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4

Virtual Innovation Work: Labour, Creativity, and Standardisation

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Virtual Innovation Work: Organisational Standards, Heightened Paradoxes, and the Role of Labouring Capacity

Innovation work usually is seen as the most creative form of day-to-day virtual and/or knowledge work, often considered to exist more on the playground than on the factory side of the contradictions of digital

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labour (see Scholz 2012). Whether in the context of the processes of creative generation of ideas or in the images of the brilliant developer and the intrinsically motivated intrapreneur, uncertainty and risk seem essentially connected with innovation (Berker 2010). Although on the spearhead of the digital revolution, innovation work is increasingly virtualised and standardised, with the 'creative class' becoming part of the 'cyber-tariat' (Huws 2003), increasingly confronted with an unknown quality of information and communication technology (ICT)-driven and organisationally driven formalisation that is partially jeopardising and restricting innovative dynamics. The design and management of innovation processes are therefore constantly torn between taming and setting free these creative forces. However, the more innovation itself becomes the decisive competitive factor for enterprises, the more this perspective fades from view. Schumpeter's distinction between invention and innovation offers enterprises the discursive legitimisation (which has now become hegemonic) for separating the apparently essentially informal nature of the creative genesis of ideas (invention) from the process of implementation (innovation), which is regarded as amenable to formalisation (Pfeiffer et al. 2010). The one is, so to speak, assigned informal space, for example, in phases of 'creative chaos' (as they are explicitly known), while in the case of the other an attempt is made to completely formalise the process by means of standardisation and complementary processes of informatisation. Through this separation, organisations are increasingly attempting either to utilise the various demands of incremental and radical innovation ambidextrously or to dissolve them contextually (Andriopoulos and Lewis 2009). This ultimately fails; however, as in the context of innovation, more than anywhere else, organisational paradoxes are particularly evident. Profit versus breakthrough, tight versus loose customer relationships, and discipline versus passion (ibid.) are seen as having the same relevance as the dichotomies of centralisation versus decentralisation, stability versus flexibility, and control versus freedom (Eisenhardt 2000).

In relation to these paradoxical categories, there seems, currently, to be a boom in processes of standardisation of innovation, which at the organisational level favours profit, discipline, stability, and control, while at the level of the work of employees calling for flexibility and passion within decentralised structures. Stage-Gate—a business model of enterprise consultation (Cooper 2001)—may be interpreted as such an experiment.

Cooper's Stage-Gate model presents the stages of product development in a generic, abstract project life cycle, from the idea through evaluation and project development. It consists of five stages, between two subsequent stages there is always a gate. At each gate, top management and senior staff from all relevant areas decide on whether to break off or to continue the project and move to the next stage (ibid.). The process is seen as state of the art in business and enjoys wide distribution (Von Ahnen and Heesen 2009). Following Brunsson (2002), we are talking here about an organisational standard that attempts to standardise processes of innovation on the basis of cost neutrality and minimisation of risk.

Theoretical debate within organisational sociology has long since taught us that enterprises cannot resolve the antithetical relationship between formality and informality through organisational structure. Every type of organisation is governed by both informal and formal hierarchy (Diefenbach and Sillince 2011); instead, relationships become more dynamic and varied. The theoretical debate on organisational paradoxes also points to their inherent and unresolvable dialectic (Da Cunha et al. 2002). What this organisational viewpoint fails to explain when taken in isolation, however, is that these tensions are either functionally productive and thus ultimately unproblematic or continually resolved and *dealt with* at a different level. The place where these paradoxes of innovation are dealt with—and *this is the proposition on which this chapter is based*—is at the level of concrete innovation work. Organisational standards like Stage-Gate, which aim to formalise processes of innovation, require all the more urgently the informal qualities of the work carried out by employees, intimately bound up with their life and experience as it is—their labouring capacity (Pfeiffer 2014). The central concern of this chapter is to empirically trace, focusing on the exemplary case of Stage-Gate, the newly arising reciprocal relationships of the informal and the formal, and in so doing to reveal *how* the paradoxes and side effects of new organisational standards are subjectively experienced, treated, and dealt with at the level of concrete innovation work.

