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Anna Ujwary-Gil

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From the Editor

This collection of articles constitutes an important review of innovativeness concepts in micro and macro perspectives and innovation capital measurement as well as organizational learning, modeling and problem-solving, age management or female entrepreneurship. Employees and their innovative behavior are of crucial importance for the organization's market success. The article provided by researchers from HIVA-KULeuven and CESO-KULeuven contributed to the discussion on how organizations can become more learning and flexible through innovative involvement of their employees. The research also emphasized the significance of distinguishing between various categories of employees (blue versus white-collar workers) in the context of variables used in designing jobs. The article also presents the traditional view of motivating employees to work and analyzes the relations between formulating tasks and innovative work behavior.

Related to the first article, the second one reviews the shaping of positive organizational behaviors, looking at them from the military systems of sharing experience and identifies possible solutions helping strengthen positive corporate culture, climate and behaviors conducive to organizational learning based on using experiences.

The next article examines the changes that have taken place in the Spanish cod fishing industry in recent years, paying special attention to the relation between innovations and the way the institutions function. It also tries to present the innovativeness process in a company based on systemic innovation approach, it describes changes in production that have taken place in the past few years and analyzes whether the changes in the production sphere translate into changes in the analyzed industry.

The part devoted to broadly understood innovativeness and organizational learning finishes with an article on innovation capital and its quantification based on a synthetic review of specialist literature in defining, categorizing and measuring innovation capital. The author has developed and empirically verified his own concept of evaluating intangible innovation assets. On the other hand, the article by K. Śliwa concerns the problem of the language used in modeling processes and problem solving. The author presented two approaches: the expert one and the interactive one. He also presented the relations between the language used to describe reality and to solve problems. The penultimate article contains considerations on age management and its presentation in macro and micro perspectives. The article lists benefits of implementing the age management strategy both for companies and for particular employees and explains the tools and ways of measuring the effectiveness of implementing knowledge-management strategy. At the end of this Volume 8,

Issue 4, the reader can learn about the issue of female entrepreneurship from the perspective of social and business changes, especially in the context of perceiving it as an important source of economic growth and creating new jobs.

We would like to thank our authors for their contribution to this volume. We also appreciate the evaluations of particular articles provided by our reviewers, and we strongly believe that the papers included in this volume will contribute to better understanding of complex processes of innovation, learning, problem-solving and entrepreneurship and will spur further research.

Anna Ujwary-Gil
Editor-in-Chief, JEMI

Job Design and Innovative Work Behavior: One Size Does Not Fit All Types of Employees

Stan De Spiegelaere, Guy Van Gyes**, Geert Van Hootegem****

Abstract

As innovative employees become imperative for an organizations' success, research identified job design as a crucial variable in promoting innovative work behavior (IWB) (Hammond et al., 2011). Using the Job Demands-Resources (JD-R) model of Bakker & Demerouti (2007), this article contributes to the literature as it uses recent insights on the distinction between job challenges and job hindrances (Van den Broeck et al., 2010) and distinguishes between blue- and white-collar employees. Using survey data of 893 employees of various organizations the findings generally confirm the JD-R model, although important differences were found between blue-collar and white-collar employees regarding the relation of organizing and routine tasks with IWB. Job content insecurity further was found to be very detrimental for blue-collar IWB. These findings have important HR and political implications as they show that there is no 'one size fits all' HR solution for innovation.

Keywords: Innovative Work Behavior, Job Design, HRM, white collar workers, blue collar workers.

Introduction

As innovation is a central concern for organizations, managers are faced with the challenge of mobilizing the innovative potential of all sorts of employees. As these employees have a capital of tacit knowledge (Polanyi, 1966) about the production process, the work organization and the product design, mobilizing this knowledge can result in workplace innovations with high returns on investments (Getz & Robinson, 2003). HR managers therefore face the challenge of creating a work environment in which employees can develop and exploit their innovative potential. According to a recent meta-analysis (Hammond et al., 2011), job characteristics are of central importance for employee innovativeness. Beer et al. (1984) identified already in the 80s job design as a main challenge of HR managers. Recent research on so-called

* *Ph.d. Student, HIVA-KULeuven, Stan.Despiegelaere@kuleuven.be.*

** *Research Leader, HIVA-KULeuven, guy.vangyes@kuleuven.be.*

*** *Prof., CESO-KULeuven, geert.vanhootegem@soc.kuleuven.be.*

High Performance Work Systems (HPWS) continued the academic attention on how HR systems can result in positive organizational outcomes. One of the predicted outcomes of the introduction of HPWS is an organization that flexibly responds to new environments. Lorenz & Valeyre (2005) characterized this model as an organization with high levels of employee autonomy, task complexity, learning and problem-solving. Assumingly, such 'learning type' organizations stimulate and enable their employees to be innovative and flexible. These findings on the meso-level are in line with models and findings on the micro level on the link between job design and employee outcomes (see: Bakker & Demerouti, 2007; Karasek & Theorell, 1990). Yet, this individual level literature on the relation between job design and employee innovativeness is nevertheless imperfect. First, the complexity of the relation between job characteristics and employee outcomes is rarely taken fully into account. Although theoretical models like the Job Demands-Resources model of Bakker & Demerouti (2007) stress the need to focus on the interaction effects between various job characteristics, this is rarely put into practice (Holman et al., 2011; Martín, Salanova, & Maria Peiro, 2007). Second, various studies have established the fact that HR practices like reward policies (Baer, Oldham, & Cummings, 2003; Dewett, 2004) have different effects on employees, depending on their personal and group characteristics. Yet, only a few articles took these considerations into account when studying the relation between job design and employee innovativeness (Schreurs, Van Emmerik, De Cuyper, Notelaers, & De Witte, 2011; Toppinen-Tanner, Kalimo, & Mutanen, 2002; Tsaur, Yen, & Yang, 2010). Yet, the HR reality is that jobs are rarely designed in the same way for all kinds of employees in a company. Depending on the level of education of employees, depending on their place in the company and their employment status, HR strategies are designed accordingly.

In the context of the upcoming trend towards more evidence based HRM (Briner & Rousseau, 2011), this article focuses on finding evidence on how HR practices can be tailored and result in optimal innovative work behavior. The article is the first to link job design to innovative behavior using the recent insights on the double nature of job demands, namely as job challenges and job hindrances (Podsakoff, LePine, & LePine, 2007; Van den Broeck et al., 2010). Further, the article distinguishes between blue- and white-collar employees in the study of the job design-IWB relation and studies how different job design variables are differently related to IWB.

To develop a series of hypotheses, the article first discusses briefly the concept of innovative work behavior and the relation with job design. Next, the article continues with a discussion on the importance of distinguishing between employee categories in this type of study. Further, the method and the results of the research are discussed. In the last sections we discuss the results and the limitations of the study and draw conclusions.

Innovative work behavior & job design: an HR challenge

Innovation is not only stemming from R&D efforts. Employees confronted daily with the production process are essential in identifying problems, creating solutions and actually implementing innovations in the workplace. The concept of 'innovative work behavior' tries to capture this workplace reality and can be defined as follows:

"Innovative work behavior is all employee behavior directed at the generation, introduction and/or application (within a role, group or organization) of ideas, processes, products or procedures, new to the relevant unit of adoption that supposedly significantly benefit the relevant unit of adoption"

IWB thus differs from concepts like employee creativity as it not only focuses on the generation of ideas, but also includes behavior related to problem recognition, idea championing and idea implementation (de Jong & Den Hartog, 2010). It thus encompasses all types of behavior of employees that is related to business innovation at the workplace. Both active support for innovations in the workplace and self-initiated innovation processes are included in the concept.

Optimally utilizing the innovative potential of employees is a major HR challenge in organizations. Employees are in a unique position to contribute to the innovative character of the organization as they possess a capital of tacit knowledge about the production process, the product and the work organization. Mobilizing this knowledge and enabling the development of workplace innovations is considered the optimal use of the human capital of an organization (Darroch, 2005).

Consequently, this article focuses on the relation between job design and IWB. In doing so, we go beyond the mere study of linear relations between job design variables and IWB, but use the Job Demands Resources model as a point of departure (Bakker & Demerouti, 2007; Bakker, van Veldhoven, & Xanthopoulou, 2010). Building on the earlier work of Karasek and Theorell (1990), the JDR model proposes to categorize job characteristics in essentially two groups: job resources and job demands. Job resources refer to the aspects of the work that are functional in achieving the work goals, that can reduce job demand and the associated costs in terms of health and motivation and that stimulate learning and development of employees (Bakker & Demerouti, 2007). Job demands on the other hand refer to the aspects of the job that require sustained physical or psychological effort or skills. They are associated with costs in terms of health and motivation of employees (Bakker & Demerouti, 2007). Nevertheless, recent studies found indications for the existence of two distinct types of job demands, namely job challenges and job hindrances (Podsakoff et al., 2007; Van den Broeck et al., 2010). Job hindrances would refer to those job demands that have only negative outcomes in terms of health and motivation. Job challenges on the other hand refer to those job demands that have more mixed outcomes. They would negatively affect health outcomes while at the same time positively affect employee engagement and motivation. Examples of job resources are autonomy, learning opportunities, support of colleagues or supervisors and rewards. Examples of job hindrances are job

insecurity, role ambiguity and interpersonal conflicts while time pressure and workload are generally seen as job challenges.

In the context of this research we approached the job resources using four variables referring to autonomy, learning opportunities, organizing tasks and routine tasks. Building on the previously developed JD-R model, we assume to find positive relations between the three first job resources variables and IWB. This was confirmed by various studies that found positive relations between autonomy and IWB (Krause, 2004; Ramamoorthy et al., 2005; Slåtten & Mehmetoglu, 2011) and creativity (Unsworth, Wall, & Carter, 2005). The role of routine tasks is more ambiguous. It can be seen as a negative indicator of job resources as employees that are obliged to perform constantly the same, short routine tasks have a narrow vision of the firm and the work procedures which inhibits them from making connections and seeing the big picture, both crucial for creative and innovative thinking (Oldham & Cummings, 1996). Yet, some others like Ohly et al. (2006) found positive relations between routinization and employee innovation, as routine tasks enable employees to see opportunities for improvement better.

Hypothesis 1: Job resources are positively related to IWB

For job challenges, two variables are used in this research: one referring to time pressure and the other to emotional pressure. In line with previous research on the relation between job demands and IWB (e.g. Fritz & Sonnentag, 2009; Janssen, 2000), we assume that time pressure and emotional pressure will positively relate to IWB. This is because job demands provide the need and motivation for employees to search for ways to improve and innovate on the workplace.

Hypothesis 2: Job challenges are positively related to IWB

For job hindrances we use a variable referring to job insecurity. Job insecurity was previously found to negatively affect workplace creativity as it reduces the long term engagement and commitment of the employee to the work (Sverke, Hellgren, & Näswall, 2002). A recent research of Probst et al. (2007) combining survey and experimental research methods also showed that job insecurity is indeed related to poor creativity. According to Hartley et al. (1991), job insecurity is composed of an element referring to 'employment insecurity' (fear of losing your job), and an element referring to 'job content insecurity' (fear that your job content might change). In this research we'll focus on the second aspect of job security, the 'job content insecurity'.

Hypothesis 3: Job hindrances will be negatively related to IWB

Occupational groups matter

Not all employees are expected to react equally to the different job design variables. Groups of employees tend to differ in the way they value different aspects of a job. White collar employees are traditionally found to value more intrinsic aspects of the job while blue-collar workers attach more importance to extrinsic aspects such as

rewards or job security (Centers & Bugental, 1966; Locke, 1973; Mottaz, 1985; Ronen & Sadan, 1984). Consequently, we can hypothesize that the relation between job design and employee outcomes such as IWB, is moderated by the occupational group under study. Nevertheless, only rarely articles focus on this potential moderator effect. Studies which did distinguish between occupational groups in their analyses of the effects of job characteristics on employee outcomes are the studies of Schreurs et al. (2011), Tsaur, Yen & Yang (2010) and Toppinen-Tanner, Kalimo & Mutanen (2002). Schreurs et al. (2011) distinguished between white- and blue-collar employees in the relation between the job design and early retirement. Tsaur, Yen & Yang (2010) researched the job design – employee creativity relationship in the travel agency industry and distinguished between four distinct employee categories. Toppinen-Tanner, Kalimo & Mutanen (2002) studied the effect of job stressors on burn-out and compared white with blue collar employee. All these studies concluded the relation between job design and employee outcomes depends on the occupational groups, but most studies only found small differences.

In order to develop hypotheses on the influence of the occupational group on the job design – IWB relation, we built further on research into workers motives. These studies generally conclude that for blue collar workers, extrinsic work aspects such as job insecurity are of central importance for their motivation, while for white collar employees intrinsic job aspects such as autonomy and work content are far more important (Centers & Bugental, 1966; Locke, 1973; Mottaz, 1985; Ronen & Sadan, 1984). Consequently we assume that job resources and job challenges will have larger positive relations for white-collar than for blue-collar workers. Job hindrances such as job insecurity on the other hand will have a larger negative relation with IWB for blue-collar than for white-collar employees (Sverke et al., 2002).

Hypothesis 4a: The job resources – IWB relation will be stronger for white-collar employees than for blue-collar workers.

Hypothesis 4b: The job challenges – IWB relation will be stronger for white-collar employees than for blue-collar employees.

Hypothesis 4c: The job hindrances – IWB relation will be stronger for blue-collar employees than for white-collar employees.

Figure 1 summarizes the hypotheses as developed based on the literature. The full line represents a hypothesized positive relation while a dashed line refers to a hypothesized negative relation between the concepts.

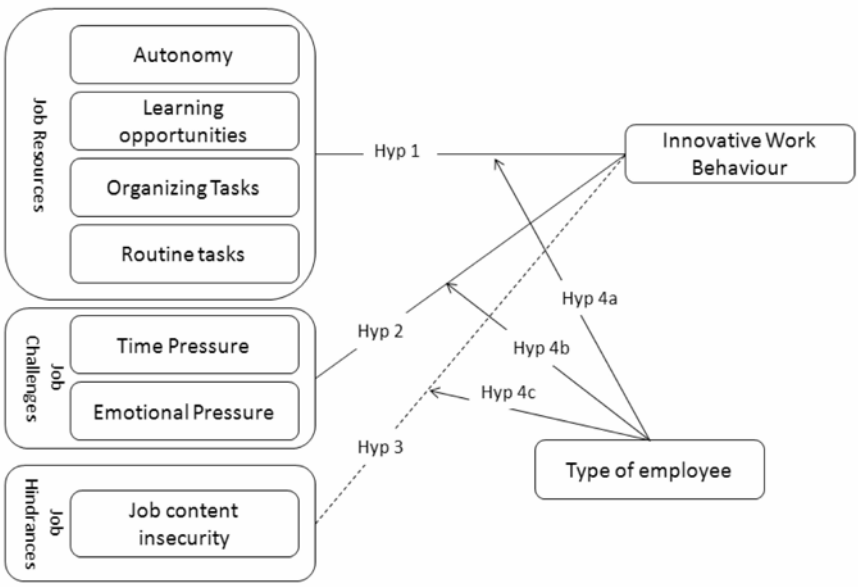

Figure 1. Hypotheses based on the literature

Data & Method

The data to test the above mentioned hypotheses were obtained through a survey completed by 952 employees of 17 different companies from various sectors of the Flemish region in Belgium. The data were gathered in the context of a project on organizational innovation. The surveys were distributed to all employees that would participate in the upcoming project of organizational innovation. The response rate was 53%, yet, 59 surveys were left out of consideration due to missing data. Of the total of 893 usable surveys, 47.89% were completed by male respondents. 60.48% of the respondents had a degree of at most higher secondary education. The average age of the respondents was 39 years old (median 40y and modus 31y). Further, 41.70% of the respondents were employed as blue-collar workers and 50.05% as white-collar employees. The rest was employed as agency worker or as member of the senior management. 70.22% of the respondents were engaged as a full-time worker.

All measures were included in a paper-and-pencil survey using 5 point Likert scales ranging from 'totally agree' to 'totally disagree'. All job control, job challenges and job hindrances measures were taken from the Dutch 'Nova-Weba' survey (Schouteten & Benders, 2004). Job control was measured using measurements of employee autonomy, organizing tasks, learning opportunities and routine tasks. The measure for autonomy included 8 items including questions like *'I can arrange my own work pace' and 'I can decide myself how I work'*. Organizing tasks were measured using a scale of four items including *'I discuss how the tasks are to be planned with others'.* Learning opportunities were measured using a three item scale including *'By doing my*

job, I learn new stuff' and *'I have the opportunity to develop my professional skills'.* Routine tasks were measured using a three item scale including questions like *'my job is tedious'*. Job challenges were measured using items referring to time pressure and emotional pressure. Time pressure was measured using a four items scale including questions like *'I have to hurry in my job'* and *'I have to work under time pressure'*, and the three items emotional pressure scale included questions like *'My work is heavy from an emotional point of view'* and *'My job puts me in emotional situations'*. Further, job hindrances were measured using a single item scale referring job content insecurity: *'I feel uncertain about the future content of my job'*. Innovative work behavior was measured using an adaptation of the scales used by Scott and Bruce (1994, 1998) Janssen (2000, 2003) and De Jong & Den Hartog (2010). Respondents indicated how frequently given statements occurred in their job, ranging from 'very rarely' to 'very frequent'. Sample items are *'finding original solution for work related problems'* and *'developing innovative ideas into practical applications'.* The internal consistency of these scales was controlled using the Cronbach alpha, the results are given in table one and are satisfactory. Further, some control variables were included in the research: age, employment status (full time or part time employment) and company affiliation. All can have an effect on the employee innovativeness as and are therefore controlled for. As most control variables, except for age, are categorical, no beta coefficients are given in the regression analysis results.

In the first step, an exploratory factor analysis was performed on all the evaluation questions included in the survey. This factor analysis confirmed the previously defined concepts. In line with the suggestions made by Mortelmans & Dehertogh (2008), restrictive summated scales were computed for the established factors in order to include observations with some missings but to delete observations with multiple missings on the items. The scales were in the next step centered to facilitate the plotting of the interaction effects. Correlations between the different variables are given in table one. In the second step, the correlation matrix was inspected and an ANOVA analysis was run in order to check for significant between-groups differences on the variables. In a third step, a multiple regression analysis was conducted in order to check the proposed hypotheses using the SAS enterprise guide 4.2 as supporting software. Subsequently, detected interaction effects were plotted for convenience of interpretation

Results

Descriptive results

Table 1 shows the correlation matrix of the variables used in the regression model. Inspection of the correlations between the different concepts reveals that multicollinearity is not a threat for the regression analysis. Furthermore, inspection of the variance inflations factors in the regression model indicates the same. Based on the variance inflation factors, we conclude that multicollinearity is not a problem.

Further, inspection of the residuals of the regression model showed that the linearity and normality assumptions of the regression model are not violated.

Table 1. Correlation matrix

		Cr α	M	Std	1	2	3	4	5	6	7	8
1	Age	-	39.29	10,05								
2	Autonomy	0.84	5.95	1.81	0.03							
3	Organizing Tasks	0.83	5.03	2.22	0.00	0.42*						
4	Learning Opp.	0.82	6.87	1.96	-0.10	0.30*	0.42*					
5	Time Pressure	0.80	5.70	1.95	0.02	0.00	0.11*	0.08 p				
6	Emotional Pressure	0.88	4.51	2.47	0.00	0.03	0.23*	0.11*	0.32*			
7	Routine Tasks	0.68	3.28	2.27	-0.01	-0.24*	-0.31*	-0.34*	-0.13*	-0.13*		
8	Job Insecurity	-	4.30	2.14	-0.06	-0.13*	-0.14*	-0.13*	0.14*	0.09 p	0.09 p	
9	IWB	0.96	4.80	1.61	-0.06	0.27*	0.46*	0.46*	0.14*	0.21*	-0.24*	-0.08

* significant at the <.001 level, p significant at the 0.05 level

Further, we inspect the mean differences between the two groups of employees: blue- and white-collar employees. In Table 2, the results of an ANOVA are shown. Clearly blue- and white-collar employees differ significantly regarding their job characteristics and their behavior. White-collar employees have higher levels of all job characteristics that we hypothesized to be positively related to IWB. Blue-collar workers on the other hand have higher levels of what we defined as a 'job hindrance': job content insecurity. Consequently, in terms of IWB, white-collars have significantly higher levels then blue-collar workers. Nevertheless, using regression analysis we will focus not on the mean differences between the groups, but on the differences in the explanatory value of the job characteristics variables.

Table 2. ANOVA analysis

	Blue Worker	**Collar**	**White Collar Worker**			
	mean	**sd.**	**mean**	**sd.**	**F-value**	
Autonomy	5.22	1.80	6.50	1.61	120.82*	white > blue
Organizing Tasks	3.98	2.18	5.84	1.90	178.99*	white > blue
Learning Opp.	6.34	1.94	7.24	1.84	48.00*	white > blue
Time Pressure	5.44	1.90	5.91	1.95	12.17*	white > blue
Emotional Pressure	3.59	2.21	5.24	2.43	105.64*	white > blue
Routine Tasks	4.36	2.14	2.44	2.01	181.40*	blue > white
Job Content Insec.	2.89	1.01	2.59	1.07	18.04*	blue > white
IWB	4.41	1.52	5.09	1.61	39.12*	white > blue

* sign <.001

Regression Results

To test the established hypotheses a three step regression analysis was run. In the first step, only control variables referring to the age of the employee, the company, the status of the employee as a blue- or white-collar employee and his working time arrangement were included. In the second step, job design variables referring to job resources (autonomy, organizing tasks, learning opportunities and routine tasks), job challenges (time pressure and emotional pressure) and job hindrances (job content insecurity) were included in the analysis. In the third and last step, interaction effects of the employee status with the different job design variables were included in the analysis. Results are shown in Table 3.

Table 3. Regression analysis

	Innovative Work Behaviour					
	Step 1		Step 2		Step 3	
	Beta	Sign	Beta	Sign	Beta	Sign
Control						
Blue Collar - White Collar	-	<.001	-	0.099	-	0.127
Age	-0.008	0.147	-0.006	0.241	-0.006	0.203
Fulltime (0/1)	-	0.015	-	0.072	-	0.079
Company	-	<.001	-	<.0001	-	<.0001
Job resources - challenges - hindrances						
Autonomy			0.065	0.036	0.034	0.009
Organizing Tasks			0.198	<.0001	0.262	<.0001
Learning Opportunities			0.260	<.0001	0.290	<.0001
Time Pressure			0.016	0.574	-0.011	0.490
Emotional Pressure			0.038	0.088	0.014	0.117
Routine Tasks			-0.056	0.025	-0.093	0.056
Job Content Insecurity			-0.003	0.941	0.069	0.741
Interactions						
Autonomy*blue collar worker					0.097	0.121
Autonomy*white collar worker					-	-
Organizing Tasks*blue collar worker					-0.145	0.007
Organizing Tasks*white collar worker					-	-
Learning Opp.*blue collar worker					-0.077	0.187
Learning Opp.*white collar worker					-	-
Time Pressure*blue collar worker					0.063	0.288
Time Pressure*white collar worker					-	-
Emotional Pressure*blue collar worker					0.047	0.327
Emotional Pressure*white collar worker					-	-
Routine Tasks*blue collar worker					0.090	0.072
Routine Tasks*white collar worker					-	-
Job Content Insec.*blue collar worker					-0.170	0.081
Job Content Insec.*white collar worker					-	-
R square	0.116	0.360	0.378			

Using these regression results we control the various proposed hypotheses. The first hypothesis is fully confirmed as we found strong positive relations between three job resources variables (autonomy, organizing tasks & learning opportunities) and IWB. Moreover, these relations are particularly strong. The found beta coefficients are the highest for learning opportunities and organizing tasks, both in the second as in the third model. The relation between routine tasks and IWB was found to be significantly negative in model, suggesting that routine tasks are indeed a negative indicator for job resources which inhibits the innovative potential of employees. Hypothesis two on the other hand is only partly confirmed. Job challenges seem to relate positively with IWB, but the relation is very weak and insignificant in the second model. Hypothesis three is, based on the second model, rejected as we could not find a significant relation between job content insecurity and IWB.

Having analyzed the direct effects between the job design variables and IWB, we now turn to the analysis of hypothesis 4, regarding the interaction effect of the type of employee on the relation between job design and IWB. We found significant differences in the relation between job design and IWB for blue- and white-collar workers for the following variables: organizing tasks, routine tasks and job content insecurity. We thus conclude that hypothesis 4a is partly confirmed as we found two job resource variables to interact with the type of employee. Hypothesis 4b is fully rejected; the relation between job challenges such as time pressure and emotional pressure does not significantly differ according the status of the employee. Hypothesis 4c on the other hand is fully confirmed. The relation between job content insecurity and IWB is significantly different for blue-collar workers than for white-collar workers. For the convenience of interpretation, we plotted the various interaction effects using the guidelines of Aiken and West (1991) and Panik (2009) as can be seen in Figure 2, 3 and 4.

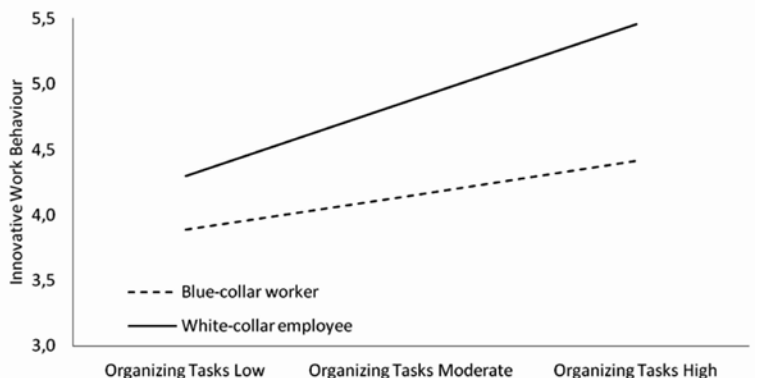

Figure 2. Interaction Organizing Tasks*Employee status on IWB

Figure 2 shows the interaction between organizing tasks and employee status on IWB. The positive relation between organizing tasks and IWB is amplified for white

collar employees in comparison with blue-collar employees. Figure 3 on the interaction between routine tasks and employee status on IWB shows the inverse effect. Here, there is no clear relation between routine tasks and IWB for blue collar employees, yet for white collar employees the relation is significantly negative.

