REGAN Project

The Software Quality Assurance competence centre team successfully finished a project focused on an analysis of regression

testing for the company T-Mobile Czech Republic in January 2015. Regression testing is according to ISO/IEC/IEEE 29119-1 (2013) „the selective testing of a system or component that has previously been tested to verify that modifications have not caused unintended side-effects and that the system or component still complies with its original requirements". As Engström and Runeson (2010) state, there is a gap between research and practice of regression testing. Research on regression testing mainly focuses on selection and prioritization of test cases with several techniques proposed and evaluated. However, industry practice on regression testing is mostly based on experience alone, and not on systematic approaches (Engström and Runeson, 2010).

The objective of the REGAN (REGression ANalysis) project was to evaluate the possibility of regression testing automation. The SQA CC team gathered information about the analyzed systems, examined releases and test plans, went through test case scenarios, conducted interviews and questionnaire surveys among testers and participated in actual testing. This way the team gathered sufficient information to provide an adequate recommendation in terms of which systems and specific test cases are suitable for an implementation of automated regression testing including a timetable plan. The team developed a methodology for assessing the suitability of regression testing automation together with a method of estimating labour-intensity of automated testing implementation. Although the methodology was adapted and tailored to the development and testing processes in T-Mobile, it could be applied also in future projects. Based on the developed methodology, automation could be viewed from both technical (whether it is possible to automate testing using standard tools) as well as economic perspective (whether it is feasible to implement such automated testing). Alongside, the competence centre performed an analysis of testing tools and recommended suitable tools for testing automation.

Integrated Testing Tool Development Project

Another key project performed within the SQA Competence Centre is the development of an Integrated Testing Tool (ITT). This project is done in collaboration with Czech software company TRASK. The aim of this project is to develop a technical solution targeted at a comprehensive and integrated use of open source tools within software quality management.

Although open source tools are used quite a lot, they are used, installed and deployed independently without any integration in place. Alongside, it is quite difficult to deploy such tools because they require numerous customizations due to their universality (openness) that prolong the entire deployment process. Currently, there is not any complex open source solution aimed at the testing area. Thus, the Integrated Testing Tool strives to fill this gap. The main aim of the project is to develop a software tool that supports software

quality management within large software projects for external customers. The benefits of this system are as follows:

- Software support of the whole testing team (Test Managers, Test Architects, Testers and Programmers);
- Unified solution linking up test management, bug management and individual applications for automated software testing (functional, performance, integration and other);
- Low deployment price – the ITT will be delivered as a single functional package; that means low cost of human resources that will not be needed for installation and preparation of the environment, the ITT will allow zero software license costs given the use of open source tools.

The result of the first stage of the project lasting for one year is a functioning version of the ITT tool that interconnects test management with bug reporting and functional and performance testing. At this point, the tool is ready for deployment on a pilot project.

Lessons Learned

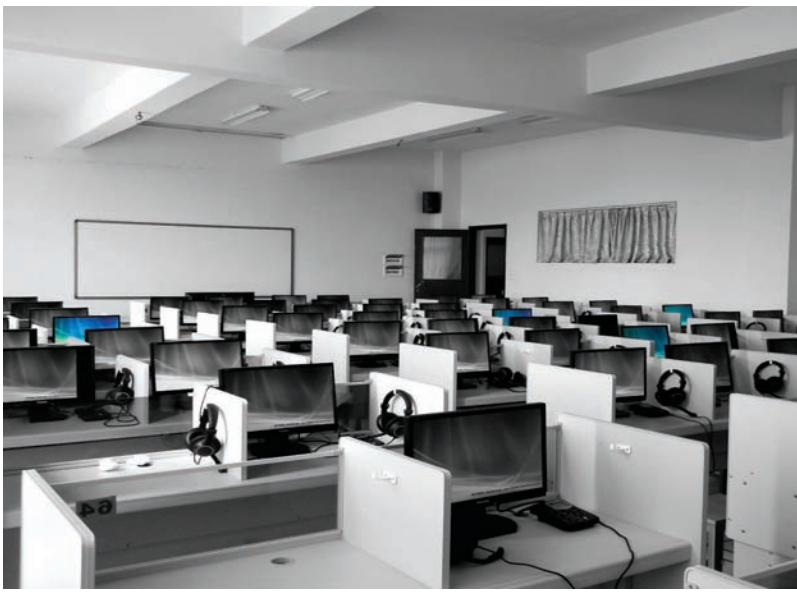
The lessons learned gained from more than three years of existence of the SQA Competence Centre are divided into three areas that are further described.

Testing Specifics

Software testing is specific in the way that it is necessary to co-operate with the team that develops software, as well as with the customer. Further, the test team members need to have access to both the contractor's company and the customer. This access means not only the physical access to a building, but also to an information system environment. This requires administrative solutions and significantly prolongs the beginning of the project.

Moreover, testing is carried out in various environments. Usually, a test environment is used and administered by the development team and an operating environment is then utilized by the customer. In this case, the testers get into a contact with sensitive company data. Thus, it is necessary to ensure that a Non-disclosure Agreement is included in the contract.

For the testing service provision, deep knowledge and skills are required and software testing tools are needed. The problem lies in the fact that commercial tools for testing are very expensive. Thus, companies that are interested in testing services prefer a complex delivery of such services, i.e. without having to buy licenses for testing tools themselves. However, neither the SQA Competence Centre nor the University of Economics are able to purchase such commercial tools. This is why the competence centre focuses on the usage of open source tools and why it strives to develop the integrated testing tool which will be then utilized within future projects.



Resource and Project Management

The overall management includes management of the competence centre and management of individual projects. At the level of competence centre management, following roles are defined: Head of the Competence Centre, Competence Centre Manager and Competence Centre Member. The Head of the Competence Centre is an academic staff or Ph.D. student and represents the competence centre in negotiations with partners and customers, signs contracts, conceptually leads the competence centre and decides on remuneration. The Competence Centre Manager is a student who manages the competence centre, coordinates individual projects, assists the CC Head, organizes activities (e.g. internal training, lectures), handles promotion of the competence centre and manages human resources. The Competence Centre Member works in the competence centre on individual projects or is a part of a pool from which people are assigned to particular projects. At the level of individual projects, it can be distinguished the role of Project Manager who manages the whole project and Project Member who works on an individual project.

A key role in the success and sustainability of the competence centre plays human resource management. The issue lies in the different degree programmes within the Czech Republic education system – the bachelor's and master's programmes. As we require the students to possess a basic level of knowledge in programming, software engineering and testing prior to joining the competence centre, we look for students in the second year of their studies. It is not certain whether the students will continue to the master's programme at the University of Economics and thus it is hard to predict the number of active members within the competence centre. With the master students, the situation is even more difficult, since the bachelor's programme lasts just for two years. Also, most of the

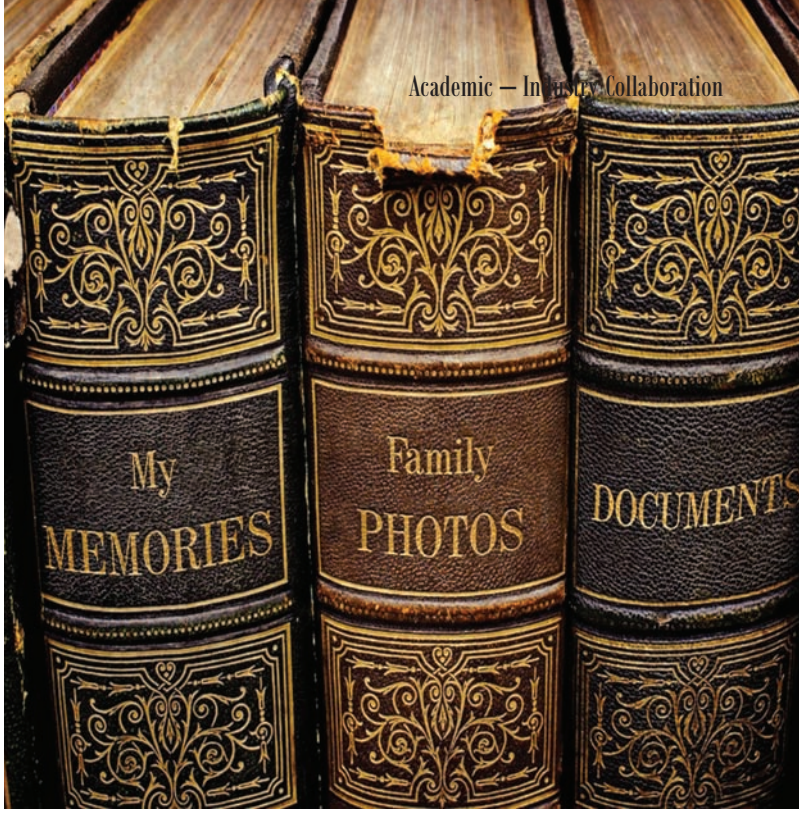
high scoring students often participate in the Exchange programme and study abroad for the whole semester. This also disrupts their activities in the competence centre. A more favourable situation then comes in the case that the master students continue with their Ph.D. studies at the University of Economics.

Another issue related to resource management that the centre staff permanently struggles with represents the time constraints of individual students. In the case of a project for practice, a full-time involvement of project members is usually required. However, the students are not able to satisfy such time requirement because they study full time and some of them even work on top of that. Thus, it is necessary to cover for the students and double their number in order to achieve a full working capacity. This significantly increases the complexity and demanding character of such project management. From the experience, innovative projects that are carried out by the students within their bachelor or master theses have proved to be an effective and functioning model.

Knowledge Management

Third key area for the sustainability of the competence centre is represented by knowledge management. Due to the high fluctuation rate of the competence centre members explained above, it is essential to preserve and transfer the knowledge acquired by the students throughout the project to others. There are already a number of resources that have been created within bachelor, master or Ph.D. theses and can be used by the competence centre. These include the following resources:

- Testing methodology following the international standards;
- Selenium tool testing methodology and manual;
- HP Quality center test management tool manual;
- Automation testing methodology and others.



