

CHAPTER 1

Work Organization and Occupational Health in Contemporary Capitalism

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Abstract: This chapter discusses recent changes in work organization and their impacts on occupational health and safety. In the last decades of the 20th century, changes in the technological, social and economic context, such as automation of production processes, globalization of markets, financialization and new social demands fostered the emergence of new rationales for production and as a consequence new rationales of work organization. Some of the main aspects of New Forms of Work Organization (NFWO) are presented: flexibility, autonomy, the importance of workers' competence and engagement and management by goals, represented by Key Performance Indicators (KPIs). We then propose that within NFWO there may be some paradoxes that workers are obliged to deal with. Beyond NFWO, some new configurations of firms, notably those based on network features, are also presented, and their relation with NFWO is discussed. In this new context organization, there are new work pathologies, namely the psychological ones, ordinarily named "stress". Final discussion points to the fact that the absence of prescribed tasks created new constraints that are behind the bullying at work. The actual augmentation of psychological suffering and mental diseases is the consequence of the performance control through KPIs that are present in management systems diffused in the corporate governance of global organizations and networks.

Keywords: Automation, bullying, competence, global productive chains, global productive networks, hazards exportation, immaterial work, international division of labor, key performance indicators, occupational health and safety, peripheral countries, stress, worker engagement, work ergonomic analysis, work organization.

INTRODUCTION

The impact of work organization over the health of workers has been recognized for a long time. Indeed, it can be stated that the very nature of so-called French

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Ergonomics, or Activity Ergonomics, is to discuss and, to some extent, confront some of the basic assumptions of classical work organization forms – namely, Taylorism and Fordism – such as the need for prescriptions and the selection of worker according to the prescribed task. The Work Ergonomic Analysis (WEA) has been able to demonstrate that the real activity performed by workers is different from the prescribed task, and that diseases may appear if this difference is not recognized. In this gap between task and real activity, the workers deployed different regulations strategies, variable according the contingents work situations. Eventually, these regulations overleap the limits of acceptable workload, generating pathogenic effects.

The opposition ‘real activity versus prescribed task’ has therefore been the center of many ergonomic inquiries during the last decades of the 20th century, corroborated by researches in others fields like sociology and psychology of work, all of them critical about the pathogenic effects of the work rationalization. Nevertheless, technological, social and economic changes that have been in course since at least 1960 provoked changes in work organization. These changes were modest at first, but proved to be dramatic in the beginning of the 2000s. For instance, work time flexibility and the possibility of work at home are wide spread practices in some industries, for instance, the software industry. May that mean that control over workers has decreased? Without rigidly prescribed times and movements, the workers have more autonomy to regulate the workload? Are workers of industries such as the software one less subject to occupational diseases?

Take the work time flexibility as an example. At Google, for instance, work time schedules are flexible and a well-known practice is that 20 percent of the work time may be dedicated to the development of new ideas, or as Google calls it ‘pet ideas’ i.e. ideas that the software developer may have had by him or herself, and that have not been appreciated by none of his or hers superiors or colleagues (Savoia & Copeland, 2011). In fact, there is no prescription of how to come up with an idea, or how to develop it up to the point of presenting it to someone else. Thus in this case there is no such opposition as prescribed task versus real activity. Does that signify than developers at Google are completely free at work and protected from occupational related health damages? Is the classical work

organization framework suitable to this case? How should researchers and practitioners who aim at investigating workers' health approach a work reality such as that at the software industry in general?

The aim of this chapter is to discuss new forms of work organization (NFWO) and how they affect workers. The chapter is organized as follows. After a brief presentation of some main aspects of Taylorism-Fordism, we examine the new rationales of NFWO considering their relationship with technological, social and economic context. The rising importance of immaterial work for contemporary capitalism is also discussed, in particular considering automated production processes. We then propose that within NFWO there may be some paradoxes that workers are obliged to deal with. Beyond NFWO, some new configurations of firms, notably those based on network features, are also presented, and their relation with NFWO is discussed. In this new context organization, there are new work pathologies, namely the psychological ones, ordinarily named '*stress*'. We will see that the absence of prescribed tasks created new constraints that are behind the bullying at work. The actual augmentation of psychological suffering and mental diseases is the consequence of the performance control through key performance indicators (KPI) that are present in management systems diffused in the corporate governance of global organizations and networks.

CHANGING THE CONTEXT: THE LIMITS OF TAYLORISM-FORDISM AND THE EMERGENCE OF NEW FORMS OF WORK ORGANIZATION

The classic forms of work organization, mainly based on the work of Frederick W. Taylor and Henry Ford, have dominated industrial life throughout the 20th century; however, some of their principles have recently been object of interrogation as they would not fit economic, technological and social reality of the late 20th and early 21st centuries. Taylor's Scientific Management theory was built over three principles: the need for a 'scientific analysis of work'; the 'scientific' selection and training of workers according to the task once prescribed; and the daily planning and control of work by management. In brief, Taylor divorced workers from work design, and created (or aimed at creating) an 'abstract' work, or task, which should be prescribed independently of workers. In fact, the development of the task is the first principle, while the selection of

workers is the second one; in other words, task precedes worker and therefore its existence is self-contained. According to Taylor, it is always possible to describe, analyze and prescribe work through concrete rules and procedures in order to introduce management control in the shop floor, but also aiming at introducing science in the shop floor, transforming work into a predictable element that could be optimized to increase performance and profits. It is important to note that both first and third principles contributed, in a way, to make labor process more 'transparent' to the management and the investors, as they eliminated the 'opacity' that was present when the worker himself dominated the process technology and knowledge. These 'professional secrets' are, in fact, the problem to be solved by the scientific analysis, a sufficient condition to define objectively a rational workload or 'normal workday'.

