

The impact of creative organizational climate on the innovation activity of medical devices manufacturing firms in Hungary

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Abstract

The purpose of this study was to empirically investigate the impact of creative organizational climate on the innovation activity of medical devices manufacturing firms in Hungary. We applied a combined qualitative and quantitative research model, focusing on two firm's case studies that are active in the above mentioned sector and differ to a substantial degree in their innovation activities. The connection between innovative climate and innovation was analyzed by comparing their organizational climate and perceptions of organizational members of innovation activities. Our findings revealed that classical models of creative organizational climate explain only partially the differences, although on the level of individual perceptions of climate and innovativeness we can find some connections.

We found one factor that differentiated the two firms in terms of organizational climate in the predicted direction: the amount, quality, sincerity and depth of **debates** going on in the organization. The level of **challenge** (high involvement, commitment and challenging goals) and the time devoted to think about new ideas and innovative solutions (**idea time**) turned out to be contrary to the expectations based on previous research – although these results are less significant statistically. The results trigger further research into the sources of competitiveness in the Hungarian medical devices manufacturing sector.

Keywords: creative organizational climate, innovation, competitiveness, Hungary

1. Introduction

Creativity and innovation are important values in the Hungarian culture. Several famous Hungarian inventors added their innovation and patents to the world's community. Just highlight the most well-known ones: the ball pen of Bíró, the Vitamin C of Szentgyörgyi, the carburettor of Csonka or Rubik's magic cube. Even in relation with these success stories a serious question arises: could the inventor set up an own business and run it successfully inside the country? But successful innovation only partly depends on creativity. It also requires an inspiring and supportive business environment.

Innovation is an immanent part of competitiveness. Without innovative companies a national economy hardly becomes competitive. Generally, innovation is handled from financial aspects in a strategic level, while several other factors have an effect on the innovation process in micro level. From these factors we mention those ones (culture, climate, HR systems) that exist the more intensively in organisations the wider scale of innovation is ensured. Our research would be also useful to governmental decision-makers, because this information can help boost and focus innovation activity at macroeconomic level.

In Hungary there is no other survey within this topic, there hasn't been any research done yet within the medical devices industry. What are the key factors of organisational atmosphere, and what is the difference between ordinary companies and outstandingly innovative firms? What is the role of creativity and other organisational factors within this difference?

1.1. Creativity and innovation

According to Amabile (1998) the main difference between innovation and creativity is that creativity anticipates innovation. Durably one cannot exist without the other: if there are no new ideas born than we have nothing that can be taken to market or if the innovation process doesn't work properly than the valuable ideas will stuck at a very early stage. These two phenomena move closely together into an organization.

In the '80s experts emphasized that creative work environment facilitates the in-house innovation of a company (Ekvall,

Arvonen, Waldenstrom-Lindblad, 1983; Ekvall, Tangeberg-Anderson, 1986; Ekvall, 1996; Zain Mohamed and Rickards, 1996; Amabile, Conti, 1999, McLean, 2005). The related literature mostly interprets creativity as an individual skill (Williams és Yang, 1999, p.378.). However, it is important to examine the context in which the creative individuals work in order to understand the benefits of creativity.

Sundgren et al. (2005) affirm that within the pharmaceutical industry the need for innovation is relatively increased. During their research focusing on a Swedish pharmaceutical manufacturer they found that information sharing, learning culture, intrinsic and extrinsic motivations and networking have a significant effect on creative climate. For the analysis they set up a structural model that used these parameters and explain the 86% of the creative climate's variance. They found that in case of the researched company information sharing had a positive effect on learning environment, which supported the creative climate, but information sharing had a direct negative effect on creative climate and intrinsic motivation (Figure 1.). The research emphasises that information sharing and the employees' intrinsic motivation play an important role in shaping the creative environment of this company.