In the second section, the chapter shows, by means of condensed empirical results, how Stage-Gate works in practice and what difficulties and disruptions it has to contend with at the level of concrete virtual work in R&D. This chapter should be understood primarily as an empirical contribution to the realities of current—and that means, above

all, increasingly standardised—innovation work. In the third section, we summarise the empirical results and complement these with a conceptual proposal from the sociology of work for the amplification and expansion of the theories of organisational paradoxes around the labouring capacity perspective. Finally, we outline the principles to be followed by a future-oriented form of standards in such dynamic areas as innovation work. Here we must state in advance a central result of our empirical work. It is that complex innovation processes need neither complete taming nor total setting free; what is needed is, rather, a meaningful degree of support for the qualities of innovative work, which ultimately again and again successfully copes with the tension between these extremes in the concrete everyday activity of virtual work.

Tamed or Set Free? An Empirical Analysis of Virtual Innovation Work

This chapter is based on the results of a multiple-company case study (Yin 2009) including five cases from one of the most important industrial sectors in Germany: mechanical engineering (VDMA and McKinsey 2014). The companies represent the industry's central categories: machinery production for general industries (Case C), machinery production for specific industries (Cases A and D), production of components for different machinery (Cases B, D, and E), and production of machinery tools and other wearing parts (Cases B and E).

Selection criteria of the cases followed the vanguard model, which focuses on high-performance organisations that often set standards, values, or principles for peers (Kanter 2009). Since other organisations are likely to follow vanguard models, the analysis of vanguard organisations enables the identification of general trends and developments within industrial sectors. The selected five companies can be classified as vanguard models because of their outstanding innovative performance and for 'building an enduring culture for the long term that enables continual change and renewal' (Kanter 2009: 3). The companies are world market leaders with their products and have a high product innovation rate. The size and revenue of the five cases have grown considerably within the last

Table 4.1 Company case sample compared to industry average

	Employees'	Turnover in Mio €	<i>n</i>
Industry average ^a	191	28	
Case A	3800	800	19
Case B	350	40	12
Case C	8500	2300	10
Case D	39,000	5198	13
Case E	1350	137	17
Total	53,000	8475	71

^aSource: VDMA 2012

Table 4.2 Socio-demographic structure of the interviewee sample

	Gender		Training			Managers'	Age ^a			
	M	F	Vocational	Academic	Both		<30	30–39	40–49	50+
Case A	17	2	11	16	8	14	0	5	9	5
Case B	11	1	10	9	8	9	1	2	6	2
Case C	10	0	3	6	0	3	0	4	3	2
Case D	13	0	7	11	5	11	0	3	8	2
Case E	17	0	6	13	2	11	1	7	8	1
Total	68	3	7	55	23	48	2	21	34	12

^aFor two persons, age information is missing

decade and are extraordinary compared with the industry's average (see Table 4.1). Four of the five enterprises have a works council.

Despite the companies' leading roles within the industry, they retain some characteristics traditional to the mechanical engineering sector (Case A = technologies for tobacco industry, Case B = sheet metal processing, Case C = laser technology, Case D = drive components and systems for rail vehicles, E = mechatronic and drive technologies). The product ranges and legal forms are typical for the mechanical and plant engineering industry. The five enterprises are largely still family owned and operated. Also, their company cultures are typical of traditional family-run businesses (Schütt 2010).

According to the company size and type of innovation process (incremental or radical), the companies chose the departments, number, and names of operationally involved personnel for interviews. The overall number of interview partners was 71, ranging between 10 and 19 per company. The socio-demographic structure of our interview sample is shown in Table 4.2.

In order to manage these sometimes conflicting settings in the field, a specific research design called 'Innovation Process Analysis' was developed. Traditional and contemporary interview methods were combined: a semi-structured interview guideline was chosen to enable narration and explore subjective and everyday work actions of innovation actors. In order to stimulate and focus narration, several visual elements were used during the interview. For example, the interview partners were shown illustrations of a plain work flow chart, a blank pie chart for the working content, and a blank stress scale. These visual elements provided an open ground for the interviewees' drawings, sketches, and explanations in regards to the innovation process (for greater detail on method and sample, see Wühr et al. 2015).