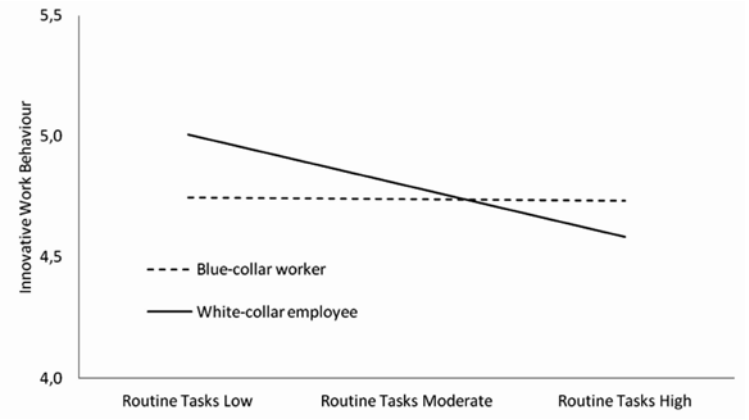

Figure 3. Interaction Routine Tasks*Employee status on IWB

Figure 4 finally shows the interaction between job security and employee status on IWB. The non-significant relation between job content insecurity and IWB in step two of our regression analysis can be explained by the pattern of Figure 4. Here, we obviously see that job content insecurity has a strong negative relation with IWB for blue-collar workers, yet a weaker but positive relation for white-collar workers.

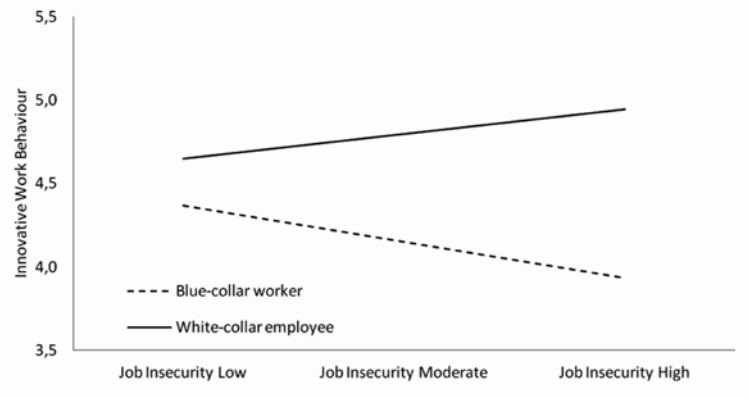

Figure 4. Interaction Job Insecurity*Employee status on IWB

Limitations

The study faces nevertheless some limitations. First, all data come from a single source, using a single method. Although various authors suggest that this does not significantly bias the results (Spector, 2006), others state that this leads to a 'common method bias' which can inflate the associations between the concepts. Finding interaction effects in the data nevertheless decreases the odds of a serious bias due to common method variance (Siemsen, Roth, & Oliveira, 2010). A second limitation is the cross-sectional design of the study. Therefore, no causal relations can be established. Alternative explanations can refer to the employee personality or the effect of innovative behavior on the job through job crafting (Berg, Dutton, & Wrzesniewski, 2008) of employees.

Conclusion & Discussion

This article contributed to the debate on how organizations can become flexible, learning type organizations based on the innovative engagement of their employees. In doing so, we used the Job Demands-Resources model of Bakker & Demerouti (2007) as a starting point, and applied recent insights on the differential nature of job demands (Van den Broeck et al., 2010). The results of the analysis of the relation of job challenges and job hindrances with IWB were in line with the idea that job challenges are job demands that can have positive employee outcomes whereas job hindrances have uniquely negative relations with employee outcomes. Further, the study stressed the importance of distinguishing between different employee categories when focusing on the impact of job design variables. The article used traditional insights on work motivations of blue- and white-collar workers and applied them to the relation between job design and IWB.

The findings in this article show that the relation between the job design and IWB differs significantly for blue- and white-collar employees. Job resources, such as organizing tasks, have a more positive relation with IWB for white-collar workers in comparison with blue-collar workers. Routine tasks on the other hand were found to have a significant negative effect for white collar workers, while this is not the case for blue-collar workers. This finding can be linked to previous literature which identified routine tasks both as a potential obstacle and a driver for innovative behavior. Regarding job hindrances, the found relation between job content insecurity and IWB was positive for white-collar employees, yet rather strongly negative for blue-collar employees. Further, regarding the relation between job challenges such as time pressure and emotional pressure, no significant differences were found between employee categories.

Although the study faces limitations, the findings can nevertheless be translated into the HRM practice. First, the findings suggest that HR managers wishing to unlock the innovative potential of employees should focus on the job design as it is a crucial predictor for IWB. In doing so, HR managers can focus on increasing the job resources, decreasing the job hindrances or evaluating the role of job challenges, yet the findings indicate that the strongest relations are found between job resources

and IWB. Increasing the organizing tasks of employees and their opportunities to use and develop their professional skills has the strongest relation with employee innovativeness. This is in line with the insights of Lorenz & Valeyre (2005) who differentiated between 'lean organizations' and 'learning organizations'. In both, employees had high levels of autonomy, yet this is combined in the lean organization with monotonous and repetitive jobs which, according to our findings, serve as an obstacle to employee innovativeness for white-collar workers. Second, HR managers should adapt and change their interventions depending on the population in focus. Although job resources are an essential driver of IWB for all employees, the relation is even stronger for white-collar employees. Low resources jobs with a lot of short routine are absolutely to be avoided if HR managers seek to stimulate the innovativeness of white-collar workers. Regarding job content insecurity, it seems that, at least on the individual level and for blue-collar employees, the ever-increasing pressure towards more flexibility might have negative side-effects on the innovative behavior of the employees, and therefore maybe the innovative potential of the organizations at large. As such, it seems that flexibilisation and innovation are not always compatible strategies for organizations.

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Abstract (in Polish)

W sytuacji, gdy innowacyjni pracownicy stają się niezbędnym elementem sukcesu firmy, badania identyfikują projekt stanowiska pracy jako kluczową zmienną w promowaniu innowacyjnego zachowania w pracy (Hammond et al., 2011). Stosując Model JD-R Bakkera i Demerouti'ego (2007), artykuł ten wnosi nowe spojrzenie na rozróżnienie między wyzwaniami i przeszkodami w pracy (Van den Broeck et al., 2010) i analizuje je dla pracowników umysłowych i fizycznych. Wykorzystując dane pochodzące od 893 pracowników rozmaitych organizacji, wyniki generalnie potwierdzają słuszność modelu JD-R, natomiast zauważono poważne różnice między pracownikami umysłowymi i fizycznymi dotyczące organizowania oraz rutynowych zadań w innowacyjnym zachowaniu w pracy. Niepewność co do treści stanowiska pracy wywiera negatywny wpływ na innowacyjne zachowanie pracowników fizycznych. Wyniki badań mają ważne implikacje polityczne jak i w zakresie ZZL, ponieważ dowodzą, że nie istnieje jedno standardowe rozwiązanie ZZL w zakresie innowacji.

Słowa kluczowe: innowacyjne zachowanie w pracy (IWB), Projekt stanowiska pracy, ZZL, pracownicy umysłowi, pracownicy fizyczni.

How to Strengthen Positive Organizational Behaviors Fostering Experiential Learning? The Case of Military Organizations

Andrzej Lis*

Abstract

The aim of the paper is to study the challenges concerning organizational behaviors crucial for Lessons Learned capabilities in military organizations as well as to indentify the solutions and recommendations to develop and strengthen positive organizational culture, climate and behaviors fostering experiential learning. The attention is focused around positive behaviors recognized by NATO as the key success factors for Lessons Learned capabilities such as: the engagement of leaders, positive mindset, willingness to share information and stakeholder involvement. The contents of the paper are mainly based on the interviews with Lessons Learned experts and practitioners representing both NATO commands, bodies and national Lessons Learned military organizations. Moreover, the outcomes of the analysis of selected military documents and the literature survey contributed to the study.

Keywords: organizational learning, Lessons Learned, positive organizational behaviors, leadership, information sharing, stakeholder involvement, positive mindset, military organizations.

Introduction

Positive Organizational Scholarship, which emerged a decade ago (cf. Cameron, Dutton and Quinn, 2003), nowadays is considered one of the most influential trends within the theory and practice of management. The positive organizational potential is recognized as the key determinant of positive organizational behaviors stimulating the development of an organization (cf. Stankiewicz, 2010; Peyrat-Guillard and Glińska-Neweś, 2010). The role of positive organizational culture, climate and behaviors is particularly important for the processes of managing organizational knowledge (cf. Kalińska, 2006, pp. 263-268; Glińska-Neweś, 2006, pp. 288-296; Glińska-Neweś, 2007, pp. 85-122). Due to its pivotal role for contemporary organizations, the topic attracts the attention of numerous researchers. Nevertheless, the majority of studies

* *Dr Andrzej Lis, Katedra Podstawowych Problemów Zarządzania, Wydział Nauk Ekonomicznych i Zarządzania, Uniwersytet Mikołaja Kopernika w Toruniu; Centrum Doktryn i Szkolenia Sił Zbrojnych w Bydgoszczy; andrzejlis@econ.umk.pl.*

gives the emphasis to business companies, while the public sector seems to be underrepresented. Therefore, the aim of this paper is to contribute to filling this gap and to study the process of developing positive organizational behaviors critical for Lessons Learned capabilities in military organizations.

The author's previous research findings on military Lessons Learned capabilities (Jabłoński and Lis, 2012b) and their key success factors "collected from the NATO, U.S. and Polish military Lessons Learned communities confirm the significant role played by positive organizational behaviors in experiential learning and organizational improvements implementation" (Lis, 2012). Positive attitudes, engagements and behaviors of commanders, Lessons Learned personnel and the rank-and-file members of the armed forces have been found to be the key success factors for Lessons Learned capabilities. The study has encompassed the perspective of the NATO Joint Analysis and Lessons Learned Centre (JALLC), the U.S. Centre for Army Lessons Learned (CALL) and the Polish Armed Forces Doctrine and Training Centre (PAF DTC). The key positive behaviors including: (1) commanders' guidance, engagement in learning processes, and promotion of organizational learning and knowledge exchange; and (2) the stakeholders' involvement expressed in capturing observations, sharing information and learning from others have been listed among the prerequisites for effective Lessons Learned systems.

As the outcome of the aforementioned exploration, the new research question has been identified: How to develop and strengthen positive organizational behaviors fostering Lessons Learned in military organizations (Lis 2012)? Finding the answer to this question is the main aim of the study. In comparison with previous surveys, the emphasis of the research attention is shifted to the process-oriented approach aimed at establishing intra-organizational conditions favorable for experiential learning and implementing improvements. In effect, the aforesaid problem becomes the main research question of the next stage of the scientific exploration and the following detailed research problems are identified (Lis 2012):

1. "What challenges (problems) concerning: the engagement of leaders, positive mindset, willingness to share information and stakeholder involvement are […] faced by Lessons Learned communities in military organizations ?
2. What are […] the solutions to these challenges (problems)? What has already been done? What are the best practices in this area? What can be done in the future?
3. What other organizational behaviors or the elements of organizational culture and climate are stimulants or obstacles to the Lessons Learned capability development?
4. Are there any observations, lessons and best practices on managing organizational behaviors which can be exchanged between military organizations and other business and non-profit sectors?"

The aforementioned research problems provide the guidance to achieve operational objectives of the study and determine its scope and field of interest. The

paper is structured in accordance with the IMRD model. The introduction is followed by the description of applied research methods, techniques and tools. Then, the results of survey are presented and analyzed. The discussion of research findings concludes the paper.

Method

The toolbox applied to solve the aforementioned research problems consisted of the following methods: (1) interviews with Lessons Learned experts and practitioners, and (2) the analysis of military documentation. Moreover, in discussion, the findings from the primary sources were juxtaposed, compared and contrasted with secondary sources published both in military and civilian literature.

Interviews, conducted between July and September 2012, enabled the collection of the Lessons Learned practitioners' opinions and insights structured around the aforementioned research problems. The respondents represented both: NATO commands and bodies as well as national organizations responsible for Lessons Learned. Moreover, additional unstructured interviews on the role played by positive organizational behaviors in organizational learning in a military environment were conducted with Lessons Learned staff officers representing Central and East European nations. In total, seven Lessons Learned practitioners from six different organizations (including three international and three national organizations) contributed to the survey. Among the respondents, there were three active officers (ranks from major to colonel), three civilians (including one PhD) and one retired officer. Apart from accomplishing Lessons Learned duties in their organizations, two of the respondents had an experience in conducting scientific surveys within the area of interest.

The analysis of military documentation supporting the empirical survey encompassed: doctrines, directives, manuals and handbooks. Due to the focus on the practical perspective, special attention was given to Lessons Learned manuals and handbooks implemented in NATO, the U.S. Army and the Polish Armed Forces.

Research

Challenges

The first objective of the study is to identify the challenges concerning organizational behaviors faced by military Lessons Learned communities. The attention is focused on behaviors recognized by the NATO Bi-Strategic Command Lessons Learned Directive (as quoted in NATO LL Handbook, 2011, p. 10) as the key success factors for Lessons Learned capabilities (cf. Lis, 2012): the engagement of leaders, positive mindset, willingness to share information and stakeholder involvement. The first step to achieve the objective is to categorize positive behaviors of leaders (commanders) and the rank-and-file members of an organization. The catalogue of such behaviors is presented in Table 1.

Table 1. Positive organizational behaviors for Lessons Learned – the checklist

Leadership	Individuals (mindset)
Leaders regularly remind staff of the importance they place on LL	Individuals actively seek out LL information when they start a new task
Leaders reward staff for the sharing and use of lessons in their work	Individuals take full advantage of opportunities to share their lessons with others
Leaders are accessible to make timely decisions to move the LL process forward	Individuals feel safe and empowered to share and use lessons
Leaders pay attention to the status of Remedial Actions and prioritize resources to ensure it gets completed	
Leaders provide L[essons] L[earned] S[taff] O[fficers] with the necessary support to develop and monitor progress of L[essons] I[dentified]	

Source: The NATO Lessons Learned Handbook (2011). Monsanto: Joint Analysis and Lessons Learned Centre, p. E-1.

Both researchers and practitioners highlight the key role played by commanders in a Lessons Learned business. As observed by Lis (2012), due to the fact that "the Lessons Learned process combines experiential learning and continuous improvements, the will and decisions of military executives are necessary to put lessons identified and recommendations into practice". The commanders' engagement and support are crucial for the whole Lessons Learned process, but they are indispensable in the remedial actions phase. Leadership in a Lessons Learned process is expressed through guidance to establish priorities and allocate rare resources, commanders' engagement and their promotion of a Lessons Learned capability within and outside an organization (Hallet et al., 2009, p. 43).

While conducting an analysis of the challenges to managing positive organizational behaviors, it is required to distinguish between the actors responsible for Lessons Learned capabilities within their armed forces or NATO ("Lessons Learned systems' enablers") and other organizations ("the stakeholders of the Lessons Learned systems"). Within organizations accomplishing the function of Lessons Learned enablers, the promotion of knowledge management and organizational learning is one of their top priorities. Therefore, their leaders and personnel are usually highly motivated and show positive attitude to capturing observations, learning from experience, implementing improvements and sharing lessons. The respondents highlight the commanders' enthusiasm and their personal engagement in promoting Lessons Learned within NATO and their armed forces. They point out the variety of approaches to accomplish this task (direct promotion versus focus on sharing published products and showing their value).

As regards to military organizations other than Lesson Learned enablers, the respondents claim that commanders usually perceive the high priority of Lessons Learned. What is more, one of the respondents representing a Central European army observes that nowadays Lessons Learned issues are trendy. In his opinion, military

leaders have, or at least officially declare, positive attitudes to developing Lessons Learned capabilities saying that "if it is new it must be good" and "if NATO has it we need to have it, too". Nevertheless, due to extreme time pressure, commanders deal first and foremost with urgent issues, not the most important ones. Therefore, sometimes commanding officers do not engage personally enough into Lessons Learned business delegating it entirely to staff personnel. In effect, experiential learning and change management aimed at continuous organizational improvement may not receive sufficient leadership engagement and support.

Regarding the rank-and-file members' engagement in the Lessons Learned process, the willingness to share information and to apply lessons and recommendations into daily business are identified as key challenges. As observed by one of the interviewed Lessons Learned practitioners: "a problem remains to convince the personnel to contribute to the changes in routine activities and processes which have been repeated in the same way for a long period of time and are not at all considered as best practices". Sharing information is another prerequisite for an efficient and effective organizational learning. Nevertheless, sometimes a strong resistance to sharing is observed. The NATO Lessons Learned Handbook (2011, p. 39) enumerates the following explanations for not sharing information provided by the military personnel:

- "Sharing negative experiences creates embarrassment and/or blame;
- It is not worth sharing until we have a solution;
- Sharing information is a risk: information obtained by the enemy could be used to exploit our weaknesses;
- Lessons can only be learned by doing: documenting experiences is a waste of time;
- The lessons are classified and we cannot change that to share them;
- Technical barriers hinder the free transfer of electronically stored information."

What is interesting, the problem of not sharing information is observed by the respondents representing both the armed forces having long experience in Lessons Learned (i.e. the U.S. Army) and the organizations where experiential learning is an up-to-date issue (i.e. the Polish Armed Forces). The resistance to share information and knowledge is particularly strong when the principles and rationale of Lessons Learned systems are in clash with the values and beliefs embedded in national and organizational cultures. Moreover, the hierarchical structure of military organizations may create an additional barrier blocking the flow of information and discouraging individuals' initiative and creativity. Therefore, in such a case the change of mental models is a prerequisite to develop a learning organization within a military context (cf. Jabłoński and Lis, 2012a, p. 22).

Misunderstanding of the role of experiential learning and Lessons Learned personnel by commanders and soldiers is another often problem, especially in the early stages of Lessons Learned programs. As experienced by the U.S. CALL, its "observers during (…) initial operations were often regarded by commanders in the field as inspectors sent to observe and document shortcomings and mistakes, and

some resisted the attachment of CALL observers to their units for this reason" (Lackey, 2003, pp. 81-82). Such an opinion is confirmed by interviewees from other nations, too. Therefore, Lessons Learned staff officers are recommended to distinguish from any auditors or inspectors. Similarly, the difference between an analysis conducted within a Lesson Learned process and evaluation is highlighted in related documents (cf. Joint Analysis Handbook, 2007, pp. 5-7).

The balance between personnel rotation and the continuity of the organizational memory and routine is listed among challenges experienced by Lessons Learned communities in military organizations. From the perspective of knowledge management and organizational learning, the rotation on military positions (usually every three years) is perceived simultaneously as a threat endangering organizational memory and as an opportunity of bringing new, fresh ideas. Therefore, the mixed establishment including both military personnel and civilian employees is recommended. As highlighted by the JALLC on its website "balance between scientific expertise and operational experience provided by a mix of military (credibility), civilian (continuity) and contractor (flexibility) analysts is essential to ensuring high-quality, insightful JALLC products".

Solutions

The second objective of the study is to identify best practices and solutions implemented by military Lessons Learned communities in order to manage positive organizational behaviors in an efficient and effective way. With regard to enhancing the leaders' and organization members' engagement and their enthusiasm for Lesson Learned and organizational learning, the following recommendations are provided by the experts from the NATO Lessons Learned community: (1) showing practical value of Lessons Learned; (2) disseminating LL products to right recipients within an organization; and (3) providing key executives with summaries focused on the most crucial issues for their decisions. A similar point of view is shared by one of the respondents. In his opinion "the best way to gain commanders' support is to present a clear, simple and understandable plan of LL process implementation into organizational processes and procedures". Certainly, the key success factor is to ensure that the Lessons Learned business is perceived as "a valuable skill set" and not as "a bureaucratic burden" (cf. Sewell, 2009, pp. 35-37).

According to the NATO Lessons Learned Handbook (2011, p. 4) "[e]veryone in an organization has a responsibility for learning lessons, but the L[essons] L[earned] S[taff] O[fficer] is central to the organization's efforts to engage everybody in seeing the value of learning lessons. If people are not engaged, they see no value and do not actively participate. It then becomes impossible for learning to take place, nullifying the LL process. The simplest way to get everyone involved in learning lessons is to ensure that the LL capability is constantly demonstrating value. To do this, the LLSO has an important role to play in conducting staff work to support the organization's LL process, LL information sharing and participation in the LL community." Having in

mind the aforementioned general rules, LL procedures and tools should be tailored to particular needs and situation of a given organization. For instance, an interesting and valuable set of recommendations aimed at managing Lessons Learned Critical Success Factors was developed in the NATO Joint Warfare Centre (cf. Table 2). The catalogue includes practical hints for Lessons Learned staff officers aimed at achieving leadership engagement, stakeholder involvement and information assurance in an efficient and effective way.

Table 2. Managing Lessons Learned Critical Success Factors – the lessons from the JWC

Leadership engagement	Stakeholder involvement	Information Assurance
Inject LL discussions into Battle Rhythm	Engage contributors and provide feedback	Actively manage observations
Invite Chief of Staff Office to LL Working Group	Exploit existing reports and returns	Encourage originators to analyse root causes
Prepare well-developed lessons	Update contributors with progress	Exploit Subject Matter Experts
Provide evidence of risk or reward	Actively manage databases	Exploit other LL archives
Exploit unit Tasker Tracker systems	Exploit lessons from outside	
Brief during exercise preparation	Consider target audiences	

Source: Eden A., Sewell P. (2012), Making the Lessons Learned process work. The lecture delivered at the LL Staff Officers Course, SWEDINT, Livgardet 27-31 August 2012.

The U.S. Center for Army Lessons Learned (CALL) enumerates three factors crucial for gaining acceptance for a Lessons Learned program in the U.S. Army: (1) introducing the After Action Review, (2) non-attributing lessons to specific units, and (3) showing value of lessons to the force. As pointed out by the CALL respondent, "the single-most important organizational behavior that fostered the acceptance of lessons learned across the Army was the After Action Review (AAR). This honest, 360-assessment got units, Soldiers and particularly leaders accustomed to listening to each other's experiences and appraisal of what actually occurred in operations and why things happened the way that they did. The AAR methodology sold this to commanders and leaders as a way to find this out with a far greater degree of accuracy and detail than they had previously enjoyed and then laid out a way ahead for them to use the information gathered to structure training to improve on shortfalls and sustain adequate or superior performance. Written AARs and the training feedback products (to training units) produced by the training cadre at the C[ombat] T[raining] C[enters] also formed the backbone of CALL's initial sources of information for its CTC products."

"The non-attribution of lessons to specific units (except for areas where positive performance was involved)", was listed as the second prerequisite in gaining acceptance for a Lessons Learned program. The CALL respondent admits that initially willingness to share information was a real challenge for organizational learning initiatives.

Overcoming this resistance the organization "took a valuable lesson from that training environment, which held as one of its core beliefs the Las Vegas philosophy of "what happens here, stays here." In effect, while disseminating lessons across the U.S. Army, the CALL has avoided unveiling the identity of units and individuals unless the lessons were truly positive. Such an approach enabled the CALL to build-up "trust among units, leaders and Soldiers that the information (…) gathered from their operations would not be used against them or be used to paint them in an unfavorable light".

Showing value of the Lessons Learned capability to the force was listed as the third key factor to foster positive organizational behaviors favorable for experiential learning. Due to the fact that the Lessons Learned process combines organizational learning and change management, analyses and lessons identified are valuable only if they provide commanders with recommendations for remedial actions. As stated in the Allied Joint Doctrine for the Conduct of Operations (AJP-3B, 2011, p. 4-19) "[t] he purpose of a Lessons Learned procedure is to learn efficiently from experience and to provide validated justifications for amending the existing way of doing things, in order to improve performance". Therefore, in order to buy-in the members of an organization, the Lessons Learned personnel "must be able to disseminate its information effectively so that its customers can use the information to improve". As observed by respondents "this dissemination can be via many means [such as]: websites, databases, hard-copy products, forums, etc. In fact, the use of multiple formats is probably best, since not everyone, for example, has computer access in the field, requiring the dissemination of lessons in hard copy". Recently, dissemination has received more and more attention of Lessons Learned practitioners. Its role is highlighted both within the daily work and official documents. For instance, in 2011, the dissemination stage was added to the generic model of the NATO Lesson Learned process.

Change

Changing values, beliefs and attitudes represented by the members of an organization in order to buy them into the idea of Lessons Learned, develop their positive mindset, and stimulate their involvement and willingness to share information is a real challenge for a Lessons Learned community. Such a point of view is shared by the majority of the respondents participating in the survey. As observed by one of them: "The most crucial lesson identified for the implementation of the LL system is the mindset change of the personnel. [Nevertheless] a generally applicable model to achieve the mindset change does not exist. Each organization requires a different approach". Changing positive organizational potential, culture and climate is a long and evolutionary process rather than a revolutionary turn-around. As highlighted by one of the interviewees "things take time". Therefore, incremental improvements seem to be a recommended way of implementing change. Simultaneously, Lessons Learned personnel should apply a product-oriented approach focusing their attention on showing value of Lessons Learned and providing high quality products.

"Start small and build upon success" – this is the U.S. CALL's recommendation for managing positive organizational behaviors in the Lessons Learned context. As observed by the interviewee, "for CALL, this was almost pre-ordained, because in the mid-, to late-1980s, CALL, by necessity, focused on Combat Training Center (CTC) operations and the lessons there from. [The organization] disseminated directly to units and war fighters, which (…) also was a key ingredient. Leaders and Soldiers gradually grew confident that if they learned the lessons we published, they would perform better during their CTC rotation. When the Army started getting more routinely involved in contingency operations following Operation Just Cause in Panama, CALL started publishing lessons learned from those as well. For Operation Desert Shield, CALL produced a handbook on conditions in the theater as well as what could be expected from their Iraqi opponents and it was a huge hit with troops. (…) The longer-term operations, such as Haiti, Somalia, Bosnia and Kosovo, allowed CALL to build on credibility with Soldiers and leaders because the lessons we were harvesting and publishing had a direct impact on their operational success and in saving lives". As admitted by the CALL, buying troops into a U.S. Army Lessons Learned program had been a long process lasting over the 1980s and 1990s (cf. Lackey, 2003, pp. 79-83).

The CALL's way to get the acceptance of U.S. Army commanders and soldiers and to buy them into a Lessons Learned business provides an example of the evolutionary, incremental change of mindset. The case shows how positive behaviors and attitudes to experiential learning have been shaped along with the development of the U.S. Army Lessons Learned capability. This is one of the advantages experienced by the first movers. The followers, such as other military organizations responsible for building-up national Lessons Learned systems in their armed forces, face other challenges. On one hand, they may benefit from lessons learned from pioneers, but on the other one their sponsors and stakeholders expect immediate deliverables of high added value. Paradoxically, meeting these requirements is extremely difficult without positive organizational culture, climate and behaviors for organizational learning. Changing mindset is a time consuming activity. In effect, the risk of vicious circle becomes relatively high.