By its turn, Ford essentially increased the degree of specialization or horizontal division of work, by means of the moving assembly line that intended to increase the rate of production (quantity per hour). The rhythm of the work is paced by the conveyor. Time is the main criteria for productivity of work, as it was crucial to increase quantity within a given period of time, in a context of economies of scale (Zarifian, 1999; Veltz, 2000).

As social, economic and technological contexts changed, these principles have increasingly been criticized. First of all, work was never completely liable of objective description or concrete prescription, as the French Ergonomics and its twin concepts of 'task' ('prescribed work') and 'activity' (actual work) have largely discussed and shown (Wisner, 1995; Guérin *et al.*, 2006; Keiser, 1991; Daniellou, 2005; Daniellou & Rabardel, 2005). The introduction of automation in production processes has changed the nature of work itself. Work is no longer a – up to a point – visible combination of gestures, but it is essentially to monitor the variables and set points of a process, and to promptly act to hinder or correct deviations when they are about to happen. Some attempts to 'taylorize' this new work points to the way of indicating to the worker which action should follow each possible deviation. Even so, at least two problems remain to be solved by tayloristic approaches: first, these types of procedures are of course only possible to be prescribed if the deviation has already happen at least once; second, it continues to be impossible to prescribe how worker must monitor the process to

anticipate deviations and how cognitive work (signal interpretations, diagnostic and decisions) should happen. When we try to specify how the operator in control room must act in order to regulate the process, we fall in an infinite regress due the impossibility to know all the singular combinations in a complex production system. A similar reasoning may be applied to the introduction of information technology into administrative or service processes; according to Gorz (2005), in this case to work is to manage information flows and social interactions. In order to accomplish this goal, workers must mobilize their knowledge and creative reasoning in non-standards situations.

Finally, changes in the economic context, more specifically the competitive context, raise concern about the emphasis on economies of scale as the main source of productivity of capital. As competition increases, low prices by means of large volumes of undiversified products are insufficient to generate profits. In order to differentiate itself from competitors, issues such as product and process quality became important; increased product or service variety and lower product lifecycles call for flexibility and innovation processes within production systems. The workers adaptability and responsively (and responsibility or commitment) is necessary to attend the demands of a relatively changeable and unforeseeable context. Another way to differentiation is to add new functionalities to the product or service, improving the 'service level' of each product or service, i.e. adding value that is perceived by the consumer (or citizen, in the case of a public service). In this conception, to deliver 'service' means to conceive and make a product or service that will fit the needs of the consumer or citizen (Gadrey & Zarifian, 2002). In order to do this, it is necessary for the worker to understand which those needs are; therefore, to work is also to manage social interactions (Zarifian, 2002). All these possibilities show that, in a way, competitiveness depends less on material work and more on "immaterial work" (Gorz, 2005). Indeed, it is through 'immaterial work' that new service and products are thought up; that workers' engagement to perform a good service relation is produced; that workers' competence to optimize production processes is put in practice. In fact, all work is immaterial: the skilled artisan hand is historical and cultural 'tool', so, a corporal technology informed by social and cultural norms that are essentially immaterial. The skill is not a physiological movement or force, but an educated

gesture. The most important difference here, with services, is that language is the immediate tool and the medium of the interactions between workers and users.

This new panorama increasingly demanded new forms of work organization. The quest for product and process quality and product flexibility favored the adoption of some aspects of the so-called Toyota Production System (TPS), or lean production. In addition to changes in the way production is scheduled, reducing inventory through just-in-time and pulled production techniques, work organization also was transformed, as workers became multifunctional, performing different tasks such as production, maintenance, housekeeping and quality control (Coriat, 2000). Workers are also organized in teams, assigned to production cells. Within these cells they rotate productive functions. Workers must also collaborate with quality and cost reduction by suggesting improvements to production process, through kaizen (continuous improvement) programs. These suggestions may be thought up individually or within groups. Notwithstanding the fact that within TPS workers have the right and the duty to intervene whenever product or process quality are in danger (Coriat, 2000), standard operations procedures are still important as a control mechanism.

On the other hand, the discussion on new forms of work organization that would have as main feature the autonomy to direct workers, as opposed to the normative-prescriptive character of Taylorist-Fordist organization goes back to the 1950s/1960s with the work of the Tavistock Institute and the development of an alternative, socio-technical model of work organization. The Socio-Technical Systems (STS) aimed at re-designing production systems through joint optimisation of technical and social subsystems, with a strong emphasis in workers' participation (Cherns, 1987). The result of a STS design process would be a democratic organisation, where technical and economic goals should be achieved together with human goals (Eijnateen, 1993). Perhaps the main practical feature of a STS is the teamwork achieved by the semi-autonomous groups, also known as self-management teams. Within semi-autonomous groups, workers are multifunctional, i.e. must perform different tasks and may have autonomy to decide on issues related to production levels, production procedures, quality, sequence and division of tasks, maintenance, and budget, among others. There are fewer hierarchical levels in a socio-technical organization, and management

control over workers from the semi-autonomous groups is mainly accomplished by means of KPI. Table 1 shows some characteristics of STS, as opposed to the Taylorist-Fordist paradigm.

Table 1. Brief characterisation of STS as a new paradigm and as a changed personal attitude, according to Eijnateen (1993).

