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Democratic Lean?

Work Systems in Norwegian Industry

Thesis for the degree of Philosophiae Doctor

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Summary

Work organization in Norwegian industry has traditionally been characterized by *industrial democracy*. Industrial democracy implies that managerial prerogatives are limited by extensive and substantive worker participation, including union based representative participation in company governance and worker autonomy on the shop-floor. In the late 2000s, the interest in so-called *lean production* was renewed and intensified as a blueprint for "best practice". The prototypical lean production work organization, pioneered by Toyota Motor Company, can hardly be described as democratic. According to some critical commentators, lean production represents a reversal to Scientific Management and managerial autocracy. In particular, lean production practices such as just-in-time logistics, process standardization and hierarchical governance leave little room for worker autonomy. The fundamental premise of this thesis is that work design in Norwegian industry needs to work out the tension between traditional ideals of industrial democracy and lean production. I argue that this tension can be approached in two principal ways. The first approach is to restore democratic work design as a radical alternative to lean production. The second approach is to aim for a combination of industrial democracy and lean production. The thesis critically evaluates each of the two approaches. Based on empirical findings and a theoretical examination of the performance of work organizations based on extensive autonomy, I argue that the first alternative is inferior. Extensive autonomy tends to upset both system wide coordination and organizational learning. The second alternative is a more viable design strategy. I argue that "democratic lean" work organization, that is, a coherent combination of lean production and industrial democracy, is possible. Democratic lean implies limited worker autonomy, but retains and renews the fundamental participatory and democratic qualities of the Norwegian working life, leading to efficient operations, continuous improvement and organizational learning. Coupled with strategic differentiation and extensive automation, a democratic lean work organization will enable Norwegian industry to thrive in global competition.

Sammendrag

Arbeidsorganisering i norsk industri har tradisjonelt vært preget av *industrielt demokrati* på virksomhetsnivå, dvs. kombinasjonen av representativ medvirkning gjennom fagforeninger og direkte medvirkning gjennom ansattes autonomi (selvstyre) på fabrikkgulvet. På 2000-tallet har vi sett en fornyet interesse for såkalt *lean produksjon*, av mange betraktet som "beste praksis" for industriell produksjon. Den prototypiske arbeidsorganisering for lean produksjon, slik den ble utviklet av Toyota Motor Company, kan ikke beskrives som særlig demokratisk. Ifølge modellens kritikere innebærer lean produksjon et tilbakeslag for medvirkning og en tilbakevending til Scientific Management og autokratiske ledelsesformer. Især ansattes autonomi reduseres betraktelig som følge av lean prinsipper for just-in-time logistikk, standardisert arbeid og hierarkisk styring. Premisset for denne avhandlingen er at norske bedrifter designer sine arbeidsorganisasjoner i spenningen mellom tradisjonen for industrielt demokrati på den ene siden og lean produksjon på den andre siden. Prinsipielt kan denne spenningen løses på to måter. Det første alternativet er å vende tilbake til prinsippene for demokratisk organisasjonsdesign som et radikalt alternativ til lean produksjon. Det andre alternativet er å kombinere de to modellene for organisasjonsdesign. I avhandlingen vurderes hvert av disse alternativene. Basert på empiriske funn og en teoretisk diskusjon av sammenhengen mellom autonomibaserte organisasjonsformer og arbeidssystemets yteevne, viser jeg at det første alternativet er uhensiktsmessig. Utstrakt autonomi skaper store utfordringer med hensyn på koordinering av arbeidsprosessen og organisasjonslæring. Det andre alternativet er mer hensiktsmessig. Jeg viser at en koherent kombinasjon av industrielt demokrati og lean produksjon er mulig. Denne organisasjonsformen, kalt "demokratisk lean", innebærer riktignok en begrensning av ansattes autonomi, men bærer med seg og fornyer den norske tradisjonen for demokrati og medvirkning. Således muliggjør "demokratisk lean" effektiv drift, kontinuerlig forbedring og organisasjonslæring. Denne organisasjonsformen, kombinert med automatisering og strategisk differensiering vil bidra til å opprettholde norske industribedrifters konkurransekraft.

Structure of the thesis

This PhD thesis consists of three independent articles and a connecting article. Each independent article makes a contribution to organization theory. The articles have been submitted to academic journals. As of November 2013, one article has been published and one has been accepted for publication. The third article has not yet been accepted by any journal.

The connecting article has a double purpose. First, it synthesizes the contributions of the independent articles into a coherent argument about work systems in Norwegian industry. The synthesis also makes use of auxiliary arguments and elaborations, which are developed originally in the connecting article. Second, the connecting article clarifies the methodology which underpins the thesis as a whole. Although each independent article contains a brief methodological section, a thorough discussion of issues relating to philosophy of science and analytical strategy is outside of the scope of the conventional journal paper format. Therefore, these issues are discussed at greater length in the connecting article.

The three independent articles are:

(1) Ingvaldsen, J. A. and Rolfsen, M. (2012), "Autonomous work groups and the challenge of inter-group coordination", *Human Relations*, Vol. 65 No. 7, pp. 861-881.

(2) Ingvaldsen, J. A. (2013), "Organizational learning: Bringing the forces of production back in", forthcoming in *Organization Studies*.

(3) Ingvaldsen, J. A. and Benders, J. (2013), "Lean production and broad control spans: An odd couple?", working paper, NTNU, Trondheim, November 2013.

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Getting papers published means hard work, re-work, frustration and joy. I would like to thank editors and reviewers for their critical reading, constructive feedback, and also well argued rejections. Learning to write is a never-ending process.

Finally, I give my warmest gratitude and affection to my fiancée and foremost supporter, Asmira Delić. Thank you for being who you are and letting me share my life with you.

Trondheim, November 2013
Jonas A. Ingvaldsen

Table of contents

Independent articles

1 Introduction

> "[T]he more the individual was enabled to exercise control over his task, and to relate his efforts to those of his fellows, the more likely was he to accept a positive commitment to doing a good job. The positive commitment shows in a number of ways, not the least of which is the release of that personal initiative and creativity which is the basis of a democratic climate. Only when these conditions exist could we expect democratic representative structures to be evolved [...]. And only then could we expect these institutions to be used effectively by those whom they are supposed to serve. […] At the lowest level of autonomy the groups may simply have the right to decide on working methods and allocation of work between themselves. At a somewhat higher level, they may control some of the conditions from which they start, e.g. membership of their groups, equipment and tools, maintenance, planning and estimating, quality levels for acceptance of inputs. At an even higher level they may even be involved in the redefinitions of work goals." (Emery and Thorsrud, 1976, p. 11, 164)

> "[I]nsufficient standardization and rationalization create waste, inconsistency, and unreasonableness in work procedures and work hours that eventually lead to the production of defective products. Unless such defective work is reduced, it is difficult to assure an adequate supply for the later process to withdraw or to achieve the objective of producing as cheaply as possible. Efforts to thoroughly stabilize and rationalize the processes are the key to successful implementation […]" (Ohno, 1988, p. 41)

This thesis is about work organization in Norwegian industry. As a young researcher being socialized into the Norwegian tradition of organization and working-life research, I was confronted with the following puzzle: on the one hand, the virtues of work organization in Norway is celebrated; our distinctive tradition based on *industrial democracy* and *worker autonomy* supposedly leads to high productivity, high-quality jobs and high levels of innovation (Gustavsen, 2007; Levin *et al.*, 2012; Lorenz and Lundvall, 2011). On the other hand, I have experienced managers and researchers often looking to Japan and Toyota for "best practice" on how to organize industrial work. In the late 2000s, the interest in so-called *lean production* (Womack *et al.*, 1990) was renewed and intensified. The literature clearly suggested that the prototypical "Norwegian work organization" and lean production were distinct, largely incompatible alternatives (Benders and Van Hootegem, 1999;

Berggren, 1992; Durand *et al.*, 1999). The title of C. Berggren's (1992) book, published 20 years ago, is illustrative: *Alternatives to lean production: work organization in the Swedish*[1] *auto industry*. Given the widespread assertion that lean production represented best practice, could it be that the "Norwegian work organization" was not that productive and innovative after all? Or were managers and researchers simply carried away by the latest management fashion (Benders and Van Bijsterveld, 2000)? Or could it be that the real desire was to combine a limited version of lean production with the Norwegian democratic tradition? If so, what would this combination look like? Would it represent a break with the traditional preferences for autonomy and participation? These kinds of questions represent the background for this thesis.

By "industry" I refer to the manufacturing and process industry, where products are standardized and volumes are high. This thesis is concerned with work systems, which are points of production where tools, machinery and human labour combine to transform raw materials into useful products. Completing a thesis on industrial work organization may seem backward-looking, given the relative decline of the industrial sectors in Western economies. Supposedly, we have already entered the post-industrial society (Bell, 1976), as manufacturing has moved on to low-cost countries. The practical motivation for this thesis is a twist of that argument. If industry is to survive and thrive in high-cost countries such as Norway, labour productivity must necessarily be high. High labour productivity demands extensive automation, but also that work systems are configured for efficiency and organizational learning. This is not to suggest that Norwegian industry can survive solely based on efficient operations. Strategic differentiation, supply chain management and product-development capabilities may be even more important (Christopher, 2005; Porter, 1985) for long-term survival, but physical production still matters. The idea that organizations cannot simultaneously pursue innovation and efficiency (e.g. Burns and Stalker, 1961) is discredited. The challenge for today's industrial companies is to explore new opportunities while simultaneously exploiting their current resource base (Adler *et al.*, 1999; Birkinshaw and Gibson, 2004). A proper configuration of the work system will both lead to efficiency and support product and process innovations. This thesis aims to explore the content of such a "proper configuration" in a Norwegian context.

The context of this study is the "Norwegian working life model". At the societal level this refers to a form of coordinated market economy, where the state plays an active role as legislator and mediator between the social partners. The state also has ownership interests in major companies in different sectors. Labour unions and employer federations

[1] Sweden and Norway share the traditional preference for work organization with extensive autonomy. See Gustavsen (2007).

are organized in national confederations. A set of agreements between the employer and labour confederations, most notably the National Main Agreement, sets standards for wages and working conditions and prescribes rules for industrial conflict. In general, the working life is peaceful, and industrial relations are predominantly cooperative (Levin *et al.*, 2012). At the company level, the Norwegian model is characterized by industrial democracy (Emery and Thorsrud, 1976). Industrial democracy implies that managerial prerogatives have been limited by extensive and substantive worker participation, including union-based representative participation in company governance and workers' direct participation on the shop floor. These forms of participation are thought to be mutually supportive (Toulmin and Gustavsen, 1996). Commentators have warned that the introduction of lean production represents a threat to these established participative arrangements (Berggren, 1992; Ingvaldsen *et al.*, 2012; Johansson and Abrahamsson, 2009). Their warnings seem justified as empirical research on lean production has documented intensified managerial control, limited direct participation, poorer quality of working life and at times hostility towards labour unions (e.g. Graham, 1995; Landsbergis *et al.*, 1999; Lewchuk and Robertson, 1997; Parker and Slaughter, 1988; Sewell and Wilkinson, 1992). Since high levels of worker participation is seen as a desirable quality of the Norwegian working life, this thesis is concerned with the question of whether or not lean production can be combined with industrial democracy.

A concern with lean production in the Norwegian working life resonates with two longstanding debates within organization theory. The first is the question of technological determinism vs. organizational choice. The second is the question of the human consequences of rationalization. The thesis of technological determinism states that the nature of production technology determines what organization forms are effective; only a limited range of organization forms will realize the full productive potential of the technology (Adler, 1992; Boyer, 1998). In organization theory technological determinism is implicit in design prescriptions, which advocate a universal, "one best way" of organizing. For large-scale manufacturing, scientific management is the principle example (Taylor, 1967). The narrative of lean production as presented by Womack *et al.* (1990) is basically technologically deterministic. In successive stages of development, craft production had been replaced by mass production and mass production had been (or would soon be) replaced by lean production. In their argument, lean production will prevail because it is the more rational way of organizing high-volume production independent of context (Berggren, 1993). On the other hand, the organization theory that informed the Norwegian experiments with industrial democracy was firmly opposed to technological determinism (Emery and Thorsrud, 1976). According to Trist (1981, p. 9),

> "[it] was not true that the only way of designing work organizations must conform to Tayloristic and bureaucratic principles. There were other ways, which represented a discontinuity with the prevailing mode. The technological imperative could be disobeyed with positive economic as well as human results."

In other words, there was organizational choice. Organizational choice opens up space for designing work systems that are human rewarding, without sacrificing efficiency in a technical or economic sense. The question of lean production in the Norwegian working life actualizes the issue of organizational choice. If there are good reasons to believe that lean production is technically and economically superior even in an institutional environment, which traditionally has supported alternative forms of organizing, then the universality claim of Womack *et al.* (1990) is supported. In contrast, if it can be shown that work systems with extensive worker autonomy are equally (or even more) efficient with respect to conventional performance criteria, then Trist's (1981) notion of organizational choice is supported.

The second longstanding debate is that of the human consequences of rationalization of economic activity. Weber famously argued that technically superior bureaucratic organizations lock their members in an "iron cage" of discipline. As rationalization proceeds, this iron cage becomes increasingly harder to destroy. Conventional interpretations of Marx state that capitalist rationalization destroys the potential for human actualization and fulfilment. Labour process theorists argue that as methods of managerial control are refined, work becomes increasingly fragmented and meaningless (Braverman, 1974; Knights and Willmott, 1990). Pessimism is not ubiquitous, though, as some commentators have argued that the dominant trends in rationalization are up-skilling, re-integration of mental labour, and workers' increased participation in company management (Adler, 1992; 2007; Barley, 1996; Kern and Schumann, 1987). The question of lean production in the Norwegian working life actualizes this debate. In Barley and Kunda's (1992) schema, lean production is arguably one of the most advanced forms of rational management. Critiques have warned that lean production takes the ills of previous forms of rational management – work-intensification, tight managerial control and alienation – to new heights (Dankbaar, 1997). Less radically, Klein (1989) emphasized the "human costs of manufacturing reform"; improved process controls limit the space for workers' independence and discretion. If the critics are right, then the possibility of a combination of lean production and industrial democracy seems unlikely. In contrast, if it can be shown that a viable combination of the two can be realized, the optimists' thesis is supported.

