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Organizing Creativity: Creativity and Innovation under Constraints

Marjolein C.J. Caniëls and Eric F. Rietzschel

The best way of organizing creativity within organizations remains somewhat enigmatic to scholars, particularly when it comes to the role of constraints. On the one hand, creative organizations are often associated with freedom, autonomy, weak rules and few boundaries. On the other hand, several studies suggest that constraints, particularly design constraints, often stimulate creativity rather than suppress it. All in all, findings are mixed and inconclusive, and further research that explores this area of tension is required. The goal of this paper is twofold. Firstly, we introduce the topic of constraints and creativity, and raise some of the open questions in this field. By way of illustration, we report on a preliminary study about the role of constraints. Secondly, we set the stage for the contributions in this special issue on creativity and innovation under constraints, by identifying four central themes for further research. We subsequently outline the articles in this issue, and show how each of them contributes to one or more of these themes.

Introduction

In a business environment with continuously changing demands, organizations need to adjust and reorientate, innovate and adopt new technologies (Woodman, Sawyer & Griffin, 1993; Zhou, 2003; Shalley, Gilson & Blum, 2009). Creativity (i.e., the generation of ideas that are both novel and useful; Sternberg & Lubart, 1999) is at the root of invention and innovation (Woodman, Sawyer & Griffin, 1993; Amabile et al., 1996). Hence, leaders and managers espouse creativity as an important goal that must be nurtured and facilitated (Mueller, Melwani & Goncalo, 2012). However, organizations have to deal with the continuous tension between short-term wins of incremental innovation and uncertain long-term gains of radical innovation. Radically new ideas are therefore often dismissed by organizational leaders and policy makers as being too costly and risky to explore (Sheaffer et al., 2011; Mueller, Melwani & Goncalo, 2012). Employees with creative vision generally need to break through bureaucratic barriers and be persistent in advocating their ideas to management in order to get managerial support and freedom to explore their ideas (McDermott & O'Connor, 2002; Baer, 2012).

The best way of organizing creativity within organizations remains somewhat enigmatic to scholars, particularly when it comes to the role of constraints. On the one hand, creative organizations are often associated with spaces characterized by freedom, autonomy, weak rules and few boundaries. For example, this is reflected in Google's famous workplace design, with the office as a playground in which self-expression is encouraged (Girard, 2009). Nevertheless, most organizational actors still have to operate within the constraints and boundaries imposed by the organization, and these constraints can hamper employee creativity (e.g., Shalley, Zhou & Oldham, 2004; Amabile et al., 2006; Zhou & Shalley, 2008). On the other hand, several studies suggest that constraints, particularly design constraints, often stimulate creativity rather than suppress it (e.g., Costello & Keane, 2000; Stokes, 2001; Rietzschel, Nijstad & Stroebe, 2014; Rietzschel, Slijkhuis & Van Yperen, 2014). Constraints could stimulate creativity because they energize employee efforts, or because they reduce the complexity of a problem or task. All in all, however, findings are mixed and inconclusive. Clearly, constraints can hamper creativity, but they can also stimulate it. The question is when these

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positive and negative effects occur. This calls for further elaboration and more research that explores this area of tension. Hence, with our call for a special issue for papers on creativity and innovation under constraints, we aimed to stimulate some further debate and discussion around this topic.

In this introductory article, we have two goals. Firstly, we aim to introduce the topic of constraints and creativity, and to raise some of the open questions in this field. By way of illustration, we report on a preliminary study about the role of constraints. Secondly, we want to set the stage for the contributions of the special issue by identifying four central themes for further research. We subsequently outline the articles in this issue, and show how each of them contributes to one or more of these themes.

Studies on Constraints to Creativity

Many studies have addressed factors that influence employee creativity – factors within the employee (e.g., personality, abilities; Caniëls, De Stobbeleir & De Clippeleer, 2014) as well as contextual factors surrounding the employee (e.g., leadership, organizational support; for overviews, see Perry-Smith & Shalley, 2003; Shalley, Zhou and Oldham, 2004; Zhou & Shalley, 2008). Key findings of these studies are that constraining and controlling work conditions are predominantly negatively associated with creativity. Organizational constraints may take on various forms, including bureaucracy, and limiting the availability of resources such as money and time (Hlavacek & Thompson, 1973; Amabile & Gryskiewicz, 1989). Hence, organizations can draw up barriers and pose constraints on creative individuals, and therefore may not fully exploit the creative potential that is embodied in employees. Overall, studies demonstrating the negative impact of organizational constraints largely focus (either explicitly or implicitly) on the role of autonomy, and the degree to which constraints thwart need fulfilment (Shalley, Zhou & Oldham, 2004). Thus, the negative consequences of constraints are usually largely *motivational*: external constraints violate people's need for autonomy, which in turn diminishes intrinsic motivation, with inhibited creativity as a result.

