Management,
Knowledge and Learning
International Conference 2012

RELATIONSHIPS BETWEEN ORGANIZATION OF R&D DEPARTMENT AND INNOVATIVENESS OF A COMPANY: RECOMMENDATIONS FOR HRM

Tomasz Ingram
University of Economics in Katowice, Poland
tomasz.ingram@gmail.com

Abstract:
Literature review reveals significant interest in organizational innovativeness. Despite numerous studies little is known about factors influencing the level of innovativeness of a company. In the paper I examine relationships between the number of employees, the budget for R&D, approach for rewarding innovative employees and measures of innovativeness of a company (number of innovations created and managerial opinions about the level of innovativeness). The empirical study carried on in 250 companies in Poland (in 2011) brings support to relations between the number of employees within the R&D department and the number of innovations created as well as between existence of a formal program of innovation support and all (objective and subjective) measures of innovativeness. Surprisingly, study does not bring support for relations between the budget, rewarding of innovative employees and the number of innovations. In the final part implications for human resource management are discussed and future research directions are depicted.

Keywords: organizational innovativeness, human resource management.

1. PROBLEM STATEMENT

Growing interest in organizational innovativeness can be directly linked to popularity of entrepreneurship in recent years. The reason behind this interest lays within the nature of entrepreneurial process encompassing exploration and exploitation ideas attractive for organizations as well as innovativeness as one of the basic issues (Bratnicki, 2004, p. 19). Despite long tradition of studies on organizational entrepreneurship (and innovativeness, as its essential part) (Schumpeter, 1934) researchers still call for further research (Katila, Shane, 2005, p. 814–829). Similarly, regardless of numerous studies on organizational innovativeness results remain ambiguous or even contradictive (Danneels, Kleinschmidt, 2000, p. 1–39). It seems that innovativeness comprise of an important issue for one more reason: Companies are highly interested in knowledge on how to influence the number and quality of innovations created by their employees. Considering innovativeness as one of key factors influencing competitive advantage (Read, 2000, p. 95–119) both quality and quantity of innovations comprise of a vital issue for theoreticians and practitioners. In this regard the study addresses one of the most intriguing questions managers may ask: what shall I do to improve the number and quality of innovations created within my company?

This paper aims at examination of the relationships between the number of employees within the R&D department, R&D budget, approach for rewarding innovative employees and the number of innovations created within the company. In order to focus on managerial needs research results are followed with implications for human resource management (HRM) as significant attention paid to these issues would positively influence organizational abilities to create innovations.

2. ON THE NATURE OF INNOVATIVENESS

Entrepreneurial view and philosophy rely strongly on human resources that comprise of a precondition for “dynamic efficiency” coming from innovations that are able to produce “new options and new resources”(Bratnicki, 2004, p. 12–13; Ghoshal, Bartlett & Moran, 2001, p. 15). It all causes the redefinition of the concept of corporate success, and within turbulent environment, which forces company to become entrepreneurial (Zahra, Kuratko & Jennings, 1999), it is prevailing road to competitive advantage and well-being (Bratnicki, 2004). In this regard it clearly occurs to be fundamental issue for managers and theoreticians, and consequently, significant research interest should not surprise anyone.

Although significant interest in the issue is easily explained, the sheer number of papers dealing with it can definitely lead to confusion. Table 1 presents number of papers related to innovativeness located in the EbscoHost Database.

Table 1: Number of papers addressing innovativeness in EbscoHostDatabase

No	Time range	Number of papers	% increase referred to previous time range	% increase referred to the first time range (1981–1985)
1	1981–1985	711	100	100
2	1986–1990	1013	142	142
3	1991–1995	1540	152	216
4	1996–2000	2638	171	371
5	2001–2005	7387	280	1038
6	2006–currently	16557	224	2328

Source: prepared with data gathered from EbsoHost Database on 20 december 2011.