Conclusions

The main contribution of this article lies in the demonstration of real academic-industry collaboration in the field of Software Quality Assurance. This collaboration between universities and business was showed on the example of the Software Quality Assurance competence centre, being a part of the Faculty of Informatics and Statistics, at the University of Economics in Prague since 2012. Two successful projects implemented by the SQA CC were then presented to illustrate the core activities of the competence centre. Finally, the main areas that are specific to competence centre management and contribute to its demanding nature were identified and further discussed in lessons learned.

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The Evolution of Managerial Skills with Age

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Abstract

The present paper proposes a model of managerial abilities based upon previous research as well as business and academic literature regarding the subject and it aims to analyze the evolution of managerial abilities by age. These abilities have been previously shown to impact the managerial performance, and they are abilities that can be learned, developed and improved. The analyzed model is part of a larger Ph.D. study, and it focuses on elements regarding personal, interpersonal and administrative skills.

Keywords: managerial performance, managerial abilities, stress management, interpersonal abilities, administrative abilities

Introduction

Managerial performance represents a wide area of interest and study. This was largely analyzed and discussed and due to its complex constitution, this can lead to business performance, company success or failure (Petterson and Van Fleet, 2004, Al-Madhoun and Analoui, 2002, Stewart, 1981). From the business literature (Whetten and Cameron, 2011, Analoui, 2002, Scullen, Judge and Mount, 2003, Tonidandel, Braddy and Fleenor, 2012) it can be learnt that the managerial performance is dependent, among other elements, on several types of managerial abilities such as personal, interpersonal, technical, cognitive and administrative abilities.

The initial model proposed for this study was constituted around three major categories: personal abilities, interpersonal abilities

„People don't resist change. They resist being changed."
Peter Senge

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and administrative abilities. Each category was divided into five or six sub-categories that were tested through a questionnaire applied to the first batch of 25 respondents, in order to be able to make a reliability decision regarding the complexity of the model. For each subcategory, there were defined five items in the initial questionnaire, and the respondents were asked to scale each answer on a 10-point scale, where one represented „never" and ten represented „always".

The model

The initial model proposed was constituted of three major categories of abilities that were each divided into five or six subcategories. After the reliability study was carried out, the model was shortened, so the three major categories were subdivided into three subcategories. Table 1 shows the two models previously described:

Table 1 – *Managerial abilities model*

Initial model		Final model	
Personal abilities	Self-Consciousness	**Personal abilities**	Personal Stress Management
	Personal Stress Management		Communication
	Communication		Initiative
	Initiative		Organizing
	Organizing	**Interpersonal abilities**	Building relationships
Interpersonal abilities	Building relationships		Motivating others
	Motivating others		Empowerment and delegation
	Conflict Management		Influencing
	Empowerment and delegation	**Administrative abilities**	Decision making
	Empathy		Time management
	Influencing		Setting objectives
Administrative abilities	Decision making		Goal oriented
	Crisis management		
	Time management		
	Setting objectives		
	Goal oriented		

The Experimental Study

The final model was depicted by three items for each subcategory of abilities, which the respondents had to place on a ten-point scale, where 1 represented „never" and 10 represented „always". The questionnaire was submitted to 189 persons with jobs that implied people management from the top and senior managers to specialists and team leaders. The age range for the total of 189 respondents was between 21 and 70. Five respondents failed to mention their age, so the study was based on the responses of the 184 left. The average age of the group was 39 years:

Table 2 – *Age distribution of the investigated sample*

Age	No. of respondents	Age	No. of respondents	Age	No. of respondents
21	2	**35**	8	**49**	4
22	2	**36**	13	**50**	1
23	1	**37**	18	**51**	1
24	1	**38**	4	**52**	2
25	1	**39**	9	**53**	2
26	1	**40**	6	**54**	1
27	3	**41**	7	**55**	2
28	7	**42**	3	**56**	3
29	6	**43**	1	**57**	1
30	6	**44**	6	**58**	3
31	4	**45**	5	**59**	6
32	5	**46**	8	**60**	2
33	6	**47**	2	**61**	3
34	14	**48**	7	**62**	2

Stress and stress management was widely defined (Giordano, Everly, and Dusek, 1993, Wheaton, 1996, Linden, 2005) and the literature presents several mechanisms for coping with stress and stress management (Linden, 2005, Karagiannopoulou and Spiridon, 2011, Velicer et al., 1998, Prochaska et al., 1994). Roberts and Hunt (1991) define communication as gaining, transmitting and attaching a meaning to the information. Mikoluk (2013) separates verbal, non-verbal and written communication, Hargie (2004) speaks in his book *The Handbook of Communication Skills* about the elements that represent the basis for communication: the motor impulses, objectives and motivation as well as emotions and thinking.

Frese *et al.* (1997) state that the initiative implies the person to manage actively and persistently the obstacles. Iannarino (2010) defines self-discipline as being the first attribute of the initiative, and defined it as the ability to maintain the commitments that one makes to himself or to others. The second attribute of the initiative is optimism, the ability to maintain a positive mental attitude. The third attribute of the initiative is competitiveness, the initiative being the activity of putting competitiveness into action (Iannarino, 2010).

Forester states that *„planning is the guidance of future action"* (Forester, 1989, pg. 3). Suttle (2015), describes the planning and organizing processes as being crucial in an efficient development of activities, adding the importance of allocating a particular time frame for a specific type of action, and also for the efficient allocation of resources.

The present paper investigated each managerial skill evolution with age. Figure 1 illustrates the general growth tendency for personal stress management. In Figure 2 the tendency for communication presents only a slight increase by age. Figure 3 also shows a slight increase of initiative by age, and Figure 4 depicts a major improvement of organization skills with age:

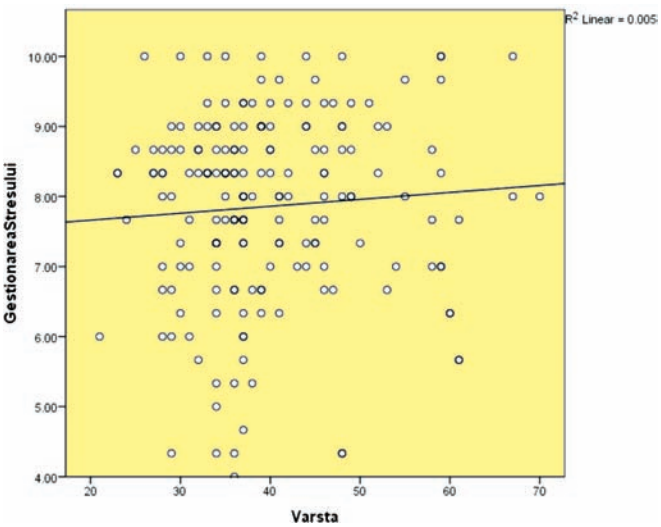

Figure 1 – *Stress management evolution by age*

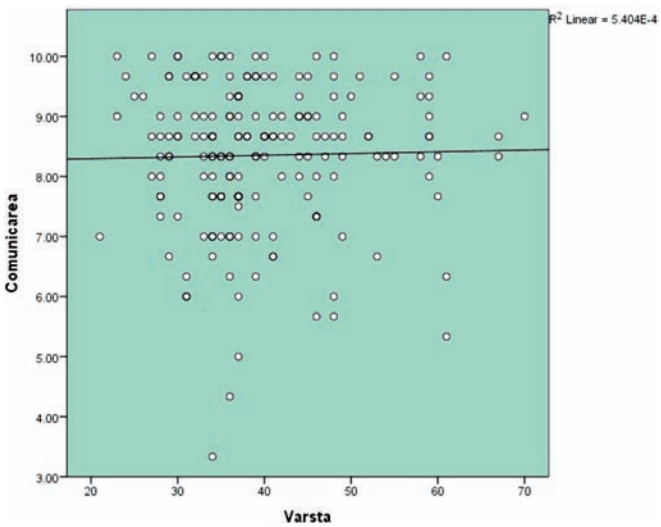

Figure 2 – *Communication skills evolution by age*

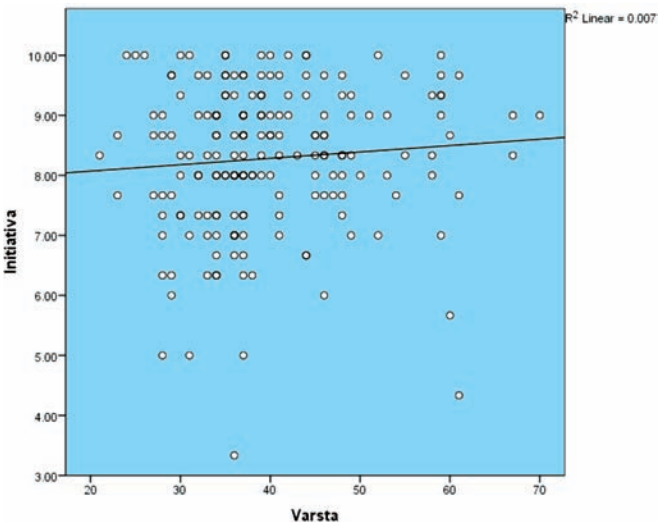

Figure 3 – *Initiative skills evolution by age*

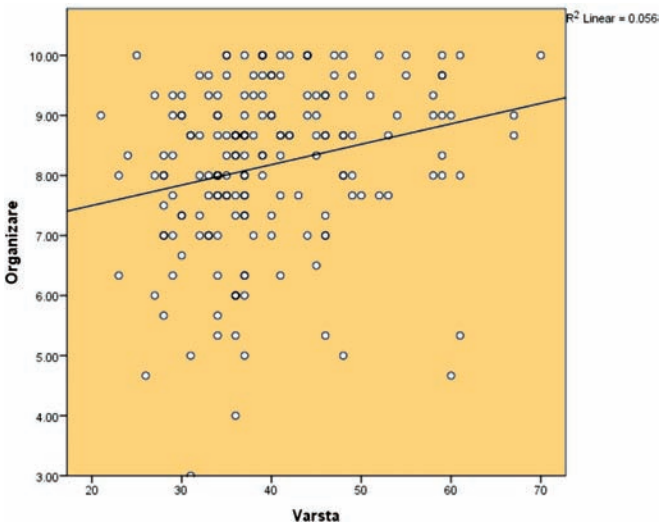

Figure 4 – *Organization skills evolution by age*

Interpersonal abilities refer to building relationships, supportive communication, gaining power and influence, conflict management and motivating employees (Whetten and Cameron, 2011). Interpersonal abilities focus on the interaction with other people. Katz (1974), state that interpersonal abilities refer to the manager's capacity to collaborate efficiently with others. This means for the manager to understand his employees, to motivate and to lead other individuals or groups. These abilities also include delegation, evaluation and efficient development of personnel. Such abilities are more difficult to acquire than the administrative ones because it is necessary to consider the differences amongst attitudes, emotions and cultural aspects.