However, there is more to constraints than diminishing autonomy. For one thing, constraints can make a problem or task more manageable, and possibly even more interesting. When people are given free rein to solve a problem, they tend to be uncreative, and adopt existing methods that have worked in the past. Ward (1994; see also Finke, Ward & Smith, 1995) referred to this tendency as the 'path of least resistance': people tend to generate those ideas that are easiest to generate. A total lack of constraints might exacerbate this tendency, as it makes the task more complex and poses more information-processing demands (Simon, 1955; Branscombe & Cohen, 1991). Moreover, a lack of constraints could also signal an absence of clear goals, which may lead to lowered effort and hence lower performance (Hirst, Van Knippenberg & Zhou, 2009). In contrast, when people are confronted with certain kinds of constraints, they tend to come up with ingenious solutions (Finke, 1990; Stokes, 2001; Rietzschel, Nijstad & Stroebe, 2014). Employees then make best use of available resources and adapt (Finke, 1990; McDermott & O'Connor, 2002). In such instances constraints are perceived as providing a challenge, and may reduce task complexity. Moreover, constraints may entice employees to find a creative new way of circumventing obstacles and dealing with organizational impediments. For example, in an interview with Fast Company, one of Google's top managers states that 'engineers thrive on constraints. They love to think their way out of that little box: "We know you said it was impossible, but we're going to do this, this, and that to get us there" ' (Salter, 2008). Hence, certain constraints may stimulate creativity rather than suppress it. *Design constraints* take the form of boundaries that are set to a certain task or goal (Stokes, 2001; Stokes & Harrison, 2002), i.e. they determine how something can be done. Paradoxically, design constraints also include limited access to resources.

Are constraints mainly harmful for creativity, as suggested by innovation research and studies into organizational creativity, or can constraints be supportive as well, as suggested by psychological research on creativity? Interactionist studies propose that organizational constraints and design constraints interact (Oldham & Cummings, 1996; Burroughs & Mick, 2004; Baer & Oldham, 2006). An organizational constraint, for example a restricted budget, may have consequences for the design as certain features may get out of reach. On the other hand, shoestring budgets may be perceived as challenging and fuel creativity. This reasoning resonates also in several contributions in the field of organization studies. For example, Brown and Eisenhardt (1997) show that a limited structure is needed as well as freedom to improvise in order to achieve successful product innovation. Similarly, Tatikonda and Rosenthal (2000)

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show that for a successful innovation process a balance is needed between firmness, i.e. rules and regulations, and flexibility, i.e. autonomy and adequate resources. Rietzschel, Nijstad and Stroebe (2014) found that brainstorming participants generated more original ideas about a narrow topic than about a broad topic, but also found that this did not translate into better selection performance (a crucial step on the path from creativity to innovation). Further, Rietzschel, Slijkhuis and Van Yperen (2014) found that high task structure (a step-by-step plan on how to perform a drawing task) stimulated creative performance for participants with a high need for structure, unless these instructions contained a non-creative example – in the latter case, task structure suppressed creativity.

Many studies have addressed constraints and their influence on employee creativity, yet findings are mixed and inconclusive. This may be partly due to the fact that 'constraints' is a complex and multifaceted construct: some constraints will exert different effects from others because they are fundamentally different in a relevant way – the difference between constraints that thwart need fulfilment and constraints that do not is a case in point. Interestingly, a similar issue holds for 'creativity': it is not a monolithic construct, but a multifaceted complex of behaviours and processes. It is important to distinguish between these different facets, because they may not relate in exactly the same way to individual and contextual characteristics. As an example, we present some preliminary data on the relation between organizational constraints and two different facets of employee creativity. While these data are by no means definitive, they can serve as a good illustration of the fascinating challenges inherent to this topic.