Brief analysis of the table shows that recent 6 years brought more studies then previous 25 years. Moreover, if there is a place for presenting deeper studies, it would lead to conclusion that last 6 years brought more than 50 % of all papers ever created (dealing with the innovativeness - as listed in the Ebsco Database).

Abovementioned popularity causes rise of different approaches to the issue. Innovativeness itself is also defined in different manners. Brief analysis of innovativeness definitions located in the Academy of Management Review allows to state that they underline four basic aspects: first, characteristics of a process (newness/novelty, creativity, significance for the company, processuality, dialectics), second, subjects of interest (organizational processes, structures, quality and quantity of goods, knowledge, technology, organizational forms, competencies/skills), third, contingencies (intra-organizational contingencies, extra-organizational contingencies, time), and finally fourth, aims (competitive advantage creation, improvement of organizational capabilities and competencies, and contesting organizational inertia)[1] (see: Almirall, 2010; Benner, 2007; Birkinshaw, Hammel & Mol, 2008; Covan & Jonard, 2009; Farjoun, 2010; Hargrave & Van de Ven, 2006; Mainemelis, 2010; Pil & Cohen, 2006; Sydow, Schreyogg & Koch, 2009). Oslo manual (2005) offers possibly the most influential definition of innovativeness that concentrates on novelty in products, processes, as well as marketing and organizational solutions.

On the basis of literature review, for the purpose of this paper, I define innovativeness as a process of creating a value for the organization or market through novel organizational solutions. Researchers underline that innovativeness as a process has both antecedents and consequences (Danneels & Kleinschmidt, 2000, p. 1–39). For the purpose of this paper innovativeness is understood as a variable dependent upon certain factors. Complete list of factors influencing innovativeness is hard, if possible, to prepare considering the number of research carried on in the field. Therefore, the paper concentrates on few of them. They were labelled as follows: financial support (the budget for innovations), organizational support (existence of R&D department and the number of its employees), motivational support (rewarding employees for new ideas) (Klein & Knight, 2005, p. 243–246). Innovativeness, understood as an effect of abovementioned factors, can be measured in terms of quantity and quality.

[1] Study on the definitions of innovativeness was carried on using coding methodology proposed by Charmaz (2006) on 9 definitions that were previously located in papers (presented in the text). After coding I was able to create 4 nodes – also presented above, in the text.

In the next part research hypotheses are formulated. They will be tested in the subsequent parts of the paper.

3. RESEARCH HYPOTHESES

On the basis of literature review I formulate following research hypotheses:

H1. The greater the budget for R&D department, the higher the level of organizational innovativeness;

H2. Existence of innovativeness program (or plan) will positively affect the level of organizational innovativeness;

H3. Existence of R&D department will positively affect the level of organizational innovativeness;

H4. The higher the number of employees of R&D department, the higher the level of organizational innovativeness;

H5. The higher the willingness to reward employees for innovations created, the higher the level of organizational innovativeness.

4. METHODOLOGY

4.1. Overview of research project and sample selection

Research results presented in this paper comprise of a small part of a larger research project carried on by members of Chair of Entrepreneurship and Innovation Management in 2011. In total, 250 companies from Poland were surveyed with the main purpose of investigating the antecedents and consequences of innovativeness of Polish companies as well as its level (measured with the use of numbers and opinions). The original questionnaire contained more than 40 complex questions. They were directed to higher level managers or owners of the company. Table 2 presents the structure of the research sample.

Table 2: The structure of research sample

	Number of Employees (size of a company)	N	Type of activity	N	Financial results	N	Income from year to year (2010/2009)	N
1	10–49	192	Trade	77	Positive (profit)	209	Growth	102
2	50-100	21	Service	74	Neutral (no profit, no loss)	29	Stable	127
3	101–249	15	Mixed	60	Negative (loss)	12	Decline	21
4	250+	22	Production	39				

4.2. Variables

With the intention of verification of research hypotheses 9 questions were from the original questionnaire were utilized. They were as follows:

In order to verify the budget for innovativeness:

1. Does your company spend a part of yearly income on development and implementation of new products, solutions, technologies? (answers: yes, I am not sure, no).
2. If so, what percentage of a yearly income it is? (answers presented as a % value).