The resistance from the members of an organization is another challenge which needs to be taken into account while planning and implementing any change. Overcoming this resistance may be extremely important and difficult while undertaking the effort to change organizational culture, climate and behaviors. The lessons from the U.S. Army prove that the After Action Review process is a strong force driving the positive change into organizational behaviors favorable for Knowledge Management and experiential learning. Nevertheless, the implementation of the AAR may be a real challenge, too. One of the interviewees, during his tour in Afghanistan as a Polish Armed Forces battalion commander, had attempted to inculcate the AAR process into his subordinates. His idea was to improve the operations of the battalion and to foster the cooperation with troops attached to the battalion from other units. He admits that he faced strong resistance from company and platoon commanding officers while

the leaders of attached units generally presented positive attitudes to his initiative. What was astounding, among the opponents there was one of the officers who had been trained in the U.S. where the AAR is deeply embedded into the organizational culture of the Armed Forces. The personnel perceived the open dialogue on their mistakes as the face threatening act and the AAR as an additional bureaucratic and time-consuming procedure. Although the AAR was aimed at discussing problems and finding solutions and improvements, initially the participants shifted their attention to blaming each other. Then, situation improved and finally the AAR provided constructive outcomes. At the beginning, AAR sessions were organized and chaired by the battalion commander and his deputy. In the second step, the leaders handed over the responsibility to company commanders. Nevertheless, when left without battalion command supervision, the "quality" of the AAR weakened. In spite of the challenges while managing the "AAR experiment" in his battalion, the respondent is convinced of the value of this technique for Lessons Learned processes. He highlights the urgency to train all the personnel in the AAR procedure and to show them the benefits of applying it in daily routine.

Summing up the aforementioned case study, the cultural differences between nations and organizations should be highlighted. While by some nations, the self-evaluation session is considered "a positive feedback", by others it may be perceived as "the acknowledging the failure" (cf. Trompenaars and Hampden-Turner 2002, p. 34 as cited in Miroński 2010, p. 53). Similarly, referring to the military context, Scheider (2011, p. 13) identifies the ignorance of national culture among misunderstandings and obstacles in developing and delivering After Action Review. He claims that "[i] n some national cultures and in many na¬tions' military cultures, self-critique is very difficult, as is expressing opinions that may contradict those of the leader or facilitator". Nevertheless, the change of organizational culture and attitudes to Lessons Learned initiatives is possible. As highlighted by the CALL, "some armies have successfully overcome this cultural difference after working with the U.S. military and understanding the importance of learning from their past" (Establishing..., 2011, p. 4). Moreover, another important lesson can be derived from the story: A successful implementation of the Lessons Learned initiative requires both leadership engagement and positive attitudes of all the personnel combined in order to overcome the psychological barriers and to appreciate the value of new solutions.

Discussion

Research findings prove the crucial role played by positive organizational behaviors in developing Lessons Learned capabilities in military organizations. First and foremost, leaders and all the members of an organization contribute to the success of failure of a Lessons Learned business. Therefore, there has been identified the need to study "How to develop and strengthen positive organizational behaviors fostering Lessons Learned in military organizations?" Finding the answer to this question has been the main aim of the study. The aim has been achieved in three steps. First of all, the challenges concerning positive organizational behaviors faced by Lessons Learned communities in military

organizations have been identified. Secondly, possible solutions to these challenges have been considered. Finally, managing the change of organizational behaviors has been discussed.

Analyzing the challenges to developing and strengthening positive organizational behaviors crucial for Lessons Learned processes in military organizations, the distinction should be made between issues concerning leadership and personnel involvement. As regards to leadership-related challenges, time shortfalls and the right prioritization seem to be the key points. Efficient and effective Lessons Learned processes require the commanders' guidance to establish priorities and allocate rare resources, their engagement and promotion of a Lessons Learned capability. Nevertheless, due to time pressure there is a risk that commanders deal first and foremost with urgent issues, not the most important ones. Information sharing and the personnel rotation are listed among the challenges for engaging all the troops within Lessons Learned business. The catalogue of barriers to effective sharing information has been identified. Nevertheless, taking into account the cultural determinants of intra-organizational communication (cf. Glińska-Neweś, 2007, pp. 205-207), information sharing seems to be especially challenging in military organizations due to their hierarchical structures (cf. Jabłoński and Lis, 2012a, p. 22). As regards to the impact which personnel rotation has on Lessons Learned processes, there is some ambiguity. Both opportunities of bringing new, fresh ideas and threats to organizational memory need to be taken into account. Misunderstanding of the role of Lessons Learned personnel by both commanders and file-and-rank soldiers is another problem. A serious risk of perceiving Lessons Learned staff officers as "inspectors" or even "spies" conducting assessment and evaluation not as "allies" collecting observations in order to provide assistance to the troops may have a detrimental effect to a Lessons Learned capability.

The opinions and insights of interviewed experts and Lessons Learned practitioners enable to enumerate some solutions to the problems identified above. Showing value seems to be the key point recommendation for developing and strengthening positive organizational behaviors crucial for Lessons Learned capabilities. Lessons Learned systems combine the processes of managing knowledge and change. They have a very practical rationale. "The idea of Lessons Learned in an organization is that through a formal approach to learning, individuals and the organization can reduce the risk of repeating mistakes and increase the chance that successes are repeated. In the military context, this means reduced operational risk, increased cost efficiency, and improved operational effectiveness" (NATO LL Handbook, 2011, p. 1). Therefore, Lessons Learned business needs to be product-oriented. Gaining commanders' and troops' respect by the U.S. CALL through providing high quality products customized to their needs confirms such an approach. Similarly as in a business sector, the "customers" analyze costs and effects seeking the highest value from their perspective. That is why it is important to develop and promote Lessons Learned capability as "a valuable skill set" enabling both leaders and the rank-and-file soldiers to achieve their aims and not as "a bureaucratic burden" which requires additional work but provides no value.

Establishing clear ground rules while capturing observations and conducting analyses and providing soldiers with simple but effective tools and techniques supporting experiential learning are another lessons identified. As experienced by the CALL, non-attributing lessons to specific units enabled the organization to gain the acceptance for a Lessons Learned program within the U.S. Army ranks. Clear ground rules between Lessons Learned staff officers and their informants are the prerequisite for the mutual trust and communication, and in effect for capturing valuable observations and collecting data necessary to further analyses. Lessons Learned solutions combine a scientific approach, formal procedures and IT technology. Certainly, these elements are important for complex and multidimensional analyses and remedial actions undertaken at the strategic level. Nevertheless, in order to be effective the Lessons Learned business requires the engagement of all soldiers. Therefore, providing them with simple but effective tools and techniques supporting experiential learning is so crucial. The U.S. After Action Review may be listed as an example of such an instrument.

Managing the change of organizational behaviors crucial from the perspective of Lessons Learned has been the last, but not least, issue under the study. Although a generally applicable model to achieve the mindset change has not been identified, some principles have been observed. First and foremost, it should be stressed that each organization needs to develop its own way of changing mindset of its personnel. A situational approach should be adopted rather than a universal one. Secondly, mindset change is a long, evolutionary process. "Starting small and building upon success" is a good practice learned from the U.S. CALL. Thirdly, the impact of national and organizational culture must be taken into account while introducing changes. Finally, leadership engagement and zeal are the key factors in overcoming resistance to change. The role of leadership, highly appreciated in all types of organizations, seems to be particularly crucial in a military context.

Summing up, the study has identified the challenges concerning positive organizational behaviors faced by Lessons Learned communities in military organizations, possible solutions and good practices as well as some principles of managing the change of organizational behaviors. Due to the great importance of the topic both for the theory of knowledge management and the practice of managing Lessons Learned capabilities in military organizations, further scientific exploration of the research area is recommended, including both quantitative and qualitative studies.

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Abstract (in Polish)

Celem artykułu jest wskazanie wyzwań w zakresie kształtowania pozytywnych zachowań organizacyjnych kluczowych z perspektywy wojskowych systemów wykorzystania doświadczeń (Lessons Learned) oraz zidentyfikowanie rozwiązań i rekomendacji służących umacnianiu pozytywnej kultury organizacyjnej, klimatu i zachowań sprzyjających organizacyjnemu uczeniu się w oparciu o wykorzystanie doświadczeń. Uwaga badawcza została skoncentrowana na pozytywnych zachowaniach organizacyjnych uznawanych w NATO za kluczowe czynniki sukcesu systemów wykorzystania doświadczeń, takich jak: zaangażowanie dowódców i pozostałych członków organizacji, pozytywna mentalność oraz skłonność do dzielenia się informacjami. Zasadniczą metodą pozyskiwania danych zastosowaną w procesie badawczym były wywiady z ekspertami i praktykami reprezentującymi dowództwa i instytucje NATO oraz organizacje wojskowe odpowiedzialne za rozwój narodowych zdolności w zakresie wykorzystania doświadczeń. Ponadto, wykorzystano wyniki analizy wybranych dokumentów wojskowych oraz literatury przedmiotu.

Słowa kluczowe: organizacyjne uczenie się, wykorzystanie doświadczeń, pozytywne zachowania organizacyjne, przywództwo, wymiana informacji, organizacje wojskowe.

The Spanish cod fishing industry: Radical production changes without significant changes in the innovation system

Manuel González-López*

Abstract

This paper studies the changes which have occurred in the Spanish cod fishing industry in the last few years. We also aim to understand the dynamics of industrial change and its relation to institutions, understood here as both formal and informal rules and conventions. Our results suggest that sometimes industries, in order to maintain their competitive position, need something more than incremental changes in their products or in the technologies that they use. As we can see with the Spanish cod fishing industry, major changes are needed which affect the institutional set-up of their production system. Nevertheless, even when major changes happen in the production sphere, this does not mean that major alterations happen in the way companies innovate, i.e. in their innovation system.

Key Words: institutions, innovation, innovation systems, cod fishing, change.

Introduction[1][2]

This paper studies the changes which have occurred in the Spanish cod fishing industry in the last few years. We also aim to understand the dynamics of industrial change and its relation to institutions, understood here as both formal and informal rules and conventions. Although innovation and change are usually understood to be key factors for economic success for both territories and industries, sometimes to innovate in a narrow sense is not enough. In some cases the survival of a given industry entails the alteration of existing institutions and major routines (David, 1993). Although some authors have already analyzed this issue (Granovetter, 1992; Grabher, 1992; Lindkvist & Sanchez, 2008), more research is needed to understand in depth the relationship between innovation and institutions. Moreover, we also analyze the changes that occurred in the way how this industry organizes its innovation processes, i.e. the

* *Universidade de Santiago de Compostela, ICEDE Research Group – Department of Applied Economics, Campus Norte, 15782 Santiago de Compostela, Galicia – Spain, Manuel.gonzalez.lopez@usc.es.*

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changes in its Innovation System (IS). We try to see whether changes at the production level have come together with changes at the IS level.

The paper proceeds as follows. In section two we discuss the relationship between innovation and institutions in order to achieve a better understanding of such a relationship. We also discuss the importance of the systematic and institutional perspective when understanding a firm's innovation process, based on the well-known innovation system approach. In section three we start by presenting the results of field research conducted in the Spanish cod fishing industry continuing with a description of the production changes that have occurred in this industry during recent years. In section four we try to see if the changes in the productive sphere have also been accompanied by changes in the industry's IS. Finally, some conclusions are included at the end of the paper that summarize our main results and considerations.

Innovation, institutions and change

As pointed out by different authors, during the last 25 years the disciplines of economic geography and regional development have experienced important progress (Martin, 1999; Scott, 2000). Part of this resurgence is due to the contribution of a number of schools and authors coming from different traditions. Among these contributions we could mention the Italian School that recovered the Marshallian concept of industrial districts (Becattini, 1987), the Californian School and the flexible specialization paradigm that emphasized the breakdown of Fordist production forms towards more flexible ones (Scott, 1988; Piore and Sabel, 1984) and the Gremi School based on the concept of "milieux innovateurs" (Aydalot, 1986; Crevoisier, 2004). According to Scott (2000) these contributions shared a general discontent with dominant neoclassical economics. Among other reasons, this is related to the fact that they usually pay attention to the development particularities of territories and sectors, instead of aiming at a general theory fitting all. Another common point was the understanding of the process of economic development as a systemic (interactive) process where the behavior of economic agents is shaped by institutions, rules and conventions. Therefore, each territory and industry will show a specific pattern of development marked by historical, technological, social and cultural factors.

Institutions and innovation

Institutions are closely related to the process of economic change. In this regard Edquist and Johnson (1997, 46) define institutions as: "sets of commons habits, routines, established practices, rules, or laws that regulate the relations and interactions between individuals and groups". Institutions, according to the referred authors, can be formal (such as laws and regulations) or informal (like conventions and habits). Taking the previous definition as a basis we could state that a contradictory relationship between institutions and innovation exists. Thus, institutions, both formal and informal, stimulate innovation because they reduce uncertainties, coordinate the use of knowledge, mediate conflicts, and provide incentives (Carlsson and Jacobson,

1997). Nevertheless, to innovate also implies to alter existing routines, habits and even legal frameworks (Nelson and Winter, 1982; Granovetter, 1992; Hayter, 2004). The former applies particularly when dealing with radical innovations or important changes occurring in one industry. Douglas North (1994) has argued about the nature of economic change pointing out that whilst most of the time it is a matter of decisions based on existing routines and institutions, some changes might entail the alteration of such routines. These decisions: *"involve altering existing 'contracts' between individual and organizations. Sometimes that re-contracting can be accomplished within the existing structure of property rights and political rules, but sometimes new contracting forms require an alteration in the rules. Equally, norms of behavior that guide exchanges will gradually be modified or wither away. In both instances, institutions are being altered"* (North, 1994, p. 361). We could infer from North's words that although some innovations are made within the existing institutional framework, others imply the alteration of such a framework.

David (1993) has also referred to the previous issue indicating that sometimes, in order to survive, industries must change their entire institutional framework upon which they are situated. *"Thus, institutional structures, being more rigid and less adept at passively adapting to the pressures of changing environments, create incentives for their members and directors to undertake to alter the external environment. Since there are many circumstances in which the external environment proves intractable, organizations and institutions are subject (in ways that properly designed technologies are not) to pressures and stresses that may cause them to abruptly collapse and dissolve or to be captured, dismembered and ingested by other competing organizations"* (David, 1993, p. 218).

Similarly, Lindkvist & Sánchez (2008) have also discussed the relationship between innovation and institutions, although referring to "conventions" (non-formal institutions). The authors referred particularly to natural resource-based industries and they point out that those industries that have been successful usually show an adaptive behavior of their conventions to new contexts. Nevertheless, other industries show less success precisely because of the rigidity of the existing conventions.

Ultimately we can conclude that there are situations where an industry needs to break the existing institutional arrangements (formed by rules, conventions, norms, etc.) in order to survive. This could mean an entire revolution on their production and IS or just partial changes affecting their components and some of their institutions. As we will try to show in this paper, there are reasons to think that the Spanish cod fishing industry has been involved during the last few years in a deep structural change. Such changes go further than simple innovations in products or processes and have implied important changes also from an institutional viewpoint.

Innovation Systems and the innovative strategies of firms

The systemic and institutional perspective shared by the new schools of Economic Geographers and Regional Economists is also found in contributions that focused their interest on the study of innovation and particularly in the so-called Innovation System

(IS) approach. This approach focuses on the specificities shown by the innovative process at countries, regions and industries (Lundvall, 1992; Cooke et al., 1998; Howells, 1999; Malerba, 2002). The IS literature stands on two major theoretical frameworks. The first is the post-Schumpeterian perspective known as the evolutionary school (Nelson & Winter, 1982; Dosi, 1982) which emphasizes, like Schumpeter did, the dynamic character of the economy in contrast with the neoclassical focus on equilibrium. Such a dynamic character would be explained by new combinations of the productive factors –innovations that are path-dependent, i.e. they are determined by previous changes in technologies and – in broad terms – in the economic structure. That would explain why each sector or territory follows different innovation trajectories shaping different IS. The other theoretical source of the IS approach is the so-called "interactive learning theories". These theories understand innovation as a ubiquitous phenomenon that is the product of multiple and continuous learning processes where multiple agents participate.

Although the innovation system approach was initially applied at the national level, it was later extended to the regional level (Cooke et al., 1998; Howells, 1998; etc), and also to the sectoral field. In this regard, Malerba (2002) defines a sectoral system of innovation and production as a set of products (new and existing ones) with specific uses as well as a set of agents that carry out market and non-market interactions aimed at creating, producing and selling those products. Thus sectoral systems own a base of knowledge, technologies, inputs and associated demands. Interactions occurring within the system are the origin of innovations and they are based on multiple channels like communication, exchange, cooperation or competition processes. Individual companies may benefit from knowledge sources in their environment by interacting with and learning from other firms, suppliers, customers, universities, knowledge organizations, and other government organizations (Lundvall 1992; Edquist 1997, etc). Likewise an innovation system can itself be understood as an institution or a set of institutions because it refers to the specific way a sector organizes its innovative behavior, therefore made up of formal and informal arrangements among stakeholders.

The systemic nature of IS does not mean that individual behavior (agency) is not important. On the contrary, a major factor to understand the direction of changes at the industrial level concerns the strategies of firms when confronting market changes (Schamp, 2005). Therefore the decision making by firms related to their internal learning processes or to their responses to external changes will also explain alterations at the IS level. A large literature exists when dealing with different innovative strategies of firms both at an individual and aggregate level (Freeman, 1974, Pavitt, 1984, etc). As pointed out by Freeman (1974), in line with the Evolutionary Theory of firms, organizations differ in part due to their innovation strategies. The author suggested that whilst some companies follow traditional, dependent or imitative strategies and hardly get involved in R&D activities (apart from adaptive R&D), others present a more active behavior regarding innovation (defensive or offensive strategies). A relationship can be found

between Freeman's classification and Pavitt´s well-known taxonomy where, based on the analysis of firms' strategies, different sectoral patterns of innovation are identified (Pavitt, 1984). While some sectors, like primary activities or traditional industries, are characterized as "supplier dominated" from the technology viewpoint, others would be more prone to carry on their own innovative activities ("science based" sectors or "specialized suppliers" sectors). We could hence say that the response to technological change varies according to the type of firms and sectors.

The previous contributions, focused on the technological profile of firms and industries, have somehow been challenged by more recent perspectives on innovation. In this sense it is worthwhile to include here the differentiation made by authors like Jensen et al, (2007) between the STI (science-technology) mode of innovation and the DUI (doing, using and interacting) mode. Both modes refer to the channels used by firms (or sectors) to incorporate knowledge in such a way that the STI mode rests more on scientific (explicit) knowledge, while the DUI mode is rather related to implicit or tacit knowledge. The concept of knowledge transfer is substituted here by the concept of learning by doing, using, and interacting. Thus, while the STI is narrowly linked to formal processes such as carrying out R&D activities, formal collaboration with universities and research centers and so on, the DUI mode of innovation rests more on informal contacts between users, producers and providers of products and technologies. Of course both modes might (and do) appear combined in the same sector and even in the same firm, nevertheless the status quo among both modes could be altered by a firm's or the entire sector's strategies when they react to changes in the competitive environment. One of these strategies (usually promoted by public policies), refers to the systematization of the innovation function in order to undertake changes in the production system. When such strategy is extended to the sector level then we could say that an important change in the Sectorial Innovation System is going on.

In this paper we will also try to see whether the changes that have happened in the Spanish cod fishing industry during the last years have been accompanied or not by changes in its system of innovation.

Production changes in the Spanish cod fishing industry

Data collection

In order to collect the information needed for our research, we designed a questionnaire that was used for the interviews carried out with the companies' managers. The industry is currently formed by five companies, although we finally obtained direct information from four companies since one refused to provide any information. Four interviews were carried out at the companies' headquarters, three interviews took place in San Sebastián (Basque country) and one in Vigo (Galicia). The interviews were carried out between the 23 November and 5 December 2009. In addition, we captured relevant opinions and views from the persons interviewed. On top of the interviews, during the

processing of information and in order to clarify some aspects and validate the results, a number of phone calls were made to the companies. Finally, since the sector is very small and all companies know each other, we gained information not only related to each company but to the whole fleet and industry as well.

The Spanish cod fishing industry: Presentation and historical review

The Spanish cod fishing industry is currently composed of five companies that manage a fleet of nine trawlers actively dedicated to cod fishing. At the beginning of 2009, there were six companies but one decided to stop its activities and transfer their fishing rights to another Spanish company. Traditionally, the cod fishing industry was located in two regions: Galicia and the Basque Country. Nowadays, two companies locate their headquarters in Vigo (Galicia), while three are in San Sebastián (Basque Country). Nevertheless, only three vessels are based in San Sebastián (Pasaia port), while the other six have their base in the Port of Vigo.

Total revenues of this industry have varied between €20 and €25m in the last 10 years, where a clear trend (decreasing or increasing) is not observed. Average revenues by firm have varied between €3.3 and €4.5m during that period. Regarding employment, a much clearer declining trend is observed. Total employment has moved from 158 employees in 1998 to 79 employees in 2007. An increase in productivity (revenue by employee) has taken place in the period and this is most probably related to production changes and innovations.

Table 1. General information of the Spanish codfish trawler fleet firms

Company	Location of headquarters	Codfish quote share	Number of vessels actively dedicated to cod fishing
Pesquera LaurakBat S.A.	Pasaia – San Sebastián (Basque Country)	9.0%	1
Velaspex S.L.	Pasaia – San Sebastián (Basque Country)	14.8%	2
Pesquera Rodríguez S.A. (Pescafria)	San Sebastián (Basque Country)	27.4%	2
Pesquera Ancora S.L. (FormerTranspesca S.A.).	Vigo (Galicia)	24.1%	2
Valiela S.A.	Vigo (Galicia)	24.4% (*)	2

(*) Valiela has recently bought the quota share of León Marco S.A, the company which stopped its activities in 2009.

The Spanish cod fishing industry has a long tradition and is narrowly linked with the Spanish long-distance fishing history. In 1924, a Galician trawler based in Vigo initiated its cod fishing activities in the waters of Newfoundland. Five years before, in 1919, the Basque company PYSBE (Pesquerías y Secaderos de Bacalao en España S.A.[3])

3 PYSBE: Cod fisheries and Dryers of Spain.

had been established; nevertheless this company did not start its fishing activities until 1927. In 1929 fishing in Icelandic and Northern European waters took place for the first time. It must be pointed out that in the beginning the Spanish fleet used a single trawler system and the incorporation of the traditional "pair trawling" system did not take place until 1949 (Oya, 1974)[4].

On a global level, the Spanish fishing fleet became the third largest at the end of the 1960s with 15 single and 64 pair trawlers. Catches reached 300,000 tons at that time, basically from the Northwest Atlantic fisheries. As it is widely known, both changes in the International Law of the Sea and stock declines due to over-exploitation forced the reduction of captures (Zeller and Pauly, 2004). Since the establishment in 1977 of the Economic Exclusive Zones (EEZs) in the European Community (EC), Canada, United States and Norway, Spanish codfish quotes have progressively decreased; and at the end of that decade catches had declined to less than 30,000 Tn.

The entrance of Spain in the EC in 1986 marked another relevant point in the recent history of the cod fishing fleet. The EC established important limitations to cod fishing which in practice meant the closing of all community fishing grounds (Baltic Sea, North Sea, Kattegat and Skagerrak) to the Spanish fleet. Meanwhile, the NAFO fisheries suffered a strong crisis at the beginning of 1990s deriving from the ban of cod fishing in those fisheries (Hilborn and Walters, 1992). Since then, the Spanish fleet has developed its activity in the Norwegian EEZ (based on the agreements between this country and the EC) and at the Svalbard fishing ground. The Spanish quota reached around 12,000 tons in 2008 and it was distributed among six companies that, as we mentioned previously, became five at the end of 2009[5].

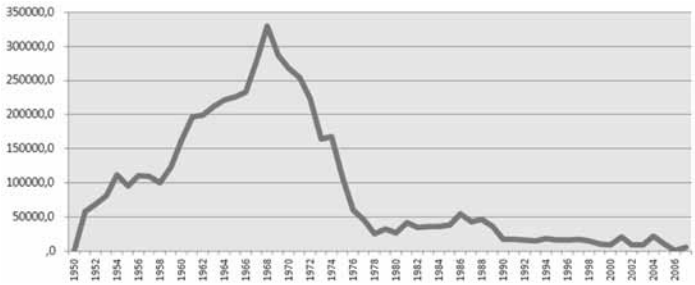

Figure 1. Volume of production, codfish, Spain (Tn). 1950–2006
Source: Own elaboration based on FAOSTAT. Global Production Statistics 1950-2007.

4 At the moment three companies use the traditional "pair trawling" system while the other two have recently changed to a single trawler system ("bou" in Spanish).

5 NAFO fisheries have recently re-opened although the quota given to the Spanish fleet is not large enough to initiate a fishing campaign there.

Codfish production: Traditional systems and recent changes

The traditional method of codfish production of the Spanish trawler fleet was to salt it on-board. This method for salting cod is also known as dry salting or kench curing where solid salt is rubbed into the fish meat, the fish is then pile-stacked in the trawler with alternate layers of fish and salt. The pile salting method results in the dehydration of much of the salted fish because of the increasing pressure from the overburden on the fish in the lowest part of the batch. The salted fish was then landed in the Basque or Galician ports and usually dried again at inner Spanish regions with an appropriate dry climate[6]. Lindkvist et al, (2008) have suggested that this method arose to optimize the vessels' stock capacity since the space on board schooners is limited. This aspect is indeed crucial when dealing with long-distance fishing, as is the case of the Spanish cod fishing fleet.

The technological process described above could be considered a part of a whole production system that also encompassed specific market relationships and conventions. For instance, there were specific commercializing channels for the Spanish fleet to use to sell their "bacalao verde"(traditional denomination of the codfish processed by Spanish trawlers) to Spanish dealers or industrial processers that were in charge of distributing the product to retailers (supermarkets, restaurants, etc). The links between the companies and their clients were in most cases based on long term and well-established relationships founded on mutual trust. In many cases the fishing companies receive purchase commitments in advance (i.e. for fish yet to be caught). Moreover, this particular product achieved a dominant position in the Spanish market during the boom of the Spanish cod fishing industry. It showed a particular appearance (split or butterfly shaped) color (yellow-green) and taste. It also required a specific procedure prior to being cooked consisting of desalting and dehydrating the salted fish over a couple of days. As pointed out by Lindkvist *et al*, (2008) these conventions and rules were also followed by foreign producers who exported salted fish to the Spanish market.