The fundamental premise of this thesis is that work design in Norwegian industry needs to work out the tension between traditional ideals of industrial democracy and lean production. In particular, this tension revolves around the issue of worker autonomy. In the tradition of democratic work design, extensive worker autonomy is seen as a necessary criterion for industrial democracy and a high quality of working life (Emery and Thorsrud, 1976; Trist, 1981). Lean production leaves little room for worker autonomy, because of tight technical dependencies, extensive standardization of work processes and hierarchal governance (de Treville and Antonakis, 2006; Ohno, 1988). This tension between industrial democracy and lean production can be approached in two principal ways.[2] The first approach would be to restore democratic work design as a radical alternative to lean production (Berggren, 1992; Sandberg, 1995). The second approach would be to aim for a combination of industrial democracy and lean production, which realizes the benefits of both. This thesis critically evaluates each of the two approaches. I argue that the first approach is a viable design strategy if it is plausible that work systems with extensive worker autonomy also lead to high performance according to conventional technical-economic criteria. Hence, I ask:

> Research question 1: *Do work systems with extensive worker autonomy lead to high operational performance?*

"High performance" indicates a level of performance that matches the level of performance attributed to the lean-production system (Adler and Cole, 1993; Krafcik, 1988; MacDuffie, 1995; Mackelprang and Nair, 2010; Shah and Ward, 2003). The second approach is a viable design strategy if a combination of industrial democracy and lean production can give rise to a work system that is internally coherent: that is, a work system in which the configurations of the different aspects of the system are mutually supporting (Findlay *et al.*, 2000; MacDuffie, 1995). Hence, I ask:

> Research question 2: *Can lean production be combined with industrial democracy to create a coherent work system? If yes, how is that work system configured?*

To anticipate results briefly, the answer to the first question is a qualified "no". The argument is made that work systems based on extensive autonomy have two fundamental technical weaknesses. One relates to system-wide coordination (Ingvaldsen and Rolfsen, 2012), and the other relates to organizational learning (Ingvaldsen, 2013). The answer to the second question is a qualified "yes". I argue for the possibility of "democratic lean": that is, essentially, a lean labour process combined with participative governance and

[2] Theoretically, a third approach would be to aim for a complete imitation of the lean-production work system. In chapter 3, I argue that this approach is not practically relevant.

supported by democracy-friendly labour institutions. Democratic lean is however not without tensions, in particular around the issue of supervision (Ingvaldsen and Benders, 2013).

The thesis has the following structure. In chapter 2, I theoretically position the thesis and explain my four main theoretical constructs, which are "work system", "industrial democracy", "worker autonomy" and "lean production". A typology is developed, which contrasts an ideal-type democratic work system with an ideal-type lean-production work system. In chapter 3, the research questions are further explained and justified. Methodological underpinnings of the thesis are discussed in chapter 4, before the three independent articles are summarized in chapter 5. In chapter 6, the main arguments are developed, and broader issues related to organizational choice and the human consequences of rationalization are picked up. Chapter 7 concludes the thesis and proposes directions for future research.

2 Theoretical positioning

2.1 Industrial work organization: Fordism and onwards

Work organization in industry is arguably the most classical topic of organization theory. The rise of large-scale manufacturing created unprecedented challenges of controlling and coordinating the joint operation of machinery and human labour. Industrial capitalism – that is, production for profits – gave employers huge incentives to scrutinize the labour process in order to cut costs and boost profits. This technical interest in work organization is evident in the works of nineteenth-century authors such as Babbage. Symptomatically, Babbage (1832/2008) approached the problem of work organization in the same way he approached the mechanical aspects of manufacturing: with logical deduction, tabulation and calculation. Traditional manufacture, i.e. the work of craftsmen, was deemed inefficient because it failed to reap the benefits of specialization and economize on skills through the division of labour. This technical interest in work organization later culminated in Taylor's (1911/1967) *Principles of Scientific management*, also referred to as Taylorism. Taylor's principles, taking the division of labour to its extreme, were presented as the "one best way" of organizing industrial production.

Simultaneously, the burgeoning fields of political economy and later sociology made industrial organization, and administration more generally, the objects of scientific investigation. The early social scientists were not primarily interested in prescribing "best practice", but rather in understanding and explaining how changes in work organization were related to wider societal transformation. Most influential in establishing organization theory as a scientific discipline were the contributions of Marx and Weber. Marx set out to explain how profits were made in the "hidden abode of production". He thereby pioneered the study of technological change, rationalization and managerial control. Weber discussed how power becomes legitimate and showed how impersonal legal-rational authority was institutionalized in the modern organizational form – bureaucracy. Since bureaucracy remains the dominating form for all but the smallest organizations (Walton, 2005), organization theory of today is very much still the study of bureaucracy.

In the early twentieth century, scientific management, technological rationalization and bureaucratic administration came together in the automotive factories of Henry Ford. Ford's distinct form of mass production showed itself to be tremendously efficient and became the standard model for industrial production in Western economies. Theoretically, *Fordism* remains the main reference model for discussions about industrial work organization. Other forms of industrial work organizations are said to extend, transcend or intensify Fordism, as is evident from labels such as "post-Fordism", "neo-Fordism" and

"anti-Fordism" (Durand *et al.*, 1999; Vidal, 2011). Historically, both the democratic model of work organization and lean production were proposed as successors to Fordism (Trist, 1981; Womack *et al.*, 1990). While Fordism by some commentators is used in a broad sense to describe a phase of (US) capitalism (Thompson, 2003; Vidal, 2011), it is here used in a more narrow sense to describe a form of work organization. According to Dankbaar (1997, p. 570), the main characteristics of the Fordistic work organization are:

- "Economies of scale based on a high division of labour;
- Separation of execution and control;
- Short-cycled machine-paced production work;
- Functional specialization of support departments;
- Specialized mechanization and/or dedicated automation."

The first two points reflect the Tayloristic principles. Tasks were fragmented into short cycles, and for each task there was one highly specialized, but low-skilled, worker. Furthermore, the worker was responsible for task execution only. The choice of tools and methods for task execution were prescribed by the foreman, or preferably the industrial engineer, who had identified optimal working methods through time-and-motion studies. This optimal way of working was standardized in a formal work procedure from which the worker was not allowed to depart. Indirect tasks (preparation, machine setup, maintenance, handling of deviances, etc.) were the responsibility of specialist personnel, typically organized in separate departments. Ford's major technical invention was the moving assembly line which automatically paced and synchronized sequential operations. The approach to machinery and automation aimed to realize economics of scale through dedicated equipment. Capacity utilization was critical. To prevent machinery from being idle in the face of disturbances, each step of the production process was buffered with semi-finished goods. This buffering created robustness (Krafcik, 1988). The managerial hierarchy of Fordism was typically tall with several layers of middle management, who coordinated and controlled production. Labour discipline was ensured through a mix of personal supervision, machine pacing (technical control) and working rules (bureaucratic control) (Edwards, 1979). In unionized plants collective bargaining agreements tended to increase the amount of bureaucratic rules and regulations, as workers' rights were tied to a quite rigid set of job classifications and grievance procedures (Burawoy, 1985). Wage levels were typically high and family supporting. Hence, the worker would soon be able to buy the product he was making. At the more macro-economical level, mass production was coupled with mass consumption.

The Fordistic work organization had tremendous influence on both practical industrial organization and theory development. It would be an impossible task to summarize the rich and diverse theoretical trajectories related to the study of Fordism. However, some general fields of enquiry can be identified. *Industrial psychologists* have primarily focused on individual motivation, small group processes and implications for job design. Early psychological research established that Tayloristic work design coupled with external supervision and monetary incentives (piecework) tended to cripple motivation and commitment. Workers became alienated and colluded in groups to withhold effort (Moldaschl and Weber, 1998). To counteract alienation and boost motivation, job redesign was advocated. Job redesign includes broadening of tasks and responsibilities, integration of planning and execution, group-based work and more supportive forms of supervision (Hackman and Oldham, 1980; Wilkinson, 1998). *Industrial sociology* has continued along the lines set out by Weber and Marx. At the micro-level this includes studies of the functions, dysfunctions and re-production of the industrial bureaucracy (e.g. Gouldner, 1954; Merton, 1940). Of particular interest were the issues of managerial control, workers' resistance and shop-floor politics, i.e. the delicate interplay between workers, managers and industrial engineers (e.g. Burawoy, 1979; Edwards, 1979; Lowe, 1993; Roy, 1952). At the more macro-level sociologists have explored how the work organization is embedded and reproduced in a wider economical and institutional context (e.g. Bendix, 1956; Burawoy, 1985; Thompson, 2003). An important topic in these debates is how national and regional differences are reflected at the point of production (e.g. Boyer, 1998; Deeg and Jackson, 2007; Smith and Meiksins, 1995). Industrial sociology has also addressed the long-term development of work organization under industrial capitalism. A central question, originating in Marx, is whether rationalization and use of new technology leads to intensification of Taylorism or rather to its reversal (e.g. Adler, 1992; Barley, 1996; Braverman, 1974; Kern and Schumann, 1984; Springer, 1999). The issue has not been settled, as shown in the recent discussion between Adler (2007) and Thompson (2007). The field of *operations management* has continued to pursue a technical interest in work organization. While Taylor's (1967) original concern was the design of individual tasks and jobs, modern operations management addresses how the organization of system-wide processes such as logistics, maintenance and production planning are related to operational performance (e.g. Mackelprang and Nair, 2010; Shah and Ward, 2003). As will be explained in section 2.4.1, the fundamental argument in support of lean production is its technical superiority vis-à-vis Fordism (Womack *et al.*, 1990). Debates on *organizational design* have addressed how and to what extent work organization is contingent on exogenous and endogenous factors such as technology, product markets, labour markets, labour legislation, strategic orientation, scale of operations, etc. (e.g. Burns and Stalker, 1961; Daft *et al.*, 2010). A fundamental question is that of technological determinism:

whether there is "one best way" of organizing production or whether there are several equally good ways, contingent on economical and institutional factors. The question of universality used to be centred on Fordism; today lean production has taken its place as the prime candidate for "the one best way" (Berggren, 1993; New, 2007; Vidal, 2011).

These diverse theoretical trajectories are brought together in debates on successors to Fordism. Democratic forms of work organization represent alternatives to Fordism. Lean production is another alternative to Fordism. Hence, to compare and discuss the viability of these organizational forms in the Norwegian working life, the thesis needs to address the different aspects of the organization theoretical problematic of Fordism: technical work organization, human motivation and commitment, operational performance, nature of supervision and management, rationalization and institutional embedment. The thesis primarily builds on the micro-sociological approach, and draws more selectively on the related fields of organizational psychology, operations management, organization design and macro-sociology.

Having clarified the basic problematic of the organization theoretical study of industrial work organization, the argument continues in a more rigorous fashion. The next section (2.2) introduces the concept of a "work system" to replace the more imprecise "work organization". The work-system model is then used to construct a typology, which identifies the characteristic properties of a democratic and a lean work system.

2.2 Work systems

Work systems are socio-technical systems in which raw materials are turned into something useful. The value-adding, transformational process of the raw material is referred to as the *labour process*. "Socio-technical" indicates that the system consists of workers and technology (tools and machinery) and their relationships (worker – worker; technology – technology; worker – technology). "System" indicates that the work system consists of interrelated parts and subsystems (De Sitter *et al.*, 1997). The work system's capability to achieve goals such as productivity, profitability or other desirable ends requires that the individual parts are properly aligned. Alignment (or cohesion) indicates that the different aspects and subsystems are mutually supporting in producing system-wide effects (Boyer, 1998; MacDuffie, 1995; Shah and Ward, 2003).

In organization theory, current interest in work systems is usually framed under the headings of "team-based work systems" (Mueller *et al.*, 2000) or "high-performance work systems" (Appelbaum and Batt, 1993; Boxall and Macky, 2009). Supposedly, teams are the

basic units in the work systems that are replacing Fordism. Supposedly, these systems are "high performing". Since both "team" and "high performance" are ambiguous concepts (Benders and Van Hootegem, 1999; Godard, 2004), these labels may serve ideological purposes more than reflecting any substantive characteristics of the work systems in question (Sinclair, 1992). In the following, these labels are used with caution. When workers are interdependent and share the responsibility for tasks, either on-line or off-line (Cutcher-Gershenfeld *et al.*, 1994), reference will be made to "groups" and "group work". A work system is "high performing" if there are good reasons to believe that the work-system configuration leads to high performance with respect to stated performance criteria.

To make analytical sense of contemporary work systems, several frameworks have been proposed (e.g. Durand *et al.*, 1999; Mueller *et al.*, 2000; Thompson and Wallace, 1996). These frameworks divide the work system into a set of well-defined dimensions. Based on a literature review, Mueller *et al.* (2000) propose five dimensions: (1) technological; (2) economic; (3) social; (4) cultural; and (5) organizational/governance. In Durand *et al.*'s (1999) comparative study of team organization in the automotive industry, eight dimensions are included: (1) degree of teamwork; (2) degree of polyvalence; (3) negotiated decisions with hierarchy; (4) autonomy; (5) salaries; (6) individual involvement; (7) union support; and (8) elected leaders. In this thesis, the "Team Dimensions Model" developed by Thompson and Wallace (1996) and later refined by Findlay *et al.* (2000) is used for analytical purposes. This model is pragmatically chosen, based on its relative simplicity and ability to capture the key distinctions between the two central models of work organization: the democratic and the lean. Figure 1 shows the dimensions of the Team Dimensions Model.