The present study aimed to consider the following interpersonal abilities: building relationships, motivating others, empowerment and delegation, as well as influencing.

Forsyth P. (2010) stated: *„Motivation provides a reason for people to want to deliver good performance. [...] Motivation works because it reflects something about human nature, and understanding the various theories about this is a useful prerequisite to deploying motivational techniques [...]"*. Whetten and Cameron (2011) present motivation as the mix between desire and commitment, where both components are equally necessary and important, and where motivation does not exist if one of the two components is missing.

Kay (2009) describes the delegation process as the process through which the manager assigns tasks, balancing the workload between team members and their abilities, allowing them the authority to make decisions regarding their tasks. He also confirms that delegation is an ability as any other and that it can be learned. Whetten and Cameron (2011) state that delegation involves the allocation of work to other people, and it is an activity inherently associated with managerial positions.

For maximized efficiency, it is necessary for managers to mix the two concepts, applying empowered delegation. Delegation can help subordinates to develop their skills and knowledge so that their efficiency can be increased. The delegation may also be used to prove confidence in the person who receives it. Empowered delegation can be used to improve the quality of decision-making by bringing more current information closer to the source of the problem. According to Whetton and Cameron (2011), empowered delegation can also increase the coordination and integration of work by channeling information and final responsibility through a single source.

Figures 5 to 8 present the age evolution for each of the interpersonal skills analyzed. It can be observed that for all the skills included in the model under this category, the general tendency is also to increase with age:

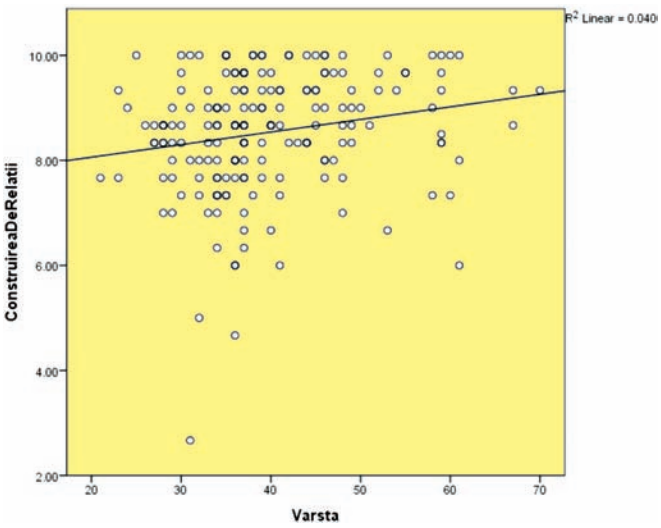

Figure 5 – *Building relationship skills evolution by age*

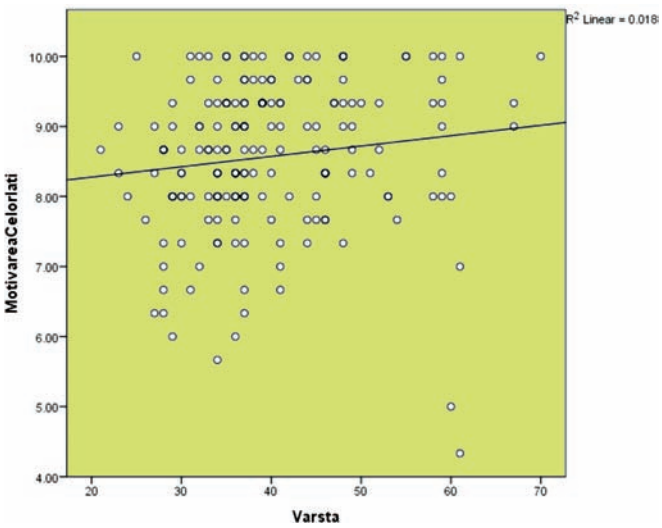

Figure 6 – *Motivating others evolution by age*

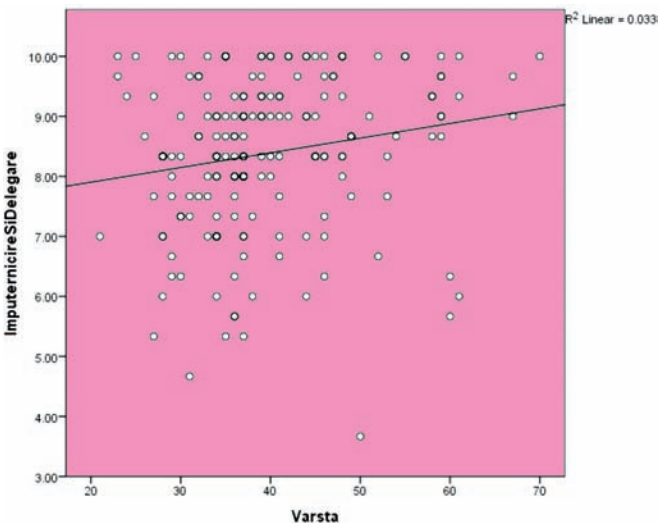

Figure 7 – *Empowerment and delegation evolution by age*

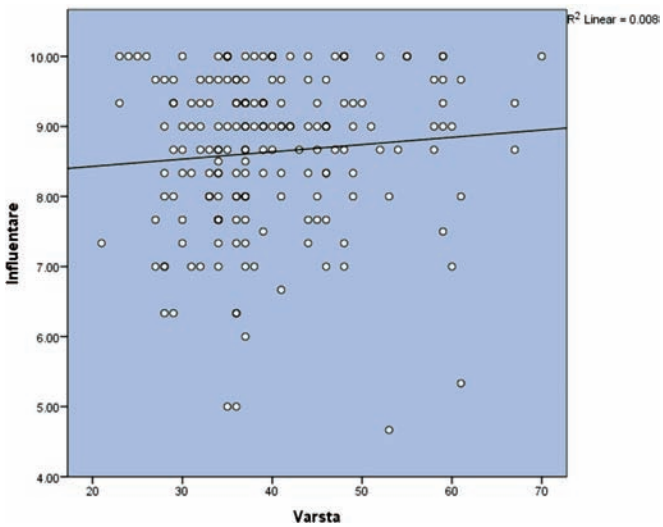

Figure 8 – *Influencing skills evolution by age*

Administrative abilities refer to such abilities necessary for applied managerial tasks. Greenbank (2010) defines *decision making* as the decision action to choose among alternatives. Finucane and Guilion (2010) argue that responsible decision making needs to fulfill several key skills such as the ability to understand information, integrating information in a consistent manner, to identify the relevance of information in decision-making and to inhibit the impulsive responses.

Advancing in age, people tend to accumulate experience in the areas where they operate and therefore to base their decisions on past experiences (Artistioco, Cervone and Pezzuti, 2003, Brown and Park, 2003). This can be both an advantage by increasing rapidity in taking decisions, but it can also be a major disadvantage, by applying personal preferences faster than taking the decision based on the analysis of available data (Johnson, 1990).

Pardey (2007) defines time management as the control over how time is spent and taking sensitive decisions regarding how it is used. In time management, a useful habit is reporting to objectives and long and short-term goals. Adair and Allen (1999) point out in their book that time is one of the most important resources one has and sadly, most of the individuals do not realize that time is a limited resource.

Whetten and Cameron (2011) state that the performance of groups that set goals and objectives is higher than the performance for groups that do not set objectives. Setting goals is generally associated with performance because it mobilizes effort, aims attention and encourages perseverance and

development of strategies (Sue – Chan and Ong, 2002). They also point out the group performance increases when the group chooses its own objectives, then when these are imposed by management.

The administrative skills were tested, and their evolution with age is illustrated in Figures 9 to 12:

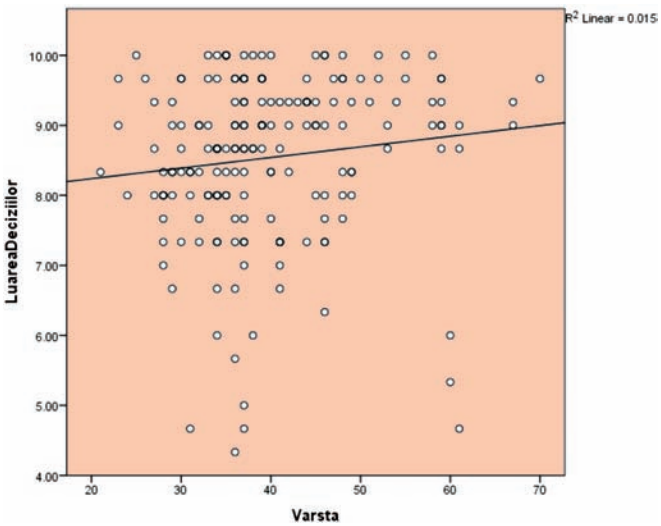

Figure 9 – *Taking decisions skills evolution by age*

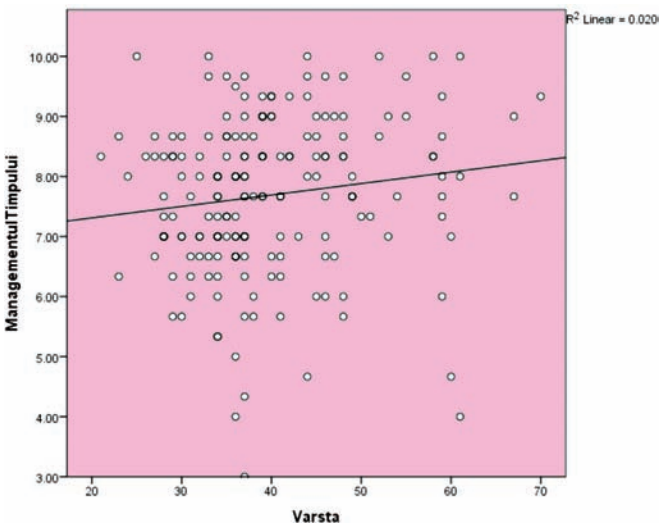

Figure 10 – *Time management skills evolution by age*

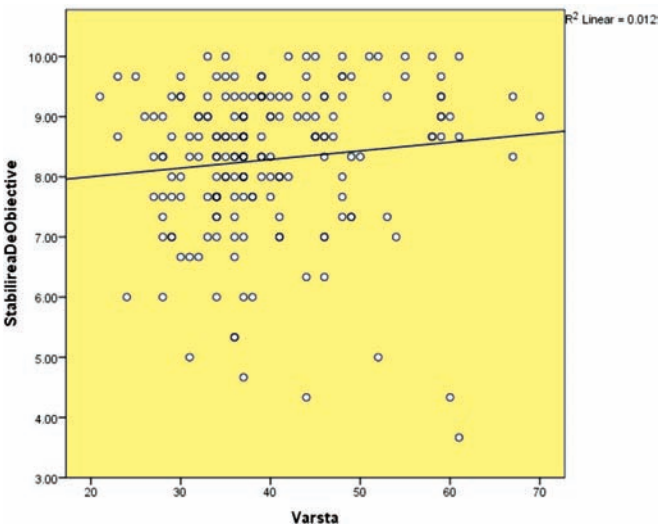

Figure 11 – *Setting objectives skill evolution by age*

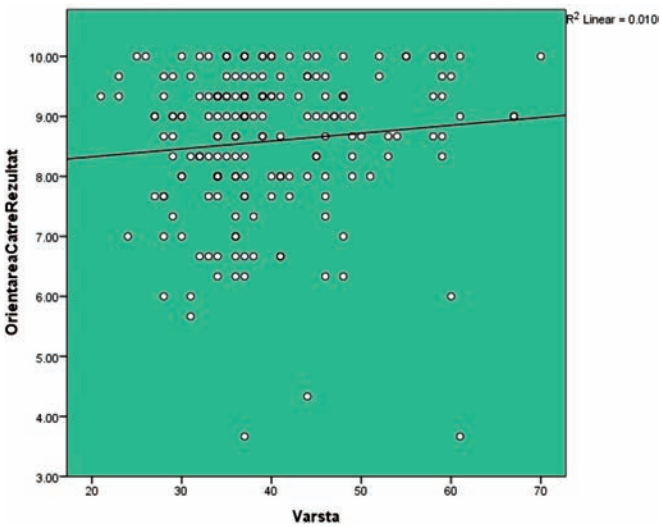

Figure 12 – *Goal orienting skills evolution by age*

It can be observed that all investigated administrative skills shown the same increase tendency with age.

Regarding the age evolution for personal abilities, it was shown that people tend to better manage their personal stress, slightly improve their communication skills and initiative and become much more organized with age (Figure 13).

In what interpersonal abilities are concerned, the results revealed the same increasing tendency with age as for the other managerial skill, so it can be concluded that people tend to grow their interpersonal skills over time by experience and learning. Figure 14 shows the increase for interpersonal skills with age:

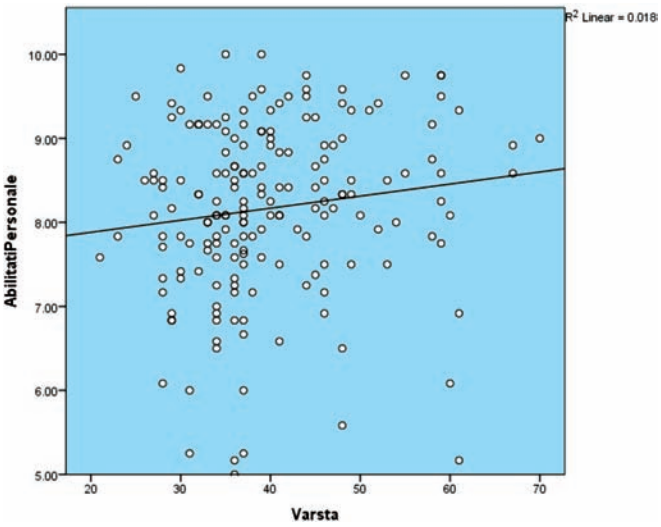

Figure 13 – *Personal abilities age evolution*

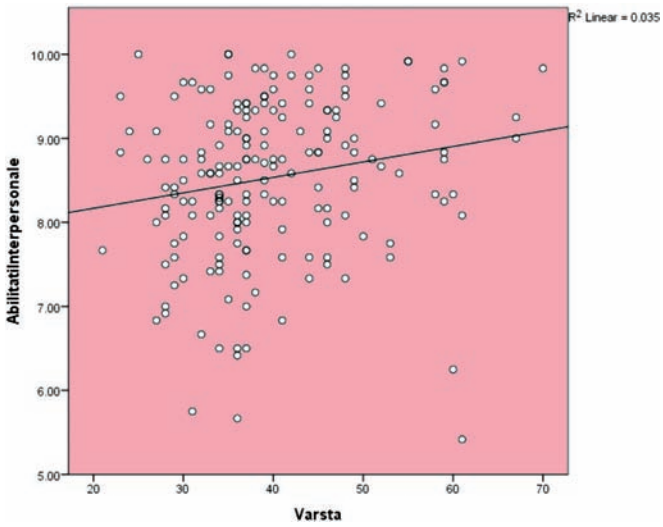

Figure 14 – *Interpersonal abilities age evolution*

Regarding the administrative skills, it can be noticed that people tend to be more focused regarding objectives and goals with age. They also tend to be more organized regarding time management and taking decisions.

Conclusions

As a general conclusion of this paper, it can be mentioned that all managerial skills present an increasing tendency with age. The results of the analysis demonstrated that all the three investigated categories of abilities (personal, interpersonal and administrative abilities) associate positively with age, so it can be said that growing in age also triggers the improvement of the managerial skills through personal development. Consistently with the specialized literature, it can be said that this ascending trend can be explained through the application of known patterns from experience to similar situations, and because of the confidence managers have on past experiences.

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„It is not necessary to change. Survival is not mandatory."
W. Edwards Deming

Changes in Production by Artificial Intelligence

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Abstract

The paper is structured in two main parts. The first part is a synthesis of the development of the current stage of the expert systems as a branch of applied Artificial Intelligence. The common components (knowledge base, control program, conjecture component), different ways of classification, applications, development tools of expert systems are successively presented. The knowledge-based systems concept, a comparison between machine problem-solving and human expert and the most important reasons for developing the expert systems in various fields of manufacturing and management are also included in this part. In the second part of the paper, an expert inspection task planning system for Coordinate Measuring Machines (CMM) is developed using Artificial Intelligence techniques. It is generative in nature and it is based on a feature-oriented computer-aided modeling system which has been developed in association with the planning system. Development of feature-oriented modeling system, direct pattern recognition for inspection planning, the inspection planning system and the inspection sequence are included in this part.

Keywords: expert system, artificial intelligence, inspection planning, feature-oriented modeling.

Introduction

Expert systems are a branch of applied Artificial Intelligence. They may be described in simple terms as an art that uses science. Expert systems skills include computer science, cognitive psychology, behavioral sciences and domain sensitivity. The product of expert systems is knowledge-based systems which emulate human intelligence (Tacu, 1998). These include expert systems, hypermedia systems, CASE (computer-aided/-assisted

„There is nothing wrong with change, if it is in the right direction."
Winston Churchill

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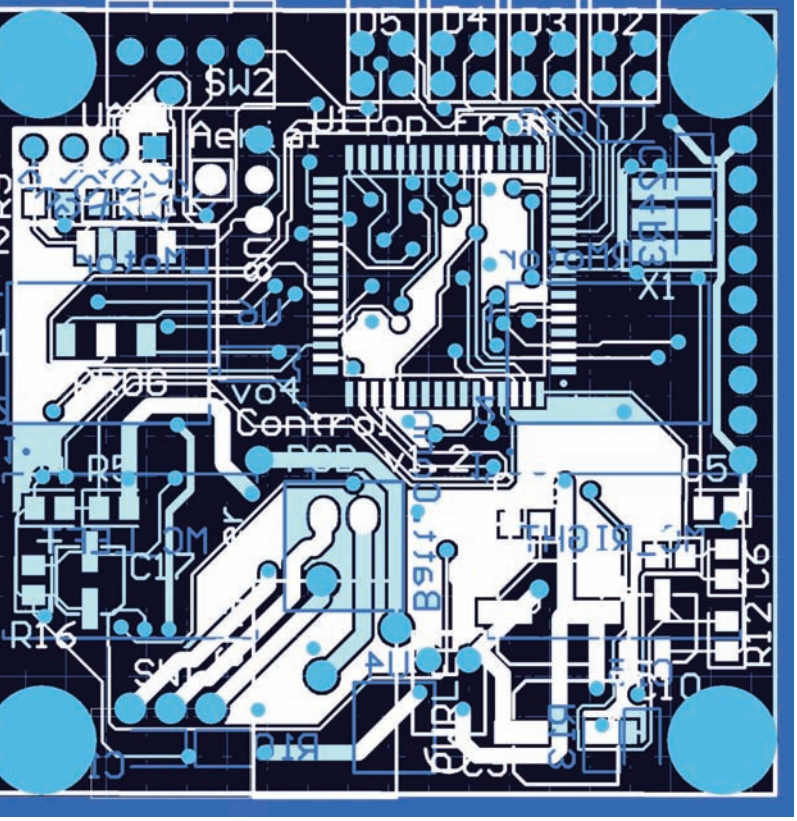


software engineering), intelligent tutoring systems and hybrid systems.

Expert systems are the most common and the most important knowledge-based systems. They are computer programs which use knowledge and reasoning techniques to solve problems that would normally require the abilities of human experts. Knowledge-based systems are in everyday use in most companies.