The traditional process of on-board salting is still in use, although it is being progressively abandoned and substituted with a freezing system. At the moment three companies still maintain the traditional system even though all three combine it with the new one. All in all, in 2009 around 68% of the catches were frozen and only 32% used the traditional on-board salting system. The substituting of the traditional method by the freezing one does not mean that the cod is sold to the final customer as frozen fish since a relevant part of the frozen fish is eventually salted by the processers. This happens particularly with catches landed in Norway (at least two out of five companies land part of their catches in Norway).

6 The landing of on-board salted fish currently takes place only at one Spanish port situated near to Vigo (Cangas) because this is the only port where the needed infrastructure and labor for salt fish unloading is available. The salted fish is usually bought by intermediaries who use Vigo (Cangas) as a temporary stock point before sending it to driers situated in other parts of Spain.

Changes in the conservation system were accompanied by other changes related to product characteristics. The Spanish companies of cod fishing currently sell three basic types of products that combine two conservation systems, frozen and salted:

- Split cod or "Butterfly". This is sold as the traditional salted fish but in some cases is also landed as frozen cod.
- HG (headed and gutted). This is sold mainly as frozen (but part of it is later salted by processers).
- Fillets. These are sold by the fishing firms mainly as frozen.

Apart from the previous basic products at least one company has launched other product innovations and is trying to sell little cod loins, “kokotxas” (cod cheeks), etc. Besides, most of the companies have implemented small changes in fillets affecting its appearance (and other aspects) in order to attend to market requirements.

Both product and process innovations have required the incorporation of new technologies. Thus in recent decades, one company has built a new trawler and another has undertaken deep transformation in their fleet. In both cases important changes were made in the processing plants. Innovations here regard the design of more efficient plants, the incorporation of new industrial cold systems, new conservation systems or new packing systems. Related to the previous point we must call attention here to an important issue. Thus, when we asked the company managers about the technologies used in their production process the interviewees indicated that in most cases they have been in use in the fishing sector for a long time. It is just in the last decade that the Spanish fleet has incorporated this already available technology. This means that innovation in the industry did not find technology barriers and therefore the main force for innovation is, very likely, “the market pull” (instead of the “technology push”). (Coombs *et al*, 1987).

Joseph Schumpeter (1942) used to include the opening of new markets among types of innovation. Relevant changes have occurred in recent years in the Spanish codfish industry also in this field. To some extent the traditional method of commercializing and the associated rules and conventions are still in use. Nevertheless, as in the production sphere, important changes have occurred in recent years.

Firstly, an internationalization process of sales has been taking place. At least two companies are now selling to clients situated in countries other than Spain and one of them (the largest in the industry) sells the majority of its catch abroad. Ultimately, and according to the information obtained from the companies, in 2009 around 59% of total sales took place in the Spanish market, while 41% took place at international markets. An important part of foreign clients are located in Norwegian ports. The cod landed in Norway is usually a frozen cod product that is later salted (and probably a good part of it exported to Spain).

Secondly, some companies have tried to move to other clients apart from dealers and processers. We refer basically to retail chains located not only in Spain but also in countries like the United Kingdom or France. The products sold in these markets are

usually fillets (particularly the UK where they are commercialized under the famous dish of "fish and chips").

Generally speaking we can affirm that the launch of new products by the Spanish cod fishing industry has been associated with changes in the market sphere. Thus whilst the traditional "bacalao verde" is sold exclusively to Spanish dealers or industrial processers, the new products are sold mainly to foreign clients, some of them retail branches. Thus the whole production system of the Spanish cod fishing industry seems to have been altered.

Why is the Spanish cod fishing industry changing?

We have seen that the Spanish cod fishing industry is introducing deep changes in its production and commercializing system. The result is the progressive abandoning of the traditional on-board salted fish, the production system that has characterized this industry since the beginning of the last century. The reasons have to do with a strong restructuring occurring in the Spanish salted fish market over recent decades, a process that has been described in depth by Lindkvist et al, (2008). Next we point some factors related to that restructuring:

- Social and cultural changes occurring in modern societies have led to a general trend of introducing frozen products into consumer diets. The incorporation of women to the labor market has reduced the time for typical home tasks like daily shopping or cooking in such a way that has made frozen products become very popular. Thus, codfish is increasingly consumed by final consumers as a frozen product, with presentations and tastes that may differ from the traditional salted one. In Figure 2 we can observe how frozen codfish is increasing its relative weight in the Spanish market while salted codfish (included in the category of fresh codfish) has reduced its quota[7].
- Moreover, in the market segment of salted fish (still predominant in countries like Spain and Portugal), traditional on-board salted fish as a product shows some comparative disadvantages. According to the views of Spanish producers this is largely due to the eruption of foreign producers in the Spanish market since the 1980s. This opinion fits reasonably well with the results of the study made by Lindkvist et al, (2008), who highlighted the influence of Icelandic producers' strategies on the dynamics of the Spanish salted fish market. As a result, salted fish produced by a means of alternative salting methods is now dominant in the Spanish market. We refer to methods like direct brining that is more flexible in terms of production time and makes the desalting and dehydrating process unnecessary for consumers (since it is done by the producers). Moreover, a wide variety of salted fish products, like light salted fillets, have been introduced in the market. These products have better

7 We are aware that part of frozen codfish has previously been subject to a salting process, as is the case of the light salted frozen fillets. In any case it seems clear that frozen codfish is increasingly present in the Spanish market regardless of whether it has been salted or not.

acceptance by consumers largely because of their appearance. On-board salting usually gives codfish a yellow appearance that does not attract consumers who associate freshness and quality with a white color. Meanwhile, other methods can salt fish by maintaining the white appearance. Although the Spanish producers insist on the higher quality of their product and maintain that the traditional salted fish does not show cost disadvantages, they are aware of the market changes. One of the interviewees agreed by pointing out that: *"it is too late to launch any strategy to maintain the traditional salted fish"*.[8]

- Finally, social, cultural and economic changes have also altered the traditional distribution channels of the Spanish codfish. Large supermarket and retail chains have become the key stakeholder in the Spanish food market, displacing, in the case of salted fish, the traditional dealers and processers that were dominant in the market. According to Lindkvist *et al*, (2008), this process has also been influenced by the Icelandic producers' strategies that established their own sales network, avoiding the traditional Spanish one: *"They* (the Icelandic producers) *have been able to change Spanish production institutions and distribution systems. With their light salted frozen fillets, they have established innovative and new products that have required a new distribution system and that meet the demands of modern customers in the markets".* (Lindkvist et al, 2008, p. 119).

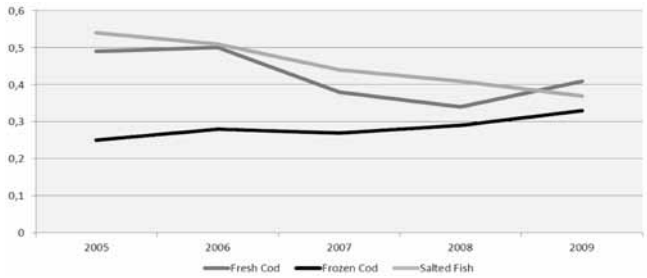

Figure 2. Codfish consumption per capita (Kg/population)
Source: Own elaboration based on the Base de datos de consumo en hogares of Ministerio de Medio Ambiente y Medio Rural y Marino.

Changes in the IS of the Spanish cod fishing industry

We have seen how the Spanish cod fishing industry has innovated in different fields but we still do not know if these innovations have been accompanied by changes in the way the industry incorporates knowledge. For this reason we asked the companies about the channels of knowledge incorporation and innovation. By this means we aimed to obtain a simplified picture of the Spanish cod fishing IS.

8 In this regard, during recent years a new product has entered the Spanish market. We refer to light salted fillets mostly coming from China and other Asian countries. They are produced based on frozen HG exported from Europe that is then filleted and exposed to a process of salt solution injection. According to the opinions of the interviewees the quality of this product is quite poor and its success lies both in its low prices and the lack of adequate labeling.

The results indicate that the companies are rarely involved in explicit innovation activities. Thus, none of the companies undertake internal research and development (R&D) activities, neither do they have specific departments or personnel involved in innovation. The lack of involvement also means an absence of collaboration for innovation with other companies, universities or other institutions. Furthermore, channels for innovation are in general not explicit or formal and show a rather passive innovative role of companies. Thus, all companies use contacts with clients, providers and personnel of other firms to incorporate knowledge. Although the questionnaire did not distinguish between formal and informal contacts, the persons interviewed pointed out that the informal contacts are used most often. All companies use internal learning processes as an innovation channel as well as the attendance of sector fairs or conferences and specialized publications. Finally, the acquisition of machinery is also used by all firms. Other means used, in this case not by all companies, refer to the hiring of specialized personnel or to training activities. The personnel in charge of technological or innovation issues are also employed as a channel for knowledge incorporation although we must indicate here that no company has specific personnel for these tasks but persons who are dedicated just occasionally to this field.

Regarding the importance given to each of the channels used to innovate or incorporate knowledge, the results reinforce the previous ones. Thus, formal and informal contacts together with internal learning processes and the acquisition of machinery and equipment are considered to be the most important channels to innovate. The rest of the channels demonstrate a medium importance, while specialized publications are considered to be of little importance.

Therefore, we are dealing here with an industry that is poorly involved in explicit innovative activities like R&D or formal collaborations for innovation. For this reason, to optimize fishing and processing tasks firms incorporate technology embedded in machinery and equipment bought from world leading manufacturers. This confirms Pavitt's taxonomy where fishing sector was typified a "supplier dominated" sector from the technological viewpoint. Nevertheless the Spanish codfish companies have important advantages that draw on implicit knowledge, most of it coming from informal contacts and internal processes. These advantages draw on the accumulated "know-how" related for instance to the Galician and Basque rich tradition of the distant water fishing fleet. In this regard, even when dealing with the incorporation of new machines and equipment, it is very important to count nearby on world leaders' shipyards. Another advantage regards the established linkages with the Spanish market where "knowing who" (knows the market) and "knowing what" (the market wants) becomes very important. Finally, internal learning processes are also very relevant and, according to some opinions, they draw highly on the role of the captain and the technical inspector who own precise information about all processes happening on-board. All in all, the Spanish cod fishing industry seems to be following the DUI mode for knowledge incorporation and innovation and almost nothing new, as stated by the persons interviewed, has been done in this regard. We could maybe point to a somehow significant change referred to the taking over of a new generation of

firms' managers (in most cases the children and grandchildren of the company founders) who is most cases are at higher educational levels than their predecessors.

We can conclude that no important changes have happened in the way the companies incorporate knowledge and finally innovate. While other companies and industries, in order to change their production system, have been forced to undertake an explicit innovative effort and therefore to change the way they articulate their system of innovation, this does not seem to be the case in the Spanish cod fishing industry. On the contrary: the companies rely upon factors that have been "always there" like providers, internal knowledge and so on. For this reason we can affirm that no relevant changes have happened in the IS of this industry.[9]

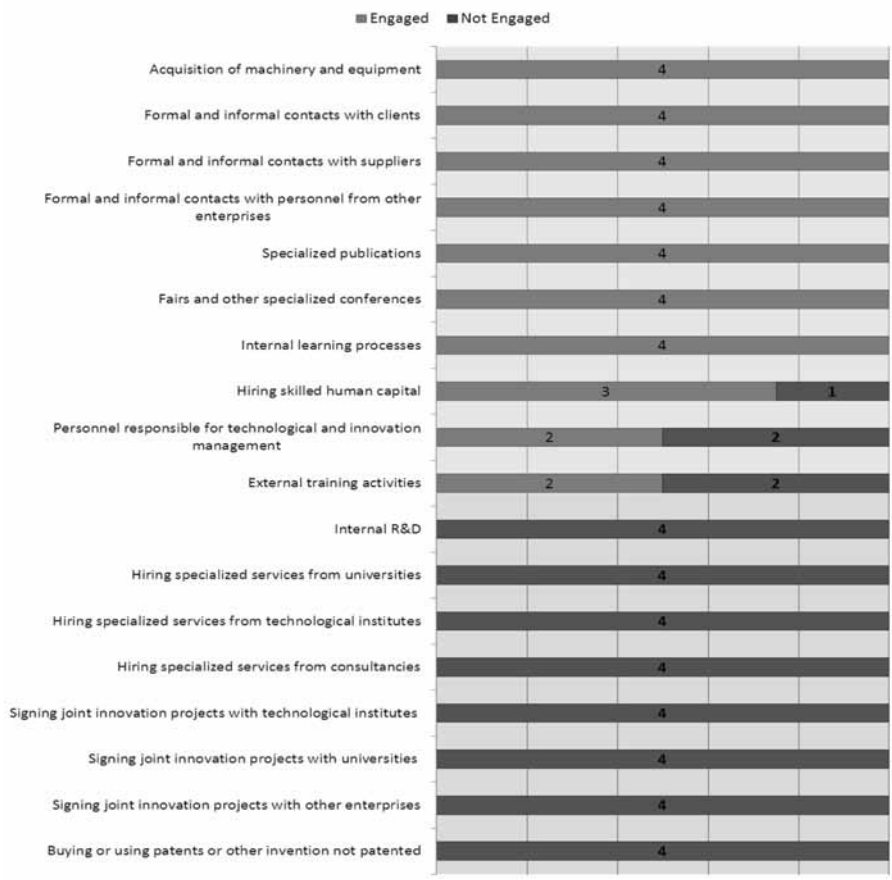

Figure 3. Use of channels for innovation and introduction of new knowledge into the company

9 The fact that the companies do not seem to have changed their innovation channels does not mean that no changes have happened at this level, it only means that the way the industry organizes its innovation activity has not suffered particular changes. Nevertheless it is obvious that the "accumulated" internal knowledge has continued to "accumulate" or that machinery providers do not supply as before.

Conclusions

In this paper we have analyzed the changes that have occurred in the Spanish cod fishing industry in recent years. In order to understand such changes we conducted field research to investigate the recent innovative patterns of this industry. Innovations are understood here from a systemic viewpoint, i.e. as the response of a particular industry not only to changes in technologies but also to social or cultural factors. Our results indicate that innovations implemented by the Spanish cod fishing industry go further than simple incremental innovations in products or processes but are accompanied by a deep institutional change. The main driver of such deep changes is the restructuring which has happened in the Spanish salted fish market, the traditional market of the Spanish cod fishing industry. As mentioned, social and cultural changes occurring in Spain during recent decades together with the eruption of the strategies followed by strong foreign competitors have changed the rules of the game in the market.

As a result of the restructuring of the Spanish salted fish market, the tiny Spanish cod fishing industry has been obliged to restructure itself in order to survive. This has been done by different means: a) incorporating the freezing conservation system and progressively abandoning the on-board salting system (process innovation); b) diversifying its product offer by incorporating new products like salted/frozen fillets and others (product innovation); and c) diversifying their market strategies by both internationalizing their sales and selling directly to retailer and supermarket chains.

Nevertheless, in this case changes in the production system do not seem to have been accompanied by significant changes in the IS. The way and channels through which the Spanish cod fishing companies innovate and incorporate knowledge have not changed recently. In order to innovate, the companies basically rely on machinery purchases, internal know-how and informal contacts with clients, providers and other firms of similar industries. The sector fits therefore quite well with the Pavitt (1984) category of "supplier dominated" sector from the technological viewpoint and, from a broader perspective on innovation, it is closer to the DUI than to the STI mode of knowledge incorporation.

Therefore we can conclude that sometimes industries, in order to maintain their competitive position, need something else than incremental changes in their products or in the technologies that they use. Like the Spanish cod fishing industry, major changes are needed which affect the institutional set-up of their production system. Nevertheless, even when major changes happen in the production sphere this does not mean that relevant alterations happen in the way companies innovate, i.e. in their IS.

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Abstract (in Polish)

Niniejsza praca analizuje zmiany w hiszpańskim przemyśle połowu dorsza w okresie kilku ostatnich lat. Autorzy próbują również zrozumieć dynamikę zmian przemysłowych oraz jej związek z instytucjami, rozumianymi tutaj jako formalne i nieformalne reguły i konwencje. Wyniki naszych badań sugerują, że czasami aby utrzymać konkurencyjność, branże potrzebują czegoś więcej niż tylko stopniowych zmian produktów czy technologii. Jak widać na przykładzie hiszpańskiej branży połowu dorsza, potrzebne są gruntowne zmiany, które wpłyną na cały system produkcji. Nawet jeżeli sferę produkcyjną dotkną gruntowne zmiany, nie oznacza to poważnych zmian w sposobie dokonywania innowacji przez firmy, czyli w w ich systemie innowacji.

Słowa kluczowe: instytucje, systemy innowacji, przemysł połowu dorsza, zmiana.

Innovation Capital and its Measurement

Tomasz Kijek*

Abstract

Innovation capital regarded as an element of intellectual capital reflects the ability of an organization to create and commercialize the new knowledge (innovations). The aim of this study is twofold. Firstly, an attempt is made to give a concise review of innovation capital concept and its measures in selected intellectual capital – IC –models. Secondly, this paper sets out to extend the current models and introduce a new valuation method of innovation capital. Moreover, the paper provides empirical evidence about the use of the proposed method.

Keywords: innovation capital, knowledge assets, intellectual capital, measurement.

Introduction

With the increasing importance of new knowledge, innovation capital has become the core of intellectual capital providing a powerful drive for gaining and sustaining competitive advantage (Sullivan, 1998). The results of recent studies (Wang, 2011; 2012; Chang and Hsieh, 2011) using R&D as a proxy for innovation capital have unambiguously shown the positive relationship between innovation capital and the firms' performance. Strategy literature derived from the resource-based theory (Wernerfelt 1995; Barney 1997) states that in order to fulfill a sufficient condition for effective managing and extracting value from innovation capital it is necessary to recognize and measure its elements (Castro et al., 2010). A few authors (i.e. Edvinsson and Malone, 1997; Wagner and Hauss, 2000; McElroy, 2002; Chen, Zhu, and Xie, 2004) have tried to define innovation capital in a distinct way and propose their own categorization of the concept. The definitions of innovation capital differ from one another with relation to the defining perspective (i.e. technological, organizational or sociological) and the scope of categorization of innovation capital. The differences in the definitions of innovation capital lead to different approaches to measuring it. But what is common to all the measurement methods is that they measure only particular elements of innovation capital, not the concept as a whole. Given this, the paper is intended as a review of the literature available on defining and measuring innovation capital, as well as it introduces and validates a new valuation model of innovation capital.

* *Dr Tomasz Kijek, University of Life Sciences, tomasz.kijek@up.lublin.pl.*

The proposed methodology of estimating the value of innovation capital is based on the assumption that it is possible to funnel a part of the value of intellectual capital to the value of innovation - generating knowledge assets. In the valuation procedure innovation capital represents a multiplicative function/equation of three elements, i.e. the value of intellectual capital, an extracting coefficient and an efficiency coefficient. The first coefficient allows for extracting the value of innovation capital from the value of intellectual capital. The second coefficient represents what in Edvinsson and Malone's (1997) terminology is called "the truth detector" of the equation. Details on each step of the estimation procedure are provided in the next section of the paper.

Definitions of innovation capital

Innovation capital is a term that arises from a conjunction of two seminal economic concepts, i.e. capital and innovation. The former is treated in neoclassical capital theory as a factor of production that enters as an input into resources transformation process (Birner, 2002). Most contemporary economists assume that there are two kinds of capital included in the production function models, i.e. physical capital and human or knowledge capital, both of which are accumulable (Arestis, Palma and Sawyer, 1997). The stock of capital can render different productive services that affect its value. The latter can be understood as a process (Trott, 1998; Tödtling, Lehner and Kaufmann, 2009) or an effect (Dosi, 1992; Adams, Bessant and Phelps, 2006). In the first approach, innovation consists of all the decisions and activities that occur from the recognition of a need or a problem, through research, development and commercialization of an invention (Rogers, 2003, p. 137). In the second approach, innovation means the introduction of a new or significantly improved product (or service), process, marketing method or methods in organizational practices within a company, in the workplace or in foreign affairs (OECD, 2005, p. 46). In the light of the presented meanings of the concepts of innovation and capital, innovation capital is a bundle of the firm's resources/assets that renders complementary services in the process of new knowledge (innovation) creation and commercialization. This definition sensu largo can be further detailed on the basis of intellectual capital – IC –theory.

There is no generally accepted definition of innovation capital in IC literature. One of the earliest definitions is given by Edvinsson and Malone (1997). They describe innovation capital as renewal capabilities of a company in the form of intellectual properties and other intangible assets used to create and introduce new products and services to the market. There are other definitions of innovation capital that not only benefit from Edvinsson and Malone's approach but also add new concepts such as learning, culture, technology and networks that are crucial in the new product/service development process. Table 1 summarizes some of the definitions of innovation capital introduced in IC literature.

Table 1. Definitions of innovation capital

Definition	Authors
The competence of organizing and implementing R&D, unremittingly bringing forth a new technology and a new product to meet customers' demands.	Chen et al. (2004)
The capabilities of a company to generate value in the future. It contains the component development of processes, products and services, but also technology and management issues.	Wagner and Hauss (2000)
The ability of a company to develop new products, as well as any creative ideas.	Tseng and Goo (2005)
A particular archetypical social pattern which aims at production, diffusion and application of new knowledge by, and for, an organization.	McElroy (2002)
Direct consequence of the company's culture and its ability to create new knowledge from the existing base.	Joia (2004)
The combination of organizational knowledge necessary to develop future technological innovations.	Castro, Verde, Saez and Lopez (2010)

The analysis of these definitions allows for the identification of key features of innovation capital that can be described as follows:

1. Its intangibility.
2. Its potential to create value in the future.
3. Its reliance on technologically as well socially as embedded knowledge.
4. Its excludability by property rights and trade secrets.

Moreover, these definitions provide a useful framework for the identification of innovation capital components.

Elements of innovation capital

In the resource-based view of a firm, innovation capital, treated as the ability of a company to create and commercialize innovations, can be regarded as a bundle of assets and, more generally, resources. An asset/resource is strategic if it fulfills the requirements of being valuable, seldom, immobile and not substitutable (Barney, 1997). As previously stated, innovation capital possesses attributes that make it a "strategic asset". For the purpose of identifying innovation capital assets, it is important to specify the nature of these assets in relation to the new knowledge (innovation) generation and commercialization process.

According to Edvinsson and Malone (1997), innovation capital consists of two components, i.e. intellectual property – IP and other intangible assets. Intellectual property represents legally protected and codified knowledge that can be viewed as business assets (Sullivan, 2000). Urbanek (2008) groups IP rights into two bundles, i.e. creative IP rights (e.g. trademarks, author rights) and innovative IP rights (i.e. utility models, patents). The latter exist in order to protect an invention that meets three requirements for a patent: novelty, non-obviousness and usefulness. In general, invention is the first occurrence of an idea for a new product or process, while innovation is the first commercialization of the idea (Fagerberg, 2004, p. 4). Invention

is mainly the result of R&D activity defined as creative work carried out on a systematic basis in order to increase the stock of knowledge and the use of this knowledge to devise new applications (OECD, 2002, p. 28). It is important to note that International Accounting Standards No 38 - IAS 38 – differentiate between the research and the development phases. This separation causes that the research phase, providing (general) new scientific or technical knowledge and understanding, is, in terms of IFRS, not regarded as an investment, which conflicts with the resource-based view of innovation capital (Günther, 2010, p. 323). From the resources perspective, both innovative IP rights and R&D are in most cases the technological, codified (registered and unregistered) knowledge assets in a portfolio of innovation capital.

Another group of the elements of innovation capital consists of intangibles that are in most cases non-technological and embodied in the organizational routines and thinking of the employees. These elements can be described as follows:

1. Innovation strategy that relates to strategic choices a firm makes regarding its innovation (Ramanujam and Mensch, 1985), i.e. the selection of the type of innovation that fits best the firm's objectives and the allocation of resources to different types of innovations.
2. Innovation culture that is the mixture of the innovation-related attitudes, experiences, beliefs and values of the employees (Sammerl, 2006, after: Schentler, Lindner and Gleich, 2010, p. 307). Innovation culture has an integrating function and stimulates innovation activities.
3. Innovation structure that encompasses both the innovation process organization (i.e. roles, responsibilities, steps, etc) and the way the employees engaged in the innovation are grouped (Adams et al., 2006, p. 33).
4. Knowledge (technological and non-technological) possessed by the employees engaged in the innovation process. This knowledge is tacit to varying degrees. The stock of knowledge can be increased by internal and external learning of an organization (Schentler et al., 2010, p. 308). Internal learning refers to the creation of new knowledge within the enterprise, while external learning pertains to the integration of knowledge from outside the enterprise.

Figure 1 shows that innovation capital assets render services in the innovation process in combination with other assets of a firm such as physical assets, financial assets and other intangible assets. The theory and practice of the innovation process indicate that for a successful implementation of new inventions, the organization requires both the physical backup, i.e. machinery, equipment and buildings, and the financial one (Dodgson, Gann and Salter, 2008). In relation to the intangibles employed in the innovation process, Wagner and Hauss (2000) point to the dynamic interactions between the innovation capital's assets and other types of intangible assets. They also stress that effective implementation of innovations depends on the use of all kinds of intangibles in innovation activity.

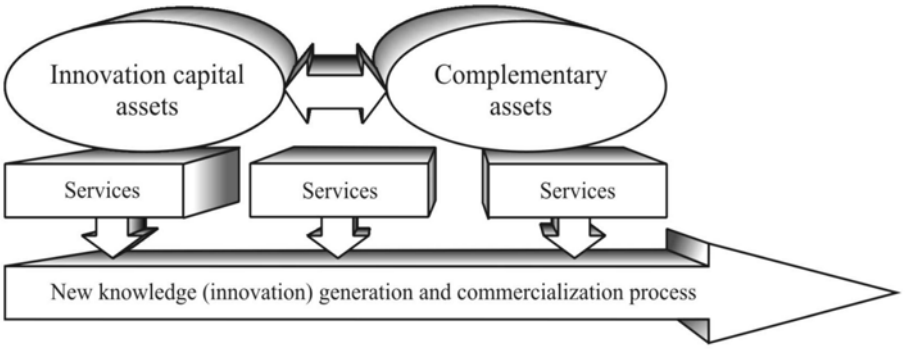

Figure 1. Innovation capital and complementary assets in new knowledge creation and commercialization process

To sum up, innovation capital consists of a set of resources/assets that can be regarded either as static knowledge – potential input to the knowledge transformation process, or dynamic knowledge – in transformation, and finally as the results of the knowledge transformation process. Under this approach, the stocks of innovation capital elements can be increased by knowledge flow from inside or/and outside of the company. For technological assets Dierickx and Cool (1989) made the distinction between the stock of technological know-how and R&D expenditure, treated as the knowledge flow, using "bathtub" metaphor. The fact that know-how depreciates over time induces R&D spending. In case of non-technological and uncodified knowledge assets counting of their stocks is extremely difficult. However, given the nature of these assets, Johnson (1999) argues that the use of sociological measurements may be most appropriate in this case.