A New Perspective on Constrained Creativity

Following studies by DiLiello and Houghton (2006, 2008) and Binnewies, Ohly and Sonnentag (2007), we distinguish between creative potential and practised creativity. *Creative potential* is closely linked to self-efficacy, which is defined as 'the belief [that] one has the ability to produce creative outcomes' (Tierney & Farmer, 2002, p. 1138). Hence, this refers to whether employees think that they can be creative. In contrast, *practised creativity* is defined as 'the perceived opportunity to utilize creativity skills and abilities on the job' (DiLiello & Houghton, 2008, p. 39). Practised creativity (i.e., executed creativity) differs from creative output, which is a performance measure (Hinton, 1970). Practised creativity reflects the extent to which employees perceive themselves to be able to actually exploit their creative potential at work (Hinton, 1970; DiLiello & Houghton, 2006, 2008).

By distinguishing between practised creativity on the one hand and creative potential on the other, we can develop hypotheses on the impact of constraints on each of these two facets of creativity. In line with results from extensive studies in the field of innovation management and organizational creativity, we hypothesize that practised creativity is negatively related to constraints. Constraining and controlling work conditions inhibit employees' exploiting their creativity (Amabile et al., 1996; Oldham & Cummings, 1996; Choi, Anderson & Veillette, 2009).

> *Hypothesis 1:* The degree to which employees perceive constraining organizational factors (impediments) is negatively related to employees' practised creativity.

It has to be noted that the absence of a particular constraining factor cannot automatically be interpreted as the presence of a supportive factor (Choi, Anderson & Veillette, 2009). Hence, we cannot assume that the presence of a constraint, e.g., lack of organizational support, indicates the absence of a corresponding supportive organizational factor, e.g., organizational support for creativity. Therefore, creativity stimulating factors should explicitly be taken into account when studying creativity.

Supporting conditions will stimulate practised creativity (Amabile et al., 1996, 2004; Shalley, Zhou & Oldham, 2004; Zhou & Shalley, 2008). Adequate resources provide employees with the possibility to learn about their tasks, gain task-related knowledge, and enable them to explore, generate and exploit creative ideas (Amabile, 1988; Oldham & Cummings, 1996; Leach, Wall & Jackson, 2003). Furthermore, the availability of tangible resources is perceived as a signal of the importance of the employee's task and enhances self-worth (Amabile et al., 1996).

Given the (presumed) independence of constraints and resources, the question arises whether constraining and supportive organizational factors might interact. We expect that the negative relationship between constraining organizational factors (impediments) and perceived possibilities to be creative on the job (practised creativity) is weaker when resources are low. In other words, supportive organizational factors are expected to *buffer* the negative effect from constraining organizational factors on practised creativity. Hence, we hypothesize:

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Hypothesis 2: The negative relationship between perceived constraining organizational factors and perceived practised creativity is moderated by perceived supportive organizational factors in such a way that this negative relationship is weakened in the presence of supportive organizational factors.

However, for creative ability (as opposed to practised creativity), the effects of constraints and resources may be somewhat different. Constraints may stimulate a feeling of confidence in one's own ability to be creative and find an ingenious way around problems such as budget constraints or time limits. Following earlier research (e.g., Finke, 1990; Stokes, 2001), we hypothesize that the feeling of having creative abilities (creative potential) may be positively related to constraints. Therefore, we propose that:

Hypothesis 3: The degree to which employees perceive constraining organizational factors is positively related to employees' creative potential.

It is likely that the availability of organizational resources in various forms, e.g. time, money, facilities and materials, is positively related to the self-perception of one's skills. With more resources, the realization of larger dreams seems possible, and potential outcomes and success seem to be in easy reach. Hence, supporting organizational factors are expected to positively contribute to the self-perception of having creative abilities. Now, the question arises whether and how supporting organizational factors interact with constraining factors.

Interestingly, previous research on learning and academic performance suggests the existence of a 'Big fish in a little pond' effect (also called the frog-pond effect). In a non-conducive environment, students' 'academic self-concept' can increase (Marsh & Parker, 1984; Marsh, 1987). The essence of this effect lies in social comparison (Festinger, 1954): how people feel about themselves (e.g., their abilities) is partly a function of how favourable the comparison is with relevant others. In the academic context, this means that students who learn within a non-conducive environment (e.g., less prestigious schools) will tend (all other things being equal) to see their academic abilities in a more favourable light than students learning within a highly conducive environment. A similar effect may occur when it comes to organizational creativity: working in an organization that is non-conducive to creativity (e.g., because the context is very constraining) may give rise to social comparison processes that, paradoxically, increase employees' sense of creative potential. Furthermore, a constraining environment restrains possibilities to experiment and test ideas. When ideas are not put to the test, people can easily maintain a self-image of being creative, because there is no possibility to benchmark their ideas to the ideas of others and there is no objective feedback on the success or failure of the idea itself.