Old Paradigm	... Give up
Redundancy of parts External coordination and control Autocracy Fragmented socio-technical system Technological imperative – man as extension of machine Organisational design based on total specification Maximum task breakdown, narrow skills One person-one task Alienation	Feeling of having learned it all Reductionist thinking Dependence on procedures False simplicity It is ‘they’ who are to blame Virtue of being certain Belief in stability
New Paradigm	... New Reality
Redundancy of functions Internal coordination and control Democracy Joint optimisation of the socio-technical system Man is complementary to machine, and a resource to be developed Optimum task grouping, multiple broad skills Self-managing social system Involvement and commitment	Learning never stops Systems thinking Focus on results Complexity Personal accountability Doubt Continuous change

Beyond STS theory, in the late decades of the 20th century diverse authors tried to identify some principles of ‘new production rationales’ that shared the principle of autonomy to workers. For instance, Terssac & Dubois (1992) summarized the principles of ‘new production rationales’: (a) the new rationale is not exhaustive. It no more aims at prescribing all production phenomena, but it intends to facilitate the management of non-planned territories, of aleatory events and of uncertain and variable environment. The new rationale aims at managing informal elements, not to suppress them; (b) men are seen as competent actors, capable of taking initiatives and decision within production systems. Competence and autonomy are no longer residual consequences of automation of production processes, due to the nature of automation as discussed before, but they are principles of organization. Control is needed to guarantee that competence will

not generate non pertinent improvised acts. (c) the new rationale also brings flexibility to production systems and work organization. Flexibility is considered a property of modern production systems, due to increased competition based on variety, speed and innovation. In this sense, Veltz & Zarifian (1992) point that in order to be flexible, organization must be capable of learning how to manage unpredictable incidents; it must allow short cycles of decision making; it must favor horizontal coordination and communication; and it must encourage the development of competences.

In the next section we will investigate in more detail three practical aspects of the NFWO that were raised by this new rationale: autonomy; competences; and the adoption of KPI as a control mechanism.

KEY ASPECTS OF NFWO: AUTONOMY, COMPETENCES AND KEY PERFORMANCE INDICATORS

Even if more radical new forms of work organization such as STS has a limited diffusion in production systems, perhaps due to its questioning of the division of power established by the classical forms of work organization, the principles of NFWO may be found widespread in manufacturing and service environments, as well as in administrative functions.

Thus, the need for rapid answers in work situations or processes whose demands are permeated by variability, which includes situations such as high contact service (in which the customer is one source of variability) or innovation activities, leads organizations to grant greater autonomy to workers, or, at least, to extend the worker's decision-making field, even if within working conditions and/or organizational spaces predetermined by other actors. There would be greater 'discretion' to the workers in this condition (Maggi, 2006). In this sense, the result of work depends on the engagement of workers – as Zarifian (1999) affirms, in this situation the work goes back to the worker; it is impossible to predict a task independent of who will perform it, as pretended in Taylorism.

As a result, the increase in workers' autonomy comes along with a concern with the qualification or competence of workers, so that both the daily, regular work

and the unexpected activities can be treated in the best possible way. In a way, competence replaces old standards and procedures.

Strictly speaking, the concept of competence is not equivalent to the formal qualification; qualification is part of the competence. In this regard, one can identify at least two major theoretical frameworks that have distinct concepts on competence: one sees competences as attributes possessed by employees (such as skills, formal qualifications and attitudes), regardless of their work situation (for example, Boyatzis, 1982). Other framework states that competence exists only as practice, being defined as a 'responsible act' (Le Boterf, 1995), a practical understanding of work situations with which the worker is faced and on which occurs the initiative and responsible action of the worker, eventually engaging coworkers in action (Zarifian, 1999). This practical understanding can be supported by explicit knowledge previously acquired, but such knowledge will be transformed by the very competence in action. This theoretical framework, which we prefer, treats the competence not only as an individual issue, but also as an organizational issue: the competence only exists when the individual acts in the organization. Put in another way, if the organization interdicts initiative and action, competence does not appear. So, when we adopt such a concept of competence, we must abandon the Taylorist concept of 'selection of competent workers'; selection is not sufficient. It is necessary to allow the continuously building of competence, in the practice of work.

On the other hand, the management control in such circumstances is not carried out primarily through the comparison of actual work to standard operating procedures, but rather by the results achieved that are measured by performance indicators. The counterpart of the expansion of the scope of 'responsible action' of the worker is the control by key performance indicators (KPI), which makes 'responsibility' a concrete issue. In fact, KPI systems, such as the Balanced Scorecard (Kaplan and Norton, 2001a; 2001b), proliferate among contemporary organizations, both in private companies and public companies. Particularly in the public sector, the management by KPIs has become synonymous with 'good management', with the 'new public management' best practices that would be characterized by reducing bureaucracy with managerial control (Paula, 2005; Bresser-Pereira, 2000).

In KPI systems, a set of indicators is defined, on the basis of the strategic objectives of the company, and deployed throughout the various hierarchical levels and the different functions. Indicators will operate as coordination mechanisms (Mintzberg, 1983), communicating to employees what is expected of them, directing their actions, assisting their decision-making and motivating them to improve besides, of course, controlling them (Kaplan & Norton, 2001a; 2001b). Every aspect of the company's strategy could be reflected in the KPI systems: costs, quality, flexibility and even innovation; indeed, companies begin to measure aspects such as 'numbers of ideas per worker', or 'number of published papers per engineer' as proxies for innovation. In addition, the system of KPIs is often related to a system of rewards, so that compliance with goals will generate consequences for the remuneration or the workers' career plan.

The notion of a 'system' of indicators has a double meaning: first, the company has different stakeholders whose goals can have multiple natures, and the system should contemplate all of them – in the BSC, for example, indicators should reflect the interests of the shareholders (financial), the interests of customers, the internal needs of the operation and the vision for the future of the company (learning and growth perspective). To Kaplan and Norton, these 'four perspectives' must be balanced in the system of indicators. In addition, being a 'system' means that the indicators of each department or organizational function and of each hierarchical level should be related to each other, so that the goal of a department does not interfere negatively in the goal of other department. For example, achieving the goal of the sales sector should not mean to spoil the goals of production, for instance, to reduce overtime work. Thus, in practice it is a very complex system that presents to the worker a myriad of performance indicators whose goals must be achieved.

