

Working on something else for a while

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Working on something else for a while: Pacing in creative design projects

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Abstract

In an interview study among 25 architects we investigated how activities were allocated over time in the design phase of an architectural project. Specifically, linking the literatures about pacing behavior and incubation, we set out to identify patterns related to how the interviewees paced their activity before a deadline. We used two types of materials to stimulate the answers in the interview: 1) standard graphs, developed in previous research; 2) a timeline. Five main themes emerged, that were termed pacing; milestones; multiple projects; deadlines; and quality–time trade-offs. Based upon the results we propose a model that includes overlapping U-shapes of activity, that is, most activity at the start of a project and right before a deadline. A second study provided a comparison of the pacing patterns among 85 respondents in jobs that required different levels of creativity. Not only U-shape pacing, but also deadline pacing was more common in creative jobs, whereas early starting patterns were less

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common. The two studies provide insight into how professionals in creative jobs deliberately use pacing that allows for incubation.

Keywords

Creativity, incubation, pacing, deadlines, time

Introduction

A substantive amount of empirical evidence reveals that creativity at work (i.e. the development of ideas that are novel and potentially useful (Amabile, 1996; Shalley et al. 2004)) is related to organizational innovation, effectiveness, and survival (Amabile, 1996). Moreover, the current shift towards knowledge-based work has turned creativity into a source of strategic advantage (DeFillippi et al., 2007), which makes the role of creative professionals increasingly important to the economy.

A growing number of research articles have examined the influence of personal and contextual factors on creativity at work (Shalley et al., 2004). In this study, we focus on the execution of creative work, rather than personality or working conditions. In particular, we focus in more detail on pacing style, i.e. patterns that indicate the allocation of time and efforts for the execution of tasks in relation to the deadline (Gevers et al., 2013, 2006). The concept of pacing was introduced by Gersick (1988, 1989). She observed that instead of working at a constant pace of activity, project teams only displayed high levels of activity at points in time (at the mid-point and towards the end of a project) when group members were highly aware of the project deadline, whereas the teams were relatively inactive at other points in time. This pattern was found in group and in individual projects (Chang et al., 2003; Gevers et al., 2006; König and Kleinmann, 2005; Lim and Murnighan, 1994; Nandhakumar and Jones, 2001; Seers and Woodruff, 1997; Waller et al., 2002). Nandhakumar and Jones (2001) expressed it as follows: “rather than a steady flow of time towards regular milestones, the team members’ work was marked by significant changes in pace. Periods of relative inactivity [...] were matched by intensive efforts as deadlines for projects approached” (p. 207).

In general, little is known about processes that evolve over time in creative work (Drazin et al., 1999). Most research followed a static research perspective and investigated concurrent relations, rather than processes as they evolve over time (Roe, 2008). In this study, we examine the extent to which different levels of activity occur over time in creative projects. The research question was: Which pacing patterns occur in creative projects?

More generally, this question is related to theory on time work (Flaherty, 2011), the way in which people use temporal autonomy, or agency. As such it is a special case on the allocation of time at work, related to the broader issues previously addressed in research on time work. For example, how individuals purposefully construct activities and social situations in order to create particular kinds of temporal experience (Flaherty, 2003) and how professionals develop adaptive responses to the demands for time in their jobs and in family life (Moen et al., 2013).

In order to introduce our study, we first provide an overview of past research on incubation time. Although this topic is highly relevant, we contend that theory in this area cannot be tested in a field setting because it is not clear in which time intervals the theory should be interpreted: minutes, parts of the day, weeks? Since work is normally followed by some form of rest and recovery, should time off work be seen as incubation time? We suggest that an exploratory study is appropriate because these questions have not been answered in the literature. We examine pacing styles further to provide insight into how activity and inactivity occur in creative professions, and to develop a model that may be helpful to future research.

Incubation time

The literature on incubation time is largely based on the model of creative problem solving of Wallas (1926). This model describes four stages: 1) preparation, in which individuals gain in-depth knowledge about a problem; 2) incubation, the period of time during which individuals take some time away from the task; 3) illumination, in which an insight or good idea comes to mind, suddenly and unexpectedly; and 4) verification, in which the applicability of the idea is verified. However, many problem solving endeavors end at an impasse at the preparation stage, in other words, one feels 'stuck' (Beefink et al., 2008). The underlying assumption of Wallas' model is that incubation time aids to overcome this impasse: instead of focusing more on the problem in order to solve it, persons should distance themselves, and the solution will present itself suddenly.

The incubation hypothesis has been tested experimentally, and it has found considerable support (e.g. Christensen and Schunn, 2005; Segal, 2004; Smith and Blankenship, 1991). Three possible explanations for the positive effect of incubation time have been provided (Segal, 2004). First, as was originally suggested by Wallas (1926), the effect can be explained by the unconscious integration of information that is stored in memory. A second explanation is that cues unrelated to the problem encountered during the incubation period may trigger the emergence of new ideas. A third

explanation questions the role of conscious and unconscious information processing during the incubation period, and suggests that the positive effect can be explained by the act of merely addressing a problem anew. Empirical evidence has been provided to support each of these explanations (Dijksterhuis and Meurs, 2006; Segal, 2004; Sio and Rudowicz, 2007).

