ABSTRACT
People, organizations and societies benefit when there is an appropriate fit between individuals and their environments, especially when it comes to innovation. This article elaborates on the findings of two case studies in the telecommunications industry dealing with different style preferences when innovating. The article also describes the findings of a research project within one of the biggest professional aerospace organizations and elaborates on the role of organizational climate and leadership influence on innovation. In addition, we tie both cases together and look for the impact of people and their environment on innovation. This article indicates the impact leadership has on organizational climate and what levering power climate has on innovation processes. Furthermore it underscores the necessity of not letting chance interfere with putting together a team, which needs to be done through a deliberate process. Finally, the article suggests that problem-solving styles make a difference for some of the dimensions of creative climate and therefore should be taken into account when leading or managing people.

INTRODUCTION
“Creativity is now a core necessity for success in a profoundly changing organizational world. Creativity is simply essential, because organizations and their environments are both changing so fundamentally” (Ford & Gioia, 1995:4). Indeed, creativity and innovation have become key ingredients in improving organizational performance. A recent study by IBM (2010) provided a similar conclusion. They interviewed 1,541 CEOs, general managers and senior public sector leaders to better understand the challenges and goals of today’s CEOs. The main issue that surfaced was that CEOs need to capitalize on complexity. One practice to do so is by embodying creative leadership since creativity came forward as the most important leadership quality to have in today’s ever growing more complex world. History has taught us that many companies have been able to put their “name on the map” as concept leaders in their field or even a dominating force within their market as a result of applying creativity to improve their organizational outcomes (e.g., 3M, Apple, Google, IDEO, Nokia,…). Other scholars and practitioners have also increasingly recognized the need for deliberately developing and managing creativity, as well as the demand for organizational innovation as a means for survival and growth (Gilson, 2008; Zhou & Shalley, 2008).

But before we dive directly into the deep end, we might want to explore this concept of creativity a bit further. Throughout the decades, a long list of definitions about creativity has been produced by academics. Amabile (1988) defined creativity as the production of novel and useful ideas. Rothenberg (1990) indicated that creativity is the production of something that is both new and truly valuable. Whereas Torrance (1989) wrote about creativity as “the process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements, disharmonies, and so on; identifying the difficult; searching for solutions, making guesses, or formulating hypotheses and possibly modifying them and retesting them; and finally communicating the results by an individual or small group of individuals working together”. In general we defined creativity as the making and communicating of meaningful connections and insight. This differs greatly from innovation, which we described as the transformation of these connections and insights into deliverable business results. This implies that creativity can occur without innovation, but you cannot be innovative without creativity. In other words: creativity is a prerequisite for innovation.

One of the key turning points in creativity research has often been defined as the presidential address of J. P. Guilford (1950) to the American Psychological Association. This spurred a new wave of
academics (re)discovering the field. One very significant topic could be described as the nature of creativity. In the early 1960’s Rhodes started his research into the question “What is creativity?” In 1961 he came to the conclusion that creativity is a multi-facetted concept comprised of 4 factors: product, process, person and press. Since then lots of other academics came to similar conclusions (Gowan, 1972; Hallman, 1963; Isaksen, 1987; MacKinnon, 1978; Mooney, 1963; Runco, 2004). Products are ideas formed into tangible or intangible outcomes. Process applies to motivation, perception, thinking, communication, ... Person relates to intellect, personality, style, traits, habits, preferences, ... Finally, press (also described as place) refers to the relationship between humans and their environment (climate, culture, ...).

Scott Isaksen and Ruth Noller were the first to create a graphical representation of the 4 P’s in a Venn diagram in the early ’80’s. It provided, and still provides, a simple but clear overview of how the different P’s relate to each other.

![Diagram of the Four P's of Creativity and Innovation](image)

**Figure 1. The Four P’s of Creativity and Innovation**

Due to the complexity and multi-facetted nature of creativity a call for an interactionist (or ecological or systemic) approach to creativity has been put forward (e.g. Csikszentmihalyi, 1999; Isaksen, Puccio & Treffinger, 1993; Woodman & Schoenfeldt, 1989). By taking an interactionist approach, multiple facets of a larger model are being looked at together rather than assessing them as a single facet. This brings forward the notion that the whole is more than its individual parts.

To illustrate this interactionist approach, and the benefits it holds over studying a single facet, often a beautiful story about an Indostanian village populated by blind men is told (By John Godfrey Saxe, 1816 – 1887).
It was six men of Indostan
To learning much inclined,
Who went to see the Elephant
(Though all of them were blind)
That each by observation
Might satisfy his mind.

The First approached the Elephant,
And happening to fall
Against his broad and sturdy side,
At once began to bawl:
“God bless me! But the Elephant
Is very like a wall!”

The Second, feeling of the tusk,
Cried, “Ho! what have we here
So very round and smooth and sharp?
To me ‘tis mighty clear
This wonder of an Elephant
Is very like a spear!”

The Third approached the animal,
And happening to take
The squirming trunk within his hands,
Thus boldly up and spake:
“I see,” quoth he, “the Elephant
Is very like a snake!”

The Fourth reached out an eager hand,
And felt about the knee.
“What most this wondrous beast is like
Is mighty plain,” quoth he;
“‘Tis clear enough the Elephant
Is very like a tree!”

The Fifth, who chanced to touch the ear,
Said: “E’en the blindest man
Can tell what this resembles most;
Deny the fact who can;
This marvel of an Elephant
Is very like a fan!”