To sum up, NFWO rose as opposed to the classical models of organization; in fact, they present assumptions that are quite different to those of Taylorism and Fordism. However, the NFWO can also load paradoxes, particularly in a globalized economic environment in which competition is extreme and the logic of financial capital predominates over productive capital, in a process known as financialization (Zilbovicius & Dias, 2005). The next section will explore some of these paradoxes and their consequences for safety and health.

PARADOXES IN NFWO

KPI Versus Autonomy

A first issue concerns the issue of autonomy, which is an important assumption and practice in NFWO, versus the need for control of results to shareholder brought by increased competition and the predominance of financial capital. The question can be stated in a simple way: investors demand the greatest possible transparency about decisions made in the company, so that they can assess, as continuously as possible, the relevance of keeping their investment or disinvest in the company. So, it is up to the company to define the ways of ensuring such transparency. One of the ways to ensure transparency in operating levels would be relying on standardization of processes as the main coordinating mechanism, which would amount to an increased bureaucracy, as did Taylor in his time. As we have seen, standardization is reduced in NFWO, although it can still be found in ISO 9000 certifications and the like. However, in the present competitive environment, standardization generates dysfunctions that are extremely counterproductive from the point of view of the shareholder remuneration. That is why other forms of control can be introduced, weakening the standardization as the main control instrument; the performance indicators can occupy such space, even though the standardization may not completely disappear.

In order to control through performance indicators and ensure greater transparency, information and communication technologies (ICT) contribute in an almost fundamental way. New ICT allow remote and real time control over workers (Zuboff, 1994). For instance, we recently investigated the case of a water service public company, traded on the São Paulo Stock Exchange, which has introduced an electronic system of reading service consumption and instant issuance of invoices to customers. The main intention of introducing such a system was to reduce working capital as simultaneously reading and issuing the invoice reduced drastically the time between reading the consumption and the payment by the client (from 21 days in small towns and 12 days in big cities for 9 days in both cases). At the same time, the electronic reading system facilitated the control over the workers, who carry out their activities remotely (in the consumption places: residential and commercial buildings), once the system

records the time of each reading, the worker displacement interval between residences and intervals for lunch, for instance.

This control system is utilized in all companies inserted in global supplier networks in the form of contract manufacturing. In this case, KPI systems, notably concerning costs, quality and production rates, and ISO certification are the basic conditions for the perfect interchangeability of components made in all countries, usually in peripheral ones. Despite all circumstances and differences, the quality, costs and production rates must be equivalents, due to competition pressures. In this network structured in various levels, the top industries are, not rarely, supported by the work in subhuman conditions. This reality is well known, but this necessary relation with the corporate organization and governance is not sufficiently stressed. The KPIs are now extended to environmental and social criteria, trying to grasp these and others 'unfair' competitive practices, but not only the KPI system is insensible to the real condition of the underground work, but also it is its principal determinant. In the modernity, we always can find workers in slavery like conditions not only in the agricultural activities but in the main industrial cities.

In this way, a major contradiction is present: in conditions of fierce, global competition, combined with financialization, the control and transparency requirements are placed. Thus, is it possible that real autonomy exists? In fact, the discussion is not new. Deleuze (1990) advocated the passage of a 'disciplinary society', described by Foucault (1975), towards a 'society of control', in which the discipline of the bodies retrieved from the confinement and by the discipline of timetables, movements and procedures shall be replaced by 'continuous', malleable control, provided, in particular, by the new ICTs and based on numbers, indices and every data associated with each object (or subject) to be controlled. Zarifian (2003) describes how this control is reflected in working conditions by means of flexible working time; malleable space; and malleable subjective engagement.

So, although there is a need to exercise a certain degree of autonomy, in order to meet the criteria of competition and capital growth, at the same time worker is

controlled through a multitude of performance indicators. The space of action that is supposed to be large can, in fact, continue to be quite restricted.

This is reinforcing by the extension of the indicators to safety and health management systems. Here, we are in the worst of the worlds: performance control by indicators and by safety standards. The obliged transparency and publicity of the results, including social, environmental and safety/health indicators creates an 'opacity' of the facts in the bottom of the production chain (in the 'shop floor'). The KPI system is coupled with reward system and bonuses in a manner that the bottom events influence the goals of the executives in the top. So, by an opportunistic (and perverse) adaptation and group coercion in all levels, including the victim itself, the accidents and occupational diseases are masked to preserve the appearance of good performance and save the bonuses.

Managers, and some authors, are incapable to perceive that this opportunistic behavior is not an immoral one, but a necessary consequence of the governance rationale founded in KPI systems. If frequency and gravity indicators of health and safety are messed with production and financial performance, then sub-notification by workers and supervisors in the shop floor is rational. This behavior is reinforced by the formalist method of accident analysis. Due to the unavoidable distance between tasks' prescription and real work, we can always find a deviation behavior in the causal chain of an accident, because workers are engaged in the solution of a problem that cannot be solved solely with the actual procedures. Frequently, the problem is raised by norms conflicts, called for the discretionary competence of the workers. Eventually, these decisions may be involved in a sequence of events that precede an accident and the worker is invariably judged as negligent or imprudent. So, without an objective reason to justify his choice, the victim prefers, if possible, to hide the accident. The obligation to publicize the health and safety indicators' implies the production of the good indicators as a parallel activity, instituting a new form of invisibility of the real work conditions.