Ekvall and Ryhammar (1999) also researched the creative climate at the University of Örebro. By using several types of questionnaires they measured several variable groups inside the university. During the analysis it turned out that organizational climate has significant effect on organizational outcomes, but the organizational realities (organizational structure, leadership style, resources) have significant effect on both organizational outcomes and organizational climate. According to Ekvall's (1999) results the most powerful correlation was revealed in Dynamism (0,49), Idea support (0,44), Risk taking (0,42) and Challenge (0,40). It was also shown that 35 per cent of the variance of creativity's parameter was explained by organizational climate. A clear logic pattern has displayed along the correlations: the human relation oriented values and leadership oriented values are significantly correlating with the creative environment.

According to Ekvall (1996) organizational climate influences business processes like problem solving, decision making, communication, cooperation, controlling and other internal, psychological processes like learning, creation, motivation or commitment. A company has various disposable resources (man, money, machines, materials) that are used during its operations. These processes have different outcomes: high or low quality products, loss of profit, improvement etc. Climate has a remarkable impact on these business processes, and it can be explained in organizational context as a mediator between resources and outcomes (Figure 2.).

From this model we can conclude that organizational climate has a great impact on innovation and creativity. Three significant research programs took place in the '80s and the '90s that aimed to investigate the attributions of creative and innovative organizations (two in the USA and one in Europe). Numerous theoretical results, publications and hypotheses were born as a result of these programs. Next to these results, every other research contributed additional questionnaires to measure creative/innovative climate. Amabile and Grysiewicz (1989) developed the Work Environment Inventory (WEI) questionnaire, Isaksen (1995) created the Situational Outlook Questionnaire (SOQ) and Ekvall (1988) set up the Creative Climate Questionnaire-t (CCQ). During these research a clear picture has developed on creative climate that can be summarised by followings (Ekvall and Ryhammar, 1999):

Organizational members perceive their objectives and assignments as significant challenges. The tasks they do are noteworthy and they pay attention to the development and the survival of the company. Employees can freely suggest ideas, collect information, interact with colleagues inside or outside the organization, and take advantage of this freedom. They are not tied by internal communication rules. New ideas and change initiatives are welcomed. People get a common ground and support new proposals. People are daring to declare their own opinions because they trust each other. They do their jobs without fear because in case of failure or inefficiency there shall be no victimization. Debates arise in an open and non-authoritarian atmosphere. These debates are not harmed by individual conflicts and hate. Uncertainty is a ruling force inside the organization that inspires employees to take risk. They take advantage of the arising opportunities and prefer experiments and tests to theoretical examination and wide scale analysis.

1.2. The dimensions of Creative Climate

The Creative Climate Questionnaire was developed by Göran Ekvall. Within his research he differentiated ten dimensions of organizational climate that help, stimulate or block innovation.

1. **Challenge:** It means that organizational members are emotionally involved into the company's goals and operations. A high Challenge climate is present when people feel joy and experience meaningfulness in their job, and so they invest much energy into work.

2. Freedom: Denotes the behavioral independence of organizational members. In a high Freedom climate people are making contacts freely, exchange information, initiate and make decisions. The opposite is a rule-bound and passive environment.
3. Idea Time: The amount of time organizational members can and do use for elaborating new ideas. In a high Idea time situation possibilities exist to test and discuss suggestions and fresh impulses that were not planned and scheduled in advance.
4. Idea Support: Describes the ways new ideas are handled in the organization. In a supportive environment bosses and workmates are attentive and supportive, people listen to each others' initiatives, there is a constructive and positive climate.
5. Openness: The emotional safety in relationships. In a high Openness environment everyone in the organization dares to put forward new ideas and opinions. Initiatives can be taken without fear of reprisal and ridicule in case of failure. There is a straightforward communication style.
6. Dynamism: The eventfulness of life in organizations. In a high Dynamism environment new things happen all the time and ways of thinking are frequently changing. There is a "psychological turbulence" which is characterized by "full speed" and "breakneck".
7. Playfulness/Humour: The spontaneity and ease that is displayed. A relaxed atmosphere with jokes and laughter is present in a high Playfullness environment.
8. Debates: The occurrence of clashes and encounters between differing points of views, ideas, experiences and knowledge. In a Debating organization many voices are heard and people are keen on putting forward their ideas and questioning the status quo.
9. Conflicts: The lack of emotional and personal tensions (in contrast to conflicts between ideas) in the organization. When there are many Conflicts (and the measure is actually low) people dislike each other and the climate is characterized by "warfare", plots and traps being its usual elements.
10. Risk Taking: the tolerance of uncertainty in organizations. A high score means that decisions are quick and prompt, arising opportunities taken and concrete experimenting is preferred to detailed investigation and analysis.