The Sixth no sooner had begun
About the beast to grope,
Than, seizing on the swinging tail
That fell within his scope,
“I see,” quoth he, “the Elephant
Is very like a rope!”

And so these men of Indostan
Disputed loud and long,
Each in his own opinion
Exceeding stiff and strong,
Though each was partly in the right,
And all were in the wrong!
Today we face a similar challenge within the field of creativity. For example: psychologists are more interested in the person aspect, educators see more value in tools, techniques, and methods. Artists think about the outcome – a beautiful painting or a lifelike statue – and economists are more likely to think about the economic impact (Isaksen, 2010).

For this article we tried to make a point of the necessity to look at multiple facets of the four P model at the same time by providing an overview of two case studies at major telecommunications organizations (Michotte, 2010) dealing with Person and Product, and an other overview of a research project at a major aerospace engineering organization (Retz, 2011) dealing with Place and Product. Finally, we provided a short overview of the possibilities of connecting Person and Place in order to perform better in the Product part of the model.

OVERVIEW OF DIFFERENT CONCEPTS

This section of the article elaborates a bit more about the different constructs we have touched in the first part. This provides the reader with crucial knowledge to interpret the results and use them in a practical manner.

CLIMATE VERSUS CULTURE

To start this segment off it might be interesting to note that when we are talking about culture and climate, we are talking about organizational culture and organizational climate and not about national cultures or environmental climate aspects such as global warming. Climate and culture are two constructs that have been used as synonyms for each other by many writers, researchers and practitioners. This inaccuracy is understandable since both constructs are strongly related but they still are different from each other. Luckily, within the academic community there seems to be a general consensus of what culture and climate are and what they aren’t.

Culture can be described as the values, beliefs, history, traditions, etc., reflecting the deeper foundations of the organization. It is about what the organization values. Other aspects related to culture are symbols, heroes and rituals; all aspects that come back in the onion models of culture theory from Schein (1985) and Hofstede (1997).

Climate on the other hand is defined as recurring patterns of behavior, attitudes and feelings that characterize life in the organization. It is about what organization members’ experience. At an individual level of analysis this concept is called psychological climate (Isaksen & Lauer, 1999; James & Jones, 1974). When we aggregate this concept we are talking about work unit or organizational climate (James, 1982; James, James, & Ashe, 1990; Turnipseed, 1994). This level of climate can be described as the objectively shared perceptions that characterize life within a defined work unit or within the organization.

So, what are the clear differences between climate and culture? We can assert that climate is more observable at the surface level within the organization than culture and that it is more amenable to change and improvement efforts (McNabb & Sepic, 1995). Thomson came to a similar conclusion when he stated: “Changing the culture of an organization by tackling it head on as a single facet of organizational life is really, really tough. To go deep into cultural change you have to be talking about beliefs and values, and these go to the very soul of the organization and its people. It is much easier to change the climate and language of the business.” (1998: 240). We are not going to explore these differences between culture and climate much further, but there is some excellent literature about this topic (e.g. Denison, 1998).

It may be clear by now that we have focused our attention organizational climate in this article. But does this construct has any other advantages beside being more amendable to change? Luckily, it has! What follows is a non-exhaustive list of some of the aspect that climate has been able to effect:

- Climate is a key capability for innovation and growth (Davis, Arnett, Gibbons & Milton, 2000);
Climate enables to better handle chaos and constant change (Firenze, 1998; Isaksen & Ekvall, 2007; Isaksen & Tidd, 2006);
Climate enables to better work globally (Firenze, 1998);
Climate enables to better meet customer needs (Firenze, 1998);
Climate enables to better increase teamwork and knowledge sharing (Firenze, 1998);
Climate is a key factor in promoting improved business performance (Kotter & Heskett, 1992):
  - Revenue increase by 682%
  - Stock price increase by 901%
  - Net income increase by 756%
Climate has a positive effect on profitability, sale- and productivity ratios, job satisfaction, job stress, employee turnover and the change that a business unit becomes a success (Harter, Schmidt & Keyes, 2002);
Climate has a positive effect on customer satisfaction and perceived service quality (Wiley & Brooks, 2000);
Climate has a positive effect on perceived innovation (Isaksen & Akkermans, In Press).

As demonstrated, organizational climate is a pretty important aspect of doing business and managing your employees!

PROBLEM-SOLVING STYLE

We stated earlier that within the “person” quadrant of our model for innovation and creativity certain aspects such as style and preferences could be found. Problem-solving style fits right into this quadrant. Let’s begin by defining what a problem actually is. This term easily brings across a bad vibe. It is often associated with being difficult, not pleasant or negative. Treffinger, Selby & Isaksen stated that a problem “…represents a gap between where we are of what we have, and a desired location or outcome (2008: 390).” Johnson indicated that “…a problem arises when a person is motivated toward a goal and his first attempt to reach it is unrewarding” (1972: 133). Looking at a problem this way already changes the connotation the word holds. A problem most definitely can be tackled in a creative way.

Isaksen (1995) provided three continua that outlined the distinctions and relationships between creativity and problem solving. A problem area or task definition can be clearly defined and structured or it can be fuzzy, ill defined, and ambiguous. The former is served by problem solving, the latter by a creative kind of problem solving or problem finding (Carson & Runco, 1999; Getzels & Csikszentmihalyi, 1976). The way to obtain the solution or the solution method can be known, predetermined, and relatively simple, or it can be unknown, complex and non-determined. The former is more a function of memory, expertise and knowledge. The latter requires creativity of thought (Geary, 2005; Kirton, 2003). The desired outcome can already exist or be readily available, or might not exist or be available. The former situation calls for focused inquiry. The latter calls for creativity and inventiveness (Beer & Nohria, 2000; Bossidy & Charan, 2002).