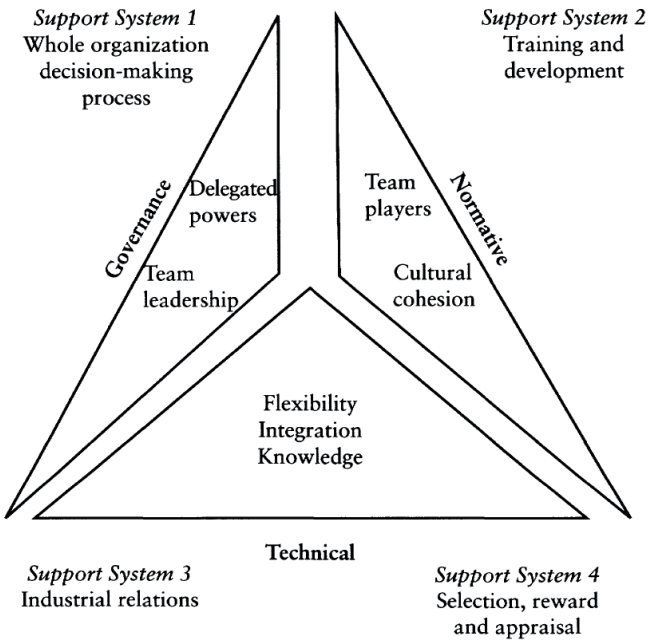

Figure 1: Team Dimension Model (Findlay *et al.*, 2000, p. 1551)

The technical dimension deals with the technical divisions of labour: that is, how a set of interdependent tasks are distributed to individuals and groups. Task distribution is closely related to how workers' skills and competences are utilized and developed. On the one hand, single-task, single-skill work designs allow for a high degree of specialization. On the other hand, multi-skilling creates functional flexibility. The nature of tasks is highly dependent on how tools and production machinery are designed and the degree of automation. Machine-paced work typically leads to short cycle times and repetitive, highly specialized tasks. Conversely, worker-paced work is associated with longer cycle times and broader utilization of skills (Van Hootegem *et al.*, 2004). When the degree of automation is low, operators primarily work directly with transforming the raw materials. When these direct tasks are automated, workers will be more concerned with indirect tasks such as preparation, machine setup, maintenance and quality control (Kern and Schumann, 1987). Also included in the technical dimension is how the system improves its processes by responding to deviances, revising routines or engaging in more systematic continuous improvement, e.g. by establishing off-line problem-solving groups (MacDuffie, 1997).

The governance dimension deals with the distribution of decision-making powers, supervision and management. According to Thompson and Wallace (1996, p. 107), there are three main governance issues: "(1) the extent of delegated powers over such questions as distribution of work, methods of production and allocations of team members; (2) the selection and function of team members; (3) the relationship between team and wider organizational governance in the form of decision making and bargaining structures". When workers have a strong influence on these issues, either directly or through their representatives, governance can be said to be *participatory*. Conversely, governance can be said to be *autocratic* when these issues are decided on by managers or industrial engineers.

The normative dimension deals with employees' values, beliefs and subjective interpretations of their work situation. Industrial psychologists have long recognized the importance of these "soft" issues; the right mindset among workers raises motivation and fosters cooperation. Weberian sociology emphasizes how the re-production of governance relations is dependent on their perceived legitimacy (Bendix, 1956; Burawoy, 1979). A large body of critical scholarship has explored how management utilizes normative control or "cultural engineering" to legitimize prevailing power relations and align the interests of workers with those of management (Barker, 1993; Casey, 1999; Kunda, 2006). However, empirical research has shown that workers' normative orientation cannot easily be prescribed (Findlay *et al.*, 2000; Knights and McCabe, 2000; Vallas, 2003a). Rather than identifying with the official culture, workers may take pride in hard, masculine work (Collinson, 1992) or craftsmanship and independence from management (Bélanger *et al.*, 2003; Ezzamel *et al.*, 2004). As a result, modes of governance may be normatively contested.

In addition to the three main dimensions, the Team Dimension Model includes four company-wide support systems: (1) whole-organization decision-making process; (2) training and development; (3) industrial relations; and (4) selection, reward and appraisal. As support systems, these need to be aligned with the main dimensions (Findlay *et al.*, 2000, p. 1550). "Whole-organization decision-making process" describes the way decisions are made beyond the narrow sphere of work organization. This thesis will primarily focus on the nature of representative participation: how the workers' voice is institutionalized in wider company governance. "Training and development" and "selection, reward and appraisal" deal with conventional HRM issues. "Industrial relations" describes the relationship between management and organized labour. In the context of the Norwegian working life, we will be dealing with unionized settings. In general, labour unions need to strike a balance between "boxing" and "dancing" with management (Huzzard *et al.*, 2004). "Boxing" indicates traditional bargaining, negotiation and industrial conflict. "Dancing"

indicates information sharing, co-decision making or institutionalized labour–management partnerships (Rubinstein, 2001).

2.2.1 Work-system ideal types

In chapters 2.3 and 2.4, the Team Dimension Model is used to construct a typology of two ideal-type work systems: (1) a democratic work system and (2) a lean-production work system. The purpose of the typology is to "abstract and systematically explore key theoretical ideas" (Meyer *et al.*, 1993, p. 1180) associated with the two systems. The Team Dimension Model provides the set of dimensions and homogenous categories which enable comparison. In this thesis, the typology is used to frame the research questions and theoretically inform the following arguments.

Ideal types are abstractions constructed for theoretical and analytical purposes (Bryman, 2008). Ideal types are "the one-sided accentuation of one or more points of view and by the synthesis of a great many diverse, more or less present and occasionally absent concrete individual phenomena" (Weber, 1904, cited in Doty and Glick, 1994, p. 233). The work-system ideal types highlight the internal consistency in the work-system configurations, and how these configurations reflect underlying design principles. The design principle underlying the democratic work system is to create a democratic workplace with high levels of worker participation and autonomy (Emery and Thorsrud, 1976). The design principle underlying the lean-production work system is to eliminate process variability (Shah and Ward, 2007). The ideal types are derived theoretically and do not claim to represent empirical reality. They might exist, but are not expected to do so (Doty and Glick, 1994). Roughly, the democratic ideal type corresponds to the type of work system aimed for in the Norwegian Industrial Democracy Programme in the 1960s. Clearly, this is a long time ago, but these organization designs have had a strong impact on Norwegian working life, in particular as a normative ideal for what constitutes democratic and humane organizations. The lean-production ideal type corresponds to idealized descriptions of work systems of Toyota Motor Company in the 1990s. These descriptions continue to have a strong impact as an organizational blueprint, often perceived to constitute "best practice" for industrial operations (Liker, 2004; New, 2007).

2.3 Democratic work systems in Norway

The ideal-type democratic work system is derived based on an elaboration of the theory and practice of industrial democracy in Norway. First (section 2.3.1), the fundamental concepts of "industrial democracy" and "worker participation" are clarified. Second (section 2.3.2), the historical trajectory of the Norwegian working life model is presented with special attention paid to the Industrial Democracy Programme and its lasting consequences for Norwegian working life. The presentation in this section focuses on labour and industry legislation, industrial relations and normative notions of partnership and good work. Third (section 2.3.3), the work-design theory underpinning the field experiments with industrial democracy is reviewed. Here, special attention is paid to the concept of "worker autonomy", which has great implications for the configuration of the technical and governance dimensions of the work system. Fourth (section 2.3.4), the main ideas from the preceding sections are synthesized into a theoretical notion of a democratic work system.

2.3.1 Industrial democracy and worker participation

"Democracy" intuitively means "rule by the people" (Schumpeter, 2010, citing the classical doctrine of the enlightenment philosophers). The term is most commonly used in a political science sense to describe the relationship between the people and the state. In liberal, Western countries democracy means that the people through majority vote elect representatives to the legislative and executive branches of government. This "competitive struggle for people's vote" is the minimalist definition of democracy advocated by Schumpeter (2010). Other democracy theorists, in particular those associated with "deliberative democracy" or "participatory democracy" (Pateman, 2012), advocate stronger necessary criteria for democracy.

> "The existence of representative institutions at national level is not sufficient for democracy […] For a democratic society to exist, it is necessary for a participatory society to exist, i.e. a society where all political systems have been democratized and socialization through participation can take place in all areas. The most important area is industry […]" (Pateman, 1970, p. 42-43).

Hence, according to Pateman (1970) democracy requires that all social and economical institutions are democratized by allowing for citizens' active participation.

"Industrial democracy" can positively be understood as democracy applied to industry. The label "industrial" is perhaps too restrictive, since "industrial democracy" also

applies to non-industrial economical activity, e.g. provision of services and public administration (Levin *et al.*, 2012). To include also non-industrial sectors, the terms "workplace democracy" or "democracy at work" (Emery and Thorsrud, 1976) are perhaps better. But since this thesis is about industry anyway, the conventional concept, industrial democracy, will suffice.

If we shift the level of analysis from the state to the company by substituting "workers" for "people", industrial democracy would intuitively mean "rule by the workers". This notion of industrial democracy is fundamentally problematic since it contradicts some of the basic institutions of a capitalist economy, such as private ownership of the means of production, and owners' prerogative in company management (Williamson, 1985). In a capitalist economy the right to manage resides with the entrepreneur (owner/manager) or shareholders. Furthermore, this right to manage can be bought and sold through financial transactions. Even if we apply the minimalist democracy definition of Schumpeter, implying that workers have the right to elect their managers, industrial democracy would be close to a contradiction in terms. If we apply even stronger criteria for workers' large-scale participation (Pateman, 1970), industrial democracy is easily associated with anti-capitalism (Greenberg, 1975). In principle, capitalists and workers are free to contract any form of management they desire, including democratic ones, but as emphasized by Jensen and Meckling (1979), capitalists have never voluntarily given up their managerial prerogatives on any significant scale.

Rather than defining industrial democracy positively as an application of general criteria of democracy to industry, industrial democracy can be understood negatively as limitations to owners' managerial prerogatives.

> "The movement toward so-called "industrial democracy" is currently receiving much attention in Western Europe. Legal developments there are institutionalizing it in two forms. First, firms are being required to seat voting labor representatives on their policymaking boards [...]. Second, various new legal constraints are being imposed on the rights of management and owners of firms to make decisions, for example, on their right to dismiss or lay off employees, their right to modify production processes, and their right to close plants. These "management rights" which are being constrained (as well as the right to organize corporations without labor representation on the boards of directors) are all specific examples of the general right of individuals to voluntarily enter into contracts." (Jensen and Meckling, 1979, p. 472)

A negative definition implies that industrial democracy can take many concrete forms. The scope of company decisions under democratic control may vary, along with the rules for decision making. A negative definition does not state any absolute criteria for when a company can be judged as democratic. Industrial democracy is thus a matter of degree (Levin *et al.*, 2012).

Such a conceptualization of industrial democracy brings to the forefront the issue of *worker participation*. Worker participation implies that "the employer, voluntarily or by compulsion, yields power of decision to the employees or their representatives" (Busck *et al.*, 2010, p. 288). In the technically oriented literature, particularly within human resource management (HRM), worker participation is seen as a managerial tool to improve efficiency (Wilkinson and Fay, 2011). It is conventionally argued that participation boosts individual motivation and commitment, reduces workplace anomie and elicits workers' suggestions for improved practice (Wilkinson, 1998; Wilton, 2011). In this sense, expanded decision-making power is a "gift" from management to the workers (Greenberg, 1975). In the context of industrial democracy, worker participation acquires a different meaning (Wilkinson and Fay, 2011). Rather than a gift, participation is seen as a *right*. This notion of rights echoes Pateman (1970); by virtue of democratic citizenship, workers have the right to influence company management. In a similar vein, reformists within the labour movement have argued that organized labour should have a legitimate voice in company decision making through collective bargaining, worker councils, worker board representation or other representative arrangements (Wilkinson and Fay, 2011).

Common to these rights-based notions of participation is the demand that participation should be substantive; that is, it should imply real transfer of authority to the workers or their representatives (Foley and Polanyi, 2006). According to its advocates, industrial democracy implies redistribution of power within the company and the transformation of existing patterns of authority (Emery, 1980; Qvale, 1976). What is elsewhere labelled "weak forms of participation" or "employee voice" – e.g. information sharing and consultation – is seen as a necessary condition for participation, but not by itself constituent of participation in a substantive sense.

Worker participation can take many concrete forms. Several schemas of classification have been proposed (Black and Gregersen, 1997; Cotton *et al.*, 1988; Dachler and Wilpert, 1978; Poole, 1975). A widely used distinction is that of indirect or representative participation versus direct participation (Busck *et al.*, 2010; Kim *et al.*, 2010). Representative participation means that workers are represented in committees and other decision-making bodies either by their labour union(s) or other elected representatives. This form of participation is usually governed by collective agreements

and/or national labour legislation. Direct participation refers to the involvement of individuals or work groups in decisions about job design, task execution and problem solving. This form of participation is usually concerned with the immediate work environment. It is seldom regulated by law, but may be the object of local collective agreements.