On the one hand, many would say that creative output is largely a matter of effort, “perspiration rather than inspiration”, which would imply a steady pace. On the other hand, time away from a task, or inactivity, aids creative processes and helps to overcome impasses, i.e. feelings of being ‘stuck’ (e.g. Beeftink et al., 2008; Segal, 2004).

Incubation time in a field setting has received very little research attention (for an exception, see Wells, 1996). Nevertheless, researchers generally agree that some time away from a creative task is helpful to creative performance (Cronin, 2004; Elsbach and Hargadon, 2006). By linking this domain of research to that of pacing, we aim to investigate if incubation plays a role in the pacing patterns of creative professionals, and if so, how.

Pacing patterns before a deadline

Research on task pacing behaviors has built on Gersick’s Punctuated Equilibrium Model (Gersick, 1988, 1989). Originally, the Punctuated Equilibrium Model referred to patterns of relative stability and sudden radical change in evolution (Eldredge and Gould, 1972). Gersick (1988, 1989) found that the patterns of change in activity in teams between the start of a project and its deadline resembled the pattern of a punctuated equilibrium, and she transposed the Punctuated Equilibrium Model to the social sciences. It referred to behavior at the group level, but Seers and Woodruff (1997) showed that these patterns also reflected task pacing behaviors at the individual level, and research on student procrastination (the unintended delay of work, Van Eerde, 2003) reveals a similar pattern (Schouwenburg and Groenewoud, 2001). Also, intended delay, also termed strategic delay (Klingsieck, 2013) may occur as an indication of agency, or temporal autonomy, within the framework of time work (Flaherty, 2011).

Although procrastination may be seen as a general problem of self-regulation that is applicable to everyone (Van Eerde, 2000), not everyone is equally likely to procrastinate. Different pacing styles of individuals can be distinguished (Claessens, 2004; Gevers et al., 2006) and research has elaborated on them (Gevers et al., 2008, 2013; Mohammed and Nadkarni, 2011; Shipp et al., 2009). These pacing patterns are: 1) early starters: they start early and are less active towards the deadline; 2) steady pacers, who have a constant pace towards a deadline; 3) deadline workers (most likely also procrastinators) who are relatively inactive at the beginning, but

enormously active at the last minute when the deadline approaches; and 4) a combination of early and deadline workers, with a relatively inactive phase during the midpoint of a project, a U-shaped curve.

Combining the knowledge on incubation time and pacing patterns, we set up this study to answer our research question: which pacing patterns occur in creative projects?

Method

Participants

Twenty-five Dutch architects were interviewed. We chose to study the work of architects who are generally considered creative professionals (Feist, 1998; Kirton, 1994; Unsworth, 2001). Architects need creative problem solving skills to design buildings that meet the technical specifications, and artistic skills are necessary to give their designs aesthetic value. Twenty-two of the participants were male, reflecting the male dominated nature of the profession in the Netherlands.

The architects' work experience varied from less than five years up to more than 30 years. Besides their architectural work, some architects held positions in management or middle management. Some others were self-employed, running small businesses. The architects were recruited through 'snowball sampling' (Babbie, 2005: 190), meaning that the networks of the interviewed architects were used to approach other architects for the study.

Procedure

Interviews of between 60 and 90 min each took place at an interviewee's home or workplace. All interviews were conducted by the second author. To learn more about the patterns of activity and inactivity over time, two approaches to collect data were used: (a) pacing pattern graphs, (b) project timelines.

Pacing pattern graphs. We used the scale with the graphical representations of the different pacing patterns derived from Claessens (2004), showing the aforementioned pattern as four graphs, in which a line indicated the pattern of activity (see Figure 1) before a deadline. The graphs served as a starting point for discussion, asking the architects to choose the pacing patterns that fitted their design work best, and to elaborate on their choice.

Project timelines. In the next part of the interview, we asked each architect to focus on one project they had recently finished. More specifically, we

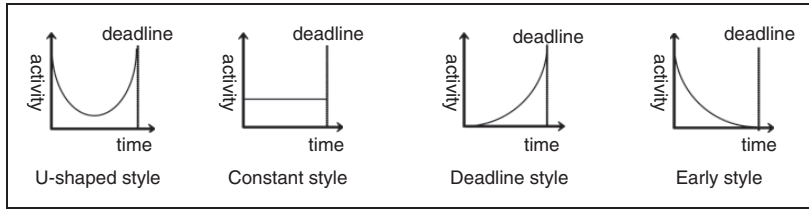


Figure 1. Pacing styles.

asked them to focus on one particular phase of the project, the design phase. A full architectural project generally contains three major phases: (a) a design phase, (b) a drawing phase, during which detailed construction drawings are developed, and (c) a construction phase, during which the building(s) is (are) constructed. We focused on the design phase, because this is the phase of the project in which both problem solving and artistic creativity are required, and we wanted to focus on creative work tasks specifically. The design phase has a clear start and finish: It starts with the first meeting with a customer and ends on a specific date at which the design should be sent in for approval by the customer and the local authorities, the design deadline.