It is important to note that it is not enough if any of the dimensions gets too many scores. It can refer to the shifting of the weights. For instance, too high degree of dynamism is not enough alone if it does not couple with advanced trust and openness. In this case, active people become frustrated and their ideas would not be able to root inside the organization. Dimensions are strengthening each other. Referring the previous example if people get in touch with other departments they can meet new aspects, new behavior and it can energize them in their daily job. Accordingly, we can announce that communication plays an essential role in an organization. If these communication channels are obstructed or doesn't even exist than new ideas cannot flow intensively into the organization, which limits the innovation potential.

1.3. Research question and hypothesis

As a result of the literature overview we would like to test the hypothesis that a creative organizational climate leads to higher levels of innovation. Based on the definitions of the creative organizational climate factors we can hypothesize each factors' contribution to the level of innovation activity in organizations, measure the relation between overall creativity in climate and search for the factors that have the strongest impact on innovation. The relation between creative organizational climate and innovation has not been empirically examined yet in the medical devices manufacturing sector, that has a long tradition of innovation in Hungary.

2. Research methodology

The research was conducted at two companies in the same industry segment. The companies were selected based on their different degrees of innovation activities while having similar characteristics in many other respects (size, age, number of employees etc.). Due to non-disclosure agreements with the enrolled companies in our research, we simply refer to the organizations as A and B, without revealing their names. We based the comparison of these companies on questionnaires measuring creative climate, employees' perceptions and interviews about innovation activities as well as the analysis of documents.

Company A's profile

The SME manufactures angular vein forceps and other types of taggers and extractors for human and veterinary purposes. Founded 20 years ago the company has now 200 employees, with 140 workers working on the shop floor. It produces for export 95% of its sales, so there is a need for high quality and a flexible development of products based on clients needs. Customers' needs are communicated through a commercial company that deals with their (and other suppliers') products through catalogue selling. The international commercial company located in Germany translates these expectations to the Hungarian development and quality engineers, who actually work on new products and innovations. A recent success story in the organization was a new tool that has been developed for the dental treatment of horses. According to the interviews one of the main creative elements in the development process was that the engineers working on the project have borrowed a skull of a horse from a university, because the feedback and expectations coming through the German commercial company were unclear, so they decided for more concrete (hands on) experimenting.

Company B's profile

It is also an SME, dealing with development, manufacturing and sales of medical devices. Date of foundation is 1989. Currently over 160 people are employed, nearly half of them in the headquarters that houses the product development institute, management, sales and service department. Their philosophy is to be flexible for customers both in terms of product development and service and keep reinvesting a considerable part of profit into upgrade and development (together with external sources such as successful development tenders) in order to keep product portfolio up-to-date. The key product groups are cardiology and radiology: producing a full range of ECG devices, defibrillators, patient monitors and x-ray devices. Besides the human appliances also developed ECG and monitor for veterinary use. The key strength of these devices is that the software, modules and accessories are specifically developed for veterinary purposes. Their products are being offered in over 100 countries through an international distribution network.