As we have seen, industrial democracy is advocated on the grounds that it realizes the democratic rights of individual workers or collective labour. It is also thought to advance democracy in society at large (Pateman, 1970). In the literature industrial democracy is also advocated through a set of auxiliary arguments about its supposed benefits to workers and the company (Foley and Polanyi, 2006). There are essentially three arguments: one economic, one humanistic and one social. *The economic argument* is basically that democratic decision making within the company is good for conventional business goals such as productivity and profit. By involving workers in decision making, the human resource is better utilized. Operationally, participation allows for decentralized decision making, which leads to simplified control and coordination of technical processes (Delarue *et al.*, 2008). Furthermore, workers' experiences and suggestions are valuable input for organizational learning, including refinements of products and process (Bessant and Francis, 1999; Gustavsen, 2007). According to *the humanistic argument*, industrial democracy leads to jobs and workplaces which are more "human fulfilling". Karasek (1979) famously found that decision latitude is a key determinant of physical and psychological strain. Organizational psychologists argue that participation in decision making leads to increased job satisfaction (Wagner, 1994). According to Foley and Polanyi (2006) industrial democracy leads to better work-life balance and better employee health. Since these "human" variables are related to motivation and commitment, a humane workplace is also arguably more productive and profitable (Wilton, 2011). Finally, *the social argument* states that industrial democracy reduces social antagonism and conflict. It creates trust among the social partners and enables partnership between management and organized labour (Gustavsen, 2007; Levin *et al.*, 2012). Democratic decision making builds decision legitimacy and eases implementation of organizational changes (Dent and Goldberg, 1999; Toulmin and Gustavsen, 1996).

Arguments in favour of industrial democracy and extensive worker participation are all contested. Politically, industrial democracy has been denounced both from the left and the right. Radical socialists have interpreted industrial democracy as "incorporation approach", by which labour and its organization end up reproducing capitalist hegemony (Burawoy, 1979; Cressey and MacInnes, 1980). Conservatives have argued that workers' right to participation is an undesirable limitation of economic freedom (Jensen and Meckling, 1979). Following Hayek (1944), the expansion of labour legislation and

nationwide agreements between the social partners push towards economical centralization, corporatism and finally serfdom. The substantial claims underlying the economic, humanistic and social arguments have also been challenged theoretically and empirically (e.g. Bacon and Blyton, 2006; Busck *et al.*, 2010; Cotton *et al.*, 1988; Kelly, 2004; Kim *et al.*, 2010; Ramsay *et al.*, 2000; Vidal, 2007a; Wagner, 1994). A critical examination of the arguments in favour of industrial democracy is deferred for later. For now, it is sufficient to notice how industrial democracy is legitimized by a set of right-based, economic, humanist and social arguments. In the next section, I will show how these arguments were used to produce and re-produce a Norwegian notion of industrial democracy.

2.3.2 The historical trajectory

Compared to other west European nations, Norway was industrialized relatively late. With industrialization followed a common pattern of social unrest and at times violent confrontations between employers and organized labour (Levin *et al.*, 2012). In 1899, the Norwegian Confederation of Trade Unions (LO) was established. Employers followed up one year later by establishing the Confederation of Norwegian Business and Industry (NAF, later NHO). In 1935, a historical compromise was established with the *National Main Agreement* between the LO and the NAF. The agreement set boundaries for strikes and national standards for wages, working hours and working conditions. The agreement can be interpreted as a class compromise, where employers accepted organized labour as a legitimate negotiation partner, and organized labour accepted employers' fundamental right to manage. Thereafter, industrial relations in Norway have been characterized by nationwide agreements (Gooderham *et al.*, 2006). The main negotiations about wages and working conditions are conducted nationally for each industrial sector. Local labour unions and business federations are obliged to conform to national agreements.

After the Second World War the Labour Party won majority in parliament on a programme to expand the welfare state within the framework of a coordinated market economy (Gustavsen, 2007). A harmonious and cooperative working life was seen as a means to secure peace and build welfare. In the 1950s, ideas about economic and industrial democracy reached the top of the political agenda. Expanding the influence of organized labour was a core concern for the Labour Party and its close allies in the LO. Rhetorically, the question was asked: "Why should democracy end at the factory gates?" At the same time, labour leaders were concerned about the deteriorating effects of Tayloristic rationalization on the quality of working life (Emery and Thorsrud, 1976). Lessons from the American Human Relations school and the Tavistock Institute in the UK (Trist, 1981)

indicated that there were viable alternatives to the Tayloristic imperative that could both raise productivity and secure decent-quality jobs. As such, the core idea behind industrial democracy was not to overthrow capitalist relations of production, but rather to strengthen labour's participation within a coordinated capitalist framework (Gardell and Gustavsen, 1980).

The Industrial Democracy Programme was launched in 1962 as a joint commitment between the social partners (LO and NAF) supported by the state and working-life researchers (Emery and Thorsrud, 1976). In its first phase, the programme was concerned with labour representation on company boards. Apart from being a goal of its own, board representation was thought to promote more participatory forms of work organization: that is, to create a "forward synergy" of participation (Butler *et al.*, 2013). Researchers evaluated national experiences from state-owned companies and other forms of formal representative arrangements that were at the time practised in the UK, West Germany and Yugoslavia (Thorsrud *et al.*, 1964). The final report concluded that board-level representation in itself was hardly efficacious in advancing industrial democracy. Representatives found it hard to use their influence to advance the interests of labour (Thorsrud *et al.*, 1964, p. 111). In addition, having representatives on the board of directors did not seem to make much difference for the rank-and-file members of the organization (Qvale, 1976, p. 455). The researchers concluded that what was needed in order to advance democracy in the workplace was to transform the ways in which work was organized and managed. Still, in 1973 the Labour Party pressed forward a law that demanded labour representation on boards for companies having more than 30 employees (Levin *et al.*, 2012).

The second part of the Industrial Democracy Programme followed up the conclusions from the first part and turned attention to work organization and micro-level governance. At this level, lack of participation and involvement was most widespread (Emery and Thorsrud, 1976, p. 2). Furthermore, a "reverse synergy" was argued for (Butler *et al.*, 2013), in that direct participation on the shop floor would make the representative structures more efficacious.

> "The bulk of evidence suggested that the more the individual was enabled to exercise control over his task, and to relate his efforts to those of his fellows, the more likely was he to accept a positive commitment to doing a good job. The positive commitment shows in a number of ways, not the least of which is the release of that personal initiative and creativity which is the basis of a democratic climate. Only when these conditions exist could we expect democratic representative structures to be evolved that are appropriate to the very real restraints

> that exist in industry. And only then could we expect these institutions to be used effectively by those whom they are supposed to serve." (Emery and Thorsrud, 1976, p. 11)

To test out these ideas, field experiments with alternative forms of work organization were launched. These were re-designs of work built on the principles of classical socio-technical design (STS) (Cherns, 1976) and in particular the concept of "autonomous work groups" (Cummings, 1978). The theoretical ideas underpinning the experiments will be explained in section 2.3.3 below. In general, the core ideas were to increase the level of worker autonomy and substitute non-hierarchical for hierarchical governance.

The Industrial Democracy Programme had a lasting impact on the Norwegian working life, influencing labour legislation, the relationship between unions and management, work organization and normative ideals of "good work". In 1977, The Working Environment Act was passed. The law demands that jobs are designed to allow for worker discretion and intrinsic motivational factors. In 1982 the Main Agreement between the LO and the NHO was renegotiated. An amendment was added in which the social partners are obliged to cooperate on issues related to rationalization, redundancies and organizational development. On the national level, a standing committee devoted to supporting local union–management partnerships, the HABUT, was established (Levin *et al.*, 2012, p. 49). At the company level, union–management partnerships were widely institutionalized. Apart from board representation and collective bargaining, labour representatives are involved in joint union–management committees working with safety, health and environment (HSE) and organizational development. In addition, labour unions and management tend to work closely together on a more informal basis (Rolfsen, 2011; Øyum *et al.*, 2010). Øyum *et al.* (2010) refer to these practices as "unregulated representative participation". In comparison to other industrialized countries, in particular the UK and the US, industrial relations in Norway benefit from high degrees of information sharing, cooperation and trust (Gustavsen, 2007; Levin *et al.*, 2012).

The experimental work designs associated with the second phase of the Industrial Democracy Programme had only limited diffusion to industry at large (Qvale, 1976). They did, however, inform similar redesign experiments elsewhere in Scandinavia, Germany and the US (Busck *et al.*, 2010; Pasmore, 1995), and in particular the Volvo experiments with "human-centred production" in the early 1990s (Sandberg, 1995). In Scandinavian working-life discourse the failure of widespread adoption of socio-technical design is conventionally attributed to resistance from management and the resilience of bureaucratic forms of organization (Qvale, 1976; Thorsrud, 1977). Another explanation offered by Greenwood and Levin (2007) is that the more radical ideas of worker autonomy and

participation became co-opted and diluted by modern HRM notions of empowerment. Despite limited direct diffusion of socio-technical design, the core ideas have remained highly influential as a normative notion of "good work" (Johansson and Abrahamsson, 2009). This notion has been particularly emphasized within the labour movement, but is also generally respected by employers. The state has continued to sponsor research programmes whose goal is to establish and promote union–management partnerships and good work (Gustavsen, 1992). Survey research indicates that worker autonomy and group-based organization forms are more prevalent in Norway and Scandinavia than elsewhere (Gallie, 2003; Gill and Krieger, 1999; Nijholt and Benders, 2010).

During the past few decades, both agreements and labour legislation have been revised, but the core elements are retained. Recently, the principle of broad participation – that is, the combination of representative and direct participation (Toulmin and Gustavsen, 1996) – was confirmed as national labour policy (Ministry of Labour, 2010). Union coverage remains high, at least in the industrial sectors. On the shop floor, jobs tend to have decent quality. This can be attributed partly to democratic ideas, but also to the fact that high wage levels have more or less eliminated labour-intensive production.

This section has traced the historical development of industrial democracy in Norway. Developments have taken place along four dimensions: 1) labour and industry legislation; 2) the relationship between organized labour and employers at the national and local level; 3) work design; and 4) normative notions of partnership and good work. The next section further discusses work design.

2.3.3 Classical socio-technical design

This section elaborates on the theoretical ideas which underpinned the field experiments of the second phase of the Industrial Democracy Programme. As we have seen, the goal of these experiments was to increase the level of direct participation, and thereby increase economic performance, job satisfaction and the efficacy of representative participation. The redesign of work built on the principles of classical socio-technical design (STS) (Cherns, 1976; Van Eijnatten, 1993).

Classical socio-technical theory made a fundamental argument for *organizational choice* (Trist, 1981). Neither technological development, nor economic dynamics determine which organizational forms are viable (Trist and Bamforth, 1951). Hence, organizational design could balance the need for productivity, worker participation and the quality of

working life (QWL). According to Emery (1959) the work system could be modelled as a combination of a technical and a social subsystem. Each of these systems had a set of "requirements" or "needs" necessary for its reproduction and development. The requirements of the technical subsystem are the classical concerns of operations management, i.e. productivity, production layout, capacity utilization, maintenance, logistics and so on. The requirements of the social subsystem are a set of "psychological job requirements" at the individual and group level. Emery and Thorsrud (1976, p. 15) state the following psychological job requirements:

1. "The need for the content of the job to be reasonably demanding (challenging) in terms other than sheer endurance and yet providing some variety (not necessarily novelty).
2. The need for being able to learn on the job and go on learning (which implies known and appropriate standards and knowledge of results). Again this is a question of neither too much or too little.
3. The need for some area of decision-making that the individual can call his own.
4. The need for some minimal degree of helpfulness and recognition in the workplace.
5. The need to be able to relate what he does and what he produces to his social life.
6. The need to feel that the job leads to some sort of desirable future."

According to Emery (1959) the goal of organization design is to find a *best match* or to *jointly optimize* the requirements of the technical and social subsystems. Emery argued that Fordism, with its single emphasis on optimizing the technological subsystem, is dysfunctional for both productivity and job satisfaction. In STS, the main instrument to achieve joint optimization was to substantially increase the level of worker *autonomy*. Increased autonomy was assumed to increase productivity, increase job satisfaction and enable organizational learning. Autonomy literally means "independence" or "freedom of choice" (Adler, 2007; Klein, 1991). As an individual-level construct, autonomy is usually conceptualized according to Hackman and Oldham's (1980, p. 79) definition:

> "[Autonomy is] the degree to which the job provides substantial freedom, independence, and discretion to the individual in scheduling the work and determining the procedure to be used in carrying it out".

As a group-level construct, the defining properties of freedom, independence and discretion apply to the work group. Summing up the classical socio-technical literature, Cummings (1978, p. 625) proposes the following conceptualization:

> "Variously referred to as "autonomous," or "composite", or "self-managing" work groups, these work designs generally include: a relatively whole task; members who each possess a variety of skills relevant to the group task; worker discretion over such decisions as methods of work, task schedules, and assignment of members to different tasks; and compensation and feedback about performance for the group as a whole".

"Whole tasks" are antithetical to Tayloristic prescriptions for short cycle times and a detailed technical division of labour. Whole tasks also indicate that indirect activities (preparation, machine setup, maintenance, handling of deviances, etc.) are integrated into the groups' area of responsibility. The groups should preferably have all the necessary tools, skills and competencies necessary for task completion. To further clarify the autonomy concept, three issues will be explored: first, the relationship between individual autonomy and group autonomy; second, autonomy as a matter of degree versus autonomy as a property; third, the relationship between autonomy and direct participation.

First, group autonomy does not necessarily imply individual autonomy (Benders and Van Hootegem, 1999). Group autonomy describes the relationship between the group and its environment, not the group's internal decision-making process. Through some method of decision making, an autonomous group may decide on standards or procedures that limit individual autonomy. A case in point is Barker's (1993) case study, where autonomous groups developed quite rigid expectations and rules for individual behaviour. Still, group autonomy may be combined with extensive individual autonomy when the group's decisions are delegated to individuals. Since both individual autonomy and group autonomy are predictors of job satisfaction and commitment (Hackman and Oldham, 1980; Karasek, 1979), STS typically sought to combine them. To make group decision making the responsibility of a single, dedicated group leader contradicts the general principles of STS (Ingvaldsen and Rolfsen, 2012).