The architects were asked to start with a brief description of the building(s) that had been designed. Then, we gave them a large (A3) piece of paper with a timeline on it. The timeline simply consisted of two dots and a line: On the left side of the line, one dot marked the project start and on the right side another marked the design deadline. Timelines are “graphical representations people can fill in with details; as visual artifacts, they are more easily processed than other forms of communication.” (Barry, 1997: 279, in Yakura, 2002). We asked each architect to fill out the timeline with major activities, and, if applicable, also with milestones within the design phase. We used the timelines as a vehicle to elaborate on the different facets of the design process over time. This was a very open-ended discussion about the process of the development of the design, resulting in anecdotes of typical events that had happened during the design process.

Data analysis

All interviews were audiotaped and notes were taken during the interviews. Also, the timelines were kept as graphical representations of the design projects. The essential excerpts of the tapes were transcribed and segmented, 1022 phrases in total. These phrases were categorized by two coders following a procedure of open coding, which is a systematic

coding procedure known from its application in grounded theory methods (Babbie, 2005; Strauss and Corbin, 1990). The phrases were coded and assigned to one of three main categories: (a) *pacing*, concerning phrases that referred to fluctuations in activity levels over time; (b) *creativity*, concerning phrases about creativity or the creative process, and (c) *deadlines*, concerning phrases about milestones and deadlines. The first coder's categorization of each phrase was compared with the second coder's categorization of that phrase. The average agreement of the two coders was 69.1%. The corresponding Cohen's kappa of .52 indicated moderate agreement (Landis and Koch, 1977). Therefore, all phrases on which the coders disagreed were reexamined and discussed until both coders fully agreed on re-assignment to one of the three categories. The three categories included 258, 363, and 401 phrases, respectively. Five specific themes that led to inclusion in the model will be highlighted in the following.

Results

Pacing

The majority ($n = 18$) of the architects had been using U-shaped pacing patterns. One of them, Martin,¹ gave the following description of his pacing pattern: "At the start I work a lot on it, so I know how much [work] it is...but once I know, oh, well, that much work needs to be done, then I wait as long as possible, and then I do everything right before the deadline..." (2, A037-052²). Of the remaining seven architects, three said they were deadline workers, and had only been highly active close to the deadline. One said he had a constant pattern, which means that his project work was characterized by a constant level of moderate activity. Three architects did not want to choose one of the pacing patterns shown to them, because they thought their pacing patterns had been more complicated, and could not be represented by one of the figures. Specifically, they said that their patterns were (a) not as abstract as the graphical representations, but fluctuated much more over time, (b) varied from project to project, or (c) could be combinations of pacing patterns (for example, a combination of a constant pattern with a heightened level of activity towards deadlines). Nevertheless, most of the architects immediately recognized themselves in one of the pacing patterns, which suggests that the graphic pacing pattern scale had sufficient face validity.

Most of the architects ($n = 15$) referred to the creative process to explain their pacing pattern. Willem, for example, said: "It works rather well...to free some continuous time [at the start], so you can thoroughly work your way into it, and thus become aware of the complexities and pitfalls. Well,

then you let the material sink in for a while. Thus, the dip in activity is used for letting the material sink in, really.” (9, A160-170). In addition, Martin said: “. . . in this period of time, where I do nothing, that is really the period that I become aware of the problem, and where inspiration comes to me.” (2, A048-052). Although we did not ask directly whether the period of inactivity was related to the creative process in this study, the comments of the interviewed architects were in this direction.

Thus, most architects had very similar ways of pacing their design projects: They distributed their work efforts over time using U-shaped patterns, because, according to them, this supported their creativity. However, the fact that three architects argued that their pacing patterns did not fit the simple graphs may be an indication that more sophisticated representations may provide additional insights into the patterns of task activity in creative work.

Milestones

All timelines of the architects included at least two milestones, and often more, reflecting the design phase of architectural projects in a design cycle. After the first meeting that marks the start of the project, architects work on a concept design. This concept design is discussed with the customers and revised until they are satisfied. Then, a more detailed design is made, the preliminary design. This design is also discussed with the customers and revised until they approve it. Then, a final design is made, which is discussed again with the customers and revised and then send to the local authorities for approval.