Problem-solving style has been defined by Selby, Treffinger & Isaksen as the “constant individual differences in the ways people prefer to plan and carry out generating and focusing activities, in order to gain clarity, produce ideas, and prepare for action. An individual’s natural disposition towards change management and problem solving is influenced in part by mindset, willingness to engage in and respond to a situation as presented, and the attitudinal dimensions of one’s personality” (2004: 222).

The majority of the creativity literature mostly focused its research on level or capacity of creativity. They searched for links between creative ability and the degree to which people possess certain traits
or abilities such as intelligence (Guilford, 1977; MacKinnon, 1978). Lately a second flow of research has been gaining increased interest. This line of research separates capacity or ability from style, preference or modality. It is known as the level-style issue (Kirton, 2003; Isaksen, 2004). Instead of asking “How creative am I?” (a level question) these researchers ask “How am I creative?” (a style question). Problem-solving style belongs to the latter group and is therefore a style measure.

So why does style matters? First off all, individuals who are aware of their personal style are also able to adapt their style to the demands of the situation. They learn to stretch beyond their preferences and will be able to deal with certain situations in a different manner they wouldn’t have been able to otherwise (Selby, Shaw & Houtz, 2005). Secondly, everybody has his or her proper problem-solving style. Everybody solves problems, small or large, in their own way. Because every individual solves his or her problems in a different way, a lot of different styles coexist. In general, it is broadly agreed upon that no single style is more or less valuable in a society or group, neither is a single style more creative than another style. But through understanding of problem-solving style, everyone can become a better problem solver. A third reason is called coping. This deals with how someone works outside of his or her own preference. Finally the forth reason deals with how someone can cover their own style preferences by adapting other style preferences when needed in certain situations.

SAMPLE

In this part we will describe the samples of the case studies and the research project in order to get a clear view of what kind of subjects we are dealing with.

THE CASE STUDIES

This article describes a case study approach on two real-life front end of innovation projects, situated in the IT industry. More specifically, they were situated in the domain of mobile communications. The companies that sponsored the projects both spend millions of dollars on the development of new products each year. The Creative Problem Solving Group, Inc. (CPSB) was contracted to guide and facilitate both project, which were situated in the Fuzzy Front End (FFE) of innovation. The ultimate goal was to gain deep and meaningful insights of end-users needs in the area of mobile communication. As a means to reach this goal GEMagination™ was applied. GEMagination™ is a method to identify the unmet, unarticulated needs of consumers. It aims at developing product concepts that are closely aligned with consumer needs. Guided imagery is the cornerstone of this method. The outcomes from both projects were very well received within the sponsoring companies and provided the basis for the development of break-through new products. It is out of the scope of this article to go into much detail about the methodology of GEMagination™, FFE or the individual case studies. For this information I would like to refer to Michotte (2010).

Both projects were very similar in nature and execution. They are situated in the same area and the used the same methodology. This allowed us to aggregate the data in order to have a data set of ample size to do some meaningful statistical analyses on them.

After aggregation the final sample was comprised of 63 participants. It is important to know that the participants were not part of a random selection. A marketing firm was contracted to find a large number of potential participants. The possible partakers then were given VIEW: An Assessment of Problem Solving Style: a tool to determine someone's problem-solving style (more about this measure in the assessments section of the article). This made it possible to select a good mix of different style profiles. In the end, the final group of 63 participants was comprised of heavy users, medium users, consumers, enterprise, government, thought leaders, and company employees. Ages ranged from 19 to 64 years old with 38 males and 25 females. It is this group of participants that provided insights into consumer needs.
The insights offered by the participants were measured on two general levels: fluency and quality. All the generated options were registered linked and traced back to the participants who produced them in order to measure the level of fluency. The quality of the generated options was assessed on three levels:

- The personal level: the first measure on the personal level was called Total number of hits an individual received. This variable shows how many hits an individual received for all the options they generated. The next variable was named Numbers of generated options hit. This variable indicates how many of a participant's options were hit. The final variable within the personal level aspect of quality looked at the 25 options that received the most hits during the focusing phases.
- The company level: the quality of the options as perceived by the companies was measured by how many of the participant's options were implemented in workable concepts. This variable was named Number of options used in concepts.
- The consumer level: the variable Number of high-quality options generated was created to measure this aspect of quality. The options that were used for the highest-ranked concepts and idea clusters were linked back to the participants who generated them.

These additional seven variables allowed looking at differences in quality and fluency amongst the participants.

The focus during these case studies can be found at the People part in collaboration with the Product piece. Questions as “Who produced the most options?”, “Who produced the most useful options?”, ... were analyzed.

THE RESEARCH PROJECT
In 2007 Kevin Retz, a doctoral student at Apollos University, contacted CPSB to gain support for his dissertation. Kevin was looking at factors affect creativity and innovation from the aerospace engineer's perspective. CPSB agreed to support him through providing him with an assessment that effectively and efficiently measures organizational climate for creativity: The Situational Outlook Questionnaire (SOQ – more about this measure in the assessments section of this article).

Questionnaires were mailed out to 1,800 members of a professional association within the field of aerospace. With a 10% response rate, the final sample was set to 180 participants. Ages ranged from 18 to 66, 14 woman and 70 men divulged their gender and the sample was made up of 70 engineers, 40 participants held a technical profession and 66 did not disclose this information.