Applications of Expert Systems

Expert systems are classified according to the size of knowledge base: small (less than 500 rules), medium (more than 500 but less than 10000 rules), and large (more than 10000 rules) (Andone, Țugui, 1999).

As far as development methodology is concerned, there are expert systems constructed using programming languages (for example, C, LISP or PROLOG) and expert systems produced by shells. Shells are computer software systems that provide: a knowledge representation mechanism, a control program to process the knowledge base and a user interface (Andone, 2002).

According to the approach used in constructing the knowledge base, there are rule-based, example-based, and integrated expert systems. The rule-based systems are also called production systems. Their knowledge base consists of production rules, focused on 'IF' conditions and 'THEN' action concepts. Such systems move from condition to condition by interfacing with the users. They are the best solution in cases in which declarative and procedural knowledge can be represented in a rule format. Example-based systems generate rules, conclusion, and solutions from the past examples stored in the knowledge base. Since an inference is based on a limited sample set, such systems are also called induction systems (Zaharie *et al.*, 2003). They are the best solution in cases in which the rules are not known and the system must deal with prediction, judgment and heuristic knowledge. Integrated systems are based on a variety of techniques for knowledge-base design and search. They may combine production rules with frames, or deduction with inductive examples.

As far as the approach to emulating human reasoning is concerned, there are deduction-based and induction-based expert systems. Deduction-based systems, like production systems, use rules to reach conclusions by deductive reasoning. Some applications of deductive reasoning in expert systems are: assembly (integration of individual parts into a whole); planning (sequence of events to accomplish a task); and design (application of known principles to produce new things) (Moise, 2006). Induction-based systems treat the knowledge base as example-based and evaluate it using inductive reasoning. Some common

applications of inductive reasoning in expert systems are: diagnosis (identification of problem causes), testing (matching of items against criteria) and prediction (extrapolation of known outcomes to the future) (Moise, Naianu, 2003).

Expert systems are either stand-alone or embedded (Gherasim, Cocianu, 2005). The stand-alone program runs on a computer as a sole application. The embedded expert system is a part of another program. It may be either a portion of a conventional program which is accessed when needed, or it may run concurrently with other application.

Expert systems are also classified according to applications fields (Alexandru, 2002):

1) *manufacturing expert systems* are designed to make the manufacturing process phases (planning, design, production, control) more efficient;
2) *financial expert systems* are used in money management (banking, accounting insurance);
3) *educational expert systems* are involved in the development and delivery of instruction (school, professional training, media);
4) *medical expert systems* are used in diagnosing, analysis of symptoms, drug prescriptions and curing methods;
5) *scientific expert systems* are involved in all scientific fields, from anatomy to zoology;
6) *military expert systems* are used for strategic and tactical aspects of military operations;
7) *public domain expert systems* provide a variety of intellectual services from game playing and home-banking to legal counseling and weather forecasting.

As far as the expert systems purpose is concerned, there are three types: advisory and consultancy systems; human decision-making replacements; and creators of new expertise in a given field. There are ten types of expert system applications (Zaharie *et al.*, 1998):

1) *interpretation* – interfering the significance of the real situations, based on the descriptions from sensory data;
2) *prediction* – interfering the consequences of given situations, based on those already known;
3) *diagnosis and maintenance* – inferring malfunctions from observable events;
4) *design* – automatic configuration of objects and systems under established constraints;
5) *planning* – designing a sequence of courses of actions, oriented towards objectives;
6) *monitoring*, or comparing observations to expected outcomes;
7) *debugging*, or prescribing remedies for malfunctions;
8) *repair*, or executing plans to administer prescribed remedies;
9) *instruction*, or performing diagnosis and prescribing action;
10) *control* – intelligent automatic manipulation of the systems behavior of systems.

Development Tools

The process of building an expert system begins with problem identification or prospecting. After the problem has been selected, the task of prototyping follows. Prototyping is the most time-consuming phase in the process and consists of interviewing domain experts and other sources of knowledge in order to acquire the material necessary for the knowledge base. After the knowledge representation technique(s) have been selected, the coding of the system follows, and the first working prototype is produced (Hristea and Bălean, 2005). This is shown to the experts and the users and their comments solicited. The outcome of this (iterative) process is a series of new prototypes, modified according to the suggestions. Eventually, the system is put into production, implemented, and where necessary, maintained in order to enhance its functionality. Technically speaking, expert systems could be developed in any programming language equipped with an 'IF' command.

There are a variety of computer languages applied in developing commercial expert systems, namely Basic, COBOL, LISP, PROLOG, Pascal, C and FORTRAN to OPS5, Nexpert, EPITOOL or GKS (*G*raphical *K*ernal *S*ystem) (Pop and Șerban, 2004). In 90 per cent of the cases, more than one language was used to produce the expert system code. However, some languages are not suited for rule-based or frame-based programming. LISP (*LIS*t *P*rocessor) is the most widely used Artificial Intelligence programming language, followed by PROLOG (*PRO*gramming in *LOG*ic), a programming language based on predicate calculus (Neagu *et al.*, 2006).

Expert System for Inspection Planning

Inspection is of paramount importance in modern manufacturing. As products accuracy increases and limits on geometric tolerance become tighter, to meet more complex functional specifications, more effective inspection planning and execution becomes indispensable. The use of Coordinate Measuring Machines (CMM) is widespread in the industrial environment. Generative inspection planning for CMM, using Artificial Intelligence techniques is developed (Darlington, 2000; Patterson, 1990). The efficient and economical operation of these machines, and their CAD-directed programming and task planning require detailed investigation in order to develop flexible inspection systems which facilitate the integration of CMMs in automated manufacturing systems.

This paper presents a knowledge-based solution to generative inspection task planning for CMMs. The analysis of traditional inspection processes reveals the following generic steps:

1. Understanding the part and its inspection criteria as specified in the engineering drawings;

2. Decision-making regarding the inspection procedure, given the available inspection facilities;
3. Executing the inspection plan.

Understanding the part and its inspection criteria is a matter of interpreting the engineering drawing and specifications. Once this is done, inspection tasks may then be planned, for available inspection facilities and tools, using expert knowledge. Inspection plans may be executed using appropriate links with the inspection machines and tools.

In this paper, a feature-oriented modeling and planning system approach is proposed. Emphasis is placed on the full description of parts and the application of the expert system and knowledge engineering techniques so that a modeled part can be automatically recognized by process planning system for machining and inspection. This approach is not limited to inspection planning and is applicable to manufacturing process planning in general.

Since the inspection planning system is dependent on the use of feature based modeling and feature extraction, using syntactic pattern recognition, prior to the use of inspection knowledge rules, these aspects will be described briefly.

Development of Feature Oriented Modeling System

A feature-oriented modeling system consists of three major parts (Figure 1): feature base, interactive modeling, dimensioning and tolerance module, the knowledge base for tolerance assignment consultation.

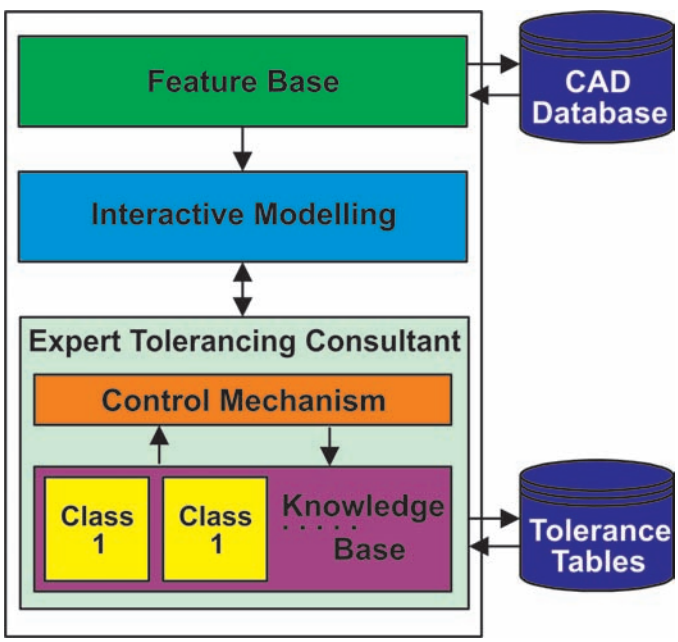


Figure 1 – *Modeling System Structure*

The *feature base* is created by examining and decomposing a representative sample of parts and establishing the relationship between the basic features and the manufacturing operations. For example, a rotational part may be composed of cylinders, screws, key seats and holes. The machining operations contain turning, drilling, boring, milling and grinding. Geometric tolerances may include cylindricity, angularity,

perpendicularity, concentricity and coaxiality. Dimensional tolerances are specified for diameters and lengths. All these features, geometric and dimensional tolerances as well as surface finish etc. are captured in the part data file produced by the developed feature-based modeling system.

The selection of the primitive features is a trade-off between the generality and flexibility of the modeling system and the complexity of the feature representation data structure and its manipulation. A preliminary version of a feature base for rotational parts is shown in Figure 2:

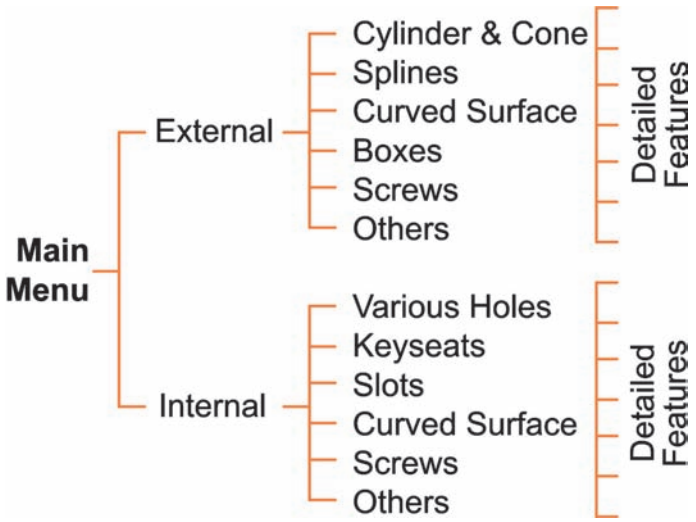


Figure 2 – *The feature base listed in the menu*

Direct Pattern Recognition for Inspection Planning

The Syntactic Pattern Recognition approach is a commonly used technique for natural language manipulation. A pattern is represented as a collection of primitives just as a sentence is composed of a group of words in certain order (Hristea and Bălean, 2005). This approach is chosen for representing parts features and recognizing them later in order to automatically plan their manufacturing process and inspection. The procedure consists of:

a) Selection of pattern primitives. Primitives extraction is an important part of pattern recognition. It requires a strong knowledge of the physical nature of the problem being solved since there is no general solution for the primitive selection. For different parts, different geometric tolerances may be required to support the functional requirements. Hence, it is possible to group the parts together using the similarity of inspection primitives.

b) Clustering. A similarity measure between two syntactic patterns usually includes the similarity of both their structure and primitives. It is expressed as Levenshtein Distance between the two patterns. This distance is defined as the smallest number of transformations required to make them become exactly the same (Iwata, Moriwaki and Ueno, 1992). This method is used to cluster parts and features according to their inspection requirements. Rotational parts are examples of clustering analysis (Iwata, Moriwaki, and Ueno, 1992).