This reasoning leads to an expected interaction effect in which the relationship between organizational constraints and perceived potential creativity is moderated by the availability of organizational resources in such a way that if resources are low, employees rate their own creative potential higher when the work context is unfavourable.

Hypothesis 4: The positive relationship between perceived constraining organizational factors and perceived potential creativity is moderated by perceived supportive organizational factors in such a way that this positive relationship is enhanced in the absence of supportive organizational factors (resources).

Hence, in essence, we argue that although constraints may make employees *feel* more creative, constraints may prevent them from actually *using* their creativity. Strikingly, a lack of organizational resources will even enhance the feeling of having creative abilities, whereas the presence of organizational resources enhances the feeling of *being able* to actually exploit creative potential at work.

Figure 1 shows the way in which we hypothesize the relationships between organizational constraints and support with creative potential and practised creativity. We conducted an organizational survey study to test these hypotheses.

Method

Respondents and Procedure

Respondents were employees of a large Dutch mobile communications company, which granted access to all employees from every hierarchical and educational layer of the organization. We targeted a group of 1,000 employees, chosen at random from the total list of employees (about 2,500). An online questionnaire was used to administer the survey and a personal invitation was sent via email, which contained the purpose of the study and a statement that the firm endorsed the study. Furthermore, confidentiality and anonymity were ensured.

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	Practised creativity	Creative potential
	-	+
Constraining organizational factors (impediments)	Employees are prevented from enacting their embodied creativity	Employees feel creative because they are solution-focused and unconventional thinking is encouraged
	Buffering	**'Big fish in a little pond' effect**
Moderating effect of supportive organizational factors (resources)	Supportive organizational factors are expected to buffer the negative effect from constraining organizational factors on practised creativity	A lack of organizational resources will enhance a feeling of having creative abilities that just cannot be exploited
	Constraints may prevent employees from actually *using* their creativity	Constraints may make employees *feel* more creative

Figure 1. The Creativity vs Constraints Matrix

A total of 329 usable responses generated a response rate of 32.9 per cent, which is slightly better than comparable studies (Cummings, Hinton & Gobdel, 1975; George & Zhou, 2007; Cohen-Meitar, Carmeli & Waldman, 2009), and compares favourably to other web-based studies (e.g., Klassen & Jacobs, 2001). The sample included 69 per cent male and 31 per cent female employees; the mean age of the respondents was 36.9 years (SD = 7.1), and their organizational tenure was 6.8 years (SD = 4.1). Of the respondents, 45 per cent had a bachelors degree, 28 per cent a masters degree and 27 per cent started working after secondary school.

Measures

Multiple-item self-report scales, closely following previous studies, were used to measure each construct. Consistent with other research (e.g., Amabile et al., 1996) all items were measured on Likert scales with an even number of alternatives. Even response Likert scales force respondents to make a choice between either side of the scale, and make it impossible to misuse the middle option as an N/A proxy (Kulas, Stachowski & Haynes, 2008). In this case we adopted a six-point Likert scale, in which answer alternatives correspond to a rating of how often a certain situation occurs (never, rarely, sometimes, often, very often, always). We provided verbal labels for the scales and avoided using bipolar numerical scale values (e.g., –3 to +3) in order to reduce acquiescence bias (Kulas, Stachowski & Haynes, 2008).

Creative potential and practised creativity were both measured with items adopted from DiLiello and Houghton (2008), who showed the construct validity of these concepts. *Creative potential* was measured with six items ($\alpha = 0.81$); an example of an item in this scale is 'I feel that I am good at generating novel ideas.' *Practised creativity* was measured with five items ($\alpha = 0.79$); an example of an item in this scale is 'I have opportunities to use my creative skills and abilities at work.'

Organizational impediments and resources were measured with items from the KEYS questionnaire (Amabile et al., 1996, with permission). Amabile et al. (1996) showed the psychometric characteristics and validity of KEYS. Organizational *constraints* were measured with 12 items ($\alpha = 0.83$); and example of an item from this scale is 'Destructive criticism is a problem in this organization.' *Resources* were measured using six items ($\alpha = 0.75$); an example of an item from this scale is 'Generally, I can get the resources I need for my work.'