The milestones in the timelines represented moments in time at which architects had meetings with customers to present their work. This means that they had to have completed some work before these moments in time. Therefore, these milestones were generally perceived as being intermediate deadlines. Philip described the different deadlines: “There are two deadlines: The first is just the next meeting . . . and the other is, in fact, the product [the final design].” (5, A227-233). Also, Michael explained that he viewed his milestones as intermediate deadlines. In addition, he told us that each of the milestones influenced his work pace. Specifically, he asked “Are we allowed to draw another [graph]?” (16, A078-079). He drew a pattern of successive U-shapes, which resembled a pattern of recurring cycles of the U-shaped pattern with high levels of activity around project milestones and the deadline and periods of inactivity in between. Thus, the U-shaped pattern was repeated for each intermediate deadline. In light of the occurrence of intermediate deadlines in all of the projects described, repeated U-shaped patterns may represent the pacing patterns of these creative projects better than a single U-shaped pattern.

Working on multiple projects

The original U-shaped pattern, and also the repeated U-shaped pattern, imply periods of inactivity. However, architects were not really inactive during these periods of time. Instead, they were working on other projects. During the interviews, all but one architect mentioned that they worked on multiple projects, and that periods of disengagement from one project had been providing the opportunity to work on another project. This means that pacing patterns of multiple projects overlap.

Deadlines

In the original U-shaped pattern, the deadline was a vertical line. This line represents a specific point in time at which a certain amount of design work needs to be completed. However, a line may not have been the best representation of a deadline, because it assumes a fixed character of deadlines, and the interviews revealed that they are not necessarily predefined and fixed. Although most architects confirmed that they had set milestones and design deadlines when the projects started, six architects had made a conscious decision *not* to make such rigid appointments beforehand. Chris, for example, said: "I try to avoid deadlines." (16, A094-098). Instead, he promised his customers that he would work on the design and told them that they could be expecting it in about six weeks. He said that he would give them a call when he was ready. This is a good example of a unspecific definition of a deadline.

More fixed agreements were also made between architects and their customers. Seven architects mentioned that deadlines were imposed upon them by their customers. Richard, for example, who primarily dealt with professional customers, told us: "Usually, it [a deadline] is dictated by others." (24, A154-155). The other architects negotiated about their deadlines, or picked the dates for the deadlines themselves. For example, Martin explained that he had made a project planning at the start of the project. He told us: "That's something you just discuss for a moment [with the customer], after which you put it down in a calendar." (2, A682-692).

Once set, the architects also differed in the rigidity with which they adhered to deadlines. Sarah, for example, stated that although she had finished her work on time at all project milestones, she had been aware that she could have moved her deadlines, since the customers she had made a design for had been "two people to whom you can say: 'I have not finished it yet, it will be ready next week.'" (21, A393-395). Marc sometimes found excuses to buy himself some more time: "For example, I can very easily ask a customer a certain question about something he had not

thought about before, which I say I need to know, and so he will be busy for two weeks. Meanwhile I have some more time to think thoroughly about that project, or maybe do some work on another project that needs attention.” (22, A050-056). About one-third of the architects ($n=9$) mentioned the possibility of shifting deadlines.

Four other architects had a very different view: They had taken their deadlines very seriously. André explained for example: “Deadlines are there for a reason. Often, very much depends on it. . . . They not only have agreements with us, but with building constructors, structural engineers, and suchlike, and then you just have to finish your work within that amount of time.” (3, A006-011). Two architects explained that some deadlines could be shifted, whereas others could not.

Quality-time trade-offs

Some architects mentioned quality reduction decisions because of time limitations. In creative projects, the solution is unknown beforehand, and this leaves room for architects to use their own interpretation of what needs to be presented at a deadline meeting. One-fourth of the architects ($n=6$) admitted that they sometimes had used this lack of clarity to do less than they initially had wanted to do. Kent, for example, told us: “When I am working under high time pressure . . . and run out of time, then I lower my standards with regard to the quality of my work, not with regard to the quality of the final design, but I complete the concept design a bit less or a bit less detailed.” (7, A162-166). Phillip explained: “You should reveal [to a customer] that you have thought about the problem and, at least, that you partly solved it. Maybe you made not as much progress as you had hoped for . . . but if you can defend it well, than it’s never a problem.” (5, A188-192). Thus, these results show that both time and the design may be subject to reinterpretation over the course of a project.

Discussion

The results of the interviews showed that the architects generally (a) paced their creative projects using U-shaped pacing patterns, (b) repeated these patterns multiple times within one project, with peaks of activity around project milestones and the deadline, (c) worked on multiple projects concurrently, which means that pacing patterns of different projects overlapped, and (d) sometimes interpreted their deadlines flexibly, which may also have affected their pacing behavior. We used these results to construct a visual representation of the pacing patterns in these creative projects.

First, on the basis of the results, the visualization should include U-shaped pacing patterns. These findings are in line with incubation time literature (e.g. Smith and Dodds, 1999; Wallas, 1926; Wells, 1996). Specifically, the U-shaped pattern describes a pattern of activity and inactivity over time that fits the stages in the creative problem solving model of Wallas (1926): preparation (activity), incubation (inactivity), and verification (activity).