The main difference between the two companies was first of all in their innovation activity. The number of innovative products in Company B was triple of Company A's new product innovations in the past 3 years. Company A had a more conservative organizational structure (e.g. the questionnaire was administered according to organizational units) and a competitive incentive system (based on individual performance measurement) that often leads to withholding information. Company B had a more organic type of structure (in the survey we could only refer to employees' university specializations like mathematicians, mechanical or electrical engineers, except for sales or finance) and a collectivistic bonus scheme.

The original CCQ questionnaire contained five questions in each dimension. We shortened the original model, using three questions in each dimensions because the increased compliance of employees. We added three questions referring to employees' perceptions about the innovation activity of the organization. This indicator was built in the model as a control parameter of other innovation factors. The questions referred to the followings:

- How innovative is the company?
- Do they develop new products/services more often than their competitors?
- How dynamic is the innovation activity of the company in accordance with its market opportunities?

These questions allowed us to examine the relationship among organizational climate and innovation activity, at individual levels, using aggregated data of two organizations. (Regression Analysis)

Our questionnaire contained 33 questions with a 1-5 Likert-scale.

In our analysis we compared only headquarters data (development engineers, sales and controlling) because manufacturing was a separate sub-culture (also geographically distanced) in both companies. We collected 31 questionnaires in company A and 27 in company B, that is a 52 - 44% respondent rate respectively.

The interviews (an interview session typically lasted from 50 to 70 minutes) primarily served as a feedback to the managers, as well as contributed to a better understanding of quantitative survey results. They also aimed, however, to collect some lessons learnt from successful and unsuccessful innovation projects.

Wherever available, we collected business reports and other relevant documentations as a supplement for the interviews. We used these archive data to crosscheck the relevant information and verify the reliability of data obtained via interviews.

3. Research findings

3.1. Validating a new and short version of the creative organizational climate questionnaire

The first step in the research process was to establish the validity of our research tool. We have started our research with some preliminary interviews with employees based on a longer version (5 items per factor) of the questionnaire. We have checked respondents' understanding by asking for examples and also examined the validity of the dimensions by analyzing stories that have been told in connection with the answers given. Based on the feedback we have created an instrument that has only 3 items per factor and with a high reliability (Cronbach's Alphas ranging between ,71 and ,84). See table 1. for Cronbach's Alpha figures and inter-item correlations. The measure of perceived innovation activity was also reliable.

3.2. Comparing Company A and B on Innovation Activity and Creative Climate dimensions

3.2.1. Innovation activity and overall climate

According to our research the innovation activity of Company B was significantly higher than Company A's based both on unobtrusive measures (number of new products and innovative projects) as well as employees' perceptions. On the 5 point Likert scale Company B had 3,98; Company A had 3,40 on average (see Table 2 for comparison), a result that has also been confirmed with T-test (see Table 3. for confidence intervals at a 95% level for differences). It is interesting to observe that unobtrusive measures showed an activity that was almost triple at Company B, while the measure based on employees' perceptions shows only a modest, though significant difference.

Based on these measures we can confirm that Company B was characterized by significantly higher innovation activity, so the next question that emerges is whether the overall level of creative organizational climate and/or some of its factors do explain the difference. Surprisingly the overall level of creative climate was not different in the two companies, Company B's average actually was lower (3,68) than Company A's (3,78), however the difference is not significant in statistical terms. So basically employees in both company had a perception of working in a creative climate.

We have found three factors that differentiated the two firms in terms of their organizational climate: Debates (in the predicted direction); Challenge and Idea time in the reverse direction - although these last two results are less significant in a strict statistical sense. In the followings we will shortly introduce the results and try to give an interpretation in the light of the interviews.