Second, autonomy is always a matter of degree. Since work is an interdependent collective activity, freedom, independence and discretion will be partial. This is captured by socio-technical authors' reference to "*semi*-autonomous groups" (e.g. Emery and Thorsrud, 1976). The level of autonomy can be assessed based on the individual's or the group's influence over key work-related issues such as working methods, production goals, team membership, time flexibility, job rotation, quality control, machine changeovers and selection of group leader (if applicable) (Murakami, 1997; Rolfsen and Langeland, 2012). It follows that the individual or the group may be highly autonomous with respect to some issues, and less autonomous with respect to others. This notion of a multi-dimensional continuum of autonomy complicates the use of the dichotomous labels "autonomous" and

"non-autonomous". A Tayloristic work design implies non-autonomy, since the individuals and groups would score low on all dimensions proposed by Murakami (1997) or Rolfsen and Langeland (2012). But where do we draw the line between "semi-autonomous" in a general sense and "autonomous" in a stronger sense? According to Hackman and Oldham's (1980) definition the criteria is that freedom, interdependence and discretion are "substantial". According to Murakami (1997, p. 750) decision making is "truly autonomous" when "the groups reach decisions with no input from management". Murakami's emphasis on workers' independence from management is somewhat imprecise, since earlier in the paper he describes autonomy as the "'relative' lack of dependence" (p. 749). In a general sense "lack of dependence" also applies to the relationship between different groups, and between the groups and non-managerial external parties such as industrial engineering (Adler, 2007). For instance, tight sequential dependencies between groups would imply less "time flexibility", which is one of the dimensions used to assess the degree of autonomy. In the following, the label "autonomous" will be reserved for individuals or groups that are largely independent in a technical sense and can make decisions without input or approval from management or other external parties. Consistent with Hackman and Oldham's (1980) definition and the widely cited papers of Klein (1991) and de Treville and Antonakis (2006), I focus on scheduling and work methods as the core work-related decisions. That is not to say that other dimensions are not important. Analytical precision requires simplification, and given traditional and contemporary conceptualizations of autonomy, scheduling and work methods are the most central aspects. Groups that have some influence over these issues but require input or approval from external parties (management, industrial engineers, or other groups) will be described as semi-autonomous.

Third, it follows that autonomy implies direct participation, but not necessarily vice versa. Recall that participation means that employees are assigned decision-making powers (Busck *et al.*, 2010). With respect to shop-floor decision making, autonomy can be understood as participation in a strong sense; decisions about how work is performed is to a very large extent, if not completely, delegated to work groups. When individuals or groups can influence decisions but not make them unilaterally, e.g. in the case of worker–management or inter-group co-decision making, there is participation but not autonomy.[3]

[3] An example will illustrate how I conceptualize autonomy and participation in relation to different levels of analysis. Imagine a work system that consists of two groups of workers. For the sake of simplicity, imagine that the only relevant decisions are those of work methods. If each worker can choose his own work methods, each worker is autonomous. If the group collectively decides on the work methods, then the individuals are not autonomous, but the groups are. If the individual has influence over how the collectively decided work methods are designed, there is individual-level participation. The same line of reasoning applies to the inter-

Since autonomous decision making is concerned with the immediate work environment, it has no necessary relationship to representative participation, whose scope is typically higher-level decision making (Kim *et al.*, 2010, p. 378).

The cornerstone of classical socio-technical design is the autonomous work group. In the practical redesign of work systems, work groups seldom became more than semi-autonomous (Emery and Thorsrud, 1976; Kelly, 1978; Trist, 1981). However, autonomy in a strong sense remains the normative ideal, and the autonomous group remains the reference point for a *theoretical* treatment of the subject matter.

Designing work systems for autonomous work groups has widespread consequences for technical work design and work-system governance. Technically, tasks have to be distributed in ways that allow for group autonomy. First, the technical dependencies between the groups should be kept to a minimum, so that the groups enjoy discretion within stable boundary conditions. This is achieved by parallel production flows or buffering of sequential flows (De Sitter *et al.*, 1997). Second, cycle times have to be long so that the groups can balance their internal workload (Van Hootegem *et al.*, 2004). Third, work methods should be specified at a minimum (Cherns, 1976). The Tayloristic imperative of standardizing the "one best way" of completing a task is rejected on the grounds that it limits local decision latitude.

Regarding governance, the proponents of STS were highly critical to traditional patterns of authority and the role of industrial engineering. Particularly the supervisor/foreman role was the object of harsh criticism. According to Emery (1980) the prevailing "master-servant" relations between supervisors and workers were the main obstacle to advancing participatory governance (see also Ingvaldsen and Rolfsen, 2012). Herbst (1976) prescribed that hierarchical forms of control and coordination should be replaced by mutual adjustment in network-based structures. Furthermore, Elden (1986) argued that overall work design and large-scale restructuring should be the object of broad participative processes in which labour and management enter into a balanced dialogue. Hence, the power of industrial engineering to prescribe production layout and work procedures should be limited.

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group level. If the two groups must agree on common work methods, there is no longer group autonomy. If each group has influence over the collective inter-group work methods, there is group-level participation.

2.3.4 Ideal-type democratic work system

In table 1 the ideal-type democratic work system is summarized. The content of the technical and governance dimensions builds on the presentation of classical socio-technical design in section 2.3.3. The content of the normative dimension and the support systems builds on the presentation in section 2.3.2. The model is internally consistent, and reflects the fundamental idea that there is synergy of labour-union-based representative participation and workers' direct participation on the shop floor. Direct participation raises democratic awareness, and thereby supports the functioning of representative institutions. By participating in organization design, worker representatives can raise the level of direct participation and increase the quality of working life. This emphasis on participatory synergies and labour unions' role in supporting direct participation is a distinctive Scandinavian trait (Gustavsen, 2007). In the international literature, direct participation and union-based representative participation are often presented as substitutes, not complements (Butler *et al.*, 2013). Direct participation is achieved through autonomous work. Along the technical dimension, autonomy requires whole tasks and inter-group independence (parallelization, buffering). Along the governance dimension, autonomy implies extensive delegation of decision-making powers and non-hierarchical control and coordination.

To complete the analysis with respect to the Team Dimensions Model, some further aspects will be elaborated on here. The nature of small-scale organizational learning and continuous improvement is a sub-category of the technical dimension. The form of learning associated with autonomous groups can be described as "craft based". This assertion will be explained and justified in section 6.2. The core idea behind this form of learning is that the integration of mental and manual labour along with minimal external specification of work methods enable workers to reflect in and on their actions (Schön, 1983) and thereby improve work routines. Two of the support systems, "training and development" and "selection, reward and appraisal", deal with HRM issues. As we have seen, labour legislation demands that jobs have intrinsic learning opportunities. Permanent employment reflects the strong position of independent labour unions. In Norway, labour regulations have been advanced to prevent temporary (foreign) workers from undermining national wage levels and working conditions. Wage negotiations follow a highly centralized pattern, in which the national labour and employer confederations are the key actors. In companies, pay is usually based on competence and seniority.

Ideal types do not lay claim to represent the actual work system. They emphasize characteristic features and overstate internal consistency. The democratic work system reflects an ideal, to which the Industrial Democracy Programme aspired. Still, this ideal and its associated ideas have had a strong practical impact. Actual work systems found in

contemporary Norwegian industry may more or less resemble the democratic ideal type. Those arrangements prescribed by law or national agreements between the employer and labour confederations are found everywhere. These primarily relate to the structure of representative participation. Normative ideals of social partnership and good work are shared across companies in the relevant sectors. Of course, some employers may identify more strongly with managerialism (Sørhaug, 1996), and some local unions may adopt a more adversary, arms-length approach to management. The greatest variations in work systems are found along the technical and governance dimensions. Here, the nature of the technological process is an important contingency. While "autonomy" or "self-management" is often the stated ideal, the extent of delegated powers may vary considerably. Some organizations have adopted work designs close to the prescriptions of classical socio-technical design (e.g. Ingvaldsen and Rolfsen, 2012), while other organizations limit group autonomy to certain aspects such as choice of work methods or internal task allocation (Rolfsen *et al.*, 2012). In some cases autonomy may apply primarily to individuals and not to groups. Despite variations, the notion that work systems in contemporary Norwegian industry resemble the democratic ideal type can be defended on the grounds that rigid applications of Taylorism are highly uncommon. Work tends not to be fragmented and standardized in detail, and supervisory control tends to be limited and normatively problematic. Compared to other countries, the Norwegian working life is characterized by group-based organization and autonomy (Gallie, 2003; Gill and Krieger, 1999; Nijholt and Benders, 2010).

Main dimensions	
Technical	Whole tasks, long cycle times Integration of indirect tasks Inter-group independence Craft form of learning
Governance	Extensive delegation of decision-making powers Non-hierarchical control and coordination Broad spans of control
Normative	"Good work" Social partnership, balance of power Democratic values
Support systems	
Whole-organization decision-making process	Labour representation on company boards Labour representation in committees
Training and development	Jobs are designed to allow for learning Long cycle times imply task variety
Industrial relations	All workers organized in a single labour union Collective bargaining Union–management cooperation in rationalization and organization development Unregulated representative participation
Selection, reward and appraisal	Permanent employment Seniority and competence-based pay

Table 1: Ideal-type democratic work system

2.4 Lean-production work systems

The presentation of the lean-production work system will proceed in three steps. First (section 2.4.1), the historical background for the current popularity of lean production is briefly outlined. Second (section 2.4.2), definitional and conceptual issues are clarified. Third (section 2.4.3), the Team Dimension Model is used to describe the ideal-type work-system configuration. The preceding presentation of the democratic work system paid close attention to the relationship between national legislation, labour institutions and work-system configuration. The following presentation pays less attention to these contextual issues. The thesis is not so much about lean production in Japan, but rather its transfer to the Norwegian working life. Hence, the presentation privileges those aspects of the work system which are likely to be adopted by Norwegian companies: that is, primarily the technical labour process.

2.4.1 Historical background

The term *lean production* was coined by the International Motor Vehicle Programme (IMVP), which studied the competitive situation in the automotive sector worldwide (Krafcik, 1988; Womack *et al.*, 1990). Lean production was presented as a systematization of the Toyota Production System (TPS) developed by Toyota Motor Company in the 1930s and continuously refined thereafter (Fujimoto, 1999; Ohno, 1988). IMVP researchers boldly concluded that lean production "would become the standard production system of the twenty-first century", supplanting all earlier forms of large-scale production (Womack *et al.*, 1990, p. 285).

The IMVP had started at MIT in 1979 to research the future of automotive manufacturing (Holweg, 2007). Ever since the advent of Ford's assembly line and the mass production of vehicles, the automotive industry had remained one of the most important sectors in the US economy. In the 1970s, the "big three" of US automotive manufacturing (GM, Ford and Chrysler) had lost marked shares both domestically and internationally. The second oil crisis had reduced demand for the typical large-engine American car. Furthermore, Japanese cars had gained a reputation of having both lower costs and higher quality than American alternatives. The threat of Japanese competition was by some commentators described as "an economic Pearl Harbor" (Holweg, 2007, p. 423).

At that time, the competitive advantage of Japanese automotive manufacturers was popularly attributed to superior technology, macro-economical factors (including trade policies and Yen/Dollar exchange rates) or Japanese cultural traits (Holweg, 2007, p. 424). Based on a large-scale assembly-plant benchmarking study, the IMVP researchers concluded differently: the competitive advantage of Japanese automobile manufacturers was explained by their superior way of organizing supplier relations, product development and operations. The comparative study showed that Japanese manufacturers, and Toyota in particular, consistently had higher productivity and higher product quality than their American and European counterparts (Krafcik, 1988; Womack *et al.*, 1990). The success of transplants – i.e. plants run by Japanese companies outside Japan – demonstrated that macro-economical or cultural factors were of minor importance. If managed "Japanese style", an US plant could be as productive as a Japanese plant (Adler, 1993a; Krafcik, 1988). Automation and use of computers were also shown not to be an explanation, since Japanese manufacturers typically invested less in automation than their European and American competitors (Ohno, 1988; Womack *et al.*, 1990).

The results from the first IMVP benchmarking study were published in the now-classic book *The Machine that Changed the World* (Womack *et al.*, 1990). The book also

contained practical advice on how the superior organization of Japanese companies could be mimicked and transferred to the West. Written for a non-academic audience, the book quickly gained great popularity. The book's central narrative is one of historical development: how mass production had supplanted craft production in the early 1900s, and how lean production in the future would supplant mass production. Apart from the comparative performance analysis, the book had little new to say about how the Japanese ran their factories. The core elements of the Toyota Production System, such as just-in-time and continuous improvement, had been documented in earlier research (see Benders and Van Hootegem, 2000; Holweg, 2007 for lists of early studies), but had failed to reach widespread attention. Conceptually, the main contribution of Womack *et al.* (1990) was to integrate these practices and tools under a common concept: lean production.

During the past few decades the "lean" concept has been generalized, and currently applies far beyond large-scale automotive manufacturing (Hines *et al.*, 2004). In their follow-up to the first book, Womack and Jones (1996) generalized "lean production" into "lean thinking", and proposed a set of sector-independent management principles. Other works make reference to lean as an overall "philosophy" for company management, in addition to the more operational principles and practices (Liker, 2004; Liker and Hoseus, 2008; Shah and Ward, 2007). As a consequence of generalization and popularity, lean has become somewhat of a management fashion (Benders and Van Bijsterveld, 2000), often with an imprecise content. First, some of the lean principles, such as "creating customer value" and "eliminating wasteful activities", are so generic that they can be equated with rational management in general. Second, in practice lean principles often tend to merge with other, often unrelated, rationalization principles, such as de-layering, business-process re-engineering, or even socio-technical principles such as autonomous work groups (Appelbaum and Batt, 1993; Benders and Van Bijsterveld, 2000; Benders and Van Hootegem, 1999).