Second, an extension of this graphical representation of an architectural project on the basis of the timelines is that it included at least two milestones, perceived as intermediate deadlines. Tasks often are hierarchically ordered with a main task divided into multiple subtasks (Carver and Scheier, 1998: 72). Similarly, projects are often divided into project phases that end with a project milestone (Nandhakumar and Jones, 2001; Yakura, 2002). As the architects explained, these milestones are generally perceived as intermediate deadlines and influence their distribution of work efforts over time. Therefore, we posit that a graphical representation of architectural design projects follows a repeated U-shaped pattern, with peaks of activity around milestones and the deadline, and periods of inactivity in between. Yet, when work time is taken as a whole, the combination of the peaks may actually indicate a stable pace.

Third, in a work setting, individuals usually deal with multiple tasks and projects at the same time (Kirchberg et al., 2009; Louro et al., 2007; Schmidt and DeShon, 2007), while previous research typically described pacing patterns for single tasks or projects (e.g. Claessens, 2004; Gersick, 1988, 1989; Gevers et al., 2006; Seers and Woodruff, 1997). The architects worked on multiple projects concurrently and periods of inactive time in one project provided time to work on other projects. Therefore, a graphical representation of the pacing patterns of the architectural design projects should represent overlapping pacing patterns of multiple projects.

Finally, we found that deadlines and milestones were not always fixed and strictly adhered to. Other studies have also shown that deadlines at work are not always met and sometimes need to be shifted (e.g. Beech-Hawley et al., 2004; Nandhakumar and Jones, 2001; Yakura, 2002). For example, in a field study among newspaper workers, Beech-Hawley et al. (2004) found that daily deadlines were highly salient yet sometimes missed. Furthermore, they found that meeting a deadline required the newspaper workers to work fast, sometimes at the cost of quality or accuracy. To include the different deadline approaches into the graphical representation, deadlines and milestones should be depicted by blurred lines rather than by sharp lines. In sum, the resulting graphical representation is depicted in Figure 2.

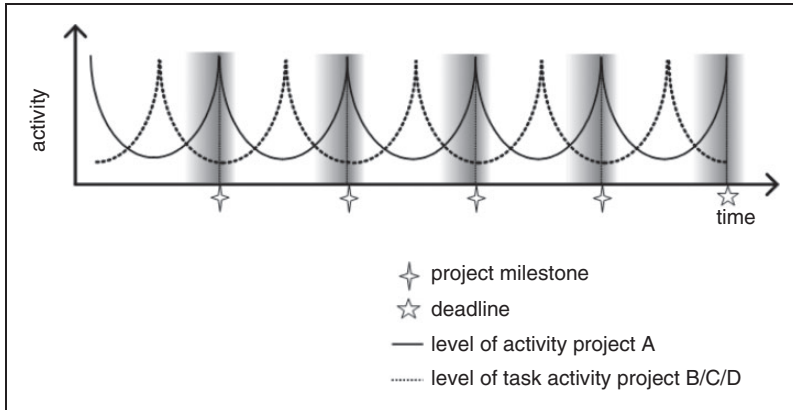


Figure 2. Archetypical pattern of activity over time in creative projects.

In a subsequent study, we sought to extend the idea of the U-shaped curve and to assess whether professionals in other creative jobs indicate they use the same style.

Study 2—Pacing: Creative versus other professions

Routine work consists of work activities that contain a low level of task uncertainty, and can therefore be performed following standardized procedures (Hirst, 1987; Van der Geer et al., 2008). However, in some professions, individuals have to solve problems for which a clear path to their solutions is unknown beforehand. These problems are known as ill-defined problems (Sternberg and Davidson, 1999), for which creative problem solving is necessary to find a solution (Cropley, 1999). The work of scientists, engineers, or managers may fall into this category. In addition to these creative problem solving skills, some professions require artistic skills (Feist, 1998) to add aesthetic value to their work. The work of people working in these professions, such as designers, architects, or writers, is in our view highly creative.

Thus, we distinguish between professions that require very little creative problem solving skills (routine work), primarily creative problem solving skills (moderately creative professions), and both creative problem solving skills and artistic skills (highly creative professions), with the first being the least and the last being the most creative professions.

As we have pointed out in the first study, the majority of architects paced themselves according to the U-shaped pattern. This type of pacing pattern may be preferred over the constant pacing pattern, because it allows for incubation. Therefore, we hypothesize that not only architects, but all

individuals working in (highly) creative professions more often use U-shape pacing patterns (Hypothesis 1), and less often use constant pacing patterns (Hypothesis 2) than those in less creative jobs.

Some of the architects said they considered themselves deadline workers. Generally, the early worker pattern may be preferred over the deadline worker pattern, because deadline workers more often miss their deadlines (Gevers et al., 2006), and produce lower quality results (Gevers et al., 2008). These effects may be the result of procrastination. The postponement of tasks may lead to increased time pressure, and consequently to difficulties meeting deadlines and to time-quality trade-offs (Van Eerde, 2000).