Competence Development Versus the Need for Short-Term Results

A second problem is related to the process of competence development. As discussed earlier, NFWO encourage the development of workers' competences,

and allow for the exercise of such competences in relatively autonomous spaces of action. However, we must emphasize that competence building – be it an individual, group or organizational competence – is necessarily a long-term process. Even if one adopts a point of view (which we do not share) according to which it would be possible to ‘buy’ competences on labor market, selecting staff according to the competences that the company craves, still it would be necessary a time for individual competences to fuse within the organization.

However, in a situation of fierce competition and the existence of the imperative to generate shareholder value, the short-term result usually predominates, given that one of the key metrics of performance is the value of the share, monitored on a daily basis and the rewards are distributed annually. Indicators of ‘value creation’ that point a bad performance can induce the shareholders the crumble of their investments more quickly, which can lead to the closure of the company. This kind of ‘short-term syndrome’ is described, for example, in Ezzamel *et al.* (2008), and is also discussed (and criticized) by Veltz (2000), Kaplan and Norton (2001a), Gaulejac (2005) and Sennett (1998).

We argue that the adoption of models based on competence, such as the proposed by Zarifian (1999), does not hold up combined with pressures for short-term financial results. Nevertheless, if the competitive environment demand differentiation strategies, the competence of workers can be required. Then, another paradox comes: the worker must develop his or her competences, and demonstrate them, in the short term, which is impossible. If ‘value’ is not generated (according to the metrics adopted), this can be interpreted, in the context, as an issue related to workers, that would not be competent – even though some metrics, like the share price, may have nothing to do with internal actions of the company, since there may not be a cause-and-effect relationship between managerial decisions and the share price (which is held also in the stock market). Also if the goals presented by the KPIs are not achieved, this might be seen by the management as a lack of competence of the worker. It is up to the employee to deal with the problem and solve it, thinking of his or her ‘employability’. In this sense, Clot & Zarifian (2009) draw attention to the fact that management by indicators may make workers’ activity (i.e. real work) invisible; in their words,

real work becomes a ‘blind point’ as “between goals on one side, (and) results on the other side, we organize the disappearance of the essential: the work itself. Workers must achieve results under the tension of numbers, and the recognition of their efforts on work disappears” (Clot & Zarifian, 2009 – translated by the authors). In other words, management may not recognize that workers may be competent even if results are not achieved – workers might have strived to achieve the goals, but something else might have happened in the way that frustrated their attempts.

Engagement in a Flexible World

Another point concerns the question of engagement. From what was exposed about the NFWOs, it may be assumed that their adoption produces and at the same time assumes greater engagement on the part of the worker; indeed, as described in Table 1, ‘personal accountability’ and ‘involvement and commitment’ are keywords in NFWO such as sociotechnical systems. At Google, a contemporary paradigm of innovative firm, workers are treated ‘entrepreneurs’ who must come up with new ideas (Savoia & Copeland, 2011). Also, Zarifian’s (1999) definition of ‘competence’ holds the worker’s initiative when facing work situations, which can occur only through his or her engagement; the worker shall decide, in this context, when to engage, without needing a superior order for this to occur (Zarifian, 2003). The author draws attention to the fact that such engagement is possible only if there is a reciprocal ‘engagement’ on the part of the company in relation to the employee *i.e.* a company's commitment to its employees (Zarifian, 1999).

To implement an effective prevention program this reciprocal engagement is also crucial. If the workers are prejudged as guilty, the accidents analysis remains superficial and the real reasons of deviations are not revealed and prevention cannot progress (Terssac & Mignard, 2011). The more distance grows between management and the workers in the shop floor, the more it is difficult to accept the justifications expressed by workers. Due the impossibility to assert the objective causes of an action, the shared experience is necessary to accept subjective explications as reasonable ones. This is an affair engaged between

workers and first level hierarchy that is mined by the moralistic judgment of the superior levels. In this way, we create a sort of social mechanism that make impossible the effective manifestation of the responsibility and autonomy of the workers, like a 'systemic thought' (Beck, 2008) that make individuals powerless to face the great risks in the modern production. Moral judgments forbid real ethical commitments and comprehensive dialogs within a hierarchical organization. Thus engagement is necessary to contemporary production not only from the point of view of economic performance but also from the point of view of health and safety aspects.

At the same time, one of the goals of contemporary company is flexibility. In addition to the flexibility of production processes and products, flexibility concerns also labor: workers must be flexible in carrying out functions; the working time is flexible; but also the quantity of workers is flexible. Indeed, in a company's capital structure, the 'human capital' is not a fixed asset and rarely, in the case of direct labor, is considered a specific asset. Not by chance, it is commonplace to note that, during crisis situations, one of the first corporate attitudes is to reduce the number of workers. Still, it is common that the announcement of major layoffs lead to high in the share price of the company concerned (Gaulejac, 2005; Plihon, 2003). How could one expect workers' engagement in a similar context? There is thus a new paradox: engaging even if the constant threat of dismissal hangs around. Once again, it is up to the worker to take care of his or her 'employability' as the only possible means of escaping such threat. Managing this risk becomes part of everyday work (Amoore, 2004).

All these constraints and organizational pressures submit all the workers (and here we need also consider the managers as workers) to perform the best despite the limited resources. Because of these excessive exigencies, bullying at work became an overall phenomenon in modern organizations. Several authors discussed this abusive work relationship and its effects on workers' health. However, the main approach explains bullying at work essentially as an event of a moral and psychological nature (for a divergent interpretation see Vieira *et al.*, 2012). In fact, bullying is no more than the top of an iceberg that occult these systemic mechanisms that creates the perversity of the current management

patterns. Insofar as this mechanism is presented as moral behavior, we remain incapable to explain the objective causes of pathogenic features in modern organizations. The perversity in the management and between workers is merely the consequence of structural forces in the organization that link the individuals in a performance based organization, supposedly consensual and coherent but, in fact, crossed by paradoxes and conflicts that block the collaborative work.