In order to assess existence of formalized plans or programs addressing innovativeness:

3. Does your company prepare a plan of development and implementation of new products, technologies, processes (answers: yes, I am not sure, no).

In order to obtain data about R&D department:

4. Is there an organizational unit responsible for finding, developing and implementing new products, technologies or processes within your organization (answers: yes, no).
5. How many employees are there in the organizational unit responsible for finding, developing and implementing new products, technologies or processes within your organization? (answers: 1 – from 0 to 4; 2 – from 5-7, 3 – 8 and more).

In order to obtain data about the motivational aspects of the research:

6. Are creative employees (finding new solutions or developing new products, technologies and processes), enforced, empowered and rewarded for their innovations? (1 – strongly disagree, 2 – disagree, 3 – it is hard to tell, 4 – agree; 5 – strongly agree).

In order to assess the level of innovativeness of a company:

7. What new products, technologies, processes or organizational solution were introduced within your company during last three years (2008–2010). Please write the number of innovations (product, process, organizational and marketing innovations, (the list of 17 different types of innovations developed by prof. T. Kraśnicka).
8. How would you rate the level of innovativeness of your company considering innovations implemented within last 3 years? (1 – the company is not innovative at all, 2 – the level of innovativeness is low, 3 – the level of innovativeness is moderate, 4 – the level of innovativeness is high, 5 – the level of innovativeness is very high).
9. How would you rate the level of innovativeness of your company in relation to main competitors within last 3 years? (1 –we are definitely less innovative, 2 – we are slightly less innovative, 3 – we are as innovative as competitors, 4 – we are more innovative; 5 – we are much more innovative).

Because of high autocorrelation between answers to question number 7 factor analysis was carried on (principal axis factor analysis with Varimax rotation). Results of the analysis are presented in table 3.

Table 3: Factor analysis results

Dimensions	Organizaitonal and marketing innovations	Product innovations	Price and packaging innovations
Organizational or marketing innovations	,999		
Marketing innovations	,999		
Organizational Innovations	,999		
New ways of selling or channels of distribution	,996		
New methods of action – procedures, etc.	,995		
Methods enforcing process, information systems	,979		
New media or promotion techniques	,939		
Changes in work/position organization	,695		,684
Product or process innovation		,994	
New methods of production		,970	
Product innovations		,952	
Product innovations new to the market		,952	
Process innovations	,458	,849	
New relations with companies or institutions		,776	,591
New logistics/distribution methods		,625	,595
New methods of price setting			,951
Important changes in form, shape and packaging			,906
Rotation - Varimax with Kaisera normalization.			
a. Rotation convered in 5 iterations			

Factor analysis results revealed existence of 3 dimenssions encompassing all questions. These dimensions were labeled as follows: organizational and marketing innovations, product innovations, and price and packaging innovations. The coefficient under the correlation matrix was greater than 0,00001 and Bartlett ($p<0,001$) and KMO ($p=0,81$) tests allowed for employment of results in further research procedure. Empirical data for question 7 were exchanged with 3 meta-variables (constructs) counted as means of answers (of loading items respectively). Alpha Cronbach results proved the data are reliable, with coefficients equal to 0,801 for dependent variable and 0,855 for all 9 questions. That allowed for further analysis.

5. RESEARCH RESULTS

In the first step Spearman's correlation analysis was carried on. Table 4 presents its results (in order to make it transparent significant correlations are emphasized).