Organisational Standardisation, Paradoxes, and Concrete Innovation Work

Four of the five companies have introduced processes of standardisation of innovation. This fact could foreshadow a future model for the industry as a whole. Stage-Gate is an accepted and widely used process that has joined many other long-established process standards, and in all cases is linked with a highly developed, conventional form of project management and control.

Stage-Gate, as an organisational standard, aims to formalise the innovation process, the risky side of which is delegated to the upstream processes of 'creative chaos' and invention, but is supposed to be tamed when the actual innovation takes place. The paradoxes between the formal and the informal cannot, however, be resolved, since the separation between creative invention and incremental innovation is artificial, and employees daily experience the inevitably heightened tension between the formal process and the real demands. The interview excerpts¹ below demonstrate this and, in particular, make two things clear: (1) The organisational standardisation of the innovation process heightens the paradoxes it sets

¹ The interviews were conducted in German and translated for this chapter into English by the authors.

out to resolve. (2) The accompanying dysfunctional fields of tension—for innovation and organisation—are resolved, and *must* be resolved, at the level of concrete innovation work.

These findings relate to the difficulty of synchronising the real innovation process with the phases laid down by Stage-Gate, and also apply to the accompanying replacement of the Stage-Gate process by the objectively necessary steps of concrete innovation work. Employees must not only tolerate this paradox, but also 'operate' the standardisation process, even though it is perceived as superseded:

When we're told 'released for development', I mean if we didn't start the development until we had the development release, we wouldn't stand a chance. So we actually make a start with the development during the project phase, we begin with concepts, and sometimes even with detailed plans. That is, activities start earlier, much earlier, than they really should according to the quality gate. (Case D, male, product manager)

The interviewees state that requirements of Stage-Gate standards are decoupled from the concrete virtual innovation work and their experience. This causes permanent discrepancies which become evident in the next excerpt:

The processes are not appropriate to the work. Or the complexity has increased to such an extent that it just cannot be represented in a process of that kind. Or the people who have tried to make the processes don't know how to approach it. [...] so much knowledge is unspoken, it's in your unconscious mind and you're not aware that you know it, and normally in life you just use it and don't give it another thought—you simply have to know it to be able to do your job properly. That can't all be packed into a process. (Case E, male, employee technical sales)

In this context, one respondent emphasises the complexity and abstraction of the process, which is such that it is not only almost impossible to convey to outsiders—even internal staff question it and have difficulty grasping it. Illustrating this, he describes his interaction with a girl student to whom he had to convey the complexity of the process. For the explanation of the first three gate stages alone, the whole morning was

needed. She said, 'No one can live that!', and the respondent answered: 'I say, yes they can, we live it'. The interview data show in an especially striking way that the process, despite its abstract irrationality, still has to be fulfilled.

A recurring theme in the interviews is the pressure, in the gate meetings, to make a decision on the releases that are due according to the plan—even when the material and technical basis for this decision is lacking. The following two excerpts from interviews with R&D workers illustrate this pressure to decide: in the first case, mistakes that have been made once ought not to be repeated, which at the time of the gate meeting would be an argument against a series release. These factually correct, customer and market-related considerations are accompanied, however, by the expectation of being 'told off', as the above quotation illustrates. In the second excerpt, there is a description of the real fears of the pressure to which one can be subjected when there are sound reasons for not agreeing to a release. Carrying on along the fixed plan seems to be an organisational dogma. Raising objections—even though they seem highly justifiable in a given case—is sanctioned:

I'll give you an example: I'm one of those people who don't agree to the series release of the machine. Reason: lack of data for specific type of handling. [...] We put a machine on the market for which we did not have full data. In other words we've actually had this experience and it was painful. [...] Due to our failure to provide the documentation and information, we jeopardised the success of its launch on to the market—no doubt about it. (Case D, male, product management)