The research project focused at the Place quadrant of the model together with the Product segment. Questions like “Does the climate of an organization affect an individual engineer's perception of being creative?” and “Does leadership affect an individual engineer’s ability to be creative?” were analyzed.

ASSESSMENTS
This part will describe the two assessment tools that were used in the case studies or research project.

VIEW: AN ASSESSMENT OF PROBLEM SOLVING STYLE (VIEW)
VIEW is an assessment tool to measure individuals' problem-solving style preferences. VIEW includes 34 items scored on a seven point Likert-type scale yielding results on three independent dimensions. VIEW is based on clear and explicit conceptual foundations and demonstrates ample evidence of

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1 A hit is a promising option identified and selected by an individual through the use of internal criteria, experience, and personal judgment.
2 During this phase the previously generated options are being analyzed, refined, developed or selected.
reliability and validity (Selby et al., 2004; Selby, Treffinger & Isaksen, 2007a&b; Schraw, 2007; Staal, 2007; Treffinger et al., 2008).

VIEW measure problem-solving style on three dimensions. Every dimension is made up of two style preferences. Table 1 below gives a clear overview of the three dimensions and the six style preferences.

<table>
<thead>
<tr>
<th>Orientation to Change (OC) – How people prefer to manage change or solve problems, to develop existing pathways or explore different pathways. ((\alpha = .87))</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Explorers tend to:</strong> Work well without structure and authority. Maintain energy by working on a wide array of tasks. Gain energy from envisioning the big picture. Welcome the freedom to create and follow one’s own rules and guidelines. See deadlines as fluid and flexible. Prefer to work away from guidance or direct supervision.</td>
</tr>
<tr>
<td><strong>Developers tend to:</strong> Be enabled by structure and authority. Maintain energy through persistence in working on a task. Gain energy from the details of follow-through and implementation. Welcome rules and guidelines for how to complete a task. Seek, accept, and meet given deadlines. Prefer to work with close guidance or direct supervision.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Manner of Processing (MP) – Where people prefer to process information, internally or externally. ((\alpha = .86))</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Externals tend to:</strong> Draw energy from interaction with other people, discussing possibilities, and building one person’s thinking on another’s. Share their thinking early, seeking input from others to refine and strengthen their thoughts before reaching closure. Also, they may press to move quickly from ideas to action.</td>
</tr>
<tr>
<td><strong>Internals tend to:</strong> Draw energy from opportunities for quiet reflection. Look to their own inner thoughts, considering ideas themselves before they are ready to share them with others. Also may prefer action that follows careful study.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ways of Deciding (WD) – What people prefer to focus on when making decisions, the people or tasks at hand. ((\alpha = .84))</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Person-oriented individuals tend to:</strong> Consider first the effect or impact of choices and decisions on people’s feelings and support, and on the need for harmony and positive relationships. They may give the greatest weight to judgments about people and relationships when making decisions.</td>
</tr>
<tr>
<td><strong>Task-oriented individuals tend to:</strong> Look first at choices and decisions that are logical, sensible, and that can be justified objectively. They tend to “let the chips fall where they may” in the interest of standards and quality issues. They may give the greatest weight to results and outcomes when making decisions.</td>
</tr>
</tbody>
</table>

Table 1. The Dimensions of VIEW

THE SITUATIONAL OUTLOOK QUESTIONNAIRE (SOQ)
The SOQ is based on more than 50 years of continuous research and use. It is a 53-item assessment tool for measuring creative climate. Besides these 53 closed-ended questions, three open-ended questions are provided at the end. The 53 questions are scored from zero to three; zero indicates “not at all applicable”, and three means “applicable to a high degree”. These 53 items relate to one of nine SOQ dimensions: Challenge/Involvement, Freedom, Trust/Openness, Idea-Time, Playfulness/Humor, Conflict, Idea-Support, Debate, Risk-Taking. The higher a participant scores on one of these dimensions, the better he or she perceives his or her climate, except for Conflict. This is the only negative dimension. In general, a lower score on Conflict indicates a better climate. Each dimension ranges on a scale from 0 to 300 (Isaksen & Ekvall, 2007). The SOQ assesses nine independent dimensions of the climate for creativity and innovation. The dimensions of the SOQ have ample evidence regarding their reliability, validity, and usefulness (Isaksen & Ekvall, 2007; 2010; Porter, 2010; Sample, 2010).

In their review of a variety of measures of organizational climate, Hunter, Bedell & Mumford (2007) identified the SOQ as well researched, standardized and validated. The SOQ is usually applied as a multi-method measure. It includes three open-ended questions that provide additional insight regarding what is working well, what the barriers are, and what needs to be done to make the climate
CREATIVITY AND INNOVATION: THE CASE OF TWO MAJOR COMMUNICATIONS FIRMS AND AN AEROSPACE ENGINEERING ORGANIZATION

more supportive of creativity and innovation. A short overview of the nine SOQ dimensions is provided below in Table 2.