Results and Discussion

Correlations and descriptive statistics for all variables are reported in Table 1. Practised creativity and creative potential were positively, but moderately, correlated ($r = 0.33$, $p < 0.001$), suggesting that the two constructs share variance but are not the same, and may hence be differentially affected by contextual variables. In line with this view, practised creativity was positively related to resources ($r = 0.41$, $p < 0.001$) and negatively to organizational impediments ($r = 0.25$, $p < 0.001$), whereas creative potential was positively

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Table 1. Descriptives and Correlations

	M (*SD*)	1	2	3	4
1. Practised creativity	3.85 (0.81)	–	0.33**	–0.25**	0.41**
2. Creative potential	4.41 (0.59)		–	0.21**	0.02
3. Organizational impediments	3.53 (0.64)			–	–0.37**
4. Resources	3.66 (0.65)				–

$n = 329$; *$p < 0.01$; **$p < 0.001$.

Table 2. Multilevel Regression of Practised Creativity on Organizational Impediments and Resources

	Estimate	*SE*	*t*	*p*
Intercept	3.93	0.07	57.78	<0.001
Creative potential	0.29	0.04	7.97	<0.001
Organizational impediments	–0.17	0.04	4.24	<0.001
Resources	0.23	0.04	5.81	<0.001
Impediments × resources	0.07	0.03	2.20	0.029

related to organizational impediments ($r = 0.21$, $p < 0.001$), and not to resources ($r = 0.02$, $p > 0.5$).

Practised Creativity

Inspection of the data showed that the data regarding practised creativity had a multilevel structure; that is, in addition to variance on the level of individual respondents, practised creativity showed variance on the level of departments/teams. Specifically, we used the deviance test (Hox, 2010) to test whether multilevel analysis was required; this was the case ($\chi^2 = 11.43$, df = 1, $p = <0.001$). We therefore used the SPSS Mixed procedure (Maximum Likelihood) to analyse the effects of organizational impediments and resources on employees' practised creativity, also controlling for creative potential. This analysis showed that organizational impediments negatively predicted practised creativity ($\beta = -0.17$, SE = 0.04, $t = 4.24$, $p < 0.001$), and resources positively predicted practised creativity ($\beta = 0.23$, SE = 0.04, $t = 5.81$, $p < 0.001$). Further, there was a significant interaction between organizational impediments and resources ($\beta = 0.07$, SE = 0.03, $t = 2.20$, $p = 0.029$; see Table 2). Simple slopes analysis for high (1 SD above the mean) and low (1 SD below the mean) values of resources showed that the negative relation between impediments and practised creativity was stronger when resources were low ($\beta = -0.24$, SE = 0.05, $t = 4.76$, $p < 0.001$) than when resources were high ($\beta = -0.10$, SE = 0.05, $t = 2.06$, $p = 0.04$) (Figure 2). Thus, the negative relation between organizational impediments and employee creativity was buffered – to some extent – by the presence of resources.

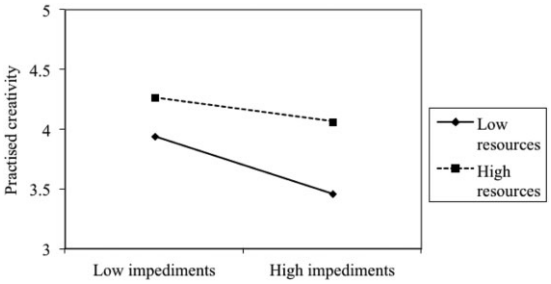

Figure 2. Simple Slopes Analysis Practised Creativity

Creative Potential

Inspection of the data showed that the data regarding creative potential did not have a multilevel structure. We regressed creative potential on organizational impediments, resources and their interaction (both predictors were standardized, and the interaction

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Table 3. Regression of Creative Potential on Organizational Impediments and Resources

	B	*SE*	*t*	*p*	Adj. R^2	Model *F*	*p*
Intercept	3.18	0.16	19.91	<0.001	0.193	0.63	<.001
Practised creativity	0.31	0.04	7.76	<0.001			
Resources	–0.02	0.03	0.52	0.606			
Organizational impediments	0.18	0.03	5.45	<0.001			
Impediments × resources	–0.04	0.03	0.76	0.080			