The actual popularity of lean production in industry is hard to assess directly, due to a lack of large-scale survey evidence and definitional ambiguity. According to Shah and Ward (2003) little empirical evidence on the actual prevalence of lean production has been published. They refer to White et al. (1999) who found that, in a fairly representative sample of US manufacturers, diverse lean practices had a frequency of implementation that exceeded 50 per cent, with some practices even above 90 per cent. A more recent review on the relationship between just-in-time manufacturing and performance points to difficulties in measuring implementation, but is still confident that just-in-time "has remained popular in practice and is still widely utilized around the globe" (Mackelprang and Nair, 2010, p. 282). While some commentators argue that lean production is the dominant form of

contemporary manufacturing (e.g. Vidal, 2011), other commentators point to limited diffusion across sectors and regions (e.g. Cooney, 2002). Research on diffusion has documented that lean-production practices are often selectively adopted and co-exist with other organizational principles and generic models (Boyer, 1998; Durand *et al.*, 1999). Furthermore, some lean implementations may be adoptions in name only (Ansari *et al.*, 2010). Despite these reservations, the popularity of lean production among industrial companies is supported by a set of proxies. First, lean production remains an important topic within academic research, both within organization theory and operations management. A high number of papers on lean-related issues are published each year, many of those case studies of implementation. Second, as argued by New (2007, p. 3546), Toyota continues to be perceived as the market leader within automotive manufacturing, and "increasingly, managers in domains beyond manufacturing have come to understand their operations in the terms of the TPS". This notion of Toyota as the creator of best practice is supported by Netland's (2012) survey of the formal production systems of 30 multinational (mostly European-based) industrial companies. The stated principles of these companies' production systems are strikingly similar and all represent variations of lean principles found in the mainstream literature (e.g. Liker, 2004). In addition, differences between industrial sectors are low. Lean production applies to aerospace, process industry, consumer electronics, equipment manufacturing as well as the manufacture of cars and heavy vehicles. Particularly relevant to this thesis is the diffusion and popularity of lean production in Norway. A treatment of this issue is deferred until chapter 3.

This section has briefly outlined how lean production was "discovered" by the IMVP study and later popularized as an organizational blueprint. In the next section, the content of lean production is clarified.

2.4.2 Lean production: JIT, SOP, TPM and CI

As argued by Shah and Ward (2007), debates about lean production are plagued with conceptual ambiguity and lack of shared definitions. Attempts to define lean production run into a set of difficulties. First, the terms "Toyota Production System" (TPS) and "lean production" are often used interchangeably. Does this imply that Toyota is the ultimate source of "correct" lean? If so, is that the classical TPS of Ohno (1988) or Toyota's continuously evolving practices (Pil and Fujimoto, 2007)? Second, should lean be perceived as a set of operational tools and techniques or rather as a set of generic principles or even a "philosophy"? Third, and related, what is the true scope of lean production; does it apply holistically to the company's organization or rather to a sub-set of functions and

processes? Womack *et al.*'s (1990) description of lean production as a "machine" emphasizes the technical nature of the concept. Hence, it would be reasonable to locate lean production along the technical dimension in Thompson and Wallace's (1996) framework. On the other hand, lean production (in a technical sense) has been shown to be supported by a set of specific HRM and governance practices (Adler, 1993a; MacDuffie, 1995; Winfield, 1994). These systemic relations justify a broader conceptualization.

This thesis will not attempt to resolve these conceptual difficulties in general. Rather, a conceptualization of lean production is adopted which is suitable to the overall topic about lean production in Norwegian industry. This delimitation has two main implications. First, the focus is on industrial work systems. Non-industrial lean, such as lean health care, lean services or lean construction, is therefore beyond the scope of this thesis (see Suárez-Barraza *et al.*, 2012, for a recent review). Furthermore, this thesis is concerned with the operational aspects of lean, not other functions of a larger manufacturing system such as product development or supply-chain management (see Fujimoto, 1999, on these additional functions). Second, this thesis focuses on those aspects of lean production which are likely to be adopted by industrial companies in Norway. Such a focus de-couples lean production from the economic and social institutions of Japan. While these institutions may be explanatory as to why lean production was developed in Japan and not elsewhere (Berggren, 1993; Holweg, 2007), the resulting practices, which will be of interest here, do not presuppose these institutions.

Based on a literature review, Shah and Ward (2007, p. 791) argue that the essence of lean production is to "eliminate waste […] by reducing variability." "Waste" is here understood as all activities and arrangements that incur costs without adding value for the customer (Ohno, 1988). As such, lean production is firmly grounded in a technical-economical rationality of productivity and efficiency. Calling for the elimination of waste is hardly a distinct quality of lean production. Scientific management also targeted the waste of soldiering and inefficient work methods (Taylor, 1967). More distinct is the desire to reduce variability: that is, to remove uncertainties and deviances so that the labour process becomes, as far as possible, predictable. Elimination of variability is dependent on the extensive use of process controls (Klein, 1991). The fundamental idea underlying lean production is that waste elimination (i.e. improved efficiency) depends on variability reduction. Only a process that is predictable and controllable can be made the object of refinements (Dean and Bowen, 1994). Unless work tasks are standardized, improved methods of working can hardly be identified and uniformly implemented (Adler and Cole, 1993). Unless product flow is balanced according to a pre-defined pattern, bottlenecks cannot be identified (Ohno, 1988).

Interpreted this way, the main innovation of Toyota and other Japanese automotive manufacturers was to devise a set of process controls and related practices that reduced variability and thereby supported waste elimination. These core lean-production practices can be summarized under the headings of just-in time (JIT), standard operating procedures (SOP), total productive maintenance (TPM) and continuous improvement (CI).

JIT was initially perceived as the defining quality of Toyota's production system, echoed in IMVP researchers' initial description of lean production as "fragile production" (Krafcik, 1988). JIT implies the elimination of intermediate stock or buffers. Hence, activities that are sequentially dependent become tightly coupled. Unless materials to be processed arrive at the prescribed time with the prescribed quality, production will in principle stop. Therefore, it is "fragile". JIT eliminates the waste of inventory costs, but as emphasized by Fujimoto (1999) its implications are far reaching. JIT immediately reveals production problems and unbalanced workloads, and thereby triggers improvement activity. As a consequence of tight coupling, sequential tasks need to be synchronized (i.e. be of equal length). In order to achieve synchronization and identify the most efficient ways of performing tasks, tasks are carefully analyzed and standardized (Adler, 1993b; Ohno, 1988). The best way of performing a task is explicated in a standard operating procedure (SOP).

Another group of lean-production practices deals with equipment management. These are referred to as Total Productive Maintenance (TPM) (Shah and Ward, 2007). TPM emphasizes general housekeeping and preventive maintenance so that tools and machinery are available when needed. In practice this means standardization of work-station layout (placement of tools, etc.) and standard procedures for periodical maintenance (cleaning, oil shifts, etc.). The methodology of SMED (Single Minute Exchange of Die) aims to reduce machine setup times. Quick changeovers enable the production line to respond efficiently to actual demand. Thereby lot sizes can be kept small, so that stocking of semi-finished and finished products is avoided (Ohno, 1988).

Continuous improvement (CI) indicates the continuous effort to improve work practices (Anand *et al.*, 2009). JIT logistics make production problems and deviances visible. Workers and supervisors are responsible for resolving these problems and preventing them from happening again. Improvement activity may also be triggered after suggestions from employees or from cost-cutting targets set by higher management. The distinctive quality of improvement activities under lean production is its continuous and systematic character (MacDuffie, 1997; Spear and Bowen, 1999). Continuity is guaranteed through two arrangements. First, continuous improvement is defined as a key responsibility of supervisors, who are obliged to initiate and follow up these activities (Fujimoto, 1999;

Ingvaldsen and Benders, 2013). Second, permanent off-line groups of supervisors and workers meet regularly in order to resolve recurring production problems and come up with improvement suggestions (Cutcher-Gershenfeld *et al.*, 1994). Formal quality systems based on key performance indicators (KPIs) and statistical process control (SPC) keep track of deviances. These are systematically analyzed through formal problem-solving methodologies, such as route-cause analysis (MacDuffie, 1997). The output of improvement activities is revisions of standards governing task execution and maintenance. In order to improve standards, time and motion studies may be applied (Adler, 1993b). To capture this combination of standardization and improvement, Adler (1993a) refers to the lean-production system as a *learning bureaucracy*.

For the purpose of this thesis, lean production can be understood as an approach to production management that seeks to eliminate waste by reducing variability in operations. The core lean practices have been summarized as just-in-time (JIT), standard operating procedures (SOP), total productive maintenance (TPM) and continuous improvement (CI). These practices are mutually supportive, and together produce system-wide effects (Shah and Ward, 2007). The next section proceeds to explore the ideal-type work system under lean production.

2.4.3 Ideal-type lean-production work system

In table 2 the ideal-type work system under lean production is summarized. Apart from conforming to the principles of lean production outlined above, the presentation of the work system builds on idealized descriptions of the Toyota Production System (Fujimoto, 1999; Womack *et al.*, 1990). As with the ideal-type democratic work system, characteristic features and systemic consistency are emphasized. Empirical research has documented that concrete implementations of lean production seldom fully resemble this ideal type. Implantations tend to be partial, and the system elements may be poorly aligned (Durand *et al.*, 1999; Pardi, 2005; Vallas, 2003b; Vidal, 2007a).

Technically, the just-in-time labour process is characterized by a detailed division of labour. Cycle times are short and work remains machine paced (Van Hootegem *et al.*, 2004). Task execution is governed by SOPs, from which workers are not allowed to depart. Autonomy, in a socio-technical sense, does not apply because of standardization and the tight coupling of sequentially dependent activities (de Treville and Antonakis, 2006). However, the technical work design departs from Taylorism in three important respects. First, job rotation is mandatory, so that each worker performs several (short-cycled) tasks.

Job rotation leads to functional flexibility and makes the system more robust in the face of staffing disturbances. To support flexibility, there are few job classifications for blue-collar workers. Second, indirect tasks, such as machine changeovers and routine maintenance, are integrated into the workers' area of responsibility. Specialist personnel are only called upon to perform non-routine tasks. Third, workers participate in off-line groups devoted to continuous improvement. Through participating in these groups workers have influence over work standards, although changes to routines must be approved by supervisors.

On the issue of governance, commentators disagree. While some argue that lean production implies the elimination of supervisory positions and extensive delegation of decision-making powers to workers (e.g. Karlsson and Åhlström, 1996; Olivella *et al.*, 2008), Ingvaldsen and Benders (2013) find that the supervisory hierarchy of the TPS is characterized by narrow spans of control and powerful supervisory positions. Typically, there is one team leader for each team of five workers and one group leader/foreman for every third team. Supervisors are appointed by higher-level managers and workers have no influence over who is appointed. For a full description of the supervisory structure and its functions, see the Ingvaldsen and Benders (2013) paper, which is a part of this thesis.

Normatively, lean production is associated with corporate socialization (Findlay *et al.*, 2000; Graham, 1995): that is, efforts to make workers identify with management's prescribed values. Arguably, when the production process is fragile and improvement activity requires workers' input, it becomes increasingly important to extract workers' consent and commitment (Sewell and Wilkinson, 1992; Vallas, 2003a). Ohno (1988) emphasizes the importance of "harmony" and cooperative relations between workers and managers. Notions of teamwork and quality, common to mainstream descriptions of Toyota culture (e.g. Liker and Hoseus, 2008; Womack *et al.*, 1990), may discursively align the interests of workers with those of management (Barker, 1993; Casey, 1999). The typical employment relationship also contributes to creating consent. In Japan, Toyota has been known to practise life-long employment (Morris *et al.*, 2006). At least decent job security seems necessarily to prevent continuous improvement from becoming self-rationalization leading to redundancies (Bacon and Blyton, 2006).

Although Japanese managers are known to consult workers and build consent (Benders *et al.*, 2000), there are few formal arrangements that limit hierarchical authority. Workers' formal participation is restricted to shop-floor problem solving. The whole-organization decision-making process can therefore be described as autocratic. A characteristic feature of the wider power distribution is the power of shop-floor supervisors vis-à-vis industrial engineering (Fujimoto, 1999; Lowe, 1993). According to Fujimoto

(1999, p. 266) supervisors make the final decisions regarding production equipment and layout.

Mandatory job rotation and demands for functional flexibility lead to extensive on-the-job training (MacDuffie, 1995). Workers are also required to master the basic problem-solving methodologies of continuous improvement, including time-and-motion studies. Supervisors play an important role in evaluating individual workers' training needs and conducting the actual training (Endo, 1998; Winfield, 1994). In Japan, seniority-based or skill-based wage systems have been the norm (Adler and Cole, 1993; Endo, 1998).

Industrial relations in Japan have followed a unique historical development resulting in institutions that are dissimilar to Western industrial relations in both their adversarial and more co-operative forms (Cusumano, 1985). Typical for Japan are enterprise unions, in which both hourly workers and salaried employees are organized. While some advocates of lean production interpret this as a sign of the cooperative spirit of the companies (e.g. Liker and Hoseus, 2008; Ohno, 1988), critics argue that it has undermined class consciousness among blue-collar workers. Cusumano (1985) judges enterprise unions to be relatively dependent of management, and generally supportive of their priorities. Enterprise unions are not involved in company governance, apart from collective bargaining over wages and working conditions. Not surprisingly, Kim *et al.* (2010) found that (union-based) representative participation was uncommon in Japanese companies. When settings up plants abroad, Toyota and other Japanese manufacturers have been suspicious of Western, independent labour unions and have sometimes taken action to avoid unionization (Graham, 1995; Pardi, 2005; Parker and Slaughter, 1988).