<table>
<thead>
<tr>
<th>SOQ Dimensions</th>
<th>High Level Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Challenge/Involvement</td>
<td>The degree to which people are involved in daily operations, long-term goals, and visions. ($\alpha = .86$)</td>
</tr>
<tr>
<td>Freedom</td>
<td>The degree of independence and autonomy shown by the people in the organization. ($\alpha = .83$)</td>
</tr>
<tr>
<td>Trust/Openness</td>
<td>The emotional safety in relationships. ($\alpha = .69$)</td>
</tr>
<tr>
<td>Idea-Time</td>
<td>The amount of time people can, and do, use for elaborating new ideas. ($\alpha = .87$)</td>
</tr>
<tr>
<td>Playfulness/Humor</td>
<td>The spontaneity and ease displayed within the workplace. ($\alpha = .88$)</td>
</tr>
<tr>
<td>Conflict</td>
<td>The presence of personal and emotional tensions (a negative dimension – in contrast to the Debate dimension). ($\alpha = .86$)</td>
</tr>
<tr>
<td>Idea-Support</td>
<td>The way new ideas are treated. ($\alpha = .89$)</td>
</tr>
<tr>
<td>Debate</td>
<td>The occurrence of disagreement between viewpoints, ideas, experiences, and knowledge. ($\alpha = .88$)</td>
</tr>
<tr>
<td>Risk-Taking</td>
<td>The tolerance of uncertainty and ambiguity. ($\alpha = .79$)</td>
</tr>
</tbody>
</table>

Table 2. The SOQ Dimensions

The version of the SOQ used in the research project employed four more closed-ended questions dealing with leadership for research means.

RESULTS

This part of the article elaborates on the findings from Michotte (2010) and Retz (2011). For more in depth analyses, limitations to the study or expanded conclusions I would like to refer to these specific dissertations.

RESULTS FROM THE CASE STUDIES

The final group of participants was made up of 32 Explorers and 31 Developers, 35 Externals and 28 Internals, and 31 People-oriented deciders and 32 Task-oriented deciders. On average they generated 11.71 options each, ranging from 2 to 30 options.

The first employed analysis was to determine whether or not there was a statistical significant difference in fluency between individuals of specific problem solving styles. The Analysis of Variance (ANOVA$^3$) indicated that a significant difference existed in fluency of option generated on the Manner of Processing dimension. Externals generated more options than Internals (average of 13.26 vs. 9.79, $p < .05$). The difference between Explorers and Developers (13.16 vs. 10.23) approach the .05-level of significance ($p \leq .057$).

With the second ANOVA the analyses of the quality part had started. Looking at the differences between style preferences and the number of generated options hit, it becomes clear that the only statistical significant difference again occurred on the Manner of Processing dimension ($p < .029$). Externals’ options got hit more often than Internals’ options (4.43 vs. 3.21).

On the total number of hits an individual received, the only statistical significant differences could be observed on the Orientation to Change dimension ($p < .048$). Explorers received significantly more hits than Developers (8.72 vs. 5.97).

To analyze the amount of high-rated options a Chi-square test was used. It indicated that Explorers produced significantly more high-rated options than Developers ($p > .05$, 18 vs. 7).

$^3$ ANOVA is a statistical method for comparing two or more groups of mean scores.
At the company level whether or not different style preferences could come up with more options that were subsequently used in concepts was evaluated. The ANOVA indicated that Task-oriented deciders came up with significantly fewer options used in concepts than People-oriented deciders (p < .03, 4.61 vs 2.44).

No statistical significant differences were found between any of the style preferences when looking at the number of high-quality options.

We will elaborate on these findings in the Discussion section of this paper.

RESULTS FROM THE RESEARCH PROJECT.
Since this research project sought out to discover an answer to two questions (i.e. (1) Does the climate of an organization affect an individual engineer’s perception of being creative? (2) Does leadership affect an individual engineer’s ability to be creative?), four additional closed-ended questions were added to the SOQ:

1. Leaders and managers I observe are effective in creating an environment that supports innovation?

2. We are successful in implementing new ideas to obtain results in my work unit?

3. In general, my organization has been successful at radical innovation?

4. In general my organization has been successful at incremental innovation?

These questions could be scored from 0 to 3: 0 not at all applicable, 1 applicable to some extent, 2 fairly applicable and 3 applicable to a high degree. The four extra questions provided the opportunity to analyze the data gathered from the SOQ in a more robust way.

Table 3 presents the descriptive statistics of the overall sample (N=180) of the 9 SOQ dimensions and the four additional questions together with the data from the aerospace sample. The table includes also the norm of innovative and stagnated organizations (Isaksen & Ekvall, 2007). This will allow taking a look at differences and similarities between the aerospace sample and these innovative and stagnated organizations.

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Innovative Norms</th>
<th>Aerospace</th>
<th>Stagnated Norms</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Challenge/Involvement</td>
<td>238</td>
<td>187</td>
<td>163</td>
<td>62</td>
<td>0-300</td>
</tr>
<tr>
<td>Freedom</td>
<td>210</td>
<td>155</td>
<td>153</td>
<td>72</td>
<td>0-300</td>
</tr>
<tr>
<td>Trust/Openness</td>
<td>178</td>
<td>166</td>
<td>128</td>
<td>66</td>
<td>0-300</td>
</tr>
<tr>
<td>Idea-Time</td>
<td>148</td>
<td>133</td>
<td>97</td>
<td>72</td>
<td>0-300</td>
</tr>
<tr>
<td>Playfulness/Humor</td>
<td>230</td>
<td>166</td>
<td>140</td>
<td>68</td>
<td>0-300</td>
</tr>
<tr>
<td>Conflict</td>
<td>78</td>
<td>101</td>
<td>140</td>
<td>79</td>
<td>0-300</td>
</tr>
<tr>
<td>Idea-Support</td>
<td>183</td>
<td>155</td>
<td>108</td>
<td>75</td>
<td>0-300</td>
</tr>
<tr>
<td>Debate</td>
<td>158</td>
<td>177</td>
<td>105</td>
<td>70</td>
<td>0-300</td>
</tr>
<tr>
<td>Risk-Taking</td>
<td>195</td>
<td>131</td>
<td>54</td>
<td>70</td>
<td>0-300</td>
</tr>
<tr>
<td>Leadership Effectiveness</td>
<td>n/a</td>
<td>1.24</td>
<td>n/a</td>
<td>.94</td>
<td>0-3</td>
</tr>
<tr>
<td>Implementing New Ideas</td>
<td>n/a</td>
<td>1.44</td>
<td>n/a</td>
<td>.92</td>
<td>0-3</td>
</tr>
<tr>
<td>Radical Innovation</td>
<td>n/a</td>
<td>1.00</td>
<td>n/a</td>
<td>.95</td>
<td>0-3</td>
</tr>
<tr>
<td>Incremental Innovation</td>
<td>n/a</td>
<td>1.54</td>
<td>n/a</td>
<td>.90</td>
<td>0-3</td>
</tr>
</tbody>
</table>