Measurement of innovation capital

In order to manage innovation capital rationally it must be measured and reported upon. The issue of measuring innovation capital is important as much as it is used to develop innovation capital assets and estimate their effect on a firm's performance (Kaplan and Norton, 1996). Therefore, there is a pressing need to measure innovation capital from the perspective of internal decision making. Moreover, innovation capital measurement is necessary for communication with external shareholders (Mourtisen, Bukh and Marr, 2005), especially with investors seeking information on future performance of companies. It is important to stress that the measurement of innovation capital is difficult, since innovation capital assets are often context specific and interconnected (Marr and Spender, 2004).

Measurement of the innovation capital regarded as a component of intellectual capital can be performed with direct methods - DIC - and scorecard methods- SC (Roos, Pike and Fernström, 2005). Financial indicators are used as a part of the direct methods to assess the value of the elements of intellectual capital, whereas in case

of the scorecard methods, non - financial indicators and indices are used. Table 2 presents lists of indicators of innovation capital in both the non - financial approach and the financial one.

Table 2. Indicators of innovation capital

Approach	Indicators
Non - financial	Number of new products/processes introduced in the last three years
	Average time of new product/process development
	Number and quality of patents or patent claims
	Number and quality of R&D employees
	Cooperation between R&D, production and marketing departments
	Propensity to exchange of knowledge in social networks
	Management's support for innovation culture
	Management ability to deal with innovation projects
	Incentives for innovative employees
	High management support for innovation
Financial	R&D expenditures
	Sale of new products
	Income from the licensing fees

Source: Chen et al. (2004), Wu, Chen and Chen (2010) and Günther (2010)

In case of certain elements of innovation capital, such as patents and R&D, it is possible to calculate their monetary value using the following approaches (Krostevitz and Scholich, 2010):

- Cost approach, which is based on cost assessment of an asset according to the costs needed to reproduce it or to duplicate it.
- Market approach, which assumes that the value of an asset can be derived from prices obtained for similar assets in the market.
- Income approach, which estimates the value of an asset by calculating the present value of future cash flows which are expected to be generated by the asset.
- Real option approach, which assumes that an asset provides the company with a range of different options. This flexibility allows the managers to avoid rigid decisions. The best known financial option pricing model is the Black-Scholes model (Sudarsanam et al., 2005).

New valuation model of innovation capital–foundations and calculation procedure

The literature review on the valuation models of intangible assets provided by Sveiby (2010) indicates that there is a lack of a model that estimates the aggregated value of innovation capital at this point in time. For example, Sullivan's (2000) Intellectual Asset Valuation – IAV model or Dow Chemical's Citation- Weighted Patents method (Bontis, 2001) allow for evaluation of the innovative IP rights but are insufficient for valuation of innovation capital as a whole. In turn, some of comprehensive IC measurement models

such as Skandia Navigator (Edvinsson and Malone, 1997) or IC index (Roos, Roos, Dragonetti and Edvinsson, 1997) tend to use and aggregate more or less consistent sets of measures of a firm's renewal and development capacity (innovation capital), but they are unable to give a direct financial value of innovation capital, which can be easily understood and interpreted by the firm's stakeholders. In order to reduce this gap in the literature on IC measurement, a new valuation model of innovation capital is introduced. Intentionally, the model is supposed to be an alternative for measurement models of innovation related intangibles, which take a narrow assets perspective or use different indices aggregated in non-financial manner.

The proposed methodology has different areas of applicability that range from external reporting to stakeholders, through comparison among firms within the same industry to management of innovation capital. The new valuation model deploys widely accepted approaches to valuation of intellectual capital, such as (Sveiby, 2010):

- Calculation of the overall value of intangible assets, using market capitalization methods or return on assets methods.
- Measurement of various components of intangible assets, using scorecard methods or direct intellectual capital methods.

At the model's foundation is a definitional assumption that intellectual capital equals the sum of human capital, structural capital, including innovation capital, and market capital that are merely labeled differently in various IC models (Bounfour, 2002). The additive form of IC concept gives the important implications for the field of IC measurement, since on the one hand it allows for a split-up of IC into a few dimensions and use of different measures covering major focus perspectives, and on the other hand it provides an opportunity for the consolidation of all the individual indicators into a single index on a firm (Roos et al., 1997) or national level (Bontis, 2004). The main problem with aggregation and disaggregation of IC elements measured in monetary terms is the choice of measurement structure. M'Pherson and Pike (2001) argue that the additive rule for value combination is the exception and suggest using conjoint measurement structures, e.g. polynomials that satisfy the combined value measurement requirement. Unfortunately, the authors do not provide convincing examples of how to measure the value effect of company's resources interaction. In turn, Roos et al. (1997) and Schweihs and Reilly (1999) propose the employment of the additive rule (1 + 1 = 2) used as a pragmatic necessity in the aggregated value calculation. In spite of these controversies, the additive rule for the IC value calculation is the main point in the proposed model.

The procedure of value calculation in this model is essentially defined by three stages:

1. In the first step of the algorithm the value of intellectual capital is calculated. The choice of valuation method at this stage is extremely important, since it has a direct impact on the next steps and determines the final result of valuation. In general, the use of a specific measurement method depends on such factors as purpose, situation and audience of measurement (Sveiby,

2010). Moreover, accurate, useful and defensibility of valuation requires the selection of a methodology applied with as much analytical rigor as the sources of input data will allow (Sullivan, 1998). For the proposed model, the choice of IC valuation method is limited to the market capitalization methods (e.g. Tobin's Q model or the market value less the book value method) and return on assets methods (e.g. KCE model (Lev and Gu, 2011) or CIV model (Stewart, 1997)). The methods assigned to the first group are often applied for an initial valuation of intangibles in situations of cross-companies comparisons, mergers and acquisitions or stock market valuations. Their support for management decisions making is constrained to an organization's level only (Skyrme, 2003). The methods of the second group are used in similar situations as market capitalization methods but they are regarded as being more sophisticated and formally rigorous. Considering the fact that the application of different methods results in values which differ, it would be recommended to utilize more than one valuation method for a comparative purpose.

2. The second stage in innovation capital valuation is the extraction of the value of innovation capital from the value of intellectual capital. This step is grounded in the additive rule for value calculation. The proxy for the extracting coefficient is the share of new products sales in relation to total sales. This coefficient is a direct measure of the exploitation of innovation capital and funnels part of the value of intellectual capital to the value of innovation capital. It relates to innovations that were introduced into the market and that resulted in a positive cash-flow (Kleinknecht, Montfort and Brouwer, 2002). By far the share-in-sales of new products or services is one of the most commonly used measures of a firm's innovativeness and is widely applied in empirical research (Crépon, Duguet and Mairesse 1998).
3. The assessment of innovation capital efficiency. The efficiency coefficient represents how effectively an organization is currently using its innovation capital and can be treated as a proxy for the quality of innovation capital's assets. The roots of the efficiency coefficient can be found in the work of Edvinsson and Malone (1997) and according to them, it captures a firm's velocity, position and directions. Efficiency in this model is defined as the ratio of the results of innovation capital exploitation (e.g. number of innovations or sales of new products or services) to innovation capital's assets. For the sake of calculation correctness, the coefficient must be normalized. The method that provides relative efficiency with multiple inputs and outputs is DEA (Data Envelopment Analysis). The DEA efficiency of the firm is measured by estimating the ratio of virtual outputs to virtual inputs in relation to the group of homogonous firms - Decision Making Units (Cooper, Seiford and Tone, 2007). DEA has been widely used in many application areas, but recently some authors, e.g. Kijek (2010), Chen and Lu (2006), have proposed to use DEA to measure the efficiency of innovation activity at the firm level.

Figure 2 presents the structure of the model in the form of mathematical relationships among its elements.

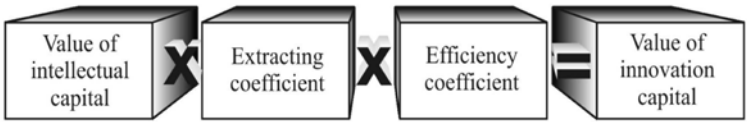

Figure 2. Elements and structure of the model

The underlying simplicity of the model allows the researchers and practitioners to adopt it in a variety of firms and sectors. The model is especially useful for knowledge based companies where the innovation intangibles form the core assets. What is important, it provides managers and other stakeholders with the financial value of innovation capital, which is especially useful for them. Moreover, the model fulfils other Lynn's (1998) criteria for measuring intellectual capital, i.e.: it is based on information that is currently accessible, it uses measures that are understandable and relevant, it proposes proxies for the quality data that constitute the measured concept.

However, there are a few drawbacks of the model. The most obvious flaw is that this method is static and relies on ex post values. Nevertheless, the model gives an opportunity to extrapolate and validate the value of innovation capital into the future. Moreover, some controversies may arise from the concept and the calculation of the extracting coefficient. Firstly, the coefficient concept relies on the assumption that the value of intellectual capital can be separated into additive elements, ignoring the fact that the synergy of intangibles has a significant share in value creation. Secondly, the allocation key is arbitrary, since innovation capital allows the company to introduce not only new products/services but also other types of innovation. What is more, the coefficient is sensitive to the "age" of the firm, especially in case of start-up companies with an extremely high level of new product revenues. It is clear that the model has its strengths and weaknesses, and that there is a possibility for its improvement.

Methodology and results of research

In order to test the new method for the valuation of innovation capital, an empirical study has been conducted. In the first stage of the study the test sample has been selected. The sample includes 9 companies from IT industry listed on NewConnect market – Polish Alternative Stock Exchange. The companies have been ranked by investors among the 25 most innovative firms listed on the NC market. The sample selection was purposive, since it was important for the study to be conducted on a set of firms rich in innovation capital. As it is known, companies in the IT sectors actively invest in innovation capital, which results in a high level of their innovativeness. The IT industry is classified as a knowledge-intensive industry, where the lifespan of technology is quite short and new product introductions are frequent. As a consequence, this industry has been often chosen for studies on intellectual capital

(Wang and Chan, 2005) and innovation (Goswami and Mathew, 2005). Moreover, the sample has been determined by model assumptions, especially by the firms' homogeneity requirement and by the requirement of the minimum number of DMUs in the DEA analysis (Emrouznejad and Gholam, 2009).

According to the procedure of value calculation of innovation capital within the model, the first step is the valuation of intellectual capital. This has been carried out by using

the KCE model based on the classical economic theory of production function. Under this approach, the value of intellectual capital is estimated by subtracting the normal returns on physical and financial assets, from the economic performance measure – normalized earnings. The residual then becomes the contribution of intangible assets. Capitalizing the expected stream of intangibles-driven earnings over future years gives an estimate of "intangible capital." The model formula is as follows:

$$VIC=(NE-\alpha*PA-\beta*FA)/\gamma \quad (1)$$

where: *VIC* – value of intellectual capital (intangible capital), *NE* – normalized earnings, *PA* – physical assets, *FA* – financial assets, α – normal rate of return on physical assets, β – normal rate of return on financial assets, γ – discount rate of intellectual capital.

The interpretations of the model variables, i.e. normalized earnings, physical assets and financial assets, have been adapted from Kasiewicz, Rogowski and Kicinska (2006). The model parameters, i.e. normal rates of return on physical and financial assets and a discount rate for intangibles-driven earnings, have been calibrated using the values of coefficients proposed by Lev and Gu (2011). To determine the normalized earnings I have used three-year historical data (i.e. the years 2008-2010).

Next, the extracting coefficient has been calculated as the ratio of the sales of the new products or services (introduced in the years 2007-2008) to the total sales in the year 2010. The lag between the period of the introduction of new products or services and the relative sale effects of these innovations is consistent with a methodology of gathering data of firms' innovation activity for making the NewConnect Innovativeness Ranking. The data provided by the ranking participants have been used in the study.

In order to calculate the efficiency of the firms, the output-oriented BCC model proposed by Banker et al. (1984) has been employed. This model assumes variable returns to scale The output orientation of the model in the study results from the assumption that the objective of the exploitation of innovation capital is to increase outputs. The model deals with one input and two outputs:

x_1j- R&D expenditure in the years 2007-2008 (as percentage of total sales).

y_1j- the number of new products or services introduced in the years 2007-2008.

y_2j- the revenues from new products or services (introduced in the years 2007-2008) in the year 2010.

The model can be expressed by the following mathematical formulation:
ψ_0=maxψ,
s.t.:

$$\sum_{j=1}^{n} y_{rj}\lambda_j \geq \psi y_{r0},$$
$$\sum_{j=1}^{n} x_{ij}\lambda_j \leq x_{i0},$$
$$\sum_{j=1}^{n} \lambda_j = 1,$$
$$\lambda_j \geq 0.$$

where DMUo represents one of the n DMUs under evaluation, and x_{io} and y_{ro} are the ith input and *r*th output for DMU_o, respectively. If 1/ψ*=1, then the firm under evaluation is efficient. Otherwise, if 0<1/ψ*<1 the firm is inefficient, i.e., this firm can increase its output levels. The efficiency scores in this study have been estimated using the program DEAP Version 2.1. Table 3 summarizes the results of the valuation of innovation capital in the selected sample of the firms.

Table 3. Values of firms' innovation capital

Firm	Value of intellectual capital [in million EUR]	Extracting coefficient	Efficiency coefficient	Value of innovation capital [in million EUR]
A	3.85	0.65	1.00	2.50
B	3.15	0.04	1.00	0.13
C	0.34	0.47	0.34	0.05
D	0.26	0.44	0.68	0.08
E	1.46	0.85	0.58	0.72
F	0.91	0.38	0.32	0.11
G	0.25	0.52	0.69	0.09
H	0.92	0.08	0.71	0.05
I	0.47	0.84	1.00	0.39
Mean	1.29	0.47	0.70	0.46
Std. Dev.	1.25	0.27	0.25	0.75

Within the sample, the values of the firms' innovation capital differ to a great extent. For firm A with the highest value of innovation capital, the reasons for its classification are quite simple to understand and can be posited as being primarily threefold. Firstly, the firm has the highest value of intellectual capital. Secondly, its extracting coefficient is quite high. Finally, the firm is efficient in the exploitation of innovation capital. The problem that may arise from the calculation procedure in this case is the size effect. A common solution to this problem is to deflate the value of intellectual capital (Abeysekera, 2011). Nevertheless, in case of other firms the size effect is balanced by the extracting coefficient and the efficiency coefficient. For instance, the second – largest firm by the value of intellectual capital (i.e. firm B) has a relatively low value

of innovation capital in relation to the leader because of its extremely low level of the extracting coefficient. As mentioned previously, the efficiency coefficient also affects the value of innovation capital to a significant extent. There are three efficient firms in the sample (i.e. firms A, B and I) and for the rest of them the values of the coefficients are less than one and indicate their level of inefficiency. Moreover, on the basis of the efficiency coefficient it is possible to measure the potential value of innovation capital, assuming efficiency of all firms.

The results of calculations of the values of innovation capital can be regarded as either strategic or operational objectives of innovation capital management. For example, the firms with extremely low values of the extracting coefficient and high values of the efficiency coefficient (i.e. firms B and H) should focus their attention on how to reformulate the innovation strategy to achieve the potential value of innovation capital. In turn, the firms that are inefficient in exploiting their innovation potential (i.e. firms C and F) ought to analyze the process of innovations implementation and identify the areas, i.e. the elements of innovation capital, for improvement.

Summarizing the results of the research, it should be noted that they are limited to the sample firms. The study allows for illustrating how the model helps to reveal the value of intangible assets rendering services in the innovation process. Moreover, the research findings supply the opportunity to identify "best practices" in relation to the exploitation of innovation capital within the sample. Although the model provides a rough value of innovation capital, the results of its application may be a starting point for a further, more detailed, valuation of the elements of innovation capital.

Conclusions

This paper produces a few important contributions to the theory of innovation-related intangibles. Theoretical implications of this work concern two subject areas: the literature on defining and categorization of innovation capital and the literature on measuring innovation capital.

In the first case, the paper provides the working definition of innovation capital, derived from the theory of capital and the theory of innovation, and identifies its key features. In addition, this work offers a new classification of the innovation capital's elements. The proposed classification goes beyond the narrow focus approaches, typical for most of IC models, since it includes a broad set of knowledge assets ranging from the technological assets to the tacit knowledge embedded in employees.

In the second case, this paper introduces a new valuation model of innovation capital with its own calculation procedure. The new valuation model is based on the assumption that it is possible to funnel a part of the value of intellectual capital to the value of innovation capital. The model consists of a three - stage algorithm. The value of innovation capital is estimated as a result of multiplying three elements, i.e. the value of intellectual capital, the extracting coefficient and the efficiency coefficient. From the methodological point of view, the method is an incremental innovation in the literature on intangibles measurement, but underlying simplicity of the model makes

it useful for managers and other stakeholders and as Skyrme (2003) comments on the stage of IC measurement development: “Here, simplicity can be a virtue” (p. 239).

Considering the managerial implications, it is worth emphasizing that the model use may facilitate the process of innovation capital management by increasing manager’s understanding of the contribution of innovation capital into a company’s performance. It seems to be extremely important for managers that innovation capital is measured in monetary terms in the model. This helps managers to focus their attention on the increase of the value of innovation–related intangibles. What is important, the results of the value of innovation capital estimation within the sample are useful in the processes of searching for best practices and identification of the areas and means of performance improvement. Moreover, the model provides more relevant information to investors and analysts on the company’s innovation capacity than traditional, single measures of innovation capital such as R&D or patents. Thus, the model may be deployed to a process of fundamental analysis to support the stock price forecasting.

The results of the model application in the sample of the IT firms are very interesting and can be regarded as an illustrative example of the model use. Moreover, the results of the study provide an opportunity to comparative analyses. Because this study has been conducted on the sample of the firms listed on the Polish alternative trading system, the results may be used as a benchmark for the comparison of the value of innovation capital of IT firms listed on other European or American alternative trading systems. Although the results seem to be informative, they have some limitations. Firstly, as previously noted, the model has been trialed with a limited number of companies form the IT industry. Secondly, the KCE model of calculating the value of intellectual capital has several drawbacks (Ujwary-Gil, 2009). Thirdly, the number of inputs (i.e. the elements of innovation capital) in DEA model used to estimate the efficiency coefficient is relatively small. Instead, there are several other elements of innovation capital beyond the scope of this study that may be included in DEA analysis.

Due to the above limitations, further research on the model application is needed. The interesting new pathways for the future are: extending the scope of research to work with a statistically significant sample, using other models of the valuation of intellectual capital in the first step of the valuation algorithm and broadening a set of inputs in the DEA method so as to include more elements of innovation capital in the process of estimating the efficiency coefficient. I believe that in this way the model may provide more accurate values of innovation capital.

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Abstract (in Polish)

Kapitał innowacyjny traktowany jako element kapitału intelektualnego odzwierciedla zdolność organizacji do tworzenia i komercjalizacji nowej wiedzy (innowacji). Podstawowe cele prezentowanego opracowania obejmują przedstawienie syntetycznego przeglądu literatury z zakresu definiowania, kategoryzacji i pomiaru kapitału innowacyjnego w wybranych modelach kapitału intelektualnego oraz opracowanie i empiryczne zweryfikowanie nowej metody wartościowania niematerialnych aktywów innowacyjnych.

Słowa kluczowe: kapitał innowacyjny, aktywa wiedzy, kapitał intelektualny, pomiar.

Languages in Problem Solving and Modeling

Kazimierz Śliwa*

Abstract

The article concerns the problem of languages used in modeling and solving problems. Its framework stems from the distinction between two problem solving approaches – expert and interactive approach. The language choice is particularly important for the latter; we cannot solve a problem using a language that has not been used for the problem description. The text presents some arbitrarily chosen problem modeling languages, including computer supported ones. Special attention is paid to the SEQUAL and System Dynamics language.

Keywords: problem modeling and solving, formal modeling languages, expert and interactive approach to problem modeling, SEQUAL, System Dynamics language.

Introduction

It is possible to discern two types of problem solving and modeling. The first one, commonly used in problem modeling practice, relies in transferring the responsibility for a problem to external experts who – after diagnosing the problem – work out a suitable model, run it, and propose viable solutions. That approach has been dominating for decades, particularly in dealing with complex problems, and we call it alienative modeling hereafter. The nature of another approach is participative; it requires all people having an interest in solving a problem to be engaged in its modeling and solving. The term „interest" means problem stakeholders for whom the problem is part of their surroundings.

The dominance of the alienative approach dates back to the 1960's; works conducted at Wharton School, MIT, or Brookings Institution led to the creation of complex econometric models of whole national economic systems containing thousands of equations. What was the practical value of those models?

In general, these complex models and their usage had led to increasing disappointment with their practical implications. Forecasts provided by these models, despite their size and complexity, did not prove true; that is why as early as in the 1970's concerns regarding further development of these models began arising. Many critical comments indicated that these models do not have stable structure, and

* *Dr Hab. Kazimierz Śliwa, Uniwersytet Rzeszowski w Rzeszowie, ksliwa@univ.rzeszo.pl.*

consequently, even small changes in the problem contents require the whole model to be re-worked. Another criticism pointed to the confusion between relationships and correlation; models were functional as far as the assumption about correlation among their components was true. Discovering relationships among problem variables is the core concept for problem modeling and solving - correlations does not always mean causality yet.

Under those circumstances a new approach to problem modeling has arisen. Although still in the initial development stage, participative modeling strives for acknowledging that problem solving is also learning about problem structure, discovering its structure and searching for leverage points existing within the structure. Problem solving domain, traditionally assigned to experts, had to be taken away from them and replaced with an open access to modeling of all involved stakeholders. Open access to problem solving and modeling creates many issues and a good part of them is linguistic – participation in problem solving depends on precise yet understandable for non experts language that would make it possible to work on problems collectively. Such a language must satisfy three requirements:

- expressiveness (the possibility of a formal description of the problem without losing its complexity and dynamics),
- clarity (ability to understand, create and modify a model by the participants),
- solvability (availability of methods for solving the model, especially the computer procedures).

If the modeling of problems, including the problem of regional development, is not to be exclusively the domain of experts, it is necessary to pose and solve the problem of modeling language. Not only do we describe the reality in our natural language, but also the way we see and understand the reality is embedded into our language. Using our natural, native language for problem modeling would be an ideal solution, yet it seems unreachable – it does not satisfy conditions mentioned above. It may be worth mentioning that the bigger the gap between natural language and the language of modeling, the greater the loss of precision of the model and its quality.

The line of argument adopted here is subordinated to this issue. At the beginning of the analysis, the generative and modeling role of spoken language is presented; then we describe the main types of languages used in the problems modeling and analyze the compatibility between the model and computer simulation. The model of a problem requires a series of operations to tackle the problem modeled through computer simulation. Without this condition problem inference is speculative and the practical value boils down to often complex but lacking practical advantages intellectual experiment. For this reason, another part of the study examines the simulation as an integral part of problem solution. and finally- the last part is devoted to the presentation of one of the most attractive alternatives in modeling – System Dynamics.

Language and problem solving

Language itself is a very dynamic system, not only in the sense that its social practice continuously modifies its forms and contents, but also that its use is associated with the intensive information processing that occurs in the brain. Elman indicates (Elman 1995), with this cognitive point of view, that this process may be something different than it is claimed by psychology. Language is an abstract representation of the reality surrounding us; its specific components can be arranged according to a variety of patterns and they create a semantic whole encompassing the situations in which we live. Traditionally, such representations were treated as a static entity, whilst the language is not a set of abstract symbols, but rather a multiplicity of meanings of space among which there may occur a variety of transitions. Some of them take place with relative ease, others with less, but generally the most difficult is the transition from one space to the other space and not within those spaces themselves (see Churchland & Sejnowski, 1992). For each space there may be a different linguistic identity – thus a different language. Therefore, mathematics has its own language, poetry uses another one, arts – painting or music have yet others. Our spoken language used in everyday practice is characterized by still other properties. To illustrate this imagine that we want to express using our natural language the music of Ludwig van Beethoven's Ninth Symphony or present the theory of gravity with a musical recording.

Linguistics and its relative science – semiotics, analyze the structure, the correctness and effectiveness of the language on three levels. The first level is semantics, dealing with the relationship between language constructs (characters) and objects of reality to which they relate; semantics, thus, takes care of binding the language to its origin (reality). Semantics affects our cognition in quite complex form. There is a feedback loop between the reality and language: we create only those constructs and meanings which have their counterpart in reality and – on the other hand - only the objects of reality that already exist in the existing repertoire of meaningful constructs (or are very close to them) are seen.

Another component of semiotics, syntax, designs formal structures of the relationship between the characters which make up the language by creating rules and their variations (e.g., grammar). The result is a set of propositional structures by which we describe reality in a way that is understandable to all speakers of that language. And finally, we have pragmatics – the study of the influence upon human behavior generated at the level of semantic and syntactic meanings. This is the most dynamic part of language, because we constantly create the meaning and interpretations of reality; they are not fixed but subject to constant change which requires learning process - reinterpreting the meanings, creating new ones – in short, the formulation of new theories of action.

Therefore, there are three areas through which our cognitive process muddles through while designing our understanding of the reality and actions aiming at it. The effectiveness of our action, the scope and character of changes produced by our behavior, depends on our crossing these areas with new meanings, rules, language.

What is the place of modeling in this picture? What linguistic dilemmas must be recognized and resolved? One will be here with reference to the graphic interface instilled into a language; such language - like no other – is an easy way to handle knowledge about the structures of the problems. This problem will be discussed further. Figure 1 presents above argumentation.