Table 4: Correlations between dependent and independent variables

Spearman's rho		Rewarding for innovations	Existence of R&D department	Number of employees in R&D department	Yearly income for innovations	% of yearly income for innovations	Innovativeness program or plan
Internal assessment of innovativeness		,153	**,157****	,141	**,226****	**,194***	**,269****
	Sig	,118	**,006**	,144	**,000**	**,023**	**,000**
	N	62	**250**	59	**250**	**105**	**250**
External assessment of innovativeness		,091	**,136***	,176	**,271****	**,205***	**,211****
	Sig	,241	**,016**	,091	**,000**	**,018**	**,000**
	N	62	**250**	59	**250**	**105**	**250**
Organizational and marketing innovations		,144	**,124***	**,436****	,027	,024	**,273****
	Sig	,142	**,031**	**,000**	,343	,409	**,000**
	N	57	**226**	**56**	226	98	**226**
Product innovations		**,239***	,108	**,494****	-,085	**,189***	**,169****
	Sig	**,047**	,062	**,000**	,113	**,036**	**,008**
	N	**50**	205	**54**	205	**91**	**205**
Price and packaging innovations		,204	,131	**,380****	,033	,080	**,258****
	Sig	,089	,053	**,008**	,341	,264	**,001**
	N	45	155	**40**	155	65	**155**

*. Correlation is significant at the 0.05 level (1-tailed).
**. Correlation is significant at the 0.01 level (1-tailed).
Source: calculated on the basis of research results

Correlation matrix analysis proves there is a relationship between the number of employees in the R&D department and number of innovations created. This brings partial support for hypothesis H4. Not surprisingly, the number of employees in R&D department does not influence opinions of key decision makers about the level of innovativeness of the company. In turn, to some extent the existence of R&D department encouraged research respondents to indicate that the company is innovative or even more innovative than its competitors. Although it brings partial support for hypothesis H3, but the lack of significant relations between dimensions of innovativeness and existence of the department does not allow supporting this hypothesis. According to correlation analysis hypothesis H2, stating there is a relationship between the formal program (or innovation plan) and the level of innovativeness, finds support. Hypothesis H1, relating the budget for innovations and the level of innovativeness finds only partial support. Surprisingly, hypothesis H5, linking organizational rewards for innovators with the level of innovativeness cannot be supported.

In order to better understand the relations between variables multiple regression analysis among correlating variables was carried out. However, models that were statistically insignificant and low r square coefficients (varying from 0,06 – for product innovations to 0,12 for internal assessment of innovations) forced to employ curve fit estimation analysis. Curve fit estimations bring further support for the relationships between the number of employees in the R&D department and numbers of innovation, although these relations were not as strong as correlations (r square varied from 0,1 to 0,25 with compound or s models).

On the basis of provided analysis there is no reason to reject hypotheses H2 and H4 (existence of innovativeness program (or plan) will positively affect the level of organizational innovativeness; and the higher the number of employees of R&D department, the higher the level of organizational innovativeness). Only partial support for hypotheses H1 and H3 was found (the greater the budget for R&D department, the higher the level of organizational innovativeness; existence of R&D department will positively affect the level of organizational innovativeness). On the basis of research results hypothesis H5 (the higher the willingness to reward employees for innovations created, the higher the level of organizational innovativeness) could not be supported. In the next part I briefly discuss implications of research results for human resource management – addressing the strongest relations identified during the research.

6. DISCUSSION, IMPLICATIONS FOR HUMAN RESOURCE MANAGEMENT THEORY AND PRACTICE, AND CONCLUSIONS

Research results did not bring support to hypotheses as supposed. Partial confirmation of hypothesis stating there is a relationship between funds allocated for innovations and lack of support for the relationship between rewarding for innovations and innovativeness of a company puts a question mark on human motivators (rewards) and organizational enablers (funds). On the other hand support for formal planning of innovation activity as well as confirmation of relationships between the sheer number of employees (within R&D department) and number of innovations can be surprising.