For example, we did not agree to this production release [of the machine], because our suppliers could not guarantee a reliable supply of parts, and I think that in the case of a process like this the management has the right to step in, but we ought to be able to come along with measures and say: 'Okay, if you can't manage this, what do you need?', and not then say: 'Oh they can cope with this.' So we have so far objected to two releases. After the production release comes the sales release and finally the series release. We always expressed our misgivings, and we were given a lot of stick as a result [...] and now we have the series release, we've had the meeting and we said: 'Okay, we'll manage it now under these conditions, but we need a bit more time to produce the machine.' [...] Perhaps people are frightened or

don't have the confidence to point out the mistakes or the difficulties there are, and then say: 'Yes we can do that by January, we still have a bit of time.' And it doesn't get done and then you have no choice and have to slam on the brakes. [...] So as I said before, you get some stick, you have to justify yourself to the top management. (Case D, male, project development manager)

So the Stage-Gate process leads to a tendency to give approval against one's better judgement, as we see from the statement of a developer in the context of a group discussion: 'Everyone puts their hand up, although everyone knows: The machine is not yet ready for serial production. But the main thing is that we go through the gate as planned.' Bit by bit a façade is built up, and there is an increasing degree of decoupling between the standard and the real demands, as this quotation concisely puts it: 'The joke about the situation is that everyone knows that the process won't function like that. [...] We're living in a world of make-believe. The process is make-believe: the way we act is different. And all levels of the hierarchy are aware of this.' What is important to stress here is apparently not the fact that organisational requirements are decoupled from real processes—this is well-documented and long recognised by organisational sociology (Meyer and Rowan 1977). Our concern is to emphasise, by means of the selected interview excerpts, that the employees are not only well aware of this decoupling, but that it is they who have to do the work to overcome, deal with, and compensate for the accompanying tensions, contradictions, and irrationalities. After all, what is explicitly perceived as a make-believe world has real consequences. These can even go as far as knowingly allowing technically misleading approaches to be further developed in order to satisfy the formal process. The following descriptions of a development process for an external customer, who had specified Stage-Gate as the basis for the product development, are a good example of this. First, two male development staff persons describe the situation:

Well, I think you have to make a distinction. On the one hand, this quality gate is design points [required by the customer], whose only real purpose—stupid though it may sound—is to check whether the supplier who wants

to do business is in a position to keep his promises. So it would actually be more straightforward at this point to say: Let's make a product, push it through the quality gate, and this would ultimately be linked with what we should like to deliver. [...] Instead we have to construct an appliance and it can happen that in the end we're kicked out of the entire project. In the meantime we've made advance payments here and there which, when it comes down to it, we shan't see again. [...] you have to try and achieve these quality gates in order to move forward. So you may be forced to build stuff that you know very well you'll never build again; it's only there so that [the customer] can tick the box that says: 'This is proof that the test has been passed, they have delivered on time.'

[At a particular point in the project] we had to struggle with these quality gates units. [...] And that was the gate that we had to get through, because otherwise we couldn't progress. At the same time we knew that we couldn't get anywhere with [the customer's product]—it was impossible. It wouldn't work. [...] We knew we had to get this junk to run in order to get through this gate, and yet we knew we had no chance whatever with this concept, in other words, we had to come up with a second concept in parallel.

The risky aspect of innovation must continually be dealt with by the employees, but on the formal side the process does not allow for any such difficulties. The innovation workers are obliged to deal with this existing paradox (as it might be called) in their day-to-day work. It cannot be resolved, quite the reverse: the contrast between work for the real demands of innovation on the one hand and work to reach particular process standards on the other hand heightens the paradox to the point of encouraging technically and economically meaningless practices. The passionate commitment of employees and their expenditure of labouring capacity become tainted with the stigma of having taken a wrong turning technically as developers, something that can cause them lasting harm on a personal level and have a very real impact on their reputation for competence and on their place in the hierarchy:

You know, and the worst of it is always that you come under attack from all sides. If we had put the kibosh on these quality gates at the time, then people would have pointed the finger at us and said: 'You're useless', and we

would have been labelled as the ones who put the kibosh on the project. Well, we somehow got the project through and now they're saying: 'Well, it wasn't all that brilliant what you did then' [...] And the new project leader made a few staffing changes and, well, in the end what happened was that I was given a rather different job [...] I had devoted myself to the project for a year, [...] and at the end of the day it was somehow a demotion. (Case E, male, member of development staff)