Main dimensions	
Technical	Short cycle times Standardization of tasks Just-in-time labour process with tight dependencies Job rotation Integration of indirect tasks Systematic continuous improvement
Governance	Hierarchical coordination and control Narrow spans of control
Normative	Corporate socialization
Support systems	
Whole-organization decision-making process	Autocratic Power of supervisors vis-à-vis industrial engineering
Training and development	Job rotation for multi-skilling On-the-job training by supervisors
Industrial relations	Enterprise unions
Selection, reward and appraisal	Job security Appraisal by supervisors Seniority- or skill-based pay

Table 2: Ideal-type lean-production work system

3 Research questions

The literature reviews of the previous chapter establish that the democratic work system and the lean-production work system are largely alternative work systems. Previous research has also highlighted the distinction between "democratic", "socio-technical", "human-centred", "anti-Tayloristic" or "Scandinavian" work designs on the one hand and "lean production", "neo-Tayloristic" or "Japanese" work designs on the other hand (Badham and Jürgens, 1998; Benders and Van Hootegem, 1999; Berggren, 1992; Dankbaar, 1997; Moldaschl and Weber, 1998; Pruijt, 2003). A comparison of tables 1 and 2 shows important differences in the three core dimensions and the support systems. In particular, because of tight sequential dependencies, extensive standardization of work processes and hierarchal governance, lean production leaves little room for the autonomous work group which was the cornerstone of democratic work designs (Benders and Van Hootegem, 1999; de Treville and Antonakis, 2006; Ingvaldsen and Rolfsen, 2012).

The two work systems are also justified differently. Lean production is essentially an operational strategy for improved performance in a conventional technical-economic sense. The theory of lean production reproduces standard micro-economical and managerialist assumptions; organizations are profit-maximizing entities, and management has the right to unilaterally devise the necessary means to maximize competitiveness. Similar to Taylorism, lean production aims to improve technical performance by subordinating production to management's rational control (Niepce and Molleman, 1998). The democratic work system seeks to balance technical-economic performance with other desirable social and psychological ends such as worker participation and quality of working life. This tension between the work systems' different underlying rationalities is accentuated by a large body of critical literature, which finds that lean production limits worker participation and autonomy and leads to a poorer quality of working life (e.g. Graham, 1995; Klein, 1991; Landsbergis *et al.*, 1999; Lewchuk and Robertson, 1997; Sewell and Wilkinson, 1992; Vidal, 2007b). In Scandinavia, working-life researchers have warned that lean production threatens established notions of "the good work" (Ingvaldsen *et al.*, 2012; Johansson and Abrahamsson, 2009; Oudhuis and Tengblad, 2013).

Work design is subject to contradictory influences, paradoxes and trade-offs (Daft *et al.*, 2010). In Norwegian industry, companies need to work out the tension between democratic ideals and lean production. On the one hand, high levels of worker participation and autonomy are psychologically and socially desirable. According to some theoretical positions, work systems with extensive autonomy and participation are also viable in a technical-economic sense (e.g. Delarue *et al.*, 2008; Glassop, 2002). On the other hand, an alternative theoretical position argues that lean production is the superior way of organizing

according to conventional performance criteria, but that autonomy and participation tend to be limited (Adler and Cole, 1993; de Treville and Antonakis, 2006; Womack *et al.*, 1990).

Theoretically, this tension can be approached in three principal ways. One approach would be to argue that the democratic work system is equally viable (or even superior) to the lean-production work system with respect to conventional performance criteria. Since the democratic work system has several extra-economic benefits, the practical implication would be to restore the democratic ideal type as the blueprint for organizational design. This approach is consistent with classical socio-technical theory (Trist, 1981) and literature that emphasizes a distinct Scandinavian trajectory as a radical alternative to lean production (Berggren, 1992; Sandberg, 1995). Literature on HRM and high-performance work systems (HPWS) lends support to this position by predicting a significant positive relationship between worker autonomy and performance (Boxall and Macky, 2009; Ramsay *et al.*, 2000). The second approach to the lean-democracy tension is to aim for a combination of the two ideal types. Such a combination would typically seek to obtain the technical-economic performance associated with lean production, and preserve decent levels of worker participation and autonomy. The third approach would be to aim for a complete imitation of the Japanese lean-production work system. Beyond the severe difficulties associated with the complete transfer of work-system configurations (Boyer *et al.*, 1998), this approach is not practically relevant. An adoption of the Japanese system of enterprise unions would require a major socio-economical transformation of the Norwegian working life, which nobody is advocating.

This thesis critically evaluates the first two approaches to the lean-democracy tension. The first approach would be a desirable design strategy if it is plausible that the democratic work system leads to high performance according to conventional technical-economic criteria. Then, practical work design is not forced to make trade-offs between performance and industrial democracy, traditionally conceived. Given systemic coherence, operational performance is primarily a function of the technical work organization: that is, the labour process. Since worker autonomy is the characteristic property of the labour process in the democratic work system, I focus on the relationship between autonomy and performance.

> Research question 1: *Do work systems with extensive worker autonomy lead to high operational performance?*

The qualifier "extensive" indicates that we are dealing with autonomy in a strong sense, not the weaker construct of "semi-autonomy" (cf. section 2.3.3). "High performance" indicates a level of performance that matches the level of performance attributed to the lean-

production system (Adler and Cole, 1993; Krafcik, 1988; MacDuffie, 1995; Mackelprang and Nair, 2010; Shah and Ward, 2003). Operational performance is assessed based on two criteria: (1) the system's ability to create a stable, coordinated production flow, and (2) the system's ability to refine its operational routines through organizational learning. The first criterion is a predictor of short-term competiveness; the second criterion is a predictor of long-term competiveness. As we have seen in section 2.4, there are good reasons to believe that a lean-production system performs well according to these criteria. Low process variability, achieved through standardization, stabilizes production flow (Ohno, 1988; Shah and Ward, 2007). Through systematic continuous improvement based on work standardization, the lean-production work system is capable of cumulative organizational learning (Adler and Cole, 1993). Answering this research question means exploring whether there are equally good reasons to believe that an autonomy-based work system will achieve high levels of performance. In a critical realist interpretation (cf. chapter 4), this means exploring the mechanisms and tendencies of the autonomy-based work system.

The arguments developed in the independent articles do not make a strong case for an autonomy-based work system (Ingvaldsen, 2013; Ingvaldsen and Rolfsen, 2012); extensive autonomy upsets both production flow and organizational learning. These results make the second approach to resolving the lean-democracy tension more relevant. Obviously, a combination of lean production and industrial democracy is logically possible. By recalling the definition of industrial democracy, we can deductively infer that a work system can be lean even though managerial prerogatives are limited. Literature on hybridization has shown that lean production may be adapted to distinct national models (Boyer, 1998; Durand *et al.*, 1999). Rather, the interesting questions are to what extent and how such a combination can be internally coherent. Since the problems of the democratic work system relate primarily to the technical dimension, the discussions will focus on the implications of reconfiguring this dimension for systemic coherence. There are several tensions which may give rise to incoherence. If "good work" equals autonomous work, then a lean labour process implies "not so good work". If autonomy is a precondition for a reverse synergy of participation (Emery and Thorsrud, 1976), then the introduction of lean production threatens to undermine representative participation. If hierarchical governance best supports the lean labour process, as argued by Ingvaldsen and Benders (2013), then the lean labour process is misaligned with non-hierarchical governance.

> Research question 2: *Can lean production be combined with industrial democracy to create a coherent work system? If yes, how is that work system configured?*

As shown in the thesis's introduction, the research questions actualize longstanding debates about organizational choice and the human consequences of rationalization. Section

6 picks up these broader questions. However, the research questions are not only of academic interest. They directly relate to ongoing restructuring in Norwegian industry.

Since the onset of the financial difficulties that started in 2008, the interest in lean production has reached new heights among Norwegian industrial companies. Companies in non-petroleum-related sectors have witnessed declining demands for their products. Simultaneously, nowhere in the world is an hour of direct labour more expensive. Competitive pressure induces companies to improve operational efficiency. Due to lack of survey evidence, it is hard to quantify what share of Norwegian industrial companies have undergone or are about to undergo lean transformation processes. However, the current interest in lean production is illuminated through a set of proxies. First, major Norwegian companies that receive public attention are proclaiming that their operations build on "lean principles".[4] Second, the Research Council of Norway has recently sponsored several long-term research programmes which study manufacturing operations.[5] My impression from attending seminars with representatives from companies participating in these projects is that lean production is widely considered to be "best practice", an ideal for how operations should be organized. Third, the growth of "Lean Forum Norway" is indicative. Lean Forum Norway was established in 2009 with an ambition to "further develop the Norwegian model of management and lean philosophy". Their annual conferences have gathered around 600 participants, including consultants, managers, researchers and representatives from the national confederation of trade unions (LO), who are keen to discuss the relationship between the Norwegian working life model and lean production.[6] In recent years, regional "lean forums" have also been established, pointing further to increased interest. Fourth, suppliers of automotive components report that their customers expect them to document that they are operating according to lean principles. Whether or not lean principles actually improve the performance of these companies, there seems to be strong isomorphic pressure towards lean (DiMaggio and Powell, 1983), particularly within the automotive sector.

This brief overview shows that the questions about industrial democracy and lean production are highly topical. At stake are worker participation and autonomy, the traditional qualities of a democratic working life. As companies (re-)discover the virtues of standardized work, tight task synchronization and hierarchical coordination, what can then be made of industrial democracy?

[4] E.g. Norsk Hydro, Elkem and REC.
[5] Research programmes include "SFI NORMAN" (www.sfinorman.no) and "Lean Operations" (www.leanforumnorge.no/lean-operations), with both of which the author is affiliated.
[6] Labour unions' point of view on lean production will be discussed in section 6.2. Obviously, LO takes the question of lean production seriously.

4 Methodology

In this chapter, the methodological underpinnings of the thesis are clarified. Section 4.1 discusses theory of science, and positions the thesis within the critical-realist tradition (Archer *et al.*, 1998). Section 4.2 summarizes how empirical material was collected and analyzed. Section 4.3 deals with one methodological objection that may be raised to this thesis: the independent papers make reference to different research strategies, which according to some textbooks build on alternative, non-compatible ontological and epistemological assumptions (Bryman, 2008; Guba and Lincoln, 2005; Morgan, 1980). Ingvaldsen and Rolfsen (2012) make reference to "interpretive analysis" and the "social constructionism" of Berger and Luckmann (1967). Ingvaldsen (2013) builds on a "Marxian materialism" (Adler, 2007; Cohen, 2000) underpinned by "critical realism". Finally, Ingvaldsen and Benders (2013) build their argument on "inductive positive science" and a "functional analysis" (Merton, 1976). I will address concerns for analytical and theoretical inconsistency.

4.1 Theory of science positioning

Debates on the theory of science underlying organization theory, and the social sciences more generally, tend to reproduce a dichotomy between interpretivism (a.k.a. constructionism, constructivism, anti-positivism) and positivism (a.k.a. empiricism, (naïve) realism, naturalism). The former supposedly leads to inductive, qualitative research, while the latter leads to deductive, quantitative research (Bryman, 2008). Since this is no treatise on philosophy, I will make no attempt to review the "paradigmatic controversies [and] contradictions" of the social sciences (Guba and Lincoln, 2005). Rather, I will briefly explain the theory of science underlying this thesis: that is, critical realism (CR).

CR emerged from Bhaskar's (1978) revised ontology of the natural sciences. Bhaskar (1998) argues that with some qualifications, the same ontological model and its associated research strategy applies also to the social sciences. CR is thus an instance of naturalism, in that it defends the unity of the sciences. CR has recently been proposed as a promising way of moving forward organization theory (Fleetwood, 2005; Reed, 2005). While having perhaps the greatest impact on labour process theory (Delbridge, 2007; Thompson and Vincent, 2010), CR has no necessary relationship to Marxian or neo-Marxian social theory (Joseph, 1998).

Section 4.1.1 clarifies the main features of the CR theory of science: the distinction between transitive and intransitive knowledge, the stratified ontology and the retroductive mode of inference. Applications of CR to social science and organization theory are discussed in section 4.1.2.

4.1.1 Critical realism

Science is possible, Bhaskar (1978) argues, because entities exist and act independently of our knowledge about them. These entities are the *intransitive* objects of knowledge: "they are the real things and structures, mechanisms and processes, events and possibilities of the world; and for the most part they are quite independent of us" (Bhaskar, 1978, p. 22). According to the CR position, the aim of science is to produce knowledge about these intransitives, and how their workings combine to generate the flux of events we experience.

The claim that intransitives exist is what makes CR "realist". What makes CR "critical" is the assertion that we have no direct access to these intransitives. Access to the world is mediated by concepts, theories, metaphors and the techniques of inquiry. Hence, scientific knowledge is *transitive*, an outcome of human activity. As such, scientific knowledge is fallible and may be affected by pre-scientific beliefs, prejudice and ideology. However, because the explanatory power of competing theories can be tested against the empirically manifest effects of the intransitives, there are rational criteria for assessing which theories are the better. While transitive knowledge is constructed through scientific practice, intransitive entities are not (Bhaskar, 1978; see also Joseph, 1998; Reed, 2005).