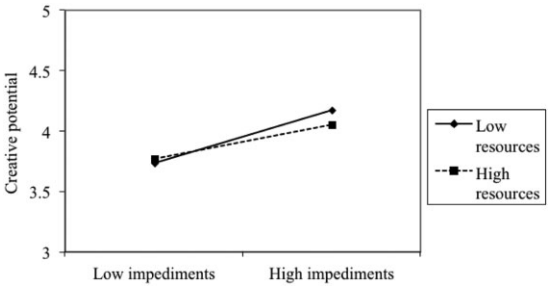

Figure 3. Simple Slopes Analysis Creative Potential

term was computed with these standardized predictors), also including practised creativity as a covariate (adj. $R^2 = 0.19$, $F = 20.63$, $p < 0.001$). As can be seen in Table 3, organizational impediments positively predicted creative potential (B = 0.18, SE = 0.03, $t = 5.45$, $p < 0.001$), and this relation was moderated (marginally significantly) by an interaction with resources (B = –0.043, SE = 0.025, $t = 1.76$, $p = 0.080$). Simple slopes analysis showed that the relation between impediments and creative potential was somewhat stronger when resources were low (i.e., 1 SD below the mean; B = 0.22, SE = 0.04, $t = 5.426$, $p < 0.001$) than when they were high (i.e., 1 SD above the mean; B = 0.13, SE = 0.04, $t = 3.22$, $p = 0.001$) (Figure 3). Thus, employees rated their own creative potential higher when the work context was unfavourable.

These results qualify earlier work on the negative effects of organizational impediments (e.g., Amabile et al., 1996, 2006; Shalley, Zhou & Oldham, 2004; Zhou & Shalley, 2008). Our results show that these effects can, to a certain degree, be attenuated by the presence of resources. Supportive organizational factors are found to buffer the negative effect from constraining organizational factors on practised creativity. Similarly, the positive effect of organizational impediments on the self-perception of one's creative skills is increased when the work context is unfavourable and non-conducive to creativity.

Gaps and Limitations

Of course, these data are tentative and need to be replicated and extended. Inevitably, our study has various limitations and gaps. In fact, several of the articles in this special issue point towards some of these gaps (and go some way towards filling them). For example, our sample was highly homogeneous, as the sample population consisted entirely of members of a single organization. Therefore, it is uncertain whether the results reported here would generalize to other organizations and countries. In this respect, it could be important to investigate whether there are differences between organizations in highly regulated (vs. less regulated) environments (Hatch, 1998; Kamoche & Pina e Cunha, 2001). Firms in heavily regulated sectors may have less room for putting employee ideas to the test than firms in less regulated environments (Vera & Crossan, 2004). The article by Lund Stetler and Magnusson (this issue) contributes to our insights into creativity under constraints by investigating the relationship between goal clarity and creativity in the automotive industry, which is heavily regulated. In contrast, Fay, Shipton, West and Patterson (this issue) investigate innovative performance under constraints in less regulated environments, namely manufacturing companies.

Furthermore, similarly to many other studies of creativity, we used cross-sectional data, which does not allow us to draw conclusions about causality. Longitudinal studies with additional relevant variables are necessary to unravel the effects of constraints and facilitators on creative potential and practised creativity. Also, vignette studies, such as that by Marguc, Van Kleef & Förster (this issue), can provide insight into causality about the impact of constraints on aspects of individual creativity.

An additional interesting avenue for further research may come from investigating whether different types of constraints might affect different individuals differently (Byron, Khazanchi & Nazarian, 2010). In our sample,

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we found no significant relationship between the availability of resources and the two creativity constructs. It could be the case, however, that for some employees creativity is highest in an environment where resources are infinite, while others may be more creative when working towards defined challenges and under limited availability of means. It would be worthwhile to incorporate variables about employee characteristics in order to get a better grasp on the way in which constraints impact on individuals (see also Rietzschel, Slijkhuis & Van Yperen, 2014). The conceptual paper of Roskes (this issue) also contributes to this line of research.

Further research may also want to investigate whether the relationship between constraints and creativity is linear, as we assumed in our analyses, or whether it may be non-linear (see Lund Stetler & Magnusson, this issue). One can imagine that experiencing a certain level of constraints is helpful (e.g., because it is energizing, or because it decreases problem complexity), but that an excessive level of constraints can have an incapacitating effect on employees (e.g., because it demotivates or leaves too little room for creative input). Then, the damaging effect on practised creativity might become larger than the initial stimulating effect on creative potential (cf. Baer & Oldham, 2006).