Gaulejac (2005) develops a contemporary and critical analysis of the new management models that establish impossible goals and succeed, in spite of this, mobilizing workers, even though they are not given the appropriate working conditions for improve performance. Goals ever increasing, contradictory goals, paradoxical injunctions, guilty attribution and individualization of results constitute the backbone of work in the ‘hypermodern organizations’ (Gaulejac, 2005). Under these pervasive phenomena, the author identifies a “subjectivist conception of action, the ideology of self-realization, which transforms the social contradictions in relational problems” (Gaulejac, 2005, translated by the authors).

The moralization of the bullying behaviors’ takes away the problem of the organization and also the impossibility to confront it. Bullying becomes a juridical problem to repair the moral damages, without consequences to the organization and management models. The goals continuously growing are not issues of the will of evil executives and administrative boards, but they only express the insatiable nature of the economic value in valorization process – that is intensified by the processes of globalization and financialization of production.

“In this sense, the growing production of material wealth exacerbates the problem because the accumulated wealth becomes an assumption of a new cycle of economic growth, a starting point that requires further productivity increases and so on indefinitely. The contradiction that the objectified labor, the immense material wealth accumulated, can only reproduce in an amplified way absorbing living labor, which becomes the ever closer basis of new cycles of development, after several mediations, manifests itself in the pressure on workers to continuously improve their performance” (Vieira *et al.*, 2011).

IMPACTS OF AUTOMATION AND WORK ORGANIZATION ON THE SUBJECTIVITY AND WORKER INVOLVEMENT

In this section we will discuss how the new productive rationality presented in the introduction impacts on work organization and on workers' subjectivity in a particular environment: the automated production processes. These impacts depend on how one understands the need for responsibility and personal involvement in decision-making; on how one deals with the possibility of error; and on how global time is divided between time of action and time for reflection on the action. The need for a worker with a different profile to meet the demands of new productive rationality can now be based on objective needs made by the way the automated production system works and how it should be managed. To understand singular and unexpected events, out of routine operational standards, calls for a new form of communicative and reflexive rationality (Zarifian, 1985).

This issue was discussed by Zarifian (1990; 1993; 1995) who proposes the concept of 'qualifying organization' (*organisation qualifiante*) to give an account of the specific needs of the new productive rationality of automated production systems. One of the highlighted aspects concerns the forms of calls and interactions of different knowledge and experiences of the agents of production, which would meet within working teams with different goals, either operational or project goals (quality improvement, optimization; diagnosis of panes in TPM- Total Productive Maintenance etc). In order for these new forms of management and organizational models to generate results, it would be necessary to provide the management of a new rationality of communicative nature rather than instrumental, which, however, is faced with various obstacles. To give just one example, the diagnosis of a breakdown in a complex, automated system, when it involves circumstances fleeing to already formalized knowledge, presupposes the articulation of several informal knowledge (production, maintenance, quality, purchasing), whose conditions of possibility (cooperative work, personal involvement, dialogue, mutual understanding) are not yet found in companies, subject to the capitalist mechanisms of control in which prevails the hierarchical organization of work. There is no communicative rationality in a situation where one of the parties is from the beginning placed in situation of social subordination,

i.e., submitted to the power of others. This is one of the main causes of distress of operators of continuous processes.

We know that the work in continuous processes industries is potentially pathogenic, due to the own characteristics to the process industry, in particular the risks of explosions and exposure to chemical agents, whose health effects are still unknown. These are perhaps the most obvious aspects, revealed by surveys conducted in nuclear power stations and chemical industries, which add the journalistic reports of accidents of catastrophic dimensions (Bhopal, Seveso, Three Mile Island, Chernobyl, among others.). Less well known is the everyday wear and tear caused by temporal requirements related to the uninterrupted flow and the uncertainties arising from the complexity of the facilities. This form of wear (commonly attributed to stress) hardly manifests as occupational specific, already recognized pathologies, but first of all as psychic suffering. In what follows we analyze two striking aspects of this suffering related to the everyday work of production flow control: the experience of time, given the relative uncertainty of events, and responsibility for decisions to be taken by operators, given the inadequacy of the rules laid down.

One of the striking features of the new automated systems is the uneven distribution of workload concerning moments and situations, what Zarifian (1995) calls possible situations (events) that occur in a not predictable manner. These moments are characterized not only by the emergency situations (e.g. severe crashes, stops), but also for situations where several small problems or even routine situations occur simultaneously (Daniellou & Boel, 1983; Daniellou, 1986). Given the oscillating character of workload and system requests, there will always be, at certain times, the other side of the coin: under load situations, in which operators are being less requested in their psycho-sensorial functions. In these moments, operators, contrary to what can imagine the hierarchy or a rushed visitor, are also working, actively monitoring certain parameters and attentive to alarms that may soar, indicating an unexpected event. Therefore it is not a useful, free time, during which the worker could devote to other activities, particularly those that require reflection; for example, to think about the causes of a recent incident or how to react to it.

It is important to retain this suggestion concerning the subjective experience of the operators in the face of uncertainty and the possibility of committing errors. As the uncertainty is, ultimately, an ontological given impossible to be excluded from production, to eliminate this source of suffering it is necessary to create conditions to deal with unforeseen events and results, which demands, in particular, interventions within the framework of work organization and management. Given the difference between knowledge and representations of engineers and workers, one of the important questions is whether the distance between them can be eliminated within a hierarchical organization of work, that is, with a differentiated allocation of tasks, responsibility and knowledge; or, if not, what conditions are necessary to establish a real dialogue between actors of production and forms of knowledge that each one of them hold. In summary, the uneven distribution of free time to reflect on the process is one of the main obstacles to the establishment of a new productive rationality.