However, it is possible that “procrastination may lead to better task performance in creative tasks” (Van Eerde, 2000: 382), because creative work may benefit from some extra time in which new insights and new information may be gained. Furthermore, it is easier to incorporate changes along the way, which may be necessary giving the high level of task uncertainty of creative work (Crompton, 1999). Thus, despite the increase in time pressure, deadline pacing may be beneficial to creative work. Therefore, we tested whether creative professionals use the deadline pacing more often than those in less creative professions (Hypothesis 3). We also tested the opposite idea: individuals working in less creative professions use the early worker pattern more than those in creative professions (Hypothesis 4).

Method

Procedure

We collected survey data among 85 participants of four workshops on time management in the Netherlands before the start of the workshops. Two workshops were organized for an audience of mainly creative professionals (such as writers and architects), one workshop for employees in healthcare or education (who had professions such as internist, head nurse; head of student office, director of education), and one workshop for employees from a public housing department (professions such as urban planner and executive secretary). In total, 48% was male, and the average age was 41.8 years ($SD = 9.4$).

Measures

Besides age, gender, and profession, two measures were included:

Pacing patterns. To measure an individual’s tendency to distribute work effort towards a deadline, we used four items of the graphic scale derived

from Claessens (2004). Each of the items consisted of a graph that described a distinct pacing pattern. The four graphs represented the pacing patterns that have been described in the introduction: (a) the 'U-shaped' pattern, (b) the 'constant' pattern, (c) the 'deadline worker' pattern, and (d) the 'early worker' pattern (see Figure 1). On a five-point Likert scale ranging from (*almost*) *never* (1) to (*almost*) *always* (5) participants indicated how often they used each in their work.

A validation study of Gevers et al. (2013) revealed that the graphs were highly correlated to multi-item textual counterparts that had sufficient internal consistency ($.72 < \alpha < .90$). The scales had discriminant and convergent validity to other constructs such as time urgency, polychronicity, and time perspective.

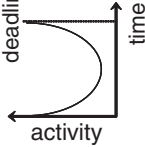
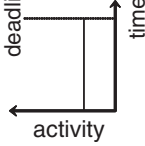
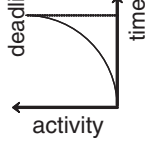
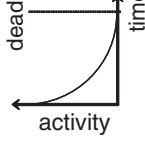
Required creativity at work. Required creativity was rated by two independent raters. Each participant's profession was rated and assigned to one of three categories: (a) routine jobs that required only little creativity, (b) moderately creative jobs that required some creativity for problem solving, and (c) highly creative jobs that required artistic creativity.³ The raters agreed on 83.5% of the professions, corresponding with a Cohen's kappa of .74, indicating substantial agreement (Landis and Koch, 1977). After the calculation of interrater agreement, the professions the raters did not agree upon were discussed until full agreement was reached, and assigned to the categories accordingly.

Results

Means and standard deviations for the use of each pacing pattern at each level of required creativity at work are presented in Table 1. Different superscripts indicate significant differences between levels of required creativity at work for each of the pacing patterns separately. Figure 3 depicts the four pacing patterns at each level of required creativity at work.

Hypothesis 1 stated that the U-shaped pacing pattern would be used more often by individuals working in more creative professions, and less often by individuals in less creative professions. An ANOVA revealed differences between the levels of required creativity at work for the use of this pacing pattern ($F=8.33$, $df=2$, $p=.001$, $\eta=.17$). The ascending solid line in Figure 2 shows that the difference was in the hypothesized direction: The more creativity was required at work, the more often this type of pacing pattern was used. This means that support was found for Hypothesis 1. Scheffé's tests showed the U-curve pacing pattern was more often used in highly creative work than in routine work ($p=.001$), and more often in

Table 1. Means and standard deviations of the use of pacing patterns at different levels of creativity at work.

	Pacing patterns							
								
	M	SD	M	SD	M	SD	M	SD
Routine work (N = 33)	2.58 ^a	.83	2.42 ^a	.98	2.42 ^a	1.42	2.24 ^a	.87
Moderately creative work (N = 36)	3.18 ^b	1.14	2.42 ^a	1.05	2.65 ^{a,b}	1.36	1.89 ^a	.71
Highly creative work (N = 16)	3.75 ^b	.86	1.88 ^a	.96	3.50 ^b	.97	1.25 ^b	.58

Note: Different superscripts indicate significant differences between levels of creativity at work, $p < .05$ (one-tailed).