This Special Issue

We received 34 submissions after our call for papers on creativity and innovation under constraints. After following a double blind review process of several stages, we eventually accepted seven papers. Thus, 20 percent of the articles submitted were eventually accepted for publication. We are pleased that the articles in this special issue reflect an enormous diversity of approaches and research designs; the studies use different theoretical perspectives, adopt different levels of analysis and deploy different methodologies. One article reports on a literature study leading to a conceptual framework (Roskes). Another article uses a comparative case study design (Bicen & Johnson). Two articles test hypotheses by applying multiple regression analysis with a moderation analysis (Fay et al.), and including non-linear effects (Lund Stetler & Magnusson). Various forms of experimental settings were chosen, including experiments with professional tools (Arrighi, Le Masson & Weil), laboratory studies combined with scenario studies (Marguc et al.) and laboratory studies combined with interviews (Ha & Yang). The samples used for the empirical papers differed widely between contributions, though most studies were carried out in an industry setting. This special issue also covers different levels of analysis with papers focusing on individual creativity (Roskes; Ha & Yang; Marguc et al.), on team innovation (Lund Stetler & Magnusson; Fay et al.), on firm innovation (Bicen & Johnson), and on creativity inducing tools (Arrighi et al.). The papers further address the effects of constraints on several creativity-related outcome variables, namely goal-related creativity (Marguc et al.), individual creativity (Ha & Yang), creative performance (Roskes), idea novelty (Lund Stetler & Magnusson), originality and feasibility of new product design (Arrighi et al.) and organizational innovation (Fay et al.; Bicen & Johnson).

Research Themes

Reading the papers in this special issue, and reflecting on the topic while developing our call, we recognized several general challenges and avenues for future research that broaden the study of the role of constraints for organizational creativity. We have loosely grouped the articles by the main challenge they address, although most of them have something to offer to all four themes.

Impact of Specific Constraints on Individual Creative Behaviour

The first challenge we identify is that we need to refine our understanding of what constraints are, and how they affect creative behaviour. Behavioural psychologists suggest that constraints tend to generate variability in the way that people approach a problem and try to find a solution (Stokes, 2001; Stokes & Harrison, 2002). Creative imagination seems to work best when one is confronted with explicitly understood constraints (Kamoche & Pina e Cunha, 2001; Kelly & Leggo, 2008). Studies in this line are predominantly based on case studies in creative industries (e.g., Beatty & Ball, 2010a, 2010b), or on small-scale experiments in a laboratory setting (e.g., Moreau & Dahl, 2005; Sellier & Dahl, 2011), mainly referring to mental constraints, i.e. artificial constraints adopted as scaffolding to generate creativity (McDonnell, 2011). The workplace might pose constraints of a different nature, i.e. more practically oriented, such as workload pressure, budget limitations or demands from other stakeholders inside and outside of the organization. Does the specific nature of constraints impact their effect on creativity? Do we need to distinguish between different types of constraints?

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The conceptual paper of Roskes (this issue) investigates how different types of constraints affect creative performance for differently motivated people, i.e. people with an avoidance motivation (striving to avert failure) versus people that have an approach motivation (striving for success). Roskes divided constraints into two groups: (1) constraints that *limit* cognitive resources, e.g. time pressure, dual-task demands, noise; and (2) constraints that *channel* cognitive resources, e.g. systematic procedural instructions, restricted goal definitions. Theoretical arguments are given for the propositions that channelling constraints boost creativity for avoidance-motivated individuals and undermine creativity in approach-motivated individuals, while limiting constraints go moderately well with approach motivation, and not with avoidance motivation.

Marguc et al. (this issue) focuses on constraints in the form of obstacles that individuals encounter while pursuing their goals at work. The research uses a vignette study combined with an experimental setting (Study 1) and a purely experimental study (Study 2) to examine whether obstacles in life promote creative thought in goal pursuit. Her findings show that people open up to using more unusual means and generate more original ideas when tackling an obstacle.

The Nature of the Creative Process

The second challenge we identify is that we need to further explore the nature of the creative process itself. Existing studies typically regard creativity as an output variable, and do not take into account that creativity encompasses a *process* from initial idea to creative outcome. Then again, it is widely acknowledged that creativity (and innovation) can best be viewed as a multistage process, with different stages being affected by different individual and contextual variables. Some authors identify two (Hammond et al., 2011), others three (Kanter, 1988; West & Farr, 1989; Janssen, 2001; Scott & Bruce, 1994; Van der Vegt & Janssen, 2003; Rietzschel, 2011; Caniëls, De Stobbeleir & De Clippeleer, 2014), four (De Jong & Den Hartog, 2010) or even five (Amabile, 1983; Kleysen & Street, 2001) phases in the creative process. However, as yet little is known about whether and how constraints differentially impact the various stages of the creative process. Another relevant perspective is offered by De Dreu, Baas and Nijstad (2008), who argue that creativity can be attained either through flexible thought, with people switching freely between mental categories, or through persistence, with people thinking more deeply within semantic categories. It is possible that constraints exert different effects on creativity depending on which cognitive strategy or pathway they use to attain creative outcomes.