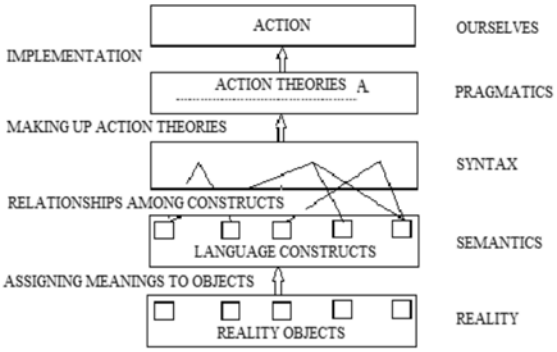

Figure 1. Modeling as learning theory of action

The key question here concerns the alternatives for the location of the modeling process in the context of language semiotics. It seems that these alternatives are:

- modeling language is a separate and specially created entity; it is an autonomous entity and although it can be analyzed in a similar semiotic perspective, its features make it inaccessible to other people. It seems that this choice is close to the aforementioned alienative approach to modeling and solving problems: language is hermetic, only we understand it, thus the possibility of criticism is reduced or eliminated.
- modeling language is merely an add-on to our natural language; it is an additional link of the semiotic structure of language that connects us to reality and there are valid reasons to believe that specialized expertise in modeling language is not necessary for modeling and solving problems.

It is helpful to support our argumentation with the paradigm reported as the Physical Symbol System Hypothesis (Newell and Simon 1976, Simon 1980). In H. Simon's words, phrases and other elements of language remind the construction in the edifice - words and expressions (semantics) are the blocks and bricks, and the relationships and rules (grammar) act as cement connecting them. Using language and thinking through the language is like construction process where the result is a mental model of the problem. The mental model of the problem is the beginning of the modeling process and necessary condition for future action.

In summary, problem solving requires modeling, either formal or intuitive, and this should take place close to the knowledge and commitment of stakeholders for whom the issue is "natural". Expert modeling approach essentially excludes this

condition, which later negatively affects the link between the solution of the problem and the practical actions of the stakeholders. For these reasons we propose the use of modeling within the context of the stakeholders' collective knowledge, and that creates significant demands for precise and collaboration - orientated modeling language.

Some remarks on modeling languages

We assumed that the modeling language is a specially designed artificial system of signs and meanings, subject to certain interpretative rules and structure, which allows the expression of knowledge and information about the object being modeled in such a way that the object behavior has an interpretive meaning to the modeler. The practice of modeling has generated many languages, most of them are associated with software design and engineering programming.

Modeling languages are subject to the same rigors as the models and their prototypes. There are four main conditions that must be met:

- modeling language should allow visualization of the structure of the modeled system, both its current structure as well as the desired future structure,
- it should allow the description of the behavior of a modeled system,
- it should provide a template for the construction/modification of a modeled system, and:
- it should document decisions designed for influencing a system.

We propose below an arbitrary classification of modeling languages; they will be classified according to different criteria, such as user's interface, relation to a particular discipline of knowledge, descriptive character or formal mathematical notation. Graphical modeling languages are commonly used in project management and statistical decision theories. In software engineering graphical languages are particularly useful as they allow for the participation of various stakeholders; designing complex software should meet their expectations which often are expressed in natural language. Thus, graphical languages play an intermediate role between spoken, natural language and resulting software design. Another reason for gaining popularity is that graphical interface is understandable for most people so that even professionally unprepared participants can take part in the problem modeling process. This group of modeling languages is the most numerous.

Next group, algebraic modeling languages are most often high order programming languages and they are used to mathematically describe problems as equations system and solve them on a large scale. Typically, these are modeling languages for optimization problems, characterized by the availability of data and information as well as clearly defined structures. They typically do not contain any indication as to how make the model operate.

Behavioral modeling languages are used to describe the behavior of complex systems consisting of components that operate in a simultaneous manner. Although behavioral languages rely mainly on process algebra, their characteristic feature is the

confinement only to observable phenomena that constitute the functioning of the system. They incline more towards descriptive languages than to modeling ones.

Modeling language of specific orientation can be divided into several groups depending on their purpose and the degree of structuring. Their common feature is a clear emphasis on software engineering in various stages of its design, which determine the type of language used. That group contains knowledge discipline oriented languages (called DspM), offering the library of concepts for each design stage and a special syntax, all in relation to the various stages of software development (discovery, analysis, design, architecture, testing). An example might be DspM SOMA (Service Oriented Architecture modeling) or SOMF (Service Oriented modeling Framework). Still other groups are domain-oriented languages (DSL), language-oriented context (DSF) and the object-oriented languages (OOML).

Especially the latter are worth attention because in many organizations they are applied to complex projects, where their essence is the involvement of numerous participants from many functional areas who otherwise would have difficulty with the participation. Object-oriented languages allow the creation of so called shared vision which is a collective wisdom enabling teams to strive for the same or similar goals. Another important feature of these languages is the extensive use of graphical interfaces and highly abstract codes of recording the contents and meanings. Although graphical access facilitates conceptual work on the project and the participation of interested persons, yet abstract code requires special preparation, thus the involvement of specialists is necessary.

And finally the last group of modeling languages has been developed primarily for modeling three-dimensional phenomena (e.g. space and structure of the WWW), and which is often referred to as virtual modeling languages. The prototype was Virtual Reality Markup Language (VRML) here, which in 1995 was replaced by the Virtual Reality modeling Language (VRML).

Table 1 shows our arbitrary classification of modeling languages, along with the main languages, which fall into any of the listed groups. It is worth noting the direction of evolution, which they were and still are subject to. Early practice of modeling problems were performed within the body of suitable scientific disciplines (e.g. algebra, econometrics) and modeling languages used were based on those disciplines to the extent that determines not only their tools, but also the domain of applicability. With the development of IT and computers for modeling and solving problems, the practice of modeling has been increasingly matching the needs of software designers and engineers (at the expense of other professional groups).

Table 1. Arbitrary typology of modeling languages

GROUP	EXAMPLES
Graphical languages	Behavior Tree, Business Process modeling Language, Business Process modeling Notation, XML, EXPRESS EXPRESS-G, Extended Enterprise modeling Language, Flowchart, Fundamental modeling Concepts , iDEF (many versions, e.g. iDEF3, iDEF4, iDEF5), Jackson Structured Programming, Visual Design Description Language, Java, programming languages C, Object Role modeling, Petri Networks, Southbeach Notation, Specification and Description Language, Unified modeling Language, Architecture description language, AADL.
Algebraic languages	Algebraic modeling Languages, AiMMS, AMPL, GAMS, LPL, MPL, OPL and OptimJ
Domain orientated languages	Unified modeling Language, MetaEdit+, Actifsource, GEMS, GME, EAST-ADL, Energy Systems Language
Object orientated languages	LePUS3, interface Definition Language, ObjecTime Limited, Core Meta-Model, Paradigm Plus,
Behavioural languages	Behavior modeling Language, Universal modeling Language
Context depending languages	Framework Specific modeling Language, Rebeca modeling Language
Virtual languages	Virtual Reality modeling Language, Virtual Reality Markup, Generative Modeling Language, Web Services modeling Language

Over the time a computer program has become the archetype of modeling; it is eventually a collection of routine, procedures, and algorithms telling computer what, how, and when to perform those instructions. From the viewpoint of modeling, a problem originates the instructions and the software is only a structural and functional replica of the problem that is to be solved. Such a significant impact of software engineering upon problem modeling has resulted in a progressive vertical and horizontal integration of modeling languages. Horizontal integration depends on opening a language to other modeling domains that have so far remained in another particular scientific discipline (e.g. econometric modeling - econometrics and optimization – mathematics). This has led to increased versatility of modeling languages. With horizontal integration the same language, depending on its properties (semantics, syntax and pragmatics), can model various fragments of the reality.

Vertical integration concerns the internal development of modeling languages. Many of them have already passed the stage of autonomous development, in which each language produces more advanced modeling tools, thus expanding their applicability and helping the horizontal integration. The strive for an universal language has taken different forms; in some cases languages collapse and integrate the properties of many languages into one of them. In others, languages have followed a common standard enabling to use more than one modeling language within the same problem scope.

The problem of language selection to a specific problem is a very complex issue. In this paper we formulated the idea that modeling complex problems, especially

complex in terms of their structure and size (number of variables), requires an interactive and collective process, because active involvement of stakeholders in the process of modeling is the critical success factor, facilitating subsequent solution of the problem and its smooth implementation. For this reason, the choice of modeling language should be dictated by the quality of this language, which consequently leads to subsequent quality of the model itself. Among the existing proposals the concept of SEQUAL by Krogstie (2002) is worth mentioning. Figure 1 shows the general structure of SEQUAL.

A detailed discussion of SEQUAL exceeds the scope of this study and is probably not necessary. The name SEQUAL is an abbreviation of "semiotic quality" and its core concept emphasizes - in addition to the sufficiency and appropriateness of modeling language - the social efficiency of the modeling problem (and this is the central thesis of this paper). Sufficiency and appropriateness of language is reflected in te possibility to capture and present the structure and behavior of problems, while the technical efficiency is its adaptation to existing system requirements (e.g. IT solutions). Technical efficiency enables automatic verification and validation of the model, which requires its translation into a computer simulation (capability to generate a suitable computer code).

Figure 2. Modeling quality – SEQUAL framework
Source: Based on Krogstie 2002.

From modeling to simulation. The language of System Dynamics

While the modeling problem is the presentation of its variables, relationships existing among them (problem structure), and resulting problem behavior in the accepted formal modeling language, the next step of solving the problem - a simulation - requires codified procedures translating the problem model into computer procedures and operations. It is a mapping problem to a computer environment, which also

requires a separate code (language). It seems that in the simulation of problems three main approaches exist:

- Discrete modeling
- Agent Based modeling, and
- Systems Dynamics modeling

Selecting one of them is of utmost importance, because each of these approaches accentuates different properties of a problem. Many decades of practical problem solving have granted rights to solve problems to experts in the area, ignoring other factors that could and should help choosing an appropriate approach to modeling. We accept in this paper that problem contents should determine the choice of the problem modeling approach; thus, it is not experts' expertise domain but the nature of the problem rather that should point to one of the three approaches.

Consider, for example, simple yet possible scenarios for economic growth. When consumer demand is growing, national production grows, and consequently, it is growing the demand for workforce securing the continuation of production at the required level. Consequently, manufacturing and service sector expand, generating demand for money and credit. Banking sector profit soars and the banks are willing grant more credit to the investment hungry sectors. Booming investment and consumption lead to the creation of the strengthening mechanism among the manufacturing, service, and financial sectors. Nevertheless, no system can grow without limits; a correct model of this problem should clearly show that mechanism and predict its failure.

Depending on the election of the approach we have different ways to model this scenario. The discrete modeling might assume that the existing market segments and consumers are "discrete" entities (events), and the labor force, businesses, and banks are available resources. Discrete in this context refers to the state identifiable behavior (ability to distinguish one state of the operating behavior of others and the ability to describe these states). Thus, problem behavior is represented as a chronological sequence of events where each event occurs at an instant in time and marks a change of state in the system. As the simulation mode is adjusted to those events the problem behavior (tendency over time) must be to great degree the continuation of previous behavior patterns. However, the extrapolation does not tell us much about the future of described system.

If we accept the subjective perspective of modeling (Agent-Based), the consumers and their behavior might depend, for instance, on marketing, market features, credit availability, and the processes of communication among all market actors. All those autonomous agents interact and the agent-based modeling attempts to assess their effects on the system as a whole. We may expect, therefore, that the complex feedback loop closing from the market and financial sector back to the corporations and consumers will be removed; again, in this case the prediction must be incomplete and short-term.

Finally, in the perspective of System Dynamics we should turn the attention to various feedback loops that can occur in this situation; for example, increased demand for loans increases their price, loans become more expensive, so the demand must decrease and people already repaying loans are starting to have trouble servicing them. This will lead to further constraint of market demand, and consequently, economic production slows down and the whole system reverts its behavior.

The success or failure of modeling complex problems (e.g. regional development) depends on understanding the relationships and internal dynamics produced by the components and the structure of a problem. Those relationships make up problem structure and determine its behavior. The policy or plan adopted for a problem is largely dependent on whether the policy makers truly understand the interaction and complexity of the system they are trying to influence. Considering the size and complexity of such problems, it is not surprising that the "intuitive" or "common sense" approach to policy design often falls short, or is counter-productive to desired outcomes. Besides, problem modelers must possess equally extensive and correct knowledge of the internal dynamics involved. It seems that out of these three approaches to simulation only System Dynamics provides suitable tools here.

Systems Dynamics was established as the modeling method in the 1950's and was developed by J. Forrester, then a professor at the Massachusetts Institute of Technology. The starting point was the transfer of the laws of physics to the field of economic, and later to social systems. Basic principles of system dynamics and features of its modeling language have been elaborated in the 60's. Attempts to use this method for modeling complex problems have proven its usefulness; it has successfully been applied to the analysis of macro-economic systems (the U.S. economy) and the regional development (under the name of Urban Dynamics). The former applications have resulted in a model explaining the long-term economic cycles of the U.S. economy, showing causes and contents of the Great Depression 1929 – 1933. In another and perhaps much more ambitious project System Dynamics was used to create a model of the world; apart of the original J. Forrester's version a number of its continuations have been produced by his students and colleagues (e.g. Denis and Donella Meadows). The usefulness of this method has caused that it was transferred to teaching in schools at all levels, both in the U.S. (so-called Project K-12) and in other countries, including Europe.

Presentation of System Dynamics as a methodology and modeling language should begin by sketching its ontological foundations. Ontological principles determine the way of understanding and modeling which affects the features of the language used. The language must capture the structure and behavior of systems exhibiting a dynamic changes over time. Therefore:

- an endogenous point of view should be adopted; the systems (problems) should be treated as closed in the sense that they can affect their input, so that the knowledge of their internal structure is sufficient to explain their behavior pattern; we assume that events are part of patterns, which are generated by problem structures,

- for understanding the structure it is necessary to identify relationships that exist between its elements; the most important type of relationships are those that create feedback loops- positive are responsible for the processes of growth and decay, negative - for their equilibrium. Circular causality in the system is the heart of system dynamics,
- importance of the identification of those variables that can accumulate their value over time (stock variables) and flows that affect them. Stocks are the memory of the system, and sources of disequilibrium mechanism driving a system away from its equilibrium state.
- things should be seen from a certain perspective. Individual events and decisions are only surface phenomena that stem from an underlying system structure.
- a continuous view should be adopted - events and decisions are not clearly separated in time and space.

The model-building scenario described above is just one of many possible scenarios.

The simulation of system dynamics models uses numerical methods that partition simulated time into discrete intervals of length „dt" and conduct the system through time one „dt" at a time. While numerical methods may be sophisticated, the simulation engine must be able to solve algebraic equations that appear in the models with algebraic loops. Unlike discrete event and agent-based models, system dynamics models are deterministic, unless stochastic pattern is chosen. Mathematically, a system dynamics model is a system of coupled, nonlinear, first order differential equations.

System dynamics suggests a very high abstraction level, and is positioned as a strategic modeling methodology. Although the language of system dynamics is very simple, thinking in its terms and on its level of abstraction is quite difficult and pose frequently a real challenge. As a matter of fact, the System Dynamics is not only a modeling language – it is first of all the way and language of capturing the reality surrounding us. Therefore, unlike other modeling languages, the System Dynamics is showing us how to interpret a problem in terms of its internal dynamics, what is our initial mental model explaining its dynamics, how to test its correctness and how to improve it, how to convert mental model into simulation model, run it, and perform operations aiming at finding its solution or solutions.

The chain of intellectual and computer operations linking the reality with final solutions is quite complex, however. Let us use a classical example from J. Forrester's seminal book „Urban Dynamics". Part of the city growth model presented there is the problem of land and housing facilities in the context of the construction industry. There is a fixed area of available land for construction. New buildings are constructed while old buildings are demolished freeing space for newer housing. We are interested in modeling and simulation of the main variable here – the number of buildings existing in the area and its change over time. Thus, it will be the primary variable of the problem.

Next step is the unleashing of our understanding that problem. Psychology has been coined very useful term here – mental model. A mental model is an explanation of our thought process about how the construction works operate. It is a representation of the relationships between its various parts as we intuitively perceive at the beginning stage of the modeling process. We all have mental models regarding all situations and problem we are involved in; in most cases story telling is the first and most natural way of conveying the knowledge about mental model. Based on this it is recommendable to identify other variables (influencing the primary one) existing in it.

Once we have the variables inventory, we proceed to reveal our assumptions about relationships existing between them. This is a critical point of the System Dynamics analysis as the statement "structure determines behavior" is probably the most important part of its ontology. It results in our initial understanding of the problem and its structure, preferably expressed with the causal diagram of the problem. Figure 3 presents one possible causal diagram of the construction problem.

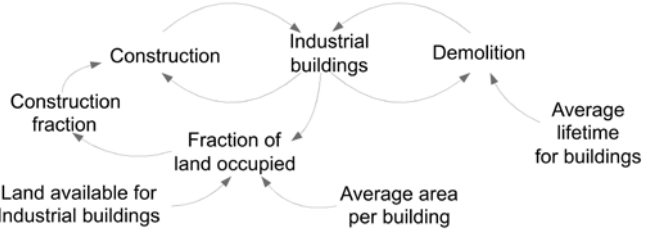

Figure 3. Causal diagram of construction – land problem
Source: Based on Forrester 1969.

The veracity of the problem requires to see whether its structure can display the same or similar behavior pattern as in reality. That cannot be done unless we convert the causal diagram into simulation ready formal model. Each variable has an equation assigned to; what is interesting and useful for the System Dynamics software is that non measurable variables (like morale, motivation, knowledge, apathy, and so forth) can be included into a model and run. Figure 4 presents Construction and Land problem converted into the viable model.

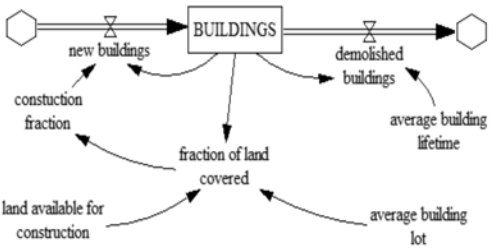

Figure. 4. Construction – land problem model with Vensim TM

Variables definition (in terms of dependence)

- BUILDINGS = f(new buildings, demolished buildings)
- new buildings = f(construction fraction, BUILDINGS)
- fraction of land covered = f(BUILDINGS, land available for construction, average building lot)
- demolished buildings = f(average building lifetime, BUILDINGS)
- land available for construction; average building lot = constant variables

Source: based on Forrester 1969 (with Vensim TM)

Having had all variables defined we can check of the behavior patterns yielded by the model through the comparison with historical data. Simple behavior over time diagrams (BOT) do that; in case of significant discrepancies either our model structure or variables definition is incorrect and require changes.

Once we obtain the problem model compatible with historical behavior pattern, we can proceed to the solution design process. System Dynamics rightfully claims that in order to change the problem behavior we should change its structure – structure determines behavior. Seeking problem solutions is thus a creative process of discovering those parts of the structure which to greater extent than other variables influence the behavior. These are so called „problem leverage points"; their control is the core concept of any policy design. Policy testing and sensibility analysis follow and they complete the problems solving through modeling and simulation cycle. Figure 5 shows this process.

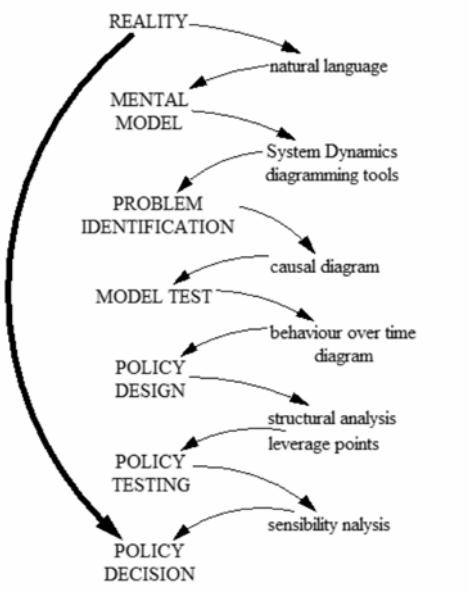

Figure 5. Problem solving through modeling and simulation with System Dynamics approach

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Abstract (in Polish)

Artykuł dotyczy problemu języka stosowanego w procesach modelowania i rozwiązywania problemów. Dwa podejścia są przedstawiane jako kanwa – tzw. eksperckie oraz interaktywne, w którym problem języka jest szczególnie ważny. Wynika to z zależności między językiem opisu rzeczywistości a językiem, w którym następuje modelowanie i rozwiązywanie problemów. Nie można rozwiązać problemu w innym języku niż ten, w którym został on opisany. Przedstawione są bardziej znane formalne języki modelowania problemów, włączając w to komputerowe modelowanie problemów. Bliżej przedstawione są języki SEQUAL oraz Dynamiki Systemów.

Słowa kluczowe: modelowanie i rozwiązywanie problemów, formalne języki modelowania, podejście eksperckie i interaktywne, SEQUAL, język Dynamiki Systemów.

Age Management as a Tool for the Demographic Decline in the 21st Century: An Overview of its Characteristics

Jan Fabisiak*, Sergiusz Prokurat*

Abstract

This paper sets out to study recent developments in the relatively new area in management theory - Age Management. First the general labor and financial market conditions are specified which have led to the growing need of an age-oriented strategy for employment in the company. Next the concept of Age Management is defined, both from the macro, enterprise-level and individual perspectives. The next section studies the benefits derived from implementing Age Management for the company and its employees, followed by a section on specific Age Management tools and measures. The penultimate section explores the prerequisites for successful implementation. This paper finds that Age Management as a concept is gaining ground, predominantly in managing and retaining near-retirement-age workers. Concluding, we find that there is a significant need for more comprehensive Age Management and effective Age Management measures to maintain firms' and economies' competitiveness in the face of demographic decline.

Keywords: demographics, age management, employment, age-oriented strategy, working practices.

Introduction

The predominant European social models and welfare-state arrangements work on the assumption of indefinite population expansion, largely conceived in the post-war period, however, the developed world is currently facing the prospect of insufficient fertility rates and ageing societies. The phenomenon of population ageing is a testimony to a society's success in achieving higher standards of living and, implicitly, increased longevity. Nevertheless, constant growth of older populations is a challenge both to policy makers, who need to reform the Ponzi scheme of pensions and welfare entitlements, as well as to companies looking for talented and efficient workers on the labour market. To take one example, according to the estimates of the European Commission, by 2030 the European Union will face a shortage of 20.8

* *Jan Fabisiak, M.A., Economist, jan.fabisiak@gmail.com.*

** *Sergiusz Prokurat, M.A, Economist, Wyższa Szkoła Gospodarki Euroregionalnej w Józefowie, serios@wp.pl.*

million working-age people, which will constitute 6.8% of the total workforce (Villosio, Di Pierro, Giordanengo , Pasqua and Richiardi, 2008). Indeed, population ageing and falling fertility rates have been treated as a threat in Western Europe for the last 20 years (Liwiński and Sztanderska, 2010). According to Walker, the two decades between 1995 and 2015 are seeing a significant fall in younger and middle-aged populations and a large increase in the older age groups (2005). The challenge of an ageing workforce seems to be characteristic of developed countries such as the UK, Germany or France. Nevertheless demographic statistics indicate that also developing countries, including Poland, will soon face the same problem.

The research aim of this paper is to analyse current trends in developed-world (predominantly European) labour markets and investigate the effectiveness of Age Management on a corporate level by reviewing current literature and qualitative analysis. This paper bases its analysis on the assumption that EU labour markets will continue to be highly protected and will suffer significant labour shortages as a result of demographic trends, thus raising the bargaining power of workers on the market.

Implications of demographic decline for welfare states, growth and modern financial markets

The European welfare state was built on the assumption that, in the phase of modern economic growth, both labour productivity and the population will grow steadily and indefinitely, allowing welfare benefits (in particular retirement pensions) to be conferred upon contemporary retirement-age cohorts (Roberts, 2004). This consumption, according to the welfare-state paradigm, would be financed by the next generational cohort, assumed to be more populous and more productive than their parents and grandparents. According to Esping-Andersen, there are three types of welfare-state regimes: 'liberal', 'corporatist' and 'social democratic' (2007). While differences between them exist, all three models are based on the Ponzi rule of financing current consumption with expected future revenue from a larger and more productive base of participants. Although their costs vary – the 'liberal' regime is closest to sustainability, while the 'social democratic' welfare state is, by far, the dearest – nevertheless all three are impossible to sustain in the long term with a shrinking or stagnant population, as the labour productivity gains required to balance the books would have to reach unrealistic levels.

Demographic change is a very long term process and there seems to be no possibility of a prompt reversal of negative trends. The influence of demographic factors on growth has been confirmed by Bloom, Canning and Moore (2004). Most importantly, since decisions to participate in the labour market are affected by age, Bloom, Canning and Moore found that 'older' societies had smaller labour supply which, in turn, led to lower potential growth. Furthermore, the same study demonstrated a peak of aggregate savings in cohorts aged 40 to 70. Therefore, an older population will be less willing to save and more to consume. These phenomena are aggravated by a third factor – 'generational crowding' – which depresses real

wages relative to labour productivity in large working-age cohorts (Easterlin, 1980; Bloom, Freeman and Korenman, 1987; Korenman and Neumark, 2000). In other words, a smaller working-age population relative to its dependents will result in depressed productivity or inflated labour costs.

The future competitiveness of companies and whole economies will be to a large extent based on the performance and productivity of older workers, as well as on an effective use of their skills. Thus an ageing society causes drastic changes in human resources strategies and requires a new approach to Age Management in companies. A growing awareness of this issue is also changing the objectives of labour market policy. In many countries its main aim is to increase the labour participation among the older population, with Age Management considered as an important factor in achieving this goal (Auer and Fortunly, 2000). This paper will focus on the comparison of mean ages of workers in various continents and those in Europe, present the influence of the Age Management concept on population ageing from the individual, corporate and societal point of view; and indicate the main motives for implementing Age Management as well as the tools and methods used to measure the success of the implementation process.

Defining Age Management

Age Management as a concept is relatively obscure in management theories. It directly relates to population ageing, active ageing, managing a diverse team and preventing discrimination. Age Management can be investigated and presented from the individual, corporate or macroeconomic labour market policy perspective.

From the individual perspective, Age Management allows a more efficient use of a person's capabilities. Age Management is an opportunity to remain on the labour market as long as possible and constantly adapt to its changing requirements by training and practice in old age. Age Management on the individual level refers not only to workers, but also to people with the potential of labour market (re)integration. Measuring work capabilities is possible by using the Work Ability Index, developed by a team of Finnish researchers (Tuomi, Ilmarinen, Jahkola, Katajarinne and Tulkki, 1998). The WAI is based on an employee questionnaire with questions covering current and future estimated work ability, health and absenteeism records, estimated sickness-related decreases in work performance and 'mental ability reserves' (Morschhäuser and Sochert, 2006). Results suggest that health issues and lower work ability may be reasons for early retirement, which is determined by burdensome aspects of a given job, as well as the health status and lifestyle of the worker. The model, illustrated in Figure 1, presents individual career Age Management, represented by the green-shaded line in the chart to the right, which is significantly different from a career path without Age Management. It is proactive rather than reactive. As illustrated by this chart, life-threatening health 'incidents' such as obesity, diabetes, even cancer and strokes, can be prevented with a proactive Age Management programme. Employees can deliberately lengthen the horizontal line of good health and prevent the long,

gradual decline by aggressively taking control of health risk factors, thus preventing sickness rather than expecting it as inevitable. This involves an individually designed programme of nutrition, supplements and exercise to increase vitality, cognitive functions and physical well-being.