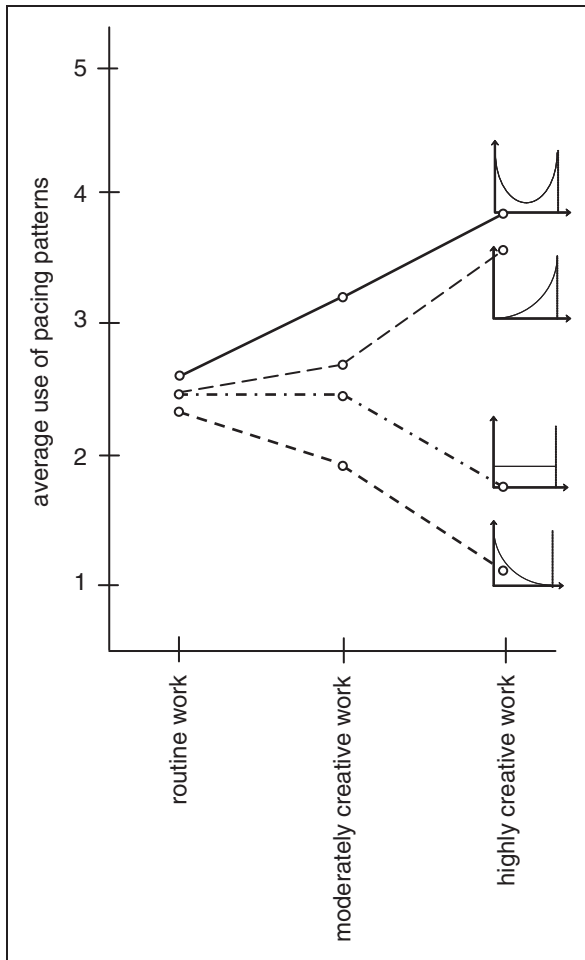


Figure 3. Pacing patterns for different professions.

moderately creative work than in routine work ($p = .012$). No differences were found between highly creative work and moderately creative work ($p = .056$).

Hypothesis 2 stated that individuals working in more creative professions would use constant pacing pattern less often than individuals in less creative professions. An ANOVA showed no differences between levels of required creativity at work ($F = 1.92, df = 2, p = .153, \eta = .05$). Thus, the results do not support Hypothesis 2.

Hypothesis 3 stated that deadline pacing was used more by individuals working in more creative professions than by individuals working in less creative professions. An ANOVA revealed a significant difference between creativity levels ($F = 3.67$, $df = 2$, $p = .03$, $\eta = .08$), supporting Hypothesis 3. The ascending dashed line in Figure 2 shows that the difference was in the hypothesized direction: The more creativity was required at work, the more often this type of pacing was used. Scheffé's tests showed differences between highly creative work and routine work ($p = .009$), and between highly creative work and moderately creative work ($p = .036$), but not between moderately creative work and routine work ($p = .475$).

Finally, Hypothesis 4 stated that individuals working in more creative professions use early pacing less than those in less creative professions. An ANOVA showed a significant difference between the levels of required creativity at work ($F = 9.35$, $df = 2$, $p = .000$, $\eta = .19$), supporting Hypothesis 4. The descending dashed line in Figure 2 shows that the difference was in the hypothesized direction. Scheffé's tests revealed that this pacing pattern was used less often in highly creative work than in routine work ($p = .000$), and also less often in highly creative work than in moderately creative work ($p = .006$). No differences were found between moderately creative work and routine work ($p = .055$).

Discussion

This test of differences in pacing patterns revealed that individuals in more creative professions use U-curve and deadline worker pacing patterns more often than individuals in less creative professions, and early worker patterns less often. No differences were found for the use of steady pacing patterns.

Three of our four hypotheses were supported; steady pacing was equally distributed over the three professional groups. Perhaps this was due to low statistical power of the small sample, as the highly-creative-professions group contained only 16 individuals. A power analysis (Faul et al., 2007) revealed a power of .38, whereas it should be .80 or higher (Cohen, 1988, 1992). A sample size of twice the size ($n \sim 160$) might reveal differences between groups for this pacing pattern.

Our findings with regard to the use of U-shape pacing patterns in creative professions are in line with incubation time literature, which suggests that it is helpful to creative problem solving to include intermediate periods for incubation (Smith and Dodds, 1999; Wallas, 1926). Our results suggest that the patterns the architects discussed also apply to highly creative work more generally, and to a lesser extent to somewhat creative work. Our study revealed that creative professionals are more often deadline workers and less often early workers. These results were to be expected on the basis of

Van Eerde's (2000) suggestion that procrastination may be helpful in the execution of creative tasks.

General discussion

Our two studies contribute to the literature in bridging the research on pacing and incubation. Specifically, they show how incubation time (Wallas, 1926) may be embedded into the pacing of creative professionals. We provided a description of incubation time in practice, grounding Wallas' creative problem solving model. This is particularly valuable since almost all empirical research on incubation has been anecdotal or experimental (Dijksterhuis, 2004).

Our study also extended the research on pacing styles. Whereas most of this literature has been focused on team processes (e.g. Gersick, 1988, 1989; Gevers et al., 2006) or individual differences (e.g. Claessens, 2004; Gevers et al., 2008), our studies indicate that creative projects may shape the circumstances that are specifically suited for U-shaped pacing.