Many of the interviews indicate that in the real-life working environment, Stage-Gate (like many other standardisation processes) often seems inseparable from rampant bureaucracy. Both employees and management discuss this in the interviews and express strong views on the subject, sometimes illustrated at length with examples. Thus, one member of the sales staff, talking about having to fill in 'an incredible number of forms', says it reminds him of 'the planned economy [...] in the former East Germany'. One of the management team puts it like this: 'They have to introduce rules, and if you're not very careful the whole thing rapidly gets out of control and it takes on a life of its own and you find yourself *filling in endless forms*.' This expansion of bureaucratic work also shows that the bureaucracy that accompanies standards is not always and not necessarily the intention and/or consequence of a particular standard itself, but evidently also has a dynamic of its own, which itself calls for an explanation. As the formal stage gives way to real processes, the flow of forms to be filled in turns into a flood—it is almost as if the formal stage, having become detached, has taken concrete form. Here too the real demand for innovation is delegated to the working capacity of employees. The organisational standard promises a more efficient innovation process, but actually produces increasing inefficiency. In the daily work of innovation, the individual must decide according to the situation what formal demands need to be met, but conversely also which ones can be ignored or deliberately circumvented in order to protect, so to speak, the heart of the work, the innovation itself, from the aspects of the process that are a hindrance to the innovation.

These condensed examples from our empirical findings serve as a snapshot of the bigger picture, and indicate that at many points the Stage-Gate process is inappropriate to the innovation requirements of mechanical

engineering, although it still needs to be 'satisfied'. The conflict between the real process and the unrealistic, but nevertheless objectively definitive, target process is what innovation actors must work to resolve. It is they who in their day-to-day work must try, time after time, to reconcile the realities of the innovation work and the absurdities of planning. In doing so, they develop the ability again and again to reduce the existing paradoxes to manageable proportions and in this way to make innovation, with its systematically informal qualities, possible, despite its increasing taming and standardisation. At the same time, the formal standardisation process itself makes extra work. With Stage-Gate and the associated project management, a considerable amount of additional administrative work is created in connection with planning, legitimisation, and reports: for the interviewees, this takes up an average of 30 % of their working time. These efforts, which are often seen as irritating add-on tasks, amount to an ongoing and significant burden on employees concerned with innovation (Wühr et al. 2015).

The Handling of Organisational Paradoxes

Stage-Gate has been the empirical focus of this chapter. We see it as a good example of new organisational standards, which are more than merely an instrument for the formalisation of the innovation process itself. What is characteristic and representative of a new quality is that current standards of innovation do not deny the element of risk involved with innovation, that is, its informal content, but very much recognise this component, and do so in a twofold way, yet at the same time turn it into an object of formalisation itself:

Firstly, the informal and risky aspect of innovation is delegated to the phase of invention or of 'creative chaos'; what remains of it in the innovation process is dominated by planned decision processes previously determined according to certain criteria and contained within the corresponding project management and control. The informal aspect of innovation is thus recognised, inasmuch as it receives its assigned scope through the requirements of the organisational standard. Thus the formal aspect can—

and must, at least according to the organisational imperative—be executed in a manner apparently outside this containment, without regard for informal necessity.

Recognition of the informal aspect relates, secondly, to the context to which innovation in the organisation is formally assigned: the actual R&D area. Here there is also a new recognition of the contribution to innovation of those organisation areas that do innovation work outside this formal assignment, and therefore are informally innovative in this sense. In Stage-Gate, this is shown in the importance given to the composition of the group of decision-makers in the gate meetings. At first sight, this appears to recognise informal innovation knowledge, which is not formally represented in organisational functional logic, since great importance (to the level of a formal standard) is attached to consideration of the perspective of downstream areas such as production or service. The form in which this informal contribution is fed into the formal innovation process, however, is in turn itself the object of formalisation and is only given consideration if the formal process is not thereby jeopardised.