Within recent years human resource management has grown from insignificant to noteworthy issue. Last ten years have even been called “golden age” of human resource management (Ulrich, 1997). Despite rapid development there are different fields requiring filling in with theory within the human resource management field. One of them is interdisciplinary research. Recently several researchers addressed issues of interplay between entrepreneurship (and innovativeness) and hrm (Miron-Spektor & Erez, 2011; O’Connor & McDermott, 2004). However, frequently such attempts fall victims to misalignment of perspectives. While entrepreneurship remains organizational level phenomenon, and consequently operates on the level of philosophy or policy/strategy, human resource management deals mainly with processes or best practice (Colbert, 2004). Such disproportion of levels of analysis has lead to problems in results interpretation and misunderstandings. Moreover, studies interrelating phenomena from different organizational levels may be perceived as inadequate or even misleading. Therefore, in this study – in the following part –a list of best practices for managers is discussed, and theory implications are briefly described.

There are at least three implications coming from the study for practitioners. Firstly, if the company is willing to be innovative – considering at least the number of innovations (and the probability theory helps to state that the higher the number of ideas, the greater the probability that some will bring a profit) – managers should create the R&D (or similar) department. Secondly, in order to maximize the number of innovations created appropriate (the higher - the better) number of employees should be allocated to it. Thirdly, organizations could certainly benefit from planning or preparing the program aiming at promotion of innovativeness.

These are people who make organization innovative. Therefore, there are at least several issues to be treated with care regarding human resource management support for innovativeness. Firstly, abovementioned R&S departments should be prepared and equipped

with well-crafted and carefully prepared job descriptions and competency profiles. This should certainly be the job of human resource management specialists considering job analysis methods necessary to use while such preparation (Brannick & Levine, 2002). Secondly, since this is the number of employees that makes the value for the company, every vacant position should be filled as soon as possible. Timing issues have been well described before in the literature (Gorter & Ommeren, 1999). Thirdly, on the other hand, they are "awesome" employees who make the difference. Therefore, special pressure should be put on the process of identification of talents. Unfortunately, talent identification procedures are not precisely described so far – therefore, organization is forced to learn by failure in this process. To some extent recruitment and selection procedures can be applied, but they frequently remain inadequate considering the specificity of talents (Ingram, 2011; Tzabbar, 2009). Surprisingly it is not compensation that requires special care. While it comprises of a part of organizational level aspect, in this case they are not money that motivate to innovate – according to research results. It is also hard to develop any recommendations for the development of such employees – but factors influencing individual willingness for innovativeness should be searched outside of formal, financial recognition.

Considering research results it seems that further studies, helping to explain in detail how employees of R&D department produce organizational innovativeness would be welcomed. It seems that grounded theory approach or case study would give better understanding of individual and collective processes aiming at creating value for customers and organization through novel ideas (Charmaz, 2006; Glaser, 1992). Although the deeper comprehension would be welcomed in that case, further studies on this topic could continuously be carried on using quantitative methods as well. However, in this case results would be better if they were comparable to existing research. The number of questionnaires usually employed in entrepreneurship research strictly call for well-crafted publicly accepted tools. Such tools would allow international results comparison and would lead to mutual understanding of researchers all over the world (or at least all over Europe).

REFERENCE LIST

1. Almirall, E., & Casadesus-Masanell, R. (2010). Open versus closed innovations: A model of discovery and divergence. *Academy of Management Review, 35*(1), 27–47.
2. Benner, M. J. (2007). The incumbent discount: Stock market categories and response to radical technological change. *Academy of Management Review, 32*(3), 703–720.
3. Birkinshaw, J. Hamel, G., & Mol, M. J. (2008). Management innovation. *Academy of Management Review, 33*(4), 825–845.
4. Brannick, M. T., & Levine, E. L. (2002). *Job analysis. Methods, research, and applications for human resource management in new millennium.* Sage Publications, Thousand Oaks, New Dehli, London.
5. Bratnicki, M. (2004). *Organizational entrepreneurshipscape: Contraditions, processes, dimensions, forms and questions.* Dąbrowa Górnicza: Academy of Business in Dąbrowa Górnicza.
6. Charmaz, K. (2006). *Constructing Grounded Theory: A Practical Guide Through Qualitative Analysis.* Thousand Oaks, CA: Sage Publications.
7. Colbert, B. A. (2004). The complex resource-based view: Implications for theory and practice in strategic human resource management, *Academy of Management Review*, 29, 341–358.
8. Cowan, R., & Jonard, N. (2009). Knowledge portfolios and the organization of innovation networks. *Academy of Management Review, 34*(2), 320–342.