Table 3. Descriptive statistics SOQ (N = 180)

In general this table indicates that the aerospace sample falls in between the innovative and stagnated norms.
To analyze the sample in a more robust manner, the complete sample was divided into four groups corresponding to one of the four answers provided on the additional questions. This process was done four times, once for every question. Subsequently ANOVA’s were calculated to look for statistical significant difference between SOQ mean scores and the four groups. Tables 4 through 7 present these ANOVA results.

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>0 = not at all applicable (n = 44)</th>
<th>1 = applicable to some extent (n = 67)</th>
<th>2 = fairly applicable (n = 50)</th>
<th>3 = applicable to a high degree (n = 19)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Challenge/Involvement</td>
<td>145</td>
<td>175</td>
<td>208</td>
<td>275</td>
</tr>
<tr>
<td>Freedom</td>
<td>110</td>
<td>146</td>
<td>184</td>
<td>218</td>
</tr>
<tr>
<td>Trust/Openness</td>
<td>122</td>
<td>155</td>
<td>189</td>
<td>244</td>
</tr>
<tr>
<td>Idea-Time</td>
<td>67</td>
<td>125</td>
<td>169</td>
<td>220</td>
</tr>
<tr>
<td>Playfulness/Humor</td>
<td>121</td>
<td>153</td>
<td>191</td>
<td>248</td>
</tr>
<tr>
<td>Conflict</td>
<td>137</td>
<td>107</td>
<td>75</td>
<td>64</td>
</tr>
<tr>
<td>Idea-Support</td>
<td>87</td>
<td>139</td>
<td>201</td>
<td>248</td>
</tr>
<tr>
<td>Debate</td>
<td>122</td>
<td>166</td>
<td>208</td>
<td>264</td>
</tr>
<tr>
<td>Risk-Taking</td>
<td>70</td>
<td>124</td>
<td>165</td>
<td>212</td>
</tr>
</tbody>
</table>

Table 4. ANOVA SOQ dimensions and “Leaders and managers I observe are effective in creating an environment that supports innovation”

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>0 = not at all applicable (n = 27)</th>
<th>1 = applicable to some extent (n = 72)</th>
<th>2 = fairly applicable (n = 55)</th>
<th>3 = applicable to a high degree (n = 26)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Challenge/Involvement</td>
<td>141</td>
<td>163</td>
<td>205</td>
<td>264</td>
</tr>
<tr>
<td>Freedom</td>
<td>99</td>
<td>138</td>
<td>172</td>
<td>226</td>
</tr>
<tr>
<td>Trust/Openness</td>
<td>113</td>
<td>146</td>
<td>182</td>
<td>240</td>
</tr>
<tr>
<td>Idea-Time</td>
<td>48</td>
<td>111</td>
<td>158</td>
<td>229</td>
</tr>
<tr>
<td>Playfulness/Humor</td>
<td>111</td>
<td>145</td>
<td>184</td>
<td>240</td>
</tr>
<tr>
<td>Conflict</td>
<td>160</td>
<td>107</td>
<td>78</td>
<td>70</td>
</tr>
<tr>
<td>Idea-Support</td>
<td>65</td>
<td>131</td>
<td>185</td>
<td>252</td>
</tr>
<tr>
<td>Debate</td>
<td>104</td>
<td>161</td>
<td>202</td>
<td>246</td>
</tr>
<tr>
<td>Risk-Taking</td>
<td>59</td>
<td>109</td>
<td>158</td>
<td>210</td>
</tr>
</tbody>
</table>

Table 5. SOQ Dimensions and “We are successful in implementing new ideas to obtain results in my work unit”
CREATIVITY AND INNOVATION:
THE CASE OF TWO MAJOR COMMUNICATIONS FIRMS AND AN AEROSPACE ENGINEERING ORGANIZATION