3.2.2 Debates

The average score for Debates in Company B (3,81) was 0,53 points higher than Company A's score on the same factor, a result that is significant at a 95% confidence level. The critical nature of this aspect of the climate can also be confirmed on the basis of the interviews: the product development process involves many different expertise areas: mechanical engineers, electronic engineers, mathematicians, software developers, medical staff – usually in cooperation with universities, and last, but not least: controlling and marketing experts. These areas are not organized into organizational units, boundaries are weak and permeable, there are no strong hierarchical structures, so “everything is discussable”; “we do not have old wise men” here (citations from Company B employees' interviews). Actually the company's CEO's (and founder) “conflicts”, who is still active in the management, with a 20 years younger head of Finances are well known in the organization.

“I usually try to push the gas-pedal and she is pressing on the brake. It may sometimes be tough, but both are important for winning in the game.” (CEO and founder of Company B)

The climate of listening to different voices in the organization, regularly asking people's opinion and feedback, questioning the status quo and developing the quality of dialogues between different expertise areas seems to be a critical part of discovering truly new and superior solutions to existing problems. In diagnostics (especially in oncology) one of the critical factors is to avoid mare's nests, i.e. type 1 error (diagnosing a healthy client ill). Company B's products are measurably higher on these measures that is due to their superior software solutions incorporating many medical and engineering innovations.

Company A was also aware the weaknesses of this dimension, referring to the asymmetric relation with the German commercial company; the problems of the competitive incentive system and the lack of training and development resources for developing the internal cooperation and communication. Based on this result we can confirm that in the model of creative organizational climate all factors are equally important and have to be in line with all the others in order to produce competitive innovations.

3.2.3 Challenge

The average score for Challenge in Company B (3,78) was 0,48 points lower than Company A's score on this factor, a result that is significant at a 94% confidence level. This difference is contrary to our expectations based on the model. A similar tendency can be observed regarding Idea Time, Company B's result on this dimension (3,39) was 0,46 points lower, that is significant at a 93% confidence level.

Based on these results we can only hypothesize that some of the factors of the original model might have changed in their emphasis, or the optimal range may have shifted down on the scale. The consequence might be that too much of one aspect, while not reaching other factors' expected standards may also result in lower performance in terms of innovation. Too much involvement and high expectations while having communication problems internally might cause tensions for some people in the organization. Similarly high Idea time and moderate Dynamism (Company A: 3,29) may also signal some internal contradictions with high Challenges.

3.3. Individual perceptions – Regression model

During the regression analysis the innovation control variables were dependent variables while the explanatory variables came from the average of the CCQ's factors. The results are shown in Table 4. The adjusted R² is 0,522, what is a moderately strong explanatory index. It means that the variables involved from the CCQ are explaining the 52,2 % of the innovation activity's variance recognized by the organizational members.

Table 4.C shows the significance level of the Beta coefficients involved into the regression. According to this, excluding the Debates factor all the other CCQ variables are not significant, however the Idea Time and the Risk Taking factors are close to the regular significant levels and the value of Beta is also important.

The standardized Beta of Debates is 0,479. The interpretation of this index is: if the perception of climate increases by one unit than the innovation activity perceived by the organizational members increases by 0,479 on average (1-5 Likert scale applied). We can conclude that on individual level there is a strong connection between the innovation activity perceived and the internal debates as well as the quality of dialogues.

4. Conclusion

Our research has demonstrated, that:

- **Creative organizational climate is a key driver of increased innovative activity within companies.**
- **Dimensions of creative organizational climate have to be managed simultaneously. There may be, however, occasional drivers of creative organizational climate, like “Debates”, as it resulted from our case study.**

The way out of the recession is innovation. The heart of innovation management is creativity that emerges from combining different kinds of knowledge and expertise. It has an outstanding contribution to the competitive advantage of the organization, in case it is managed well.

Based on our research findings, we would emphasize internal communication and cooperation, especially among different knowledge groups and expertise areas. Debates and dialogues among different departments have to be part of the everyday life of organizations. Knowledge management and organizational development interventions can effectively contribute to the dissemination and transformation of internal and external information. This process has to be channeled into knowledge generation through human interactions and technological tools, assuring optimal decision-making and innovative thinking. Human resource management with its strategic policies and tools can also contribute to knowledge sharing and cooperation.