In the study by Ha and Yang (this issue), different stages in the creative process are distinguished. The possible constraining role of positive and negative emotions for individual creativity is investigated in an experimental setting, complemented with a qualitative analysis of interviews with employees. The study reports that nurturing a moderate degree of hostility towards ideas from others facilitates creativity and idea generation. Anger, as an activating emotion, fuels cognitive fluency (see also De Dreu, Baas & Nijstad, 2008) and therefore it leads people to criticize imperfection, propose bold ideas and undertake spontaneous action. Anger is beneficial for idea creation, but constrains idea implementation by generating interpersonal conflicts. Companionate love, as a deactivating emotion, enhances solidarity, encourages thoughtfulness and cooperation. Therefore this emotion facilitates idea implementation, while being detrimental for idea generation.

Nature of the Task at Hand

A third challenge concerns the question how the relation between constraints and creativity might also depend on the nature of the tasks an employee has to perform. Not only is studying overall creative behaviour an imprecise and unfocused way of operationalizing a complex phenomenon like creativity, to really get a grasp of what is going on at the workplace scholars may need to look at the specific tasks that are performed on the job. It may be the case, for example, that tasks involving incremental improvements ask for fewer (or other) constraints than tasks of a more radical nature (Arrighi et al.; Lund Stetler & Magnusson). Other ways to distinguish between tasks might be useful as well, such as the level of expertise that is needed to carry them out, or the extent to which a constraint limits the creative capabilities/output of individuals or that of the entire organization.

The contribution by Lund Stetler and Magnusson reports the results of a survey among senior managers of an R&D department in the automotive industry. The study distinguishes between exploitative and exploratory activities at team level. It is found that mid-range levels of goal clarity, the absence of which is considered as a constraining factor, are related to fewer novel ideas (exploratory activities). In other words, either high or low levels of goal clarity is positively related to idea novelty.

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The study by Arrighi et al. focuses on new product development processes. An experimental research design is adopted, in which two CAD tools for product design are compared. The tools differ in the degree to which industrial design constraints are embedded, and the resulting designs are assessed with respect to originality and feasibility. Results show that different ways of implementing constraints in CAD tools may differentially affect originality and feasibility – and that it actually is possible to work in a 'constrained' design situation and still create designs high in both originality and feasibility.

Organizational Factors that Constrain or Facilitate Creativity

A fourth challenge for future research concerns the relation between constraints and resources, which was also alluded to in the above description of our own study. As yet, it is not clear whether and how the impact of various facilitating factors differs from the impact of their negative twin, i.e. the constraining factors that indicate the absence of certain facilitating factors.

This theme is addressed in the contribution by Fay et al., which investigates the role of the human resources management (HRM) system as constraining or facilitating organizational innovation and specifically the moderating effect of HRM system quality on the relationship between teamwork and organizational innovation. In a survey of teams in 45 UK manufacturing firms, Fay et al. found that HRM systems that provide teams with time for thoughtful reflection on their functioning enhance the positive relationship between teamwork and innovation.

The study of Bicen and Johnson also contributes to this research theme. In this study the role of resource limitations for radical innovation is addressed. Based on in-depth interviews with employees from ten start-up firms, Bicen and Johnson conclude that certain firms perceive resource limitations as an enabler rather than an inhibitor to innovation. This characteristic is typified as 'lean innovation capability'. Lean firms adopt design thinking methodology and act as bricoleurs. They are able to apply combinations of available resources, which allow them to generate many solutions to problems in a short time.

Conclusion

This special issue arose from our curiosity about the impact of constraints on employee creativity. If there is one thing that the contributions to this special issue (and our own empirical work) show, it is that the relation between constraints and creativity is complex, fascinating, and as yet, understudied. We have identified four central themes in which further research could help to increase our current understanding on this topic. The contributions to this special issue provide valuable insights in each of the identified themes. Furthermore, they show the importance of the topic from a scientific, theoretical point of view, as well as from a managerial perspective. We hope that this special issue will spark further research exploring how different aspects of individual and team creativity can be affected by different types of constraints throughout the creative process.

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