As the competence and autonomy of workers develop largely in hiding, only their errors gain visibility, that is, when they cannot control the process after taking a decision contrary to the guidance they have received. When nothing extraordinary happens, it is as if the operation had been assured by strict obedience to the guidelines of his superiors, which are seen as responsible for the proper functioning of the process. Thus a cleavage is operated in the personality of the operators, who become responsible only for errors, not being recognized by the right decisions. In these situations, workers live together with a radical ambiguity that exists in any hierarchical relationship: they do not like to work with their chiefs giving guesses but, when they are alone at night, feel the lack of his superiors in moments when they must take an important decision, as to stop a production unit.

NEW FORMS OF INDUSTRIAL ORGANIZATION: GLOBAL NETWORKS AND VALUE CHAINS

In addition to changes in the work organization, recent cross-border organizational transformations have caused impacts for labor. Strictly speaking, such transformations change the very concept of organizational boundary. Among

the main transformations, we will discuss the networks or supply chains forms of organization and the global relationships between companies.

The combination of high capital costs; high technological complexity; shorter product life cycles and financial and productive globalization fostered, notably from the end of the 20th century, the vertical disintegration of organizations, generating productive configurations in local or global networks or chains. High capital costs make it more expensive to maintain a large corporate structure, leading companies to outsourcing of no-core activities (Prahalad & Hamel, 1990). In many cases, outsourcing is performed towards different countries, generating global production networks (GPNs), a typical configuration of multinational companies (MNCs) (Ernst & Kim, 2002; Gereffi *et al.*, 2005). At the same time, the rapid technological development, toward more complex technologies, makes it necessary for companies to specialize in a few technologies, whose evolution can be perfectly mastered (Veltz, 2000; Prahalad & Hamel, 1990). Also, fierce competition, including at the global level, suggests that new fields of value in products and services are due to the combination of these technologies, requiring the experts companies, somehow, to create long-lasting relationships in order to integrate their operations (Veltz, 2000).

Conceptually, networks would mean a set of companies that relate without strong hierarchy between them. On the contrary, networks encourage cooperation and solidarity, a sense of generalized reciprocity that is common when actors share some background (be it geographical, ideological, ethnic or professional). The presence of trust decreases the need for monitoring, control, hierarchy (Powell, 1990).

Production chains would feature the existence of hierarchy, that is, some of the actors of the chain drive it. For example, there would be production-driven chains and, on the other hand, chains driven by companies that market the final product (Gereffi, 1994). More recently an alternative classification was proposed by the same author (Gereffi *et al.*, 2005): chains could be modular value chains, in which suppliers produce according to more or less detailed specifications of customers, but dominate their process technology; relational value chains, in which there are complex interactions between buyers and sellers, creating mutual dependence;

and captive value chains, in which small suppliers are dependent from larger buyers. In this situation is it not uncommon that these large buyers monitor and control the sellers' processes, including work organization.

The internationalization of productive chains and networks at the end of the 20th century raised the question of how the activities of production systems would be distributed among the countries. If the distribution of global production networks could mean new labor opportunities for emerging countries, the question is: which type of labor are these opportunities made of? The international division of labor in these networks and chains is thus an important discussion, both from the point of view of the central countries and from the point of view of emerging countries. At first, such a division seemed to point to the centralization of activities considered more 'noble', from the point of view of adding value, in developed countries, while activities that add less value, more labor intensive ones, would be shifted to developing or peripheral countries.

One central characteristic of capitalist economy is the unequal development and wealth appropriation between social classes and countries. Such inequality is set up in an international division of labor, with different attributions and wealth distribution – and also with an unequal distribution of risks. The hazards exportations to peripherals countries are a usual strategy of multinational firms (Castleman, 1979). The delocalization of entire plants is the practice in chemical and metallurgical industries due the environmental costs. With increasing labor costs, the manufacturing industries, labor intensives, also migrate to developing countries. Without social control capable to oppose the capital tendencies to increase their profitability, the human and ecological damages were intensified. Then, accidents and occupational diseases are redistributed in a world scale. In specifics production chains, the onus is all located in developing countries and the bonuses in the central ones.

One paradigmatic case in the recycling chain, where an important social and economic activity is supported by waste pickers in an 'informal' work, in subhuman conditions, that provides materials to high technological industries, like aluminum, chemical and electronics. Not enough, the incineration industry begin to dispute the attractive waste market in the BRICs (Brazil, Russia, India, China

and South Africa). In Brazil, various municipalities are planning to install incinerators, presented by European companies that find social resistances to implement this technology in home because the ecological and public health risks.

In general, Brazil occupied a place in the international division of labor that exposes its workers to greater risks. Another example is the meat industry. The meat industry is considered a success case in internationalization of Brazilian firms, supported by public funds. Nonetheless, this 'successful' economic sector is marked by the one of the higher rates of the work related musculoskeletal disorders (WMSDs). Recently (April 2013), the Brazilian Labor Ministry proclaimed a specific regulation (NR-36) to the slaughterhouse work conditions. This official standard determines pauses and others limitations to work intensification, but leaves untouched the essential of work organization that is like a Ford's line. We can forecast the ineffectiveness of the measures to prevent musculoskeletal diseases. To promote effective prevention, the 'disassembly line' could be broken into cellules of production without paced rhythm by the conveyor and longer work cycles, according the principles to sociotechnical work organization that we presented previously. But to do this implies retrocede the control over work time. Contrary to the pretension of absolute control on time and movements, the sociotechnical organization creates obscurity in work realization by the principle of minimal specification. This is one of the reasons to restrict the diffusion of this NFWO in this 'successful' industry.