Further research is recommended to involve more companies and analyze organizational climate within the same industry. Based on this, governmental organizations might be able to focus or refocus the innovation grants at macro level. Further research on innovation and creative organizational climate could serve decision makers and increase national competitiveness.

It is important to emphasize that innovation also requires significant financial resources. In order to undertake innovative initiatives and achieve great innovations companies should all be aware of those organizational factors and strategies that influence innovation.

Notes

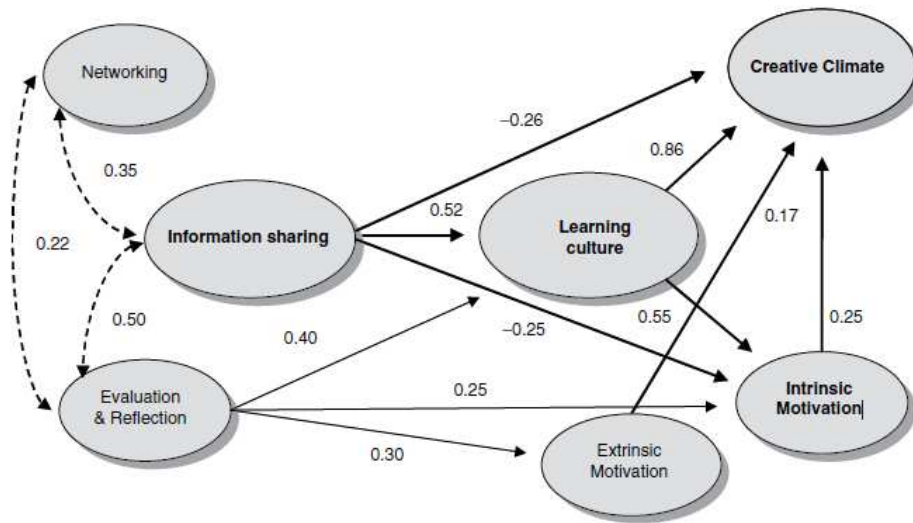


Figure 1.: Creative Climate Model (Sundgren et al. 2005)

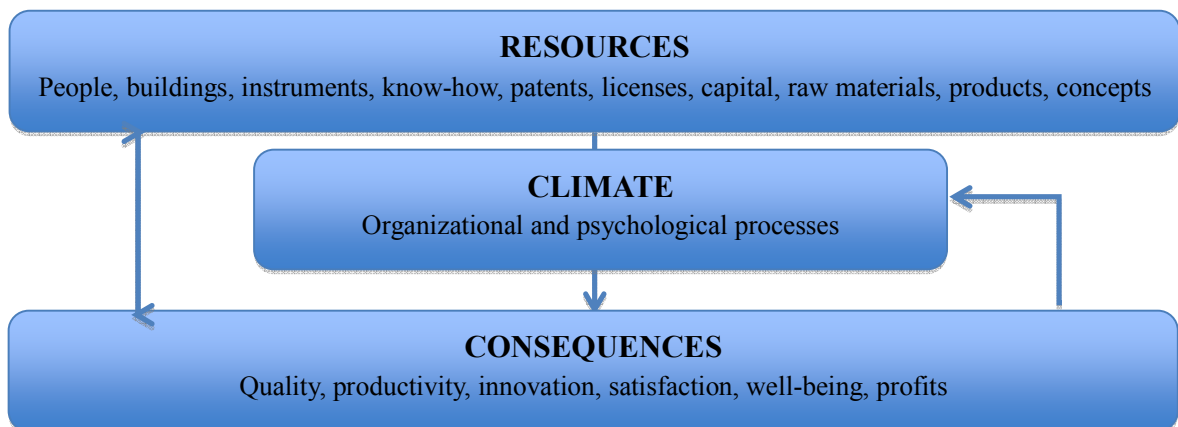


Figure 2: Organizational climate, as mediator (Ekvall 1996)