9. Danneels, E., & Kleinschmidt, E. J. (2000), *Product innovativeness from the firm`s perspective: Its dimensions and their impact on project selection and performance (Rev 1/2000),* Institute for the Study of Business Markets: The Pennsylvania State University, ISBM Report 4-2000.
10. Farjoun, M. (2010). Beyond dualism: Stability and change as a duality. *Academy of Management Review, 35*(2), 202–225.
11. Ghoshal, S., Bartlett, C.A., & Moran, P. (2001). A new manifesto for management. In. M. A. Cusumano, & C. C. Markides (Eds.), *Strategic thinking for the next economy* (pp. 9–32). San Francisco: Jossey-Bass.
12. Glaser, B. (1992). *Basics of grounded theory analysis.* Mill Valley, CA: Sociology Press.
13. Gorter, C., & Ommeren, J. V. (1999). Sequencing, timing and filling rates of recruitment channels. *Applied Economics*, 31, 1149–1160.
14. Hargrave, T. J., & Van de Ven, A. H. (2006). A collective action model of institutional innovation. *Academy of Management Review, 31*(4), 864–888.
15. Ingram, T. (Ed.) (2011). *Zarządzanie talentami: Teoria dla praktyki zarządzania zasobami ludzkimi*, PWE, Warszawa; (Talent management: Science for practice of HRM. Warsaw: PWE).
16. Katila, R., & Shane S. (2005). When does lack of resources make new firms universal, *Academy of Management Journal,* 48, 814–829.
17. Klein, K. J., & Knight, A. P. (2005). Innovation implementation. Overcoming the challenge. *Current Directions in Psychological Science,* 14, 243–246.
18. Mainemelis, Ch. (2010). Stealing fire: Creative deviance in the evolution of new ideas. *Academy of Management Review, 35*(4), 558–578.
19. Miron-Spektor, M., Erez, E., & Naveh (2011). The effect of conformist and attentive-to-detail members on team innovation: Reconciling the innovation paradox. *Academy of Management Journal*, 54, 740–760.
20. O'Connor, G. C., & McDermott, C. M. (2004). The human side of radical innovation. *Journal of Engineering and Technology Management*, 21, 11–30.
21. Oslo Manual, (2005). *Guidelines for Collecting and Interpreting Innovation Data.* Third Edition. European Commission: OECD Publishing.
22. Pil, F. K., & Cohen, S. K. (2006). Modularity: Implications for imitation, innovation, and sustained advantage. *Academy of Management Review, 31*(4), 995–1011.
23. Read, A. (2000). Determinants of successful organizational innovation: A review of current research. *Journal of Management Practice*, 3, 95–119.
24. Schumpeter, J. A. (1934). *The theory of economic development: An inquiry into profits, captial credit, interest, and the business cycle.* Cambridge: Harvard Business Review.
25. Sydow, J., Schreyogg, G., & Koch, J. (2009). Organizational path-dependence: Opening the black box. *Academy of Management Review, 34*(4), 689–709.
26. Tzabbar, D. (2009). When does scientist recruitment affect technological repositioning. *Academy of Management Journal*, 52, 873–896.
27. Ulrich, D. (1997). *Human resource champions. The next agenda for adding value and delivering results.* Harvard Business School Press, Boston.
28. Zahra, S. A., Kuratko, D. F., & Jennings, D. F. (1999). Entrepreneurship and the acquisition of dynamic organizational capabilities. *Entrepreneurship Theory and Practice,* 23, 5–10.