In the early 20th century, however, the growth of emerging countries, in particular the so-called BRICS, and implementation of public policies for technological catching up on the part of these countries, brought greater complexity to the international division of labor panorama. Indeed, the international division of labor seems to depend on conditions relating to industrial sectors, countries and even the strategies of companies (Dias *et al.*, 2012; Dias & Salerno, 2004). So, there are many possible configurations for the global chains and networks, none of them relentless. If the export of risk activities to developing countries is a reality, it can be circumvented by means of appropriate public policies.

We can see the possibilities of the public regulation in the case of outsourcing. It is usual the statement that outsourcing is cause of accidents and occupational

diseases. Nevertheless, “the precise mechanisms associating outsourcing and occupational health are not well known yet. Even being the relations between outsourcing and health apparently evident, it is not easy to demonstrate the existence of direct and specific causal relations between the change of the contractual relations and occupational diseases. The various aspects of juridical, social and economic deregulations, although real, do not explain themselves the increasing damages on the external workers’ health” (Santos *et al.*, 2009) if these damages were also observed before these organizational change. This was demonstrated in the case of privatization of the urban waste services in a Brazilian city. The deregulation of the work relations that came along with outsourcing of urban cleaning services produced a growth in the occupational diseases and accidents of the street sweepers. These specific health damages occur because the deregulation of contractual relations leave to a deregulation of the work activity itself. In particular, it was shown that the collective strategies were perturbed by the supervisors’ arbitrariness of the private enterprise to recompose the teams. The collective know-how of the groups of street sweepers working together for years was broken when one of them was reallocated because disciplinary punishment. With this group reallocation, the sweepers were also relocated in other urban sector, where they have no specific practical experience necessary to prevent accidents and to do the work more efficiently, so without overloading themselves and the teams’ companions. This experience is so important that the urban sector was subjectively appropriated and called by the sweepers as ‘*my stretch*’ (*meu trecho*). This appropriation is more than a symbolic attribution, but essential to preserve physical and mental health. The group reallocation and the consequent health problems that followed could have been avoided if regulations or other public instruments had been associated with the privatization process, within the context of a particular public policy.

FINAL REMARKS: THE OTHER SIDE OF WORK ORGANIZATION

From his beginning, capitalism is simultaneously production of wealth and poverty, unequally distributed between individuals, classes and countries. In the modern ‘risk society’ (Beck, 2008), in a great measure, all the individuals, independently of the class, is submitted to risks that encompasses the society at

all. Nuclear energy, genetically modified organisms, viruses' epidemics, catastrophic accidents in chemical and transport industries affects the individuals without concerns to social status and properties. In this sense, the management system is a democratic plague that affects managers and workers. The mental suffering and psychological diseases are equally distributed among all members of the hypermodern organization: the suicide affects both the unemployed workers and the engineers stressed by goals impossible to reach. This fact only emphasizes the systemic nature of the causal determination of the health damage in NFWO. In despite of the fact that the rewards are much more attractive to executives than to workers, they all are submitted to the same alienated work; they are not able to master their acting according to their goals. The contrary is what happens: the fixed goals determine their actions.

These organizational changes carry out a change in the standard profile of occupational diseases. The damages become more unspecific, with a symptomology similar to common diseases. In consequence, is more difficult to establish nexus with work conditions, like traditional occupational diseases with unique or multifactorial, but identifiable, causes. Now, everything happens as if the immaterial work changes creates immaterial disease factors and, also, immaterial damages, where prevail the mental and psychological ones. To determine a precise nexus between a disease and an occupational disease is always a controversial issue. Nonetheless, in this case the difficulty is potentiated by the subjectivity of the symptoms and, further, by the general profile of these diseases. Cardiovascular disturbs, depressions, phobias, sleep disturbs, psychosomatics diseases, cancers and immunologic dysfunctions are phenomena so linked to general forms of life that is difficult to differentiate the part of work conditions determinations and the general stress of the urban life conditions. Perhaps, this presumption that work and private life are isolated spheres of the society should be leaved out if we pretend explain the actual interrelationships between work and health. Furthermore, one feature of the recent transformations of work organization is the confusion of the frontiers between worktime and space and the familiar and personal spaces and time. Supported by ICT, the homework is growing and the rest time becomes waiting time disposable to satisfy the needs of flexible organization.

To discuss work organization is always delicate due the multiplicity of factors implied. Nonetheless, in our discussion and in the cases presented here some common orientations emerge:

- The conflicts between control, hierarchical organization and autonomy;
- The paradoxes arising in the subjective workers' engagement without reciprocity of the organization;
- The perverse effects of the '*gap of the procedures*', that opens space to the hierarchy arbitrariness that may take the form of KPIs;
- The obstacles and limits to develop an effective communicative rationality, nonetheless solicited by the new forms of work organizations.

Here we want to stress another point: the obscurity always carried with work activity. In fact, all the forms of work organization contain a '*dark side*', but each has and produces his specific spaces of the invisibility. These different forms of invisibility are one of the most important determinations of the health damages in work situations. They are source of the excessive workloads and, inversely, source of autonomy and workload regulations. In the sociotechnical work organizations, this obscurity is intentionally produced, although in some defined limits. If the goals are consensually defined, this space of autonomy is source of self-realization and health; if the deregulation is a pretext to impose unrealizable goals, it is source of stress and physical and psychological damages. It is the organizational power relations that give the direction. For this reason, the actual limits imposed to the workers' autonomy are so difficult to enlarge.

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CONFLICT OF INTEREST

The authors confirm that this chapter content has no conflict of interest.

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