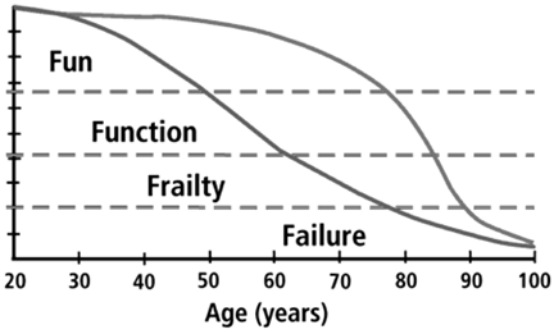

Figure 1. Functional ability of male worker vs. age (careless life vs. individual Age Management)
Source: Authors' calculation. Data and Work Ability Assessments were based on the Work Ability Index developed by Tuomi et al (1998).

The issue of Age Management can also be analysed from the company's perspective, i.e. managing human resources. The interest of directors in Age Management usually appears when situations of restructuring, organisational change, technological progress or loss of experienced and highly-skilled workers arise. However, sometimes Age Management may also be considered because of cost management considerations, due to clients' expectations, or in order to retain qualified employees. Age Management measures adopted by companies include raising awareness among management and other workers, implementing best practices in the company by adopting Age Management strategies in recruiting, training, development and promotion of workers' age optimisation, implementing lifelong learning programmes, health and safety programmes or finally flexible forms of employment.

Age Management, owing to demographic change, has also become a macroeconomic issue in labour market policy. As a result European policymakers and companies in particular have increasingly taken to Age Management to facilitate a greater share of employees over 50 in the workforce. Age Management can mean many things, so it is necessary to specify its definition for the purposes of this paper. Walker (1997, p.685) defines it as '…. the various dimensions by which human resources are managed within organisations with an explicit focus on ageing and, also, more generally, to the overall management of the workforce ageing via public policy or collective bargaining.' Implementation of these policies on both the government and corporate level varies greatly by country even in Europe, perceived as leader in this field – while Sweden's employment rate in 2009 for the 55-64 age group was above

70%, it only amounted to 31.6% in Poland (European Commission, 2009). See also Figure 2 for a comparison of data for chosen EU and some non-EU countries in 2011.

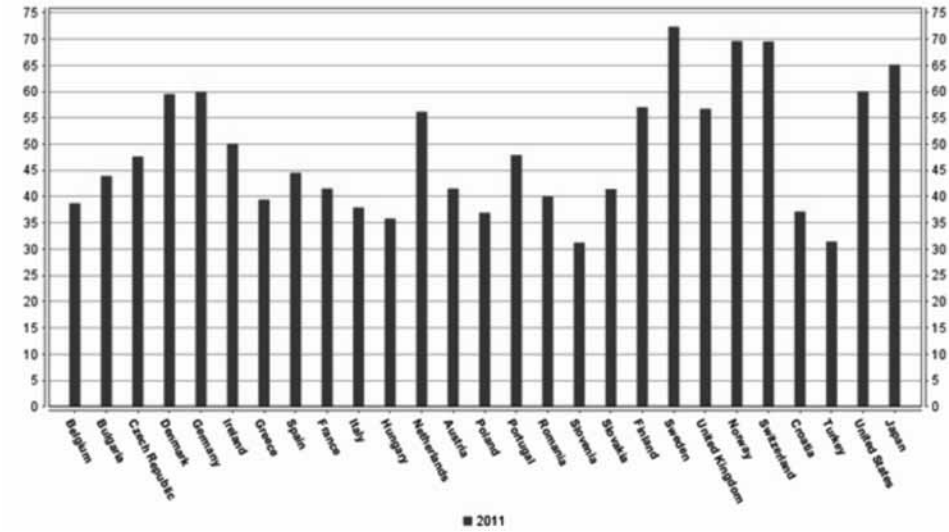

Figure 2. Employment rate of old workers
Source: Eurostat (2011). Note: Older workers are those from the 55-64 age bracket

Yet implementation also highly depends on culturally-motivated perceptions of when a person is too old to work. Here perceptions, as in the case of actual employment of older workers, also vary greatly. Moreover, these perceptions or social norms may be more rigid and difficult to change. Granted, as argued by Sweet (2009), the perceptions of the adequate age for retirement have changed over time, yet they take quite a long time to do so by adjusting to new conditions and differ from country to country. The same holds true for perceptions of achieving adulthood (and starting work), which in combination with social retirement rigidities is an obstacle to broadening employment among the young and old. Implicitly, successful Age Management practices will have to tackle these social rigidities and provide incentives for both young and old.

Reasons for implementing Age Management

This paper has already touched on the macro trends which are causing Age Management to become necessary from a policy point of view. This perspective can be supplemented by one very important macroeconomic and social factor – age discrimination in the workplace. According to a study conducted on EU workers, 6% of workers from the 15-24 age group and just under 5% from the 55+ age group were exposed to age discrimination at the workplace, constituting the two most vulnerable age groups (Villosio *et al*., 2008). It is noteworthy that these are the two groups which

companies should treat best, as their respective labour participation is low and they have the most potential to provide extra talent to the corporate world, which in some countries is already feeling the talent squeeze.

The ways in which older workers are discriminated against include: exclusion from promotion, training, benefits or even an explicit maximum age specified in a job announcement. There are also numerous more subtle manifestations, such as: limiting job responsibilities and duties of older workers, encouraging older workers to retire early in face of job redundancies and reducing incentives for people choosing to work beyond the retirement age (Villosio *et al*., 2008). Age discrimination in this form affects negatively the older workers and companies alike – companies' age bias deprives them of many very experienced and highly-skilled workers. In the case of young workers, they are most likely to be discriminated against by 'reverse ageism', i.e. being denied access to job opportunities or being allocated in an inadequate job which is bellow their qualifications (Villosio *et al*., 2008). Introducing Age Management and eradicating age discrimination in this context seems to be a win-win situation.

The reasons for adopting Age Management don't stop there. By improving their policies companies can benefit from their worker's age diversity by having a better adjustment to various client groups (broken down by age, affluence, sex etc.) (Liwiński and Sztanderska, 2010). Furthermore, the accumulation of human capital, as defined by Schuller (2001), in individuals is potentially a lifelong process. Yet an age gap persists in people's access to education and training (Organisation for Economic Co-operation and Development, 2006; Tergeist and Wooseek, 2003; Bassanini *et al*., 2005.) which creates a vicious circle – the very workers who have accumulated a great deal of human capital during their lives (older workers) upon reaching a certain age are not provided with additional training that could potentially bring the highest rewards to them and their employer. Successful Age Management policy both on the corporate and state level would be to provide equal opportunities for training and skills development to all age groups, raising productivity, improving work quality and creating companies better adaptable to change.

The need for greater participation of older workers goes beyond equal training opportunities. The growth of accumulated human capital during a worker's lifetime isn't linear and ever more companies realise that the social and professional abilities acquired by older workers are exclusive to their age group – it isn't just a question of more, it's a question of uniqueness (Liwiński and Sztanderska, 2010). Therefore making older workers prematurely redundant is a major blow to the company's human capital and its transmission to younger workers. Moreover, this paper argues that the other vulnerable age group – younger workers – is also a unique asset of this kind, as it is young people who generate most innovations and new thinking. And as the demographic bust deepens, younger workers will become a kind of 'scarce good', in time reversing the trend and making them a much sought-after age group. If a company wants to stay relevant and innovative in the business of tomorrow, it should implement

Age Management for both older and younger workers today, staying ahead of the curve and acquiring young workers and introducing young-worker-friendly policies at a fraction of future costs.

The very same shortage of young workers will also increase the demand for older ones, provided that Age Management is widely used in an industry/economy. If not, this will lead to a labour market failure, as the demand for older workers and supply of such labour will not meet at equilibrium owing to completely avoidable factors, such as the workplace not being adjusted to the needs of older employees. This adjustment is not merely a requirement of the future, it is already a very important factor as, inevitably, the number of older workers is increasing in organisations. In the absence of better healthcare, a more ergonomic workplace and age-specific training and motivating tools the company runs the risk of higher costs or lower output due to a greater amount of absenteeism among its employees (Liwiński and Sztanderska, 2010).

Other motives for introducing Age Management into an organisation's strategy of talent management may be the following (Naegele and Walker, 2006):

- Synergy effects of employing both young, motivated, creative workers and older, experienced, loyal older workers
- Improved corporate image as an equal-opportunities employer
- Better motivation for younger workers who observe their older peers benefitting from their long-term input to the company
- Greater horizontal and vertical mobility of better-trained older workers
- Preventing the professional burnout syndrome in older workers by offering them continuing career planning
- Reserve pool of readily-available temporary workers consisting of semi-retired experienced former employees with company-specific knowledge and skills

Finally, organisations should consider Age Management now to stay ahead of changing legislation regarding retirement age thresholds, collective labour bargaining and other administrative measures which seem to be in the pipeline in many developed countries and in a host of developing nations. Taken together, all the above are a powerful argument for comprehensive and active Age Management.

Age Management areas and tools

If so, which actions are required to boost older workers' productivity and thus improve their chances for employment and remaining at their current workplace for a longer time? These actions cover a host of employment phases, from recruitment to ending employment and refer to both the well-being of the worker himself as well as to his work environment. In recent years many classifications of areas relevant to Age Management have been created (See Eurolink Age, 2000; European Foundation for the Improvement of Living and Working Conditions, 1997). One of the most widespread methodologies to identify key areas has been developed by Naegele and Walker (2006), who propose the following list:

- Job recruitment
- Learning, training and lifelong learning
- Career development
- Flexible working time practices
- Health protection and promotion, and workplace design
- Redeployment
- Employment exit and the transition to retirement
- Comprehensive approaches

All these areas taken apart may not be particularly effective, but taken into a comprehensive approach, as proposed by Naegele and Walker, form the effective system of Age Management. In the area of recruitment, principal measures include banishing maximum age limits, employing specially-trained personnel for job interviews, using available public support programmes (such as wage subsidies or settling-in grants), advertisement campaigns aimed specifically at older unemployed, at-risk or early-retired applicants (Naegele and Walker, 2006). As with recruitment, also corporate training can benefit from no age requirements, tailor-made motivational and evaluation systems for older workers, or from setting up channels of knowledge and know-how transmission from older to younger workers.

As for flexible work, a number of measures can be adopted, among them: adjusting shift schedules, special measures of reducing daily or weekly working hours, partial retirement, specific models of job provision and no overtime for older workers (Naegele and Walker, 2006). These flexible measures allow using corporate resources in an optimal way, both using the human capital accumulated by older workers and not overworking them, which could lead to a substantial drop in productivity. For that matter, this measure is equally applicable to young workers, whose time availability may be limited due to ongoing studies or, increasingly in recent years, lifestyle considerations.

Returning to older-worker-specific tools, prior research provides a good overview of the importance of a healthy senior workforce: 'Good practice in health protection, health promotion and workplace design means optimising work processes and the organisation of work to enable employees to perform well and to ensure their health and capacity to work' (Naegele and Walker, 2000). The specific measures employed mainly include studying health risks specific to the workplace, employee surveys and education, regular monitoring of workers' health and finally preventive redeployment, which can be classified both in the health and redeployment areas.

Finally, the area of making older workers redundant or transitioning them to retirement is a key area in comprehensive Age Management. The case of retirement is especially delicate in its nature, as this area is most prone to labour market failures. While the ageing of societies dictates a greater need for older workers, many still find themselves in the limbo of a transitional period between the age they stop working and the age when they become eligible for pension benefits (Walker, 2005). This, we must

stress, will become more acute a problem as European countries raise their official retirement age. The answer is prolonging workers' working life and a more gradual transition into retirement, which suits both the workers and, as mentioned in this paper, organisations, which benefit from expert human capital in a more flexible way without overusing it. The main tools of both employment exit and retirement transition are the following: gradual preparatory measures for retirement at the corporate level, counselling facilities available for former employees, providing assistance in finding a new job, opportunities for retirees to maintain contact with colleagues, flexible forms of retirement and retirement transition (Naegele and Walker, 2006).

All the above measures work to their optimal effect only when taken together and the implementation of one or several particular tools should only be understood as a trial run for comprehensive Age Management (Walker, 1997). The important features of a truly transversal and comprehensive system are:

- Concentrating on prevention of older workers' redundancies
- Applying Age Management tools to workers of all ages
- Employing all areas of Age Management tools
- Flexible support to older workers affected by health issues and lacking in skills

The effectiveness of comprehensive Age Management has been proven in the literature by numerous case studies (See Liwiński and Sztanderska, 2010; Rappaport and Stevenson, 2004; Morschhäuser and Sochert, 2006; Naegele and Walker, 2006). However, there is no extensive research on Age Management for young workers, who are currently the most vulnerable age group in the workforce. The persisting high unemployment rates among even highly-skilled young people coupled with the demographic transition suggest a massive market failure. Although the argument that in several countries equilibrium can't be reached due to excessive supply of university graduates cannot be dismissed, part of the problem is most certainly on the demand side. Companies are, as suggested by the literature, starting to wake up to Age Management of older workers, but the real dearth of research on young-worker Age Management suggests that they are still unaware of the risks associated with a passive stance and the ways in which they stand to benefit from the efficient use of young human capital and, quite possibly, the best-educated generation in human history.

Data confirm this – according to the Bureau of Labor Statistics, an average American household from the under-25 age group earns nearly three times less income than the 45-54 age group, which constitutes the highest earners in intergenerational analysis. Meanwhile, the 65+ age group earns a mere 25% less (mainly thanks to pensions). These data measure only income – it is in household wealth where one expects the differences to be staggering, although estimates vary widely as wealth is more difficult to measure than income. Furthermore, the Gallup Underemployment Index stands at 19%, mostly owing to the large skill misallocation of the youngest generation of workers on the labour market. The grim prospects of young workers today and their long-term rising value as the demographic transition deepens combine into a powerful

incentive for companies to invest in Young Age Management – but the first step has to be more research on this least-studied area of Age Management. Some new methodologies which start to include a few tools designed for younger workers have recently been presented, a principal example being the research by Ball (2007), yet even these include very little focus on measures which could benefit specifically the youngest workers.

Table 1. Classification of Interventions, from 'Removing Age Barriers' Research

1. Job Recruitment	1.1 increasing maximum age limit 1.2 elimination/absence of particular age barrier 1.3 positive discrimination 1.4 support of self-help group to promote their own employment 1.5 training programmes to promote recruitment policies 1.6 employment exchange/job centre for older workers 1.7 other
2. Training, Development and Promotion	2.1 development of training and educational programmes, 2.2 in particular for older/ageing workers 2.3 existing training and educational programmes opened to older/ageing workers 2.4 creation of learning environment and workplace mentorship for older workers 2.5 career development 2.6 evaluation of performance 2.7 promotion of age-specific policy in work organisations 2.8 other
3. Flexible Working Practice	3.1 job rotation 3.2 promotion of age-specific policy in work organisations 3.3 flexible working hours/age related working time 3.4 age related leave 3.5 demotion (without change in wage level) 3.6 part-time jobs 3.7 flexible retirement/early exit scheme 3.8 gradual retirement scheme/part-time "early exit" 3.9 self regulation of pace 9.10 other
4. Ergonomics, Job Design and Prevention	4.1 ergonomic measures/improvement work conditions/ workload 4.2 organisation of tasks 4.3 mix of young and older workers 4.4 age related health and/or wealth control 4.5 older workers excluded from shift labour 4.6 other
5. Changing Attitudes within Organisations	5.1 research related to ageing and performance 5.2 programmes to change attitudes and opinions towards older workers 5.3 other

6. Changes in Exit Policy	6.1 elevation of minimum age of early exit 6.2 abolition of early exit programmes 6.3 elevation of normal retirement age 6.4 other
7. Other Policies	7.1 general age related policy; seniority programmes 7.2 sectoral age related policy as result of Collective Agreements 7.3 future plans 7.4 recognition of caring responsibilities 7.5 other

Source: Ball C. (2007), Defining Age Management: Information and Discussion Paper, TAEN - The Age and Employment Network, p.7.

Success factors in implementing Age Management

The first question arising from a discussion on Age Management implementation is how to measure success (or failure). One way is to simply record the make-up of the company's workforce by age group. This measure, however, may not be enough, even when benchmarked against other companies' performance – the changes in an organisation's age structure may well be exogenous, caused by macro trends on which the company had no influence. A more promising way of measuring Age Management implementation has been proposed by Tuomi *et al.* (2006), in the aforementioned Work Ability Index (WAI). This indicator's main objective is to identify the risk of employees leaving the company, especially for early retirement. The index can help identify both individuals and groups which are at risk of leaving the organisation prematurely and, implicitly, which areas of Age Management are failing at the company.

There are many important aspects of successfully implemented Age Management that a company needs to cover in order to enhance its WAI score. Naegele and Walker (2006) identify 7 areas of necessary measures for success. Firstly, age awareness should be introduced throughout the company by extensive training, starting with HR managers and key decision-makers and going all the way down to junior employees. Secondly, careful planning and implementation is a must, taking into account all global and organisation-specific risks and opportunities, strengths and weaknesses, to avoid major mistakes. In the third stage, after having received age-awareness training workers should immediately see improvements and age-specific adjustments of their workplace, so that they can put their new knowledge and know-how into practice. Throughout the whole process of implementation, all concerned parties (management, various organisational units, trade unions, etc.) should be brought into the discussion and convinced of the benefits of this new approach – if a strong interest group within the organisation objects, the most likely outcome will be failure of the process.

In order for everyone to be in agreement continuous communication of the goals and achievements of Age Management should be established. This, in most successful cases, is coupled with internal and external monitoring – creating a HR policy with age awareness requires organisational data on the age structure, personnel qualifications and development needs, workers' health status and work capacity etc. Finally,

Naegele and Walker (2006) identify constant evaluation during the process to search for potential weaknesses and a final assessment of the results of the implementation as the last and one of the more crucial areas in achieving an age-aware and non-discriminatory organisation. Other research suggests similar stages of successful implementation (Liwiński and Sztanderska, 2010). Table 2 demonstrates some of the benefits derived on each level from implementing Age Management.

Table 2. Age Management results for individual persons, companies, societies

Individual	Preventing premature ageing More successful, healthy life
Enterprise	Age-adjusted workplace More efficient employees with more customised management
Society	Preventing age discrimination Counteracting demographic collapse

The central point of this paper is that for Age Management to be truly successful in any given organisation, it must encompass all age groups, providing age-specific support and incentives. This will cause higher productivity in middle-aged workers, a larger share for the company of a growing labour participation of older employees and a competitive edge in the competition for ever-scarcer young talent. In the case of older workers there is a growing body of research, which identifies wage conditions, rigidity in workplace organisation, an inadequate skills and competencies match, as well as poor health as reasons for early retirement (Villosio *et al.,* 2008).

Conclusions

Age is a crucial and primary feature of any given employee which determines risk factors at the workplace, job satisfaction, access to job opportunities, workplace autonomy, work intensity, probability of vertical and horizontal mobility and even a worker's loyalty to his current organisation. Age Management in its current intellectual mainstream is primarily focused on older workers who are at or near retirement age. The argument is the following: our societies are ageing and therefore we need to provide incentives for older workers to stay on or return from retirement, thus increasing their age group's labour participation. While this is a valid line of thought endorsed completely by this paper, it unnecessarily narrows down the debate to just one age group out of many (if not all) which should be included into comprehensive Age Management. As the demographic structure shifts to one dominated by older generations, young workers will become scarce and thus more valuable to employers. In fact, even middle-aged employees should be included into a company's age-specific strategy, as they need to be gradually and fluently transitioned into the next, less-lucrative and more uncertain stage of their career. It is also important to note that comprehensive Age Management means not only a focus on all employees' age groups, but also on three levels of its applicability: individual, enterprise-level and macroeconomic.

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Abstract (in Polish)

Artykuł przedstawia nowy trend w teoriach zarządzania - zarządzanie wiekiem. Celem artykułu jest zdefiniowanie pojęcia zarządzania wiekiem oraz przedstawienie go w perspektywie makroekonomicznej, w perspektywie jednostki oraz w perspektywie firmy. Artykuł wymienia zalety wdrożenia strategii zarządzania wiekiem zarówno dla firm, jak i dla poszczególnych pracowników oraz przybliża narzędzia i sposoby mierzenia efektywności implementacji strategii. Zdaniem autorów, zarządzanie wiekiem jest sposobem na zwiększenie konkurencyjności przedsiębiorstw, jak i całych gospodarek w obliczu kryzysu demograficznego.

Słowa kluczowe: demografia, zarządzanie wiekiem, zatrudnienie, strategia, metody pracy.

Female Entrepreneurship – An Appropriate Response to Gender Discrimination

*Jacques Ascher**

Abstract

This study aims to discuss one of the most significant economic and social developments in the world – the rise of the female entrepreneurship phenomenon. Women entrepreneurship needs to be studied as a separate field for two main reasons: (a). Female entrepreneurship is an important source of economic growth in creating new jobs and by being genetically different: women provide different solutions to management and business issues; (b). Female entrepreneurship has been neglected, particularly in business research. Although equal opportunity for men and women in the entrepreneurial field is not a reality in the short range, the progress towards its achievement could be facilitated by better understanding of the impact of female entrepreneurship on society and its contribution to economic growth. This study addresses the growth in female entrepreneurship in the developed and developing countries, explores primary motivational and other factors that influence female entrepreneurship, reviews the main obstacles facing the female entrepreneur, and finally makes recommendations to policy-makers to encourage and support such activity.
Keywords: entrepreneurship, female entrepreneurship.

Introduction

The author of this study dares to define, in an integrative manner, entrepreneurial activity as a calculated risk-taking and continuing process of innovational activities that embodies discovery, evaluation and exploitation of opportunities, judgment of the possibilities and making decisions in an identified uncertainty within a rapidly changing environment by using the spillover of knowledge and creating value out of this knowledge.

Entrepreneurship is a multilevel and complex phenomenon that gained importance in the global economy as a result of changes in employee qualifications, work contents, and psychological contracts in the employment field. Entrepreneurship contributes to economic growth in being a conveyor of new or existing knowledge spillover and creative ideas that might otherwise not be utilized and realized for the

* *University of Pécs, Israel, jacques_ascher@mod.gov.il.*

benefit of all (Dejardin, 2002; Audretsch, Keilbach and Lehmann, 2006); Heertje, 2006; Langowitz and Minniti ,2007).Wennekers and Thurik,(1999) note three levels of analysis when discussing the relationship between entrepreneurship and economic growth: the level of the individual entrepreneurs operating on their own or in teams and partnerships; the firm level; and the aggregate levels of industries, regions and national economies. They state that entrepreneurship has to do with the activities of individual persons, while the concept of economic growth is relevant at levels of firms, industries and nations. Thus, linking entrepreneurship to economic growth means linking the individual level to the aggregate levels. The most significant contribution of small businesses and entrepreneurial activity is their ability to innovate. By doing things more effectively and efficiently, firms enable economic growth, rise in wages, an improved work environment, and enable a higher standard of living. This result cannot occur without a new idea and its implementation (an economic experiment). If the idea is successful, it replaces something already existing.

This process, the *creative destruction* (Schumpeter, 1934, 1942), is essential for entrepreneurial activity. However, new ideas do not always lead to an advantage: an idea has to be kept alive and designed by a creative and innovative individual (Maddox, 1995).

Entrepreneurship plays an important role in exploring the knowledge and utilizing it to provide goods and services. Acs and Armington,(2006) define entrepreneurship as "the process by which agents transform knowledge into wealth through new firm formation and growth, and then reconstitute wealth into opportunity for all through philanthropy" (p.155). The existing knowledge is apportioned among individuals, hence only a few know about an opportunity. Acs (2002) opines that this knowledge is obtained through an individual's own experience gained from his occupation and social life experiences.

During the past century, as a result of the changing society, accelerated entrepreneurial activity was accompanied by the significant participation of women in entrepreneurship across the globe. Ufuk and Ozgen, (2001) argue that entrepreneurial activity has been adopted by increasing numbers of women in recent years. Kelly, Brush, Greene, and Litovsky (2011), reinforce this statement by emphasizing that in recent years a significant number of women entered entrepreneurial activities and thus contributed significantly to entrepreneurship in all economies worldwide. They report that in 2010, 104 million women in 59 economies, representing over 52% of the world's population and 84% of the world's GDP, started and managed new enterprises. Another 83 million were running established businesses that they had started over 3½ years earlier. Taken together, 187 million women were involved in creating and operating enterprises, ranging from just over 1.5% to 45.4% of the adult female population in these 59 economies. These data emphasize the contribution women make to entrepreneurship globally. According to this report, female participation in entrepreneurship varies around the globe: 19.9% of women surveyed in factor–driven economies, stated that they were starting or running a new

enterprise, 9.7% said so in efficiency–driven economies, and 3.9% in the innovation–driven economies.

Numerous studies focus on differences between female and male entrepreneurship.

Muktar (2002) points out that the differences between genders are in terms of management style, organizational structure of the enterprises, and the degree of empowerment in them.

Verhaul and Thurik,(2001) use a panel of 2000 individuals, including 500 women, who started new firms in the Netherlands and found that women used low start–up capital, although there was no difference between the types of capital.

Cowling and Taylor,(2001) find that the women entrepreneurs have better education than men, and that in the 1990s men entered entrepreneurship in considerably greater numbers than women.

In a study based on 4,200 entrepreneurs, including 405 women, Du Rietz and Henrekson, (2000) point out that the only area where women underperform, compared to men, is in growth in terms of sales.

A study conducted by the Center for Women's Business Research in 2009 measures the economic impact of the eight million women–owned businesses in the U.S. The estimated economic impact was $3 trillion annually that translated into the creation and/or maintenance of more than 23 million jobs – 16% of all jobs in the U.S market. This report makes an interesting statement that illustrates the importance of female entrepreneurship in the world's strongest economy: "If U.S. women–owned businesses were their own country, they would have the 5th largest GDP in the world, trailing closely behind Germany, and ahead of countries including France, United Kingdom and Italy" (Center for Women's Business Research 2009).