The focus in past research on creativity at work has been primarily on creative outcomes and less so on the preceding processes (Drazin et al., 1999; Gilson and Shalley, 2004). We adopted a fairly unique approach by looking at the dynamics of action at work, a process oriented approach (Roe, 2008). This may inspire others to follow, for example in other types of design projects, or consultancy projects. The qualitative, inductive nature of the first study with a group of professionals makes the results easy to translate to practice.

However, the studies also have limitations. Maybe the most important limitation of the first study is that the architects had to recall a finished project. Possibly, the processes may not have been remembered accurately, and only reconstructed in hindsight. Thus, in future research it is important to use longitudinal research designs to rule out this possible bias. A diary study would be particularly suitable.

It is also possible that the architects liked to present themselves in a certain way to the interviewer. This may perhaps be ruled out when a less personal way of collecting the data is used.

Only three architects recognized themselves in the deadline pacing pattern, but the narrative data nevertheless suggested that deadlines and milestones sometimes posed problems. More research is needed to investigate whether creative workers have particular problems in meeting deadlines. The creative character of the work may make it particularly prone to procrastination because it entails high levels of task uncertainty (Cropley, 1999) which makes it difficult to decide when it is truly completed or whether more should have been done. Also, Parkinson's law is applicable here: work will expand or contract according to the time available (Peters et al., 1984).

Both positive and negative effects of deadlines have been found in previous research, and we recommend focusing on creative output under tight deadline conditions in particular, as many employees work under tight deadlines yet need to be creative. Thus, future studies need to control for time pressure, to establish whether all time pressured projects are more likely to be U-shaped or deadline paced, or whether incubation is really relevant, as we suggest.

Also, our studies do not provide insight into the cognitive processes during pacing. Although in experimental research incubation time is generally also operationalized as a period of intermediate inactivity (e.g. Beefink et al., 2008; Christensen and Schunn, 2005; Segal, 2004), in a work environment other activities are more likely than inactivity, and this focused attention on another activity can be beneficial to creativity (cf. Dijksterhuis and Meurs, 2006).

Practical implications

This article has practical implications for creative professionals. Our research shows that they generally use U-shaped patterns. Being aware of these patterns may help them to manage their work more in a way that is beneficial for creativity. For example, they may try to work on multiple tasks or projects simultaneously, so that they have the discretion to work on something else for a while if they feel like it. This may prevent cognitive and emotional disengagement while still trying to complete the task, such as described by Kahn (1990). However, if one works on more than one task or project, attention may be paid to the pacing of different projects. Specifically, one may want to prevent two milestones of different projects close to each other. The two peaks in activity around the two milestones then sum up to an uncomfortable high level of workload. Similarly, milestones and deadlines close to each other should be avoided. Rather, one would want to spread out the milestones and deadlines of all projects one works on evenly over time. This suggests that, in addition to planning the outline of their individual tasks and projects, creative professionals may benefit from a broad overall planning that includes milestones and deadlines of all the tasks and projects, or at least, that, if they set a new milestone meeting, they make sure that the efforts needed for the new project do not interfere with the pacing patterns of other projects. This includes exercising temporal agency, in particular the ability to negotiate when deadlines are roughly at the same time.

Conclusion

We conclude that the relation between pacing patterns, creative processes, and creative outcomes is highly relevant to study further. Future research

might answer questions such as: To what extent is U-shaped pacing more beneficial with regard to creative outcomes than steady pacing? No conscious thinking about problem results in more divergent thought than conscious thinking (Dijksterhuis and Meurs, 2006), yet we also know from procrastination research that high spurts of effort only before a deadline are generally detrimental, both to performance and mental health (Steel, 2007; Van Eerde, 2003). And following this reasoning, does U-shaped pacing lead to similar outcomes as deadline pacing? We would predict that not preparing at all does not set incubation into motion, so that the U-shaped pattern would be better for performance. Yet, individuals preferring both types of pacing were rated worse by others than those who indicated they used an early and steady pace, at least in a setting where creativity was not required (Claessens, 2004).

Also, we have no idea about what would be the ideal moment to pick up the idea again and how time pressured this second activity phase should be—should there be a spurt before the deadline or is this only a sign of procrastination? Do deadline workers have less of a need to prepare and does incubation take place anyway?

Another interesting issue is whether starting early and lessening the pace before the deadline would be dysfunctional to creativity, as it implies no incubation time. We established that this pattern is rare, and a reasonable prediction would be that it is not functional, but it has not been empirically tested.

Overall, the two studies provided some insight into pacing and creative projects. We see this as a start in formulating new research questions that may be answered using different methods and in different settings.

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Notes

1. All names are fictitious.
2. Interview 2, location on tape: side A between number 037 and 052.
3. A list with all professions is available upon request.

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