The result of this analysis is given in Figure 3. If level 1 is chosen as a criterion, then seven groups of parts will be obtained

in the final analysis. The number of groups is in fact arbitrarily determined. If a real production system requires fewer classes, then level 2 may be used as a criterion.

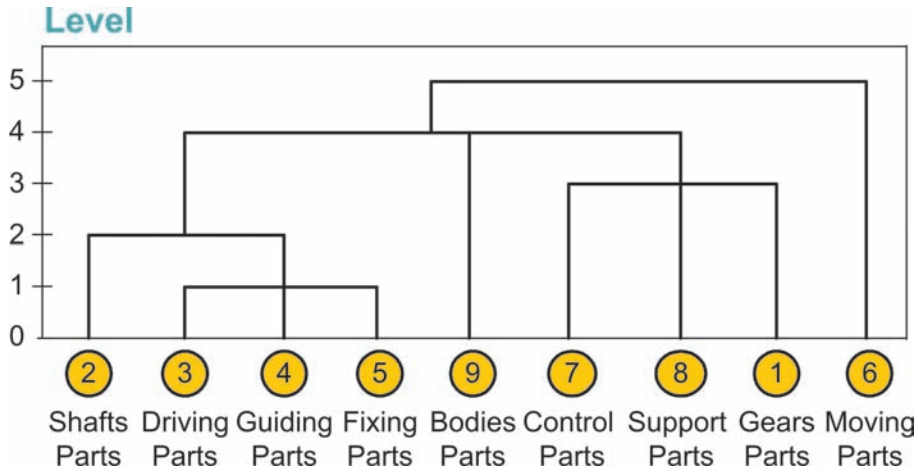


Figure 3 – *Result of Clustering Analysis*

c) Grammatic inference. After the patterns are clustered, inspection plans can be made if corresponding inspection facilities are formed. Since only inspection plans are considered and the order of inspection tasks is not significant, the results of grammatic inference for the {3, 4, 5} cluster shown in Figure 3 is expressed as follows by using a context-free grammar:

$$G = (V_n,\ V_t,\ P,\ S) \qquad (1)$$

where

$$V_n = \{S,\ T_1,\ T_2,\ldots,\ T_9\} \qquad (2)$$

$$V_t = \{a,\ c,\ d,\ f,\ g,\ h,\ k,\ l,\ m\} \qquad (3)$$

where V_n is a set of nonterminal symbols, V_t is a set of terminal symbols, P is a set of production rules or rewrite rules, S is the start symbol. The symbol a means straightness, c roundness, d cylindricity, f surface profile, g parallelism, h perpendicularity, k concentricity, l symmetricity and m circular runout. For this problem, the production rules (or rewrite rules P) can be any form combination of these primitives depending on the part design.

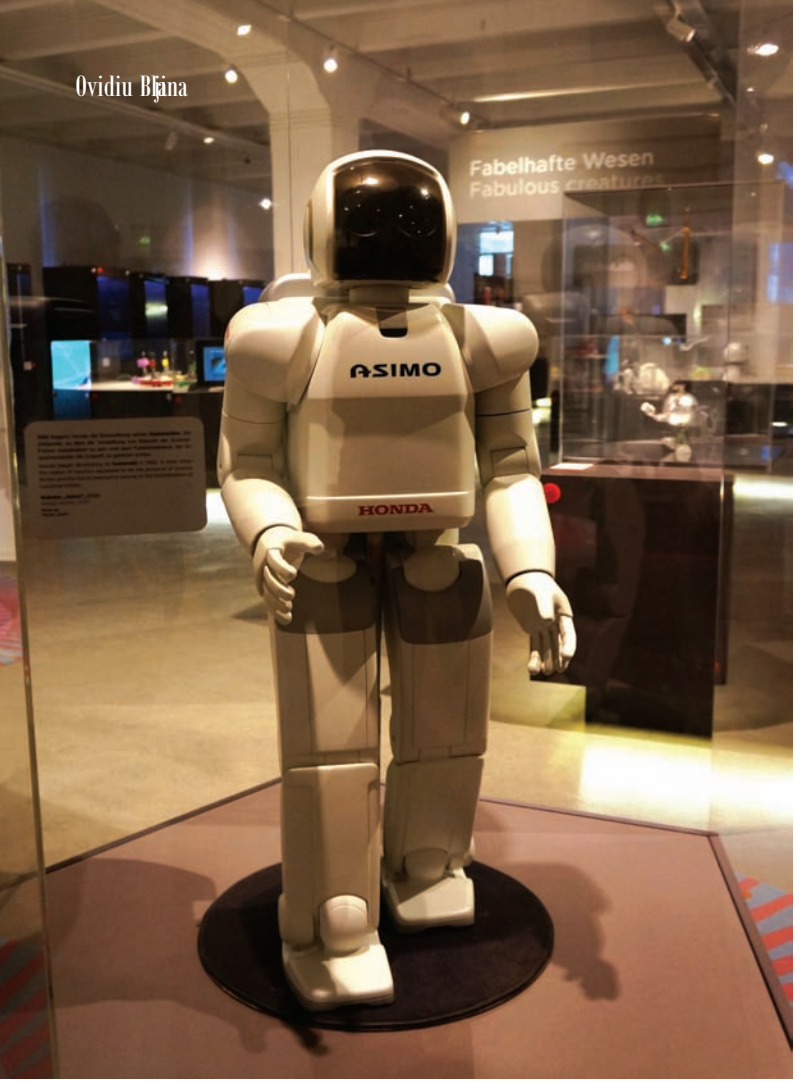
d) Syntactic analysis. The recognition of a new component consists of comparing the distances between the symbolic pattern representing the new component and every existing feature pattern to find the smallest number of transformations, and consequently the most suitable group for the new part.

Transformations are multiplied by suitable weighting factors to avoid ignoring any feature of a new part if possible. The final decision regarding selecting the machine to perform the planned task is made based on machines load balancing or economical considerations. This can also solve the problem of parts which may be suitable for assignment to more than one family.

The Inspection Planning System

Not all types of geometric tolerances can be checked by CMM. If possible, some features should be inspected using other methods.

The inspection sequence is important since the machines are expensive and should be operated efficiently. By examining the characteristics of CMMs, the



inspection process itself, parts tolerances and tolerance theory, the following principles, on which expert planning system is based, were developed:

1) The input part is examined to find out what features should be inspected using non-CMM device. Classification results can provide some help regarding geometric tolerances inspection since some, such as total runout, cannot be measured on CMMs. Then corresponding planning is done for the measurements.
2) As long as the part is fixed on the table, its orientation is determined. All features to be inspected should then be examined for accessibility.
3) Once accessibility of all features is determined, the feature datum is searched, as an important feature, and its position in list data structure is identified. Next measurement planning and corresponding tolerance checking are conducted. Since CMM checks the features geometric elements instead of recognizing the exact shape of the features, then all defined features must be decomposed and represented by these geometric elements.

When the first item is measured, an appropriate probe should be chosen. All accessible features with similar geometric elements are inspected at the same time. This is based upon efficient considerations for CMM operation.

4) Next step is to find other features which belong to other geometric elements, from an inspection point of view, and can be inspected by the current probe, then step 4 is repeated. This process is repeated until all accessible items which can be inspected by the present probe have been checked.
5) The next step is to choose another feature and to find suitable probe. Then step 4 and 5 are repeated. A similar procedure is used except that all accessible features tolerances are checked using the same datum.
6) The tolerance measurement process starts at datum features. Similar tolerance checking items are searched and completed at the same time.
7) If the first chosen tolerance requires a datum, then all measured features tolerances, based on this datum, are searched and compared with designed tolerances.
8) The above process is repeated until all tolerances are completed.
9) Then part or probe orientation is changed and the above process is repeated until the part inspection is completed.

The proposed inspection planning system can be implemented in PROLOG which is logic programming language based on the resolution principle of the first order logic (Sîmbotin, 1997) The knowledge for inspection planning is represented as production rules and assertions. The control mechanism provided by PROLOG is the depth-first, left to right search. The inference engine consists of two phases, pattern matching and unification (Blăjină, 2005).

The expert inspection planning system, shown in Figure 4, consists of the main module and several submodules, each of them having its role.

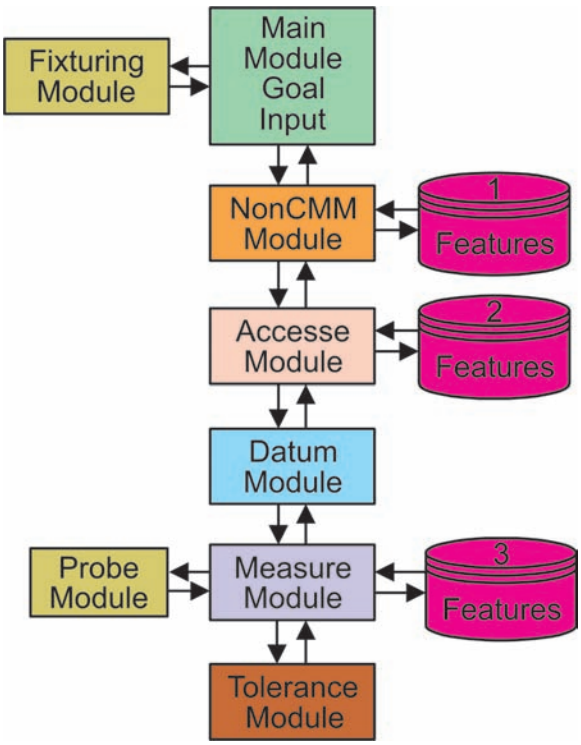


Figure 4 – *Inspection Planning System Model*

A feature can be expressed as a sequence of feature number, name, main dimensions and tolerance items. This type of definition takes into consideration both physical properties and CAD database, i.e. technical description. Parts are described using a list of the data structure in which each feature is expressed in a sub-list. Once the part to be inspected is fixed on the machine table, features accessibility must be determined and arranged so that part and/or probe orientation changes can be identified and planned. This means examining the geometric properties of all features.