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>0 = not at all applicable (n = 65)</th>
<th>1 = applicable to some extent (n = 65)</th>
<th>2 = fairly applicable (n = 35)</th>
<th>3 = applicable to a high degree (n = 12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Challenge/Involvement</td>
<td>155</td>
<td>177</td>
<td>230</td>
<td>272</td>
</tr>
<tr>
<td>Freedom</td>
<td>122</td>
<td>151</td>
<td>193</td>
<td>232</td>
</tr>
<tr>
<td>Trust/Openness</td>
<td>137</td>
<td>160</td>
<td>199</td>
<td>236</td>
</tr>
<tr>
<td>Idea-Time</td>
<td>80</td>
<td>134</td>
<td>185</td>
<td>237</td>
</tr>
<tr>
<td>Playfulness/Humor</td>
<td>129</td>
<td>155</td>
<td>215</td>
<td>256</td>
</tr>
<tr>
<td>Conflict</td>
<td>120</td>
<td>102</td>
<td>70</td>
<td>84</td>
</tr>
<tr>
<td>Idea-Support</td>
<td>102</td>
<td>159</td>
<td>209</td>
<td>243</td>
</tr>
<tr>
<td>Debate</td>
<td>127</td>
<td>186</td>
<td>222</td>
<td>254</td>
</tr>
<tr>
<td>Risk-Taking</td>
<td>80</td>
<td>135</td>
<td>179</td>
<td>225</td>
</tr>
</tbody>
</table>

Table 6. SOQ Dimensions and “In general my organization has been successful at radical innovation”

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>0 = not at all applicable (n = 22)</th>
<th>1 = applicable to some extent (n = 67)</th>
<th>2 = fairly applicable (n = 63)</th>
<th>3 = applicable to a high degree (n = 28)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Challenge/Involvement</td>
<td>144</td>
<td>166</td>
<td>194</td>
<td>257</td>
</tr>
<tr>
<td>Freedom</td>
<td>92</td>
<td>139</td>
<td>160</td>
<td>134</td>
</tr>
<tr>
<td>Trust/Openness</td>
<td>106</td>
<td>155</td>
<td>171</td>
<td>224</td>
</tr>
<tr>
<td>Idea-Time</td>
<td>50</td>
<td>111</td>
<td>144</td>
<td>227</td>
</tr>
<tr>
<td>Playfulness/Humor</td>
<td>112</td>
<td>133</td>
<td>184</td>
<td>245</td>
</tr>
<tr>
<td>Conflict</td>
<td>145</td>
<td>108</td>
<td>87</td>
<td>80</td>
</tr>
<tr>
<td>Idea-Support</td>
<td>64</td>
<td>130</td>
<td>175</td>
<td>244</td>
</tr>
<tr>
<td>Debate</td>
<td>91</td>
<td>156</td>
<td>196</td>
<td>254</td>
</tr>
<tr>
<td>Risk-Taking</td>
<td>48</td>
<td>108</td>
<td>146</td>
<td>219</td>
</tr>
</tbody>
</table>

Table 7. SOQ Dimensions and “In general my organization has been successful at incremental innovation”

All the ANOVA’s were statistically significant at the .001 level, indicating that there are major differences between the four groups of people and how they perceive their organizational climate. Obviously the difference is rather huge between the (0) and the (3) group, where the (3) group often perceived a climate that was four times higher than that of the (0) group!
Afterwards, regression analyses were used to dig deeper and to try uncovering which dimension(s) had the potential to predict a certain outcome. For example: If I perceive a higher level of Freedom, would this indicate that my organization has been successful at incremental innovation? The results of these regression analyses are presented in Table 8.

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>B</th>
<th>β</th>
<th>Sig.</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Leaders and managers I observe are effective in creating an environment that supports innovation.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>.605</td>
<td></td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Idea-Support</td>
<td>.005</td>
<td>.388</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Idea-Time</td>
<td>.003</td>
<td>.239</td>
<td>≤ .009</td>
<td></td>
</tr>
<tr>
<td>Challenge/Involvement</td>
<td>.002</td>
<td>.162</td>
<td>≤ .032</td>
<td></td>
</tr>
<tr>
<td><strong>We are successful in implementing new ideas to obtain results in my work unit.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>.973</td>
<td></td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Idea-Support</td>
<td>.005</td>
<td>.416</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Idea-Time</td>
<td>.005</td>
<td>.400</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td><strong>In general my organization has been successful at radical innovation.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>.230</td>
<td></td>
<td>.158</td>
<td></td>
</tr>
<tr>
<td>Idea-Support</td>
<td>.006</td>
<td>.444</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Playfulness/Humor</td>
<td>.003</td>
<td>.214</td>
<td>≤ .002</td>
<td></td>
</tr>
<tr>
<td>Challenge/Involvement</td>
<td>.003</td>
<td>.175</td>
<td>≤ .013</td>
<td></td>
</tr>
<tr>
<td><strong>In general my organization has been successful at incremental innovation.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>.230</td>
<td></td>
<td>.158</td>
<td></td>
</tr>
<tr>
<td>Idea-Support</td>
<td>.006</td>
<td>.444</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>Playfulness/Humor</td>
<td>.003</td>
<td>.214</td>
<td>≤ .002</td>
<td></td>
</tr>
<tr>
<td>Risk-Taking</td>
<td>.003</td>
<td>.175</td>
<td>≤ .013</td>
<td></td>
</tr>
</tbody>
</table>

Table 8. Regression Results

These regression results provide us with a rather interesting overview of those dimensions more prone to predict certain business results. For example: when trying to predict whether or not “Leaders and managers I observe are effective in creating an environment that supports innovation”, Table 8 indicates that the most potent variables in doing so are Idea-Support, Idea-Time and Challenge/Involvement. Knowing this, we can construct an equation to determine how effective leaders are in creating a creative supportive environment based on the climate someone perceives.

Effectiveness = .605 + (Idea-Support * .005) + (Idea-Time * .003) + (Challenge/Involvement * .002).