Reliability Statistics

Variables	Crombach's Alpha	Inter item correlations	Nr of items
Innovation	,712	0,51; 0,47; 0,37	3
Challenge	,794	0,58; 0,55; 0,55	3
Freedom	,737	0,67; 0,43; 0,33	3
Idea time	,829	0,74; 0,52; 0,60	3
Idea support	,844	0,59; 0,68; 0,67	3
Openness	,736	0,48; 0,47; 0,49	3
Dynamism	,721	0,41; 0,53; 0,44	3
Humor, Playfulness	,737	0,57; 0,58; 0,30	3
Debate	,712	0,51; 0,40; 0,44	3
Conflicts	,799	0,52; 0,61; 0,59	3
Risk-taking	,815	0,75; 0,54; 0,49	3

Table 1. Crombach's Alphas and inter-item correlations for creative organizational climate

Report

Company		Innovation	Challenge	Freedom	Idea time	Idea support	Openness	Dynamism	Humor, playfulness	Debate	Conflicts	Risk taking
Company B	Mean	3,9753	3,7778	3,8272	3,395	3,6173	3,580	3,555	3,9630	3,8148	3,925	3,3580
	N	27	27	27	27	27	27	27	27	27	27	27
	Std. Dev.	,69753	,99572	1,0351	1,062	1,1005	,8847	,7898	,98854	,82862	,9026	1,0974
Company A	Mean	3,3978	4,2581	4,1183	3,854	3,8172	3,634	3,290	4,1183	3,2796	3,849	3,5484
	N	31	31	31	31	31	31	31	31	31	31	31
	Std. Dev.	,59888	,70558	,60583	,9054	,73454	,7569	,6190	,65855	,47994	,7974	,56796
Total	Mean	3,6667	4,0345	3,9828	3,640	3,7241	3,609	3,413	4,0460	3,5287	3,885	3,4598
	N	58	58	58	58	58	58	58	58	58	58	58
	Std. Dev.	,70365	,87902	,83869	,9999	,92008	,8120	,7100	,82469	,71201	,8413	,85345

Table 2. Descriptive statistics for perceived innovation and creative organizational climate in the two companies

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Challenge	1.	2,791	,100	-2,140	56	,037	-,48029	,22445	-,92992	-,03065
	2.			-2,091	46,077	,042	-,48029	,22974	-,94271	-,01787
Freedom	1.	9,888	,003	-1,327	56	,190	-,29112	,21932	-,73046	,14822
	2.			-1,282	40,688	,207	-,29112	,22699	-,74965	,16741
Idea time	1.	,738	,394	-1,780	56	,081	-,45978	,25835	-,97731	,05776
	2.			-1,760	51,458	,084	-,45978	,26124	-,98412	,06457
Idea support	1.	5,622	,021	-,823	56	,414	-,19992	,24289	-,68649	,28664
	2.			-,801	44,309	,427	-,19992	,24952	-,70270	,30286
Openness	1.	,464	,499	-,251	56	,803	-,05416	,21554	-,48594	,37762
	2.			-,249	51,557	,805	-,05416	,21789	-,49149	,38316
Dynamism	1.	1,167	,285	1,432	56	,158	,26523	,18521	-,10578	,63625
	2.			1,408	49,086	,165	,26523	,18834	-,11324	,64370
Humor, playfulness	1.	1,904	,173	-,712	56	,479	-,15532	,21803	-,59209	,28146
	2.			-,693	44,254	,492	-,15532	,22402	-,60672	,29608
Debate	1.	7,180	,010	3,058	56	,003	,53524	,17505	,18459	,88590
	2.			2,953	40,423	,005	,53524	,18127	,16899	,90150
Conflicts	1.	,448	,506	,343	56	,733	,07646	,22320	-,37066	,52359
	2.			,340	52,382	,735	,07646	,22514	-,37524	,52817
Risk taking	1.	8,130	,006	-,845	56	,402	-,19036	,22523	-,64154	,26082
	2.			-,812	37,763	,422	-,19036	,23456	-,66529	,28457
Innovation	1.	,573	,452	3,393	56	,001	,57746	,17020	,23651	,91841
	2.			3,357	51,651	,001	,57746	,17202	,23223	,92269