An example for determining the feature accessibility can be found below:

IF feature(*i*) is a cylinder and;
feature(*i*+1) is a cone and;
the cone max. diameter is smaller than the cylinder diameter and;
the axis of the feature is parallel to *Z* direction,
THEN the cone is inaccessible if the common probe is used.

All features accessibility should be examined. Accessible features are stored in certain positions in a list, others are left

in positions where they can be accessed when the part orientation is changed. Since a symbol is given, the terminal point defines the list end point. Each feature in a sublist is compared with adjacent ones until completion.

Conclusion

The results presented in this paper are part of a research aimed at developing an intelligent system for manufacturing process planning tasks. The main emphasis is placed on describing the inspection planning system and related modeling functions.

Effective feature representation and recognition methods can bridge the gap between date bases produced by computer aided design systems and computer aided process planning programs. A careful selection of feature primitives is essential to achieve simplicity and speed without losing the generality of the modeling system.

This proposed generative expert inspection task planner utilizes domain specific knowledge and rules to generate inspection plans, for both rotational and prismatic parts.

Many ideas for automating inspection planning using Artificial Intelligence techniques can be implemented. These include feature accessibility, inspecting datum features first and grouping inspection tasks according to geometric features type of tolerances, measuring probes and datum features to improve the efficiency of planned inspection.

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„They must often change, who would be constant in happiness or wisdom."
Confucius

Stress and Students' Performance

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(1) UPA Solutions Bucharest, Romania, (2) University POLITEHNICA of Bucharest, Romania

Abstract

The motivation behind this research is based on understanding more about a syndrome that torment every individual, regardless of occupation zone. By choosing to investigate the professional stress among the master students it was made one of the multiple attempts to investigate possible factors that may influence their academic performance and their general behavior. Studying these consequences that produce changes in the behavior of individuals, solutions can be discovered, and by developing these solutions, we can use them in any professional field.

Keywords: eustress, distress, stress, performance

Introduction

The term „stress", is a word so often used today, a word we hear even in children's language, a word that is repeated almost obsessively, but a scientific word that only a few of us know to speak about its true meaning (Popescu, Cenea, 2006, p. 13).

Although the linguistic term „stress" is recorded for the first time in the 15th century in the Oxford English Dictionary, designating a strain or a physical pressure, the first reference to the term „stress" as a pathological term is carried out in an article published in 1936 by the Canadian pathophysiologist Hans Selye. Starting from Selye's vision about „stress" and his theories of the stress manifestations as a syndrome, Roger Guillemin formulated one of the most widely accepted definitions

„To exist is to change, to change is to mature, to mature is to go on creating oneself endlessly."
Henri Bergson

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of stress: *„a physical state, given by a specific syndrome corresponding to all the nonspecific changes induced in a biological system"* (Tatu, 2009, pp. 9-10).

A synthetic definition of the „general stress" can be „a psycho-physical reaction of the body, generated by stressors agents acting on the path of the sense organs to the brain, putting into motion – due to the limbic-cortico-hypothalamic links – a whole range of neuro-vegetative and endocrine reactions, with visible action on the whole body" (Andreescu, Lita, 2006, pp. 31-32).

Stress is triggered by external problems that people are facing, as well as how they face these problems. Most of the people face a large variety of pressure factors during their entire existence. Some persons are stimulated to give maximum efficiency only when they are stressed, especially at work or in a professional environment. But after they stop facing the tensions brought by stress in a proper way, stress symptoms begin to occur (Melgosa, 2000). Stress may involve external factors that threaten the welfare, internal factors, and physical responses to each of the sources of internal and external factors (Corey and Corey, 2010, p. 134).

According to Jurcau (2003) sociologists say that stress is due to the characteristics of the living environment. Physiologists, endocrinologists and immunologists believe that stress is the body's response to external stimulations. Psychologists argue that stress occurs due to a state of self-inefficiency perceived by the subject (Stoica, 2007, pp. 18-19). Therefore, psychological stress is characterized as a sort of relationship between the individual and the environment and is evaluated as a consequence of a depletion or excessive use of the own resources that is threatening the well-being and the comfort of the individual (Lazarus, Folkman, 1984, p. 21). All life situations that strain the body, especially the adaptive mechanism generates stress. Hence it occurs the assumption of the two forms, types of stress: distress or negative stress, which is the term commonly used, and the positive stress or eustress (Popescu, Cenea, 2006, p.18).

The perceived stress exceeding a critical intensity, the amount of which varies widely from individual to individual, is designated as „distress". The state of distress is defined as a negative, evil, harmful, destructive, factor of life that can be considered harmful in total contradiction, antagonism with the state of eustress, which is practically its opposite state.

The „distress" state is caused by intense stressful factors, which act simultaneous over a long period of time, have a strong negative effect in the biopsychosocial area and which are in complete opposition to the needs, aspirations and daily activity of the individual (Riga and Riga, 2008, p. 117). The „distress" state is caused by the excessive and prolonged use of the physiological and psychological resources, resulting

in decreased performance, dissatisfaction, psychosomatic and physical disorders (Stoica, 2007, p. 20). It may be specified that the main hormone produced during states of distress are „catecholamine" (norepinephrine and epinephrine in particular) which can occasionally cause cardiovascular diseases and can also lower the body's resistance to infection and to cancer" (Iamandescu, 2002, p. 11).

Summarizing the above, it can be said that when an individual is unable to return to the normal state of homeostatic balance, and this state of imbalance is maintained for a long time he/she can reach a functional disorder of physiological systems and negative and destructive phenomena associated with perceived stress.

The literature emphasizes another type of trophic activity with mobilizing and positive effects which is called „eustress",

but this state has been less studied. The term „eustress" designates the level of an optimal psycho-neuro-endocrine stimulation that maintains the balance and the physical and mental health status of the individual, by inducing a positive adaptation to the environment. The state „eustress" acts as a dynamic and energizing factor for the mind and body, having the effect of mobilization towards achieving the established goals (Stoica, 2007, p. 20).

The state of „eustress" is seen as a trigger for action to the benefit of the individual, because this state mobilizes him to do actions that arouse the interest in which the individual is willing to put further efforts (Biegel, 2009, p. 13).

The state of „eustress", also called the positive stress is good for the individual, is vitalizing and favorable for survival. This state makes us aware of the danger and gives us the opportunity to escape the threats. The factors that generate „eustress" are represented by the pleasant agents and situations that come from the environment and which are favorable for the individual, also by positive mental states like feelings or emotions which generally have positive consequences on the body (Riga, Riga, 2008, p. 116).

Examples of „eustress" experiences may be: the feeling of a shared love, the reunion with the loved one, finding a good news, hearing a good song and so on. The state of „eustress" is composed of elements of a physical strain, and this can include physical activities like dance, sexual activities, playing sports etc. (Maier, 2011, p. 34).

The Stress Factors

Elliot and Eisdorfer (1982) define the stressors or the stress factors as environmental events or conditions, sufficiently intense

or frequent that claim physiological and psychosocial responses from the individual. Conventional stressors are more often grouped into three large categories: physical stressors, psychological stressors and social stressors. This classification is less applicable because most often in the environment in which people operate, they interact with all these factors at the same time, which makes it very difficult to study their effects separately. Features of the contemporary life cause a daily confrontation between the man and the psychosocial stress factors, which explains why most of the research activities are predominantly focused on this category of stressors.

The stress factors at individual level reside sometimes in the structure of personality, in the emotional reactivity type, in the intellectual abilities and cognitive style, in the attitudinal and behavioral characteristics of the individual and may become harmful due to their repetitive nature.

The psychosocial stress factors acquire specific manifestations depending on the stage of the life cycle in which the individual is situated. For example for a small child, the separation from the mother is a major cause of stress; for teens, a correspondence is the identity crisis, for the young individuals it can be the professional option that will influence their entire life, the adult can be stressed because of the multitude responsibilities and at the third age, because of the biological and intellectual regression.

The profession is another existential landmark for the individual in terms of identity, purpose, appearance and revenues. The inadequate professional conditions can cause repercussions on the states of physical and psychological comfort causing stress to the individual. The occupational stress factors can come from: the physical environment (noise, vibration, extreme temperatures, lighting etc); social environment (reduced interpersonal relationships, lack of cooperation, critical or dictatorial attitudes, job insecurity etc.); the nature and organization of work (overload, repetitive work, imposed rhythm, extended hours).

According to the typology made by Le Blanc de Jonge and Schaufeli (2000), professional stressors are classified into four groups according to the aspects of the work environment or the conditions of the professional activity, factors which can be also viewed in Table 1:

Table 1 – *Categories of stressors related to the work environment*

Category	Stressors
Labor Content	Overloaded/ underflow work; Complexity of the work; Monotony at work; Increased responsibility; High-risk work;
Working Conditions	Toxic substances; Inadequate working conditions; The body position during labor; Excessive physical demands; Dangerous situations; Lack of hygiene.
Conditions of Employment	Loaded working program; Low wages; Fewer opportunities for career development; Inflexible employment contracts; Labor insecurity.
Social Networking at Work	Bad management system; Low social support; Low participation in decision making; Discrimination.

(Source: Adapted from Capotescu, 2006, p. 40.)