This equation will yield an outcome somewhere between 0 and 3, providing us with an indication about the effectiveness of a leader to create a climate supportive for creativity. Furthermore, the $R^2$ value provides us with an idea of how much of the variance for each predicted variable is explained by the other variables in the equation. In the previous example, the three SOQ dimensions predict 52.5% of the total variance in the variable “effectiveness”. For the other three variables this R²-value can be interpreted as follows: Idea-Support and Idea-Time are able to predict 60.2% of the variance.

---

4 Regression analyses are used to create quantitative prediction models for a dependent variable through one or more independent variables.
within the variable “successful implementing new ideas”; Idea-Time, Playfulness/Humor and Challenge/Involvement predict 53.7% of the “success of implementing radical innovation” and finally, Idea-Support, Playfulness/Humor and Risk-Taking predict 54.8% whether or not an organization is “successful in implementing incremental innovation”.

We will elaborate on these findings in the Discussion section of this paper.

DISCUSSION
This part of the article is build up around three major parts: a discussion about the results from the case studies, a discussion about the results from the research topic, and a part where we strive to bring those two together.

DISCUSSION ABOUT THE CASE STUDIES
There are a couple of interesting bits we can learn from the case studies. First of all it shows that companies need to carefully select team members when dealing with FFE project. Problem solving style does affect the outcome of the sessions and could be the difference between a potential win or lose. That does not mean that diversity in teams is something we must try to dismiss. It is very well possible that a group of the same style preferences is less productive because they are missing their counterparts.

Secondly, this study also feeds the debate around the level-style distinction in the field of creativity and innovation. The outcomes indicated that specific styles exhibit a greater level of creativity in certain situations.

In general we can make a case of the importance of diversity of styles in project teams, customer research projects, ... In this example the Explorers, Externals and People-oriented deciders appeared to have the upper hand. But depending on the project or the task it is imperative to carefully select your team instead of leaving this composition to chance.

DISCUSSION ABOUT THE RESEARCH PROJECT
So, what implications can be extracted from the research project? First of all, this paper indicated that it is able to discriminate between organizational climates based on certain outcome variables such as leadership effectiveness, ability to implement radical or incremental innovation or implementing new ideas in a work unit. The better the organizational climate was, the better the outcome was. So we could say that it’s imperative to strive for an as good as possible organizational climate in order to go for gold.

The results also showed that leadership has a major influence on shaping and developing the organizational climate. This is similar to what Isaksen & Akkermans (In Press) found. They used an international sample with 140 subjects, from 103 different companies employed in 31 distinctive industries coming from 10 countries. They discovered that the perceived organizational climate was a moderating variable between leadership in support of innovation and innovation as an outcome variable. This means that leadership was able to influence the climate directly and to a great extent, and that climate in its turn influenced the innovation capacities. Leadership was only mildly able to influence innovation capacities in a direct way. Other researches came to similar conclusions.

The practical implications of these findings are that leaders should focus on deliberately creating a climate for innovation instead of directly trying to influence their organization’s level of innovation. Since leadership behavior has such a profound impact on the climate for creativity and innovation, it is essential that leaders become aware of how to utilize specific behaviors in a manner that achieves the desired innovative outcomes. Therefore leadership development for innovation is critical for an organization’s survival and future growth.
This research project also indicated that if an individual is not free to think of new ideas and have time to pursue new ideas, he or she will not feel creative or compelled to be creative. The study indicated that individuals must be able to take risks and explore new ideas or approaches without the fear of retribution or having it affect their careers. Being able to do so brings forth an increased possibility to come up with creative and innovative results.

The major take-away from this research is that leadership is the most important factor to influence climate. Ekvall (1997) came to the conclusion that leadership behavior accounted for anywhere from 40 to 80% of the variance that influenced climate. So climate is the lever for innovation, but within climate the notion of how people are dealing with ideas (the support and the time to explore them) seems to be the most important factor for innovation, regardless of their radical or incremental nature.

**LINKING FINDINGS OF BOTH PROJECTS TOGETHER**

We elaborated on the impact of style preferences and outcomes. Afterwards, we also presented some findings about how the environment has an impact on outcomes. So, what would happen if we take a look at style together with the environment (Person and Place)? A recent study by Isaksen & Aerts (2011) found that different style preferences prefer different organizational climates. The study looked at how individuals perceived the organizational climate in a best-case work experience and a worst-case work experience. They found that Explorers perceived significantly more Freedom in their best-case climates than Developers, and that Explorers see far less Idea-Support in their worst-case scenario than Developers. Furthermore they also discovered that individuals with a Task-oriented deciding style observed a significantly higher degree of Idea-Time and Debate in their best-case working environments than those with a People-oriented deciding style.

In general, to maximize their contributions to creative work those with Explorer preferences may need to be given more discretion and Developers more guidance. Explorers may need to be challenged to strengthen their original ideas in order to achieve more Idea-Support. Those with strong Task-oriented deciding styles may need some help in engaging in productive Debate and building Trust when they face challenging work situations.

Since these differences exist, those who manage and lead others must rethink the notion that everyone should be treated exactly the same, particularly when the aim is to provide a climate that is conducive to creativity and innovation were individuals can thrive more. So we can say that freedom does work better!
LIST OF REFERENCES


Ekvall, G. (1997), Organizational conditions and levels of creativity. Creativity and Innovation Management, 6, 195-205.


CREATIVITY AND INNOVATION:
THE CASE OF TWO MAJOR COMMUNICATIONS FIRMS AND AN AEROSPACE ENGINEERING ORGANIZATION


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