Table 3. Results of independent sample T-test

REGRESSION MODEL

	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,723	,522	,421	,53565

ANOVA^b

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	14,737	10	1,474	5,136	,000 ^a
	Residual	13,485	47	,287		
	Total	28,222	57			

a. Predictors: (Constant), Risk taking, Debate, Challenge, Dynamism, Idea time, Humor, playfulness, Conflicts, Freedom, Openness, Idea support

b. Dependent Variable: Innovation

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	,650	,501		1,299	,200
	Challenge	-,039	,120	-,048	-,323	,748
	Freedom	,002	,130	,003	,018	,986
	Idea time	-,160	,116	-,227	-1,376	,175
	Idea support	,105	,160	,138	,659	,513
	Openness	,191	,158	,220	1,207	,233
	Dynamism	-,033	,130	-,033	-,254	,801
	Humor, playfulness	,150	,121	,176	1,243	,220
	Debate	,479	,137	,485	3,499	,001
	Conflicts	-,010	,121	-,012	-,082	,935
	Risk taking	,149	,104	,181	1,436	,158

a. Dependent Variable: Innovation

Table 4. The regression model of creative organizational climate factors and perceived innovation activity

References

1. Amabile, T. (1998). How to kill creativity. *Harvard Business Review*, 76, 77-89.
2. Amabile, T., & Conti, R. (1999). Changes in the work environment for creativity during downsizing. *Academy of Management Journal* 42 (6), 630-641.

3. Amabile, T., & Gryskiewicz, N. (1989). The Creative Environment Scales: Work Environment Inventory. *Creativity Research Journal*, 231-253.
4. Bavec, C. (2009). On the creative climate and innovativeness at the country level. *Zb. rad. Ekon. fak. Rij.* vol. 27(1), 9-30.
5. Ekvall, G. (1996). Organizational Climate for Creativity and Innovation. *European Journal of Work and Organizational Psychology*, 5 (1), 105-123.
6. Ekvall, G., & Ryhammar, L. (1999). The Creative Climate: Its Determinants and Effects at a Swedish University. *Creativity Research Journal* 12 (4), 303-310.
7. Ekvall, G., & Tangeberg-Anderson, Y. (1986). Working Climate and Creativity: A study of an innovative newspaper. *Journal of Creative Behaviour*, 215-225.
8. Ekvall, G., Arvonen, J., & Waldenstrom-Lindblad, I. (1983). Creative Organizational Climate: Construction and Validation of a Measuring Instrument. Swedish Council for Management and Work Life Issues.
9. Isaksen, S. (1995). Some recent developments on assessing the climate for creativity and change. Paper presented at the international conference on Climate for Creativity and Change. Buffalo, NY: Center for Studies in Creativity.
10. McLean, L. D. (2005). Organizational Culture's Influence on Creativity and Innovation: A Review of the Literature and Implications for Human Resource Development. *Advances in Developing Human Resources* Vol 7. No. 2, 226-246.
11. Sundgren, M., Dimenäs, E., Gustafsson, J.-E., & Selart, M. (2005). Drivers of organizational creativity: a path model of creative climate in pharmaceutical R&D. *R&D Management*, 359-375.
12. Williams, W., & Yang, L. (1999). Organizational Creativity. In R. Sternberg, *Handbook of Creativity* (old.: 373-391.). Cambridge: Cambridge University Press.
13. Zain Mohamed, & Rickards, T. (1996). Assessing and comparing the innovativeness and creative climate of firms. *Scandinavian Journal Management* 12 (2), 109-121.

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