Most of the stress factors identified get involved in the individual role attributes. Thereby, the role conflict refers to perceptual differences regarding the content of the roles of an individual or the importance of the elements supported by the role. Thus these differences arise between the individual and others within a group when they do not share the same expectations about the role. The role conflict can generate negative emotional feelings, tension, and often physical manifestations. These situations may occur due to a conflict between the requests generated by the different roles held by a person.

Research Methodology

Research objectives: Investigation of the stress level among the master students.

Research design: The type of research is a causal-comparative design that allows the study of the cause-effect relationship between the chosen variables.

Research group: The study was conducted on a total group of 30 subjects selected from a group of master students from a state university in Bucharest, Romania.

Studied variables: The independent variables were age and gender, while the dependent variables were school performance and the assessed level of stress.

Stress assessment instruments: the study used an adapted version of the questionnaire entitled „Without Stress" by Julian Melgosa (2000). The inventory consists of 96 items, grouped into six subscales, as follows: „Lifestyle" (L), „Environment" (E), „Symptoms" (S), „Professional Occupation" (O), „Personality" (P), „Interpersonal relationships" (R). The answers are given on a Likert scale with four levels of intensity, so „never" (N), „almost never" (AN), „frequently" (F), „almost every time" (AE). On the response grid were also recorded the values for the following variables: „gender", „age" and „school performance".

Data processing. The obtained data from the questionnaire were processed using the statistical program SPSS 22.00, Trial version.

Research hypotheses:

1. It is assumed that the master students record a certain load of stress.
2. It is assumed that the recorded level of stress is influenced by the age of individuals.
3. It is assumed that the stress level affects the school performance of the master students.

Research Results

By performing the central tendencies analysis, it can be observed that the investigated group of individuals have the following characteristics: the average age is 24.77 years, with the central distribution value of 23.50 years. The most common value is 23, meaning that the batch is composed of young individuals aged between 22 and 35 years, according to Table 2:

Table 2 – *Central tendencies analysis for the investigated variables*

		Subs Age	Subs Gender	Melgosa Total Score	School Perf
N	Valid	30	30	30	30
	Missing	0	0	0	0
Mean		24.77	1.83	107.23	8.5053
Median		23.50	2.00	110.00	8.4500
Mode		23	2	80	8.00
Std. Deviation		2.967	.379	21.357	.64097
Variance		8.806	.144	456.116	.411
Range		13	1	73	2.70
Minimum		22	1	71	7.13
Maximum		35	2	144	9.83

The age distribution is irregular, and the standard deviation is 2,967, according to Figure 1:

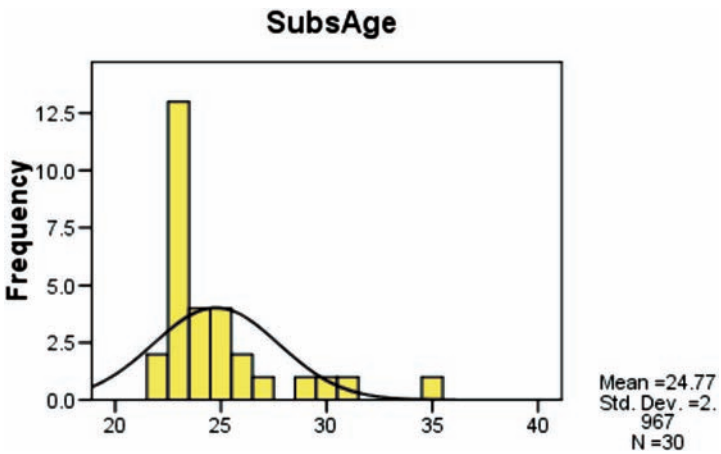

Figure 1 – *Age distribution for the investigated sample (histogram)*

The gender of the sample is predominantly female with an overwhelming percentage of 83.3% compared to the rest of 16.7% that accrues to the male gender according to Table 3:

Table 3 – *Statistical indicators for the gender of the investigated sample*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	5	16.7	16.7	16.7
	Female	25	83.3	83.3	100.0
	Total	30	100.0	100.0	

According to the Romanian grading system, the variable „school performance" can take values between 1 and 10. For the investigated sample, school performance recorded an average value of 8.5053, with the peak of the distribution of 8.4500, and the most common value 8 as presented in Table 2. The minimum and maximum recorded values of the distribution are 7.13 and 9.83. The values distribution can be viewed in Figure 2:

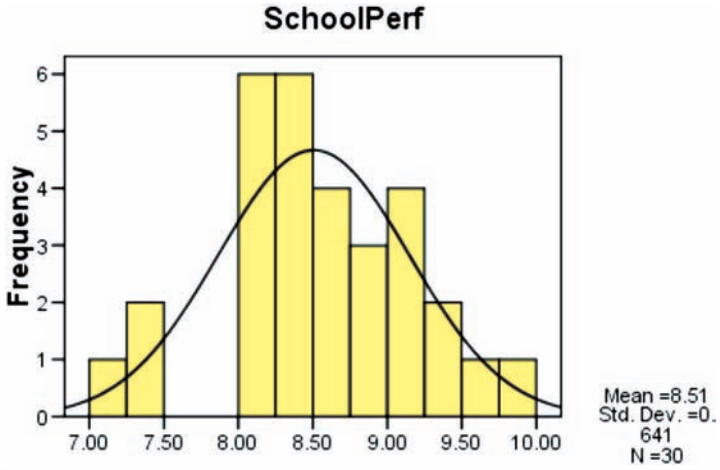

Figure 2 – *School performance distribution for the investigated sample (histogram)*

For the investigated sample, the average score of the variable „Melgosa total score", accounting for the total stress score is 107.23, with average values between 71 and 144 and the most common value being 80, according to Table 2. The distribution of the stress scores can be viewed in Figure 3 as histograms with the normal curve of distribution:

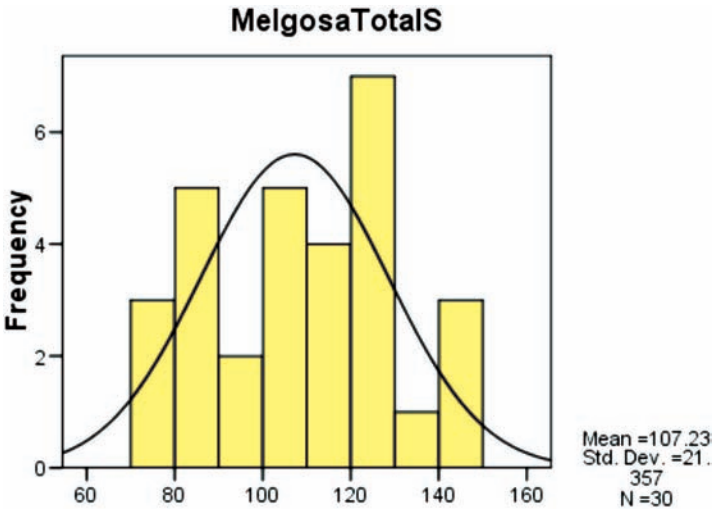

Figure 3 – *Total stress score distribution for the investigated sample (histogram)*

According to Table 4, the mean score of 107.23 has the psychological meaning of „normal stress zone", so we can conclude that stress level of the entire research sample it's psychologically normal:

Table 4 – *Standard areas of stress*

Stress zone	N.B.	Psychological significance
Z.1	0-48	Dangerously low level of stress
Z.2	49-72	Low level of stress
Z.3	73-120	Normal level of stress
Z.4	121-144	High level of stress
Z.5	< – 144	Dangerously high level of stress

With the last assertion, it can be proved that the first of the research hypothesis is demonstrated, meaning that the master students from the sample have a certain recorded stress level.

For testing the second and third research hypothesis, some Pearson correlation analysis in SPSS have been performed.

The second hypotheses presumed that the registered stress level is influenced by age. As can be observed in Table 5, the „subjects' age" variable has not recorded any correlations with the „Melgosa total score" variable, meaning that second research hypothesis is disproved:

Table 5 – *Correlation analysis of the age and stress scores for the investigated sample*

		Subs Age	Melgosa total score
Subs Age	Pearson Correlation	1	.013
	Sig. (2-tailed)		.944
	N	30	30
Melgosa total score	Pearson Correlation	.013	1
	Sig. (2-tailed)	.944	
	N	30	30

The third research hypothesis is presuming that the school performance is influenced by the recorded stress level of the subjects. The hypothesis is tested in Table 6 which lists the Pearson correlations for the two variables. According to the table, it is easily observable a statistically significant correlation (r = 0.483) viable at 0.01 confidence level between the two variables. This positive correlation means that the studied variables have similar trends: as the school performance increases, the stress also increases, showing a positive association between the two variables.

Table 6 – *Correlation analysis of the school performance and stress scores for the investigated sample*

		Melgosa total score	School Perf
Melgosa total score	Pearson Correlation	1	.483(**)
	Sig. (2-tailed)		.007
	N	30	30
School Perf	Pearson Correlation	.483(**)	1
	Sig. (2-tailed)	.007	
	N	30	30

** Correlation is significant at the 0.01 level (2-tailed).

The third hypothesis is confirmed, and it can be said that the accumulated stress level affects the school performance of the subjects. It can be observed that the subjects which report a high level of stress compared with the average score, also record a high school performance. High levels of stress may be associated with subjects involvement in school activities and their interest to achieve above average academic performance.

Conclusions

In conclusion, by following the statistical analysis and the interpretation of data, the first and the third hypotheses were confirmed, while the second hypothesis was invalidated. According to the first hypothesis, it was assumed that the master students record a certain amount of stress and this fact it was confirmed by applying the stress evaluation inventory and by interpreting the results.

According to the second hypothesis, it was assumed that the accumulated stress level vary depending on individuals age. The Pearson correlation analysis between the two variables highlighted no significant correlation, showing that the stress factor is not influenced by the individuals age, meaning that all the individuals feel the stressors agents in the same way.

The confirmation of the last hypothesis was supported by a highly significant correlation between the accumulated stress level and the academic performances. According to this association between the two variables, it can be said that the subjects who achieve high academic performances record a high level of stress as well, and vice versa, the subjects with a low academic performances record a level of stress below average.

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„Those who cannot change their minds cannot change anything."
George Bernard Shaw