So current standardisation processes like Stage-Gate increasingly recognise the informal in its new quality, but on this basis they expand the formal and formalisable and additionally make the drawing of boundaries between the formal and the informal itself the object of formalisation. At the outset, we posed the question of whether or not the tensions that have been identified in the theory of organisational paradoxes—especially the tension between the formal and the informal—are functionally productive and thereby ultimately unproblematic for innovation processes. We have attempted, by means of the empirical extracts and using the example of Stage-Gate, to show that new organisational standards that aim at the formalisation of innovation are in fact problematical and may even include dysfunctional elements. It is initially unclear why these are not (yet) visible at the organisational level, and in our opinion this can only be explained if organisational scrutiny is widened to take in the work of the employees and their labouring capacity. It is here, at the level of concrete innovation work—this much should be clear from the empirical evidence—that developments that have the potential to be organisationally dysfunctional are dealt with. It is the employees who,

on a daily basis, experience, suffer, and compensate for the paradoxes that are identifiable by organisational sociologists. The organisation itself is, in a manner of speaking, immune to the paradoxes it generates as long as their dysfunctionality is 'only' at the level of concrete innovation. As Diefenbach and Sillince (2011) have argued, Stage-Gate cannot simply be seen as an example of a formal organisational structure; it should be seen as a process that constantly produces new tensions between the informal and the formal. Smith and Lewis (2011) stress the difference between latent tensions that arise out of organisational complexity and those that are evident and perceived by the actors. From our analytical perspective focusing on labouring capacity, it is clear, for one thing, that the employees not only experience both qualities of contradictions and are not afraid to verbalise them in the interview, but that dealing with latent contradictions has become a relevant part of their daily innovation *work*. This continual need to deal with the paradoxes generated by the organisational standard cannot become evident at the level of the organisation, as it takes place at the level of concrete work and is therefore only visible to the eye of the sociologist. In the face of the complexity and dynamics of organisational change, international organisational sociology is currently discussing in a very self-critical manner a lack of new and autochthonous theories within its own discipline (Suddaby et al. 2011). Our aim in this chapter is not only to give an empirical insight into virtual innovation work but also to combine this with a conceptual proposal to expand organisational sociological theories regarding the analytical perspective of the labouring capacity that focus on paradoxes (Pfeiffer 2014). A summary that is concerned with empirical organisational work practice, however, should, in our view, include not only an empirical interpretation and a linked conceptual conclusion, but also a look at possible consequences of our results for this practice. Stage-Gate unreflectively carries with it logics and mechanisms that are similar to many other existing organisational standards that the process meets when introduced into a given context. Notions of total planning certainty and predictability are ultimately the driving force behind the introduction of these plans, inspired by the idea that complexity is, in the end, controllable, provided it is broken up into sufficiently small individual units. The limits of this essentially Taylorist perspective have long been appar-

ent in many places and, as we have shown, have to be compensated for permanently in the everyday work situation. Stage-Gate does not solve these problems and cannot do so as long as there is no plant-level strategy to break free from the old established dogma of *controlling* complexity and to start thinking organisationally and at the level of the individual employee in the direction of enabling the *management* of complexity. The demands of innovation cannot be met in the long term by means of standards that follow this logic of control. Neither can organisational standards be abandoned with no replacement; even the employees do not want to be allowed total freedom. What they want are meaningful standards that support them in their *work* of innovation. To achieve this, as we see it, what is needed is a recognition of the immanent risk inseparable from innovation *and* an acknowledgement of the ability of the employees to cope with it. The element of risk cannot be eliminated from the innovation of complex and technically extremely sophisticated products. Meaningful standards of innovation enable more freedom of action for the innovation actors in the process—their technical expertise and their long years of experience are the irreplaceable resources that necessarily accompany the materially determined uncertainty of technical innovation processes. Future-oriented innovation standards support employees in this independent and responsible work.

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Technological change has transformed where people work, when and how. Digitisation of information has altered labour processes out of all recognition whilst telecommunications have enabled jobs to be relocated globally. ICTs have also enabled the creation of entirely new types of 'digital' or 'virtual' labour, both paid and unpaid, shifting the borderline between 'play' and 'work' and creating new types of unpaid labour connected with the consumption and co-creation of goods and services. This affects private life as well as transforming the nature of work and people experience the impacts differently depending on their gender, their age, where they live and what work they do. Aspects of these changes have been studied separately by many different academic experts however up till now a cohesive overarching analytical framework has been lacking.

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Virtual Workers and the Global Labour Market

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