Despite this trend, the "gender gap" in this activity remains wide. Women are still less likely to enter to such activity than men. Reynolds, Bygrave, Autio, Cox, and Hay (2002) indicate that female entrepreneurship varies significantly among 37 GEM 2002 (Global Entrepreneurship Monitor) countries, ranging from 0.6% in Japan to the highest level of 18.5% in Thailand. Although in China, South Africa and Thailand the gap is narrower than in other countries, they conclude that there is no country where women are more active in entrepreneurship than men. Kelly, Brush, Greene, and Litovsky (2011), indicate that the proportion of women entrepreneurs varies significantly across countries, ranging from 16% in ROC to 55% in Ghana where there are six female entrepreneurs in Ghana for one male entrepreneur.

Minniti and Arenius,(2003) state that participation in entrepreneurial activities does not vary between countries and genders with respect to age. For example, among both men and women the peak years of involvement in such activities are 25–34. Those over 55 have the lowest rate of participation, both among men and women.

The Impact of Female Entrepreneurship on the Economy

The motivation for considering female entrepreneurship both in developing and developed countries derives from the increasing understanding of their important role in creating, running and developing businesses as a fundamental driver for economic growth (Acs, Bardasi, Estrin, and Svejnar 2011).

The rise of female entrepreneurship in industrialized economies is a recent phenomenon. Although the US is the most covered country regarding female entrepreneurship, women entrepreneurs in transition economies such as Hungary, Poland, Romania and Russia, in Latin America, South Asia and Southeast Asia, have a significant impact on the national economies.

In most developed economies, the real actors are no longer huge companies, but small and medium-sized firms that can provide solutions and respond to the needs arising from the new information technologies. Although in the past industrialization attracted more women into business, the present environments offer a new role for them to introduce innovation and creativity, especially where business connects with quality of life. Modernization challenges old regulations, barriers and old patterns of business that posed the major obstacles to female entrepreneurship. In the present era, which is characterized by vigorous domestic and global competition and an unstable economic environment, women entrepreneurs have a crucial role in creating new jobs, and hence reducing unemployment. Delmar and Holmquist, (2004) state that female entrepreneurs play an important role in the world economy and indicate that in the US 6.4 million self–employed women provide jobs for 9.2 million people. This data is impressive when it is compared to the Fortune 500 largest firms that together employed 11.7 million people (Woodroof, 1996).

All over the globe, female entrepreneurship contributes to stability, to well-being among communities, and provides economic opportunities for disadvantaged groups including women, low wage earners, and minorities. Another contribution is the creation of wealth as well as employment.

Many women in developing countries remain illiterate and live in poor communities. This situation does not prevent them from participating in local economies and becoming entrepreneurs. Tiny enterprises enable them to improve their lives and those of many others by creating new jobs. The participation of women in economic life in developing countries contributes to a more human, cooperative, balanced and pleasant work environment in women-led enterprises, in which individual development is engraved.

Hisrish and Brush, (1988) argue that an increasing number of women are seeking to penetrate the world of entrepreneurship, although this activity entails many risks, and the expenditure of time and energy.

Numerous studies deal with the importance of female entrepreneurship in various regions in the world.

Kay, Gunterberg, Holz, and Wolter (2003), argue that in Germany more than one million women owned businesses that provide jobs for two million employees. Their turnover is 232 billion Euros.

In the UK, women entrepreneurs have a growing share in the self–employed population and an important portion of the small enterprise population (Carter, Anderson, and Shaw, 2001).

The OECD 2003, in its Annual Labor Force Statistics, indicates the data of member economies regarding the distribution of gender in employment. According to this report, Turkey has the lowest share of women employment (13%), while Portugal has the highest (40%). The US and Canada are ranked highest, with a rate of 38–40%. The Scandinavian countries have a share of 20–25%.

Chun (1999) indicates that female employers in the APEC countries have, on average, 30% share in the employment market.

Saavedra (2001) provides statistics on self–employed women in Argentina, Brazil and Costa Rica which indicate that self–employment represents a real and important option for them, although Brazil leads over Argentina and Costa Rica. Nowadays, self–employment is increasing in Brazil and Costa Rica. The association of Caribbean States (ACS) 2012 report indicates that in Latin America women are more likely to be entrepreneurs than in other regions, and that the division there between men and women entrepreneurs is 24% versus 43% in Asia and 45% in Europe.

Based on this data, one can conclude that: (a). Female entrepreneurship has a strong effect on economies by increasing employment and sales and; (b). Women entrepreneurs play an important role in economic development and growth. The difficulty in estimating the real impact of the discussed phenomenon on the economy should be emphasized. Delmar and Holmquist, (2004) argue that there is a lack of knowledge about the actual impact of female entrepreneurship on the economy growth in most of OECD member countries.

Factors Influencing Female Entrepreneurship

No single factor motivates women to become an entrepreneur. Her reasons for that depend on several personal and external circumstances. Family support, social perceptions and attitudes towards women entrepreneurship are just some of the factors influencing the decision to become a female entrepreneur.

A survey that was conducted among 102 women in Israel (Tzemah 2000) points out the factors that effected them to become entrepreneurs. The results are illustrated in Table 1.

Table 1. Factors influencing women to enter to entrepreneurial activity

THE FACTOR	PERCENTAGE
Personal growth	39%
Economic reasons	30%
Desire for achievement	15%
Recommendations from friends or family	11%
High self-esteem	9%
Creativity	4%
Did not answer	5%

Source: Tzemach (2000).

Bruni, Gherardi, and Poggio (2004), draw up an interesting typology of female entrepreneurs' profiles based on driving factors and their incentives. The main points of the typology are presented in Table 2.

Table 2. Typology of profiles of female entrepreneurs

TYPE	INCENTIVES
Aimless	Young females who enter entrepreneurship as a result of unemployment
Success oriented	Young women who perceive entrepreneurial activity as a long-term strategy
Strongly success oriented	Women who perceive entrepreneurship as an opportunity for self–fulfillment or as a means to overcome the "glass ceiling" phenomenon
Dualists	Females seeking flexibility to balance their family and job obligations
Return workers	Women who left their jobs to care for family duties and are still motivated to self–fulfillment outside their families
Traditionalists	Women who have a strong family entrepreneurial tradition background
Radicals	Women who initiate introducing more pro–female tendencies in society

Source: Bruni, Gherardi, and Poggio (2004).

This chapter attempts to map the factors that may influence women to enter entrepreneurship. The author's conceptual model, illustrated in Figure 1, includes impacting factors on female entrepreneurship: motivation, demographic, social and economic environments, family network, education, and unemployment.

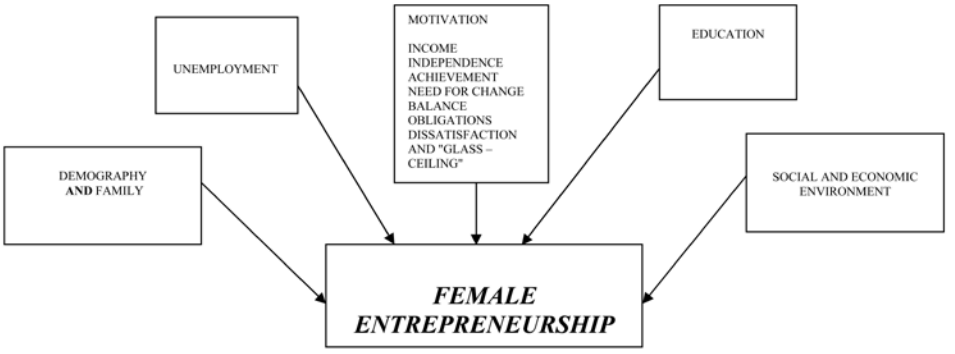

Figure 1. Conceptual model

Motivational Factors

The growth of the business depends partially on the entrepreneur's motivation. Although it is agreed that women differ from men in their personal and professional vision of life, there are some researchers who point out that female and male motivations regarding entrepreneurship initiatives are more similar than they are different (Buttner and Moore, 1997; Birley, 1989; Batory, 2004). Buttner and Moore,

(1997) argue that both genders seek independence, autonomy and higher incomes for their efforts. Berry (1980) avers that the main different factor between genders is self–confidence. The author opines that in the present era, characterized by a strong feminist movement, Berry's argument has to be challenged. Buttner (1993) asserts that women entrepreneurs are more adaptive, have more social awareness and prefer long-term planning in comparison to men. Several studies have focused on distinguishing between the motivations of male and female entrepreneurs. While men are more likely to strive for monetary rewards (Manolova, Brush, and Edelman 2008), women have a tendency to balance social and economic goals (Holmquist and Sundin, 1988; Cadieux, Lorrain and Hugron, 2002). Some of the more recent studies also indicate that women tend to place greater emphasis on intrinsic goals (McGregor and Tweed, 2000; Cornet, Constantinidis, and Asendéi, 2003; Kirkwood, 2003; Manolova, et al. 2008). That is, women seek non-financial goals such as independence and work-family balance (Duchéneaut and Orhan, 2000; DeMartino and Barbato, 2003). In addition to the diversities indicated above, the author believes that it will be useful to clarify several motivational factors that support female initiatives to become entrepreneurs, although some of them are not specific to women.

1. Generate income – Coughlin and Thomas, (2002) argue that one of the most universal motivators for women to start businesses is the need to generate income. They opine that if they had equal opportunities as men to make money in jobs, the incentive behind this motivator would be much less. These researchers further conduct an interesting typology of economic motivations according to the level of the economy: (a). Economic motivation in developed countries; (b). Economic motivation in countries in transition, and; (c). Motivation in the developing world.
2. In the developed economies many women enter entrepreneurial activity to achieve those things that the system fails to provide. In countries in transition, the lack of economic options is the major factor for women becoming entrepreneurs. In Hungary, for example, women account for 41.1% of all entrepreneurs in businesses established after 1990 (Coughlin and Thomas, 2002). In the developing world, most women entrepreneurs are pushed to entrepreneurship as a result of poverty.
3. Pride in achievement - The need for achievement, personal growth and self – determination are high motivating factors among women who have already started some entrepreneurial activities. Although success in business is measured in terms of profit, the need for achievement and the pride in it are paramount objectives among women.
4. Need for change – Women become entrepreneurs in order to make change. In contrast to men, they want to concentrate more on the client, to act more ethically and to contribute more to the community in addition to their economic aspirations. In cases wherein those goals are not achieved, women search for entrepreneurship.

5. Autonomy and independence – Buttner and Moore, (1997) find that these factors are the most important factors in decisions amongst women to enter entrepreneurship. Their study focuses on a group of women in managerial level positions who left jobs in firms to start new self–owned enterprises. Reflecting on family responsibility expected from women, Simonin (2006) points out that many women enter entrepreneurship activities because of the autonomy and flexibility that are essential to the fulfillment of their family obligations. Social expectations from the female role and responsibilities in the family are still valid (Orhan and Scott, 2001).
6. Women having a motherhood role are less satisfied with their careers and perceive entrepreneurship as a tool to adjust their career needs to their family obligations. Noble (1986) argues that men perceive entrepreneurship as a business decision while women perceive it as an integrating and balancing tool between family and career needs.
7. Frustration and boredom with the present job – These factors highly impact on women to embark on entrepreneurship. A study by Cromie and Hayes, (1991) finds that those factors were perceived by women as the main reasons for entering entrepreneurship. The present era enables women to have an opportunity for an exciting and satisfying journey in their occupation.
8. Dissatisfaction with the present job – Many women are driven to improve and expand new ideas, products and services by self-owned businesses. They fully believe they can do better than they currently do in their present jobs.
9. Work environment - Some women perceive work environments in big firms as not friendly and hence they search for entrepreneurship to change this situation (Orhan and Scott, 2001).
10. "Glass ceiling" (Coughlin and Thomas, 2002) - This factor is a significant motivational factor deriving from the fact that there are many obstacles preventing from women from achieving managerial jobs. A significant number of women take a risky step towards entrepreneurship as a result of situations in which in their actual jobs they hit the "glass ceiling" or feel frustrated and unchallenged.

Orhan and Scott,(2001) argue that entrepreneurship motivators can be best explained by push and pull factors, and that entrepreneurship is not a clear choice between the two factors, but a combination of them. Walker and Webster,(2007) argue that women are "pushed" rather than "pulled" into business and that recent studies indicate that many women choose self-employment. According to Simonin (2006) the main components of the pulling factors are independence, self–accomplishment, a passion for initiative, willingness to generate income, social status, and power. He mapped the components of the pushing factors as low family income, lack of satisfaction with salary, difficulties in finding a job, and the necessity to find a flexible job that enables balancing both job and family obligations.

Cohoon, Wadhwa and Michell (2010), collected in their study data from 549 respondents during 2008–2009 to explore male and female entrepreneurs' motivators. The individuals included in the research sample were successful entrepreneurs, 59% of whom had founded more than one enterprise. Their findings were:

- More than 56% of women, but only 31% of men were motivated to become entrepreneurs by a company founder's recruitment efforts.
- A family member or an entrepreneurial friend served as a role model for more than a half of the women and many of the men.
- 5% of both genders cited the reason that they were out at work as a motivator to enter to entrepreneurial activity.
- A slightly higher percentage of women than men were motivated by their dissatisfaction from working for someone else.
- Prior experience was significantly important to women who perceive it as crucial to success.
- Women emphasized more than men their professional and social networks as very important factors to the success of their recent startups.
- Surprisingly, and in contradiction to the belief that women entrepreneurs have less access to capital than men (Robb and Coleman, 2009), no differences were found in the types of funding between the two genders with one exception: women, much more than men, secured their main funding from business partners. No significant gender differences were found in the use of bank loans and venture capital.

Demographic Environment and Family Structure

Population growth has an impact on entrepreneurship among men and women in low income countries. In these countries, growth in population increases demand and generates competition for few jobs among more people and thus encourages more women to enter entrepreneurship activities.

For women, entrepreneurship can be a way to overcome institutional and cultural barriers as well as a tool to provide the family with additional income. It is interesting that female entrepreneurship is more frequent in low income countries with high birth rates. This is a very surprising situation since the perception is that high birth rates should create lesser ability among women to become entrepreneurs. In fact, the parenting responsibilities of women are the main reason for their high participation in entrepreneurial activities. Women, especially in countries with low income rates, have an incentive to build their owned work environment according to their moral, economic obligations and responsibilities towards their children.

Norms relating to marriage also influence female entrepreneurship (Chameleon and Wright, 1997). In the present era, more people, particularly women in developed countries, are living alone. This situation forces them to participate in entrepreneurial activities.

Education

In modern economies, the education level of the population has an impact on economic growth. Worldwide, educated women have better access to the existing opportunities, to more attractive jobs with high salaries. Reynolds et al. (2002), indicate a strong relationship between education and entrepreneurial success.

Rather surprisingly, entrepreneurial activity is higher in countries where most of the female population suffers from illiteracy. This can be explained by the situation in which educated women entrepreneurs employ illiterate women in small business not requiring special skills and abilities

Social and Economic Environments

Generally, good economic conditions are a supportive and encouraging factor for female entrepreneurship. In economies with high income rates, the correlation between unofficial economic activities and entrepreneurship is negative whilst in low income economies it is positive (Minniti and Arenius, 2003).

An additional significant factor that determines the volume of female entrepreneurship is the capability of financing this type of activity. Verhaul and Thurik,(2001) argue that women entrepreneurs have a small starting capital and that they need higher bank loans. Small capital may be a discouraging factor for women who initiate entrepreneurship activity. Higher bank loans may be related to the fact that women are more careful and prudent in taking risks and in acting in an uncertain environment. Relying on external financing has a more significant impact on developed economies as in these economies women are entering entrepreneurship activities especially in more sophisticated fields. Normally, an investor expects a short timetable for ROI as a business strategy; such a strategy may not suit women with a more conservative approach to business.

Unemployment

Reynolds et al. (2002), argue that there is a negative correlation between female entrepreneurship and unemployment especially in economies characterized by low income rates. This means that there is a decrease in female entrepreneurship in cases of unemployment, due to a reduction in demands that is conveyed to situations wherein expected profits are low. In these cases women are discouraged from embarking on new business activities.

Obstacles to Female Entrepreneurship

The previous chapter dealt with the factors influencing female entrepreneurship. As discussed there are many motivational and environmental influencing factors that may be altered over time by different events and impact on obstacles during the process. Therefore, it is not sufficient to focus on them, but it is also essential to review the main obstacles facing the female entrepreneur along the whole process of entrepreneurship. These obstacles are universal and similarly confronted by female entrepreneurs in different parts of the world (Gupta, Turban, Wasti, and Sikdar, 2005).

Delmar and Holmquist, (2004) note a four-stage entrepreneurial process: (a). Identification of an opportunity and willingness to enter the process; (b). Achievement of essential information, resources and start up; (c). Management of the business and; (d). Growth of the business. This chapter aims to review the main obstacles in each stage.

Obstacles in the Stage of Identification of an Opportunity and Willingness to Embark on the Entrepreneurial Activity

Absence of benchmarking possibilities

Shapiro and Skolt,(1982) relate the benchmarking possibilities to the existence of role models. They relate the absence of women role models to their poor presence as entrepreneurs in the past. The author defines role models as female entrepreneurs who serve as sources of imitation in their attitudes, decisions and actions, for those women who just began their journey and mentor them. The absence of role models is seen as a barrier by 64% of women in the US (Catalyst - Conference Board , 2002).

Lack of experience

Ability, knowledge and skills to explore and exploit opportunities depend on work experience and education. Delmar and Holmquist (2004), argue that women lack the experience to explore the opportunities although educated and skilled women have more chances to do so more than uneducated women.

Lack of social capital

Women are less involved in social networking and have a different network from men. In this context, one must emphasize that one of the most important factors explaining startups is the entrepreneur's social network structure. The networks in which women are engaged are mostly suitable to their family duties. This situation may become an obstacle to their business life. Women face "the double burden" syndrome, which is currently inherent in our model of society, in efforts to balance work and domestic responsibilities. The modern business world is urging "anytime and anywhere" performance requiring unfailing availability and total geographical mobility at all times (Women Matter, 2010). The human capital and social relations of women are different from men due to their networks. A female entrepreneur has not many possibilities to achieve essential resources, support and take advantage of knowledge needed to start a new enterprise.

Lack of financial capital

Financial capital is a crucial and vital asset for the entire entrepreneurial process. Lack of financial capital is frequent in the developing countries where women are not independent regarding their incomes and are mostly controlled by their husbands. The literature supports the fact that female entrepreneurs, mostly in developing countries,

face obstacles in obtaining credit for their entrepreneurial activities (Kuzilwa, 2005; Iganiga, 2008; Ibru, 2009; Okupkpara, 2009). The 2004 OECD report, presented at the 2nd OECD conference held in Istanbul, found the access to finance to be one of the specific obstacles to female entrepreneurship. In some African countries the obstacles facing a female to save and invest money are even both legal ad cultural. Moreover, research conducted in developed economies indicates that barriers still exist to women entrepreneurs obtaining external finance, although such obstacles are diminishing as financial institutions are becoming more sensitive to gender issues and start to perceive female entrepreneurs as a potential source of profit for them (Kay, Gunterberg, Holz, and Wolter, 2003).

Lack of time

Another obstacle is lack of time as a direct result of family responsibilities. Women have less time than men to develop skills and obtain updated knowledge. Lack of time prevents them from taking essential steps to achieve financial support from banks, to participate in training programs to acquire necessary skills and knowledge, and to seek out better customers or suppliers. This lack of free time has been observed in a number of studies especially regarding various developing countries such as Bangladesh (Karim, 2000), and Côte d'Ivoire, Ethiopia, Mali, Morocco, Senegal and Zimbabwe (de Groot, 2001).The results suggest that lack of time is a barrier for most women, in most economies.

Risk perception

The author believes that in most cases women are more concerned about the consequences of embarking on entrepreneurship because they fear that such activity will place greater demands on them in terms of time. Modifications in the political, economic and social environment, embodied in appropriate legislation, may contribute to changes in attitudes towards risk-taking among female entrepreneurs. According to the research findings, females tend to have lower risk propensity than male entrepreneurs, which completely mediates the effect of gender on risk behavior (Ivanova Yordanova and Ivanova Alexandrova–Boshnakova, 2011).

Obstacles in the Start-Up Phase

Gender discrimination in external financing

Generally, it is difficult to state that women have more difficulties than men in obtaining capital. However, women have lower financial assets than men and hence they depend more on external finance. Banks and other financial institutions try to optimize the loans based on clients who are able to start a new business, survive and grow. It is difficult to claim that discrimination is based on gender but it is rather logical that women lacking knowledge and skills have more difficulties in achieving external financing. Furthermore, women are not perceived as entrepreneurs because

of prejudice, social networks and family obligations. This perception prevents women from attaining external financial capital. Stereotypical perceptions are well reflected in Buttner's 1993 study, in which bank loan officers were asked to rate men and women according to nine dimensions relating to successful entrepreneurship. The findings were interesting; women were rated lower than men on seven dimensions out of nine.

In developing countries, women confront problems in obtaining financial capital due to their inferior social position. Although some obstacles still exist in developed economies, they are diminishing since the financial institutions are becoming increasingly aware of the abilities of women to enter entrepreneurial activities. Coleman and Carsky, (1996) argue that female entrepreneurs use less bank loans than men and they tend to finance their business activities by personal savings, profit, credit cards and family assistance. Haynes and Helms,(2000) find that, in addition to bank loans, female entrepreneurs surveyed in their research noted other resources in the start–up phase: personal savings, credit cards, friends, venture capital, and the sale of property.

Ufuk and Ozgen,(2001) observe that, among 220 women entrepreneurs who participated in their research, 82.3% stated that they confronted some problems in the start–up phase and 203 of them identified financing as the most significant.

Obstacles in the Management Phase

Stereotypical attitudes

The common perception is that women confront stereotypical attitudes on a daily basis in their contacts with banks, clients and suppliers in the management phase of their business. Nevertheless, Lee - Gosselin and Grise,(1990) find that attitudes regarding female entrepreneurs were positive (52%) and negative (15%).

Obstacles in the Growing Phase

Family and financing issues

Balancing family and work responsibilities concerning greater penetration into the market and attracting more customers is a very hard mission to accomplish in the growing phase of the business. Women who have more domestic responsibilities have less time to develop and leverage their business. According to European Commission Statistics 2006, on average European women devote twice as much time as men to domestic tasks. Women spend four hours and 29 minutes a day, compared with two hours and 18 minutes for men (Women Matter, 2010).

Recommendations to Policy Makers

Public policies should be aimed at supporting economic development by encouraging innovation, creativity, and growth. Governments should support the formation, development and growth of small and medium–size enterprises and encourage

individuals to enter entrepreneurial activities. Policy-makers should perceive female entrepreneurs as a special group that deserves special attention and approach.

The author of this manuscript perceives the establishment of an institutional and egulatory environment that facilitates the entrance of women to entrepreneurship, as a crucial step in reducing the obstacles and administrative barriers.

The following recommendations should be useful to policy-makers in supporting female entrepreneurs during the entire life cycle of their business:

1. Remove maximum legal and regulatory barriers to female entrepreneurship and support pro–family public policies.
2. Foster an economic regulatory environment including taxation to strengthen female entrepreneurship.
3. Increase small and medium–sized preparation programs at all levels of the education system.
4. Provide support, mentoring, coaching and training not only at the start–up phase.
5. Understand the way women perceive risk before designing support.
6. Promote equal opportunity and abolish gender discrimination.
7. Address female concerns regarding business growth and expansion in designing government supporting programs.
8. Strengthen policy coordination regarding government activities to promote female entrepreneurship.
9. Formulate strategies to provide more access to information on international markets and facilities that information and communication technology (ICT) provides.
10. Incorporate female entrepreneurship dimensions in SME related policies at the design phase.
11. Promote appropriate networks to provide knowledge and tools necessary for the development and extension of female entrepreneurship; coordinate domestic and global networks.
12. Follow up and evaluate systematically and continuously the effect of related policies on women entrepreneurship and the extent to which women take advantage of them.

Conclusion

There is no doubt that female entrepreneurship is one of the outstanding phenomena in modern economy. A growing number of women participating in entrepreneurial activities, reflects the transformation in economic and social fields. Women are increasingly crossing the economic and social barriers. They have greater confidence in their skills and abilities to build their enterprises equally, if not more successfully, than men.

Individual motivation, family structure, education, demography, unemployment, and social and economic environments are the main factors influencing female

entrepreneurship. These factors are the main determinants of the differences between women and men regarding risk perceptions in the entrepreneurial process.

Women entrepreneurs face several obstacles along the life cycle of their businesses: the absence of benchmarking possibilities, the lack of financial and social capital, of experience, time, gender discrimination, stereotype attitudes, and, finally, domestic issues.

Many policy-makers perceive female entrepreneurship as a phenomenon that contributes to economic growth. This perception should be accompanied by special attention, support and treatment. Actually, there is much more to accomplish to encourage and assist women who aspire to embark on entrepreneurial activity.

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Women Matter (2010).

Abstract (in Polish)

Niniejsza praca zajmuje się jednym z najważniejszych zjawisk ekonomicznych i społecznych na świecie – zjawiskiem wzrostu przedsiębiorczości kobiet. Przedsiębiorczość kobiet należy analizować jako oddzielną dyscyplinę wiedzy z dwóch głównych powodów:

(a). Przedsiębiorczość kobiet jest ważnym źródłem wzrostu gospodarczego w zakresie tworzenia nowych miejsc pracy oraz, z powodu odmienności genetycznej, kobiety znajdują inne rozwiązania problemów biznesowych i tych związanych z zarządzaniem;

(b). Przedsiębiorczość kobiet jest tematem zaniedbywanym w badaniach biznesowych. Chociaż nieprędko zrównamy szanse mężczyzn i kobiet na polu przedsiębiorczości, postęp w tej dziedzinie można przyspieszyć lepiej rozumiejąc wpływ przedsiębiorczości kobiet na społeczeństwo i jego wkład we wzrost gospodarczy. Niniejsza praca zajmuje się rosnącą przedsiębiorczością kobiet zarówno w krajach rozwiniętych jak i rozwijających się, bada podstawowe czynniki motywacyjne i inne wpływające na przedsiębiorczość kobiet, omawia główne przeszkody z jakimi muszą zmierzyć się przedsiębiorcze kobiety i wreszcie proponuje pewne rekomendacje dla decydentów mające na celu zachęcanie i wspieranie tej aktywności.

Słowa kluczowe: przedsiębiorczość, przedsiębiorczość kobiet.

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