The philosophical argument of Bhaskar (1978) leads to a three-layered stratified ontology. This is shown in table 3. According to this model, *events*, that may or may not be observed as *experience*, are produced by underlying *mechanisms*. Mechanisms, events and experience are all real (belonging to the domain of the real). Mechanisms, however, are not actual (belonging to the domain of the actual), since they cannot be directly observed. Events are actual, but may not be observed empirically. Hence, only experience is empirical (belonging to the domain of the empirical). Mechanisms are "ensembles of structures, powers and relations" (Fleetwood, 2001, p. 211). When mechanisms are triggered and act they become generative (Bhaskar, 1978, p. 14). If a generative mechanism is isolated, paradigmatically in a scientific experiment, it will produce regular events. In uncontrolled settings different generative mechanisms intervene and events are generated by conjunctures of possibly counteracting mechanisms. Unless scientists interfere to produce

controlled, experimental settings, there will be no one-to-one correspondence between mechanisms and events.

Bhaskar's (1978) ontology implies a specific understanding of causality. CR rejects the conventional empiricist (positivist) understanding of causality as event regularity or constancy (Fleetwood, 2001). That event *y* always (or usually) follows event *x* does not imply that *x* is the cause of *y*. Causal powers – that is, powers to affect other entities or generate events – are qualities of mechanisms, not events. It follows that causal laws are not statements about event regularity, but rather "tendency statements". Tendency statements are statements of which effects mechanisms tend to bring about when their causal powers are triggered (Fleetwood, 2001, p. 211). These effects may be counteracted by other intervening mechanisms and may not manifest as actual events. Hence a proposed causal law may be valid, even though its effects do not manifest empirically in a non-controlled setting.

	Domain of Real	**Domain of Actual**	**Domain of Empirical**
Mechanisms	X		
Events	X	X	
Experiences	X	X	X

Table 3: The stratified ontology of CR. Adopted from Bhaskar (1978, p. 13)

The research strategy of critical realism is referred as *retroduction*. Retroduction is "a mode of inference that aims at discovering the underlying structures or mechanism that produce tendencies or regularities under certain conditions through a process of model building, testing and evaluation […]" (Reed, 2005, p. 1631). Phenomena of interest are explained with reference to the conjuncture of mechanisms that can account for it. The retroductive process may in its different stages make us of both inductive and deductive reasoning, along with a broad range of methodological techniques. Observable patterns of events (in a controlled or non-controlled setting) may direct scientific investigation, and lead to a hypothesis of causal relationships (Lawson, 1998) . Model building makes use of

deduction and analogies. Theory testing typically involves inductive, statistical techniques. Therefore, different methodologies may be combined within a CR framework.

4.1.2 Application to social science and organization theory

Application of CR to the social sciences raises some additional issues. First, what are the generative mechanisms in the domain of social science? Second, do CR explanations allow for genuine human agency?

Bhaskar's (1998) principle argument is that the object of investigation in the social sciences is *social structure*. Humans choose their course of action, but both their desires and opportunities are contingent on their positions in this structure and the activities in which they participate by virtue of these positions. Social science theorizes how individual and collective human action is constrained or enabled by the mechanisms of the social structure. In the words of Bhaskar (1998, p. 207),

> "the essential movement of [social] scientific theory will be seen to consist in the movement from manifest phenomenon of social life, as conceptualized in the experience of the social agents concerned, to the essential relations that necessitate them. Of such relations the agents involved may or may not be aware".

Social structure may be defined as "systems of human relations among social positions" (Porpora, 1998, p. 343). To this definition may be added people's beliefs about this system of relations (Archer *et al.*, 1998, p. xviii). Also ideally real entities, such as ideas, opinions and theories, form mechanisms with causal powers (Reed, 2005).

Similar to natural structures in the natural sciences, social structures pre-exist the events and experiences they govern. Still, there are important limitations to this analogy between natural structures and social structures. Bhaskar (1998, p. 218-219) lists the following limitation to naturalism:

1. "Social structures, unlike natural structures, do not exist independently of the activities they govern.
2. Social structures, unlike natural structures, do not exist independently of the agents' conceptions of what they are doing in their activity.
3. Social structures, unlike natural structures, may be only relatively enduring (so that the tendencies they ground may not be universal in the sense of space-time invariant)."

As a consequence of concept dependence, activity dependence, and greater time-space specificity, social structures are more malleable than natural ones. Human actors may make (possibly erroneous) inferences about the social structures and deliberately try to change them. Social structures may also be consciously or unconsciously reproduced. Social structures change, although they may at any given moment in time be regarded as intransitive for analytical purposes.

Application of CR to the substantial field of organization theory means retroducing how manifest organizational behaviour is explained by conjunctures of psychological, technological and social generative-mechanisms. The social mechanism can be categorized further (Collier, 1998; Thompson and Vincent, 2010). Fundamentally, we are dealing with the mechanisms of capitalist production, including competition among firms and the complex labour-capital relationship. This production is embedded in the regulatory institutions of the national state (Hall and Thelen, 2009; Smith and Meiksins, 1995). Concrete firms operate within specific product markets, labour markets and value chains. Within the firm, activities are organized according to a formal organization structure which prescribes positions and activities. At the point of production, there are work systems.

Recalling the research questions, this thesis is primary concerned with the mechanisms and tendencies of the work system. Answering the first research question means exploring the relationship between the structural configurations of the autonomy-based work system, technical-economic performance and organizational learning. A possible research strategy, conforming to experimental practice, would be to isolate the mechanisms of interest and observe their manifest effects. However desirable, it is practically impossible to perform controlled experiments with real-life work systems. External factors such as technology, product markets and labour markets cannot be kept constant. The strategy adopted is to theoretically model the mechanisms and tendencies involved. By demonstrating that the theoretical model can account for my own empirical findings and other researchers' findings, the trustworthiness of the theoretical propositions is established. Theoretical propositions are also strengthened when shown to be consistent with other theoretical propositions we consider to be trustworthy.

The second research question asks specifically about the work system's embedment within national labour institutions. Will a work system which combines lean production with industrial democracy be coherent? Analytically, answering this question means theorizing the tensions and contradictions that are generated by the different mechanisms of the work system, and discussing their possible resolution.

4.2 Collection and analysis of empirical material

Empirical material for this thesis was collected in four industrial companies: three Norwegian companies and one Japanese company. Table 4 gives an overview of the companies, and what kind of material was collected. Since the research has been carried out within two larger research projects, the author had access to material collected by other researchers, including reports from previous research carried out in the same companies. Ingvaldsen and Rolfsen (2012) and Ingvaldsen and Benders (2013) describe the exact composition and size of the informant samples in Tools and JAS, respectively. In Ingvaldsen (2013), empirical material from NAS and MC is used for illustrative purposes. Roughly, this material builds on 30 interviews with workers, managers and work-design experts from each company.

Pseudonym	Products	Number of employees	Methods of data collection	Material is used in
Tools	Specialized equipment for milling and drilling	100	Individual interviews (semi-structured) Observation of meetings Archive material from prior research projects	Ingvaldsen & Rolfsen (2012) Article 1
Norwegian automotive supplier (NAS)	Light metal automotive components	500	Individual interviews (semi-structured) Work-system documentation Archive material from prior research projects	Ingvaldsen (2013) Article 2
Japanese automotive supplier (JAS)	Light metal automotive components	1,500	Individual interviews (semi-structured) Work-system documentation	Ingvaldsen & Benders (2013) Article 3
Metal company (MC)	Primarily light metal	2,500	Individual interviews (semi-structured) Group interviews (semi-structured) Work-system documentation	Ingvaldsen (2013) Article 2

Table 4: Overview of the empirical material

In line with the qualitative tradition of open-ended research, the empirical material was not collected with detailed research questions in mind, and did not aim to test predefined hypotheses (Bryman, 2008). Generally, interviews revolved around topics relevant to understanding the work systems and the informants' lived experiences of working in these systems. Typical topics would be: group/team-based work; autonomy/self-management; control and coordination; motivation; the nature of supervision; the official work system and its implementation; labour-union involvement; lean-production practices (where applicable); involvement in continuous improvement (where applicable). Managers and work-design experts were specifically asked to explain the rationale behind the official work system. Labour-union representatives were specifically asked about representative participation and their involvement in organization development. As such, data collection aimed to capture the experiences, perspectives and opinions of multiple organizational actors.

Transcribed interviews, observation records and company documentation were systematically coded for recurring themes (Corbin and Strauss, 2008). Based on an evaluation of which relevant theoretical problems the data could illuminate, ideas for research papers were developed. In some cases, additional empirical material was collected in order to get a better account of specific issues. This back and forth between theoretical studies, data analysis and data collection is typical of qualitative research, and gives a fair account of how research results are actually constructed in scientific practice (Alvesson and Kärreman, 2007; Prasad, 2005). In addition to the papers included in this thesis, the empirical material is also used in other published papers by the author and colleagues (Ingvaldsen *et al.*, 2013; Ingvaldsen *et al.*, 2012; Rolfsen and Ingvaldsen, 2013; Rolfsen *et al.*, 2012).

4.3 Incompatible methodological approaches in the papers?

In this section, one possible methodological objection to the thesis is addressed. Seemingly, two of the papers (Ingvaldsen and Benders, 2013; Ingvaldsen and Rolfsen, 2012) make reference to analytical strategies which do not conform to the critical-realist theory of science. "Interpretive analysis" (Ingvaldsen and Rolfsen, 2012) and "functional analysis" (Ingvaldsen and Benders, 2013) are arguably inconsistent with the retroductive mode of inference because they follow from different meta-theoretical assumptions (Guba and Lincoln, 2005; Morgan, 1980). The third paper (Ingvaldsen, 2013) does conform to critical realism, since it deals with the tendencies of the capitalist mode of production, understood as a generative mechanism. To underpin substantial Marxian analysis with critical realism is uncontroversial (Collier, 1998; Joseph, 1998) and does not require further elaboration here.

Ingvaldsen and Rolfsen (2012, p. 866) state that their paper builds on "interpretive analysis" and the social constructivism of Berger and Luckmann (1967). Bhaskar (1998, p. 213-214) compares his own realist model to the model of Berger and Luckmann. The difference is that while Berger and Luckmann suggest that agents continuously create social structures through objectification, Bhaskar argues that social structures are pre-given and their "construction" involves reproduction and transformation of these pre-givens. Although this is an important philosophical distinction, it has no implications for how the argument of Ingvaldsen and Rolfsen (2012) proceeds since the paper is concerned with the effects of particular structures, and not so much with how these structures are constructed, reproduced or transformed. The analytical strategy of the paper is outlined in the following paragraph:

> "[Interpretive analysis] aims to grasp the subjective meaning of social action (Bryman, 2008). The range of possible meaningful action is influenced by social structures […] Formal organizational structures are one instance of such social structures. We focus on how the formal organizational structures influenced inter-group coordination. However, we do not propose that all our findings can be accounted for by the company's choice of organizational structure. In particular themes related to individual differences and ideology showed to be important. These themes are included in order to supplement a largely structural analysis." (Ingvaldsen and Rolfsen, 2012, p. 866)

The movement from "subjective meaningful action" to organizational structure (supplemented by "ideology" and "individual differences") is consistent with a retroductive mode of inference as explained above. Retroduction requires interpretation because subjective experience must be made sense of before it can be explained with reference to conjunctures of psychological, social and ideological mechanisms. Hence, the analytical differences between Ingvaldsen and Rolfsen (2012) and a CR approach are shown to be very minor.

In Ingvaldsen and Benders (2013), references are made to "inductive, positive science" and "functional analysis". "Inductive, positive science" describes the first step of the argument, in which it is established that lean production is empirically associated with a specific supervisory structure. However, this association is not presented as a causal explanation, so the authors do not make empiricist inferences (Fleetwood, 2001). Rather, the association triggers further investigation into the nature of this supervisory structure and its relationship with the technical dimension of a lean-production work system. This is consistent with Lawson's (1998) advice of using empirical patterns as the starting point of scientific investigation. The paper proceeds with a "functional analysis" of this supervisory structure:

> "Our [argument] is developed through a functional analysis (Merton, 1976) of the supervisory structure associated with TPS/lean production. We argue that narrow control spans and the typical team leader–group leader structure are supportive of core lean production practices such as just-in-time, multi-skilling and continuous improvement. Since superior performance is explained by these core lean practices (Mackelprang & Nair, 2010; Shah & Ward, 2003), the supervisory structure indirectly contributes to performance." (Ingvaldsen and Benders, 2013, p. 4)

This "functional analysis" does not necessitate a commitment to the assumption of functionalism as a social-science paradigm (Morgan, 1980). Rather, as in Ingvaldsen and

Rolfsen (2012), the aim of the analysis is to understand the effects of the organizational structure as a generative mechanism. Ingvaldsen and Benders (2013) argue that the supervisory structure in question enables certain forms of behaviour that are supportive of the technical activities in a lean-production work system. The question of "functional equivalents" addressed in the latter parts of the paper is an exploration of whether or not alternative supervisory structures could equally well enable the desired behaviour. Hence, there is no incompatibility between the analytical strategy of Ingvaldsen and Benders (2013) and a CR theory of science.

5 Summary of the independent articles

In this section, the independent articles are summarized. The summaries focus on the papers' main results. Table 5 shows the status of the papers with respect to publication.

Article number	Title	Co-author	Status
1	Autonomous work groups and the challenge of inter-group coordination	Monica Rolfsen	Published in *Human Relations*, Vol. 65 No. 7, pp. 861-881
2	Organizational learning: Bringing the forces of production back in	(none)	Forthcoming in *Organization Studies*
3	Lean production and broad control spans: An odd couple?	Jos Benders	Unpublished manuscript.

Table 5: Overview of papers and publication status.

5.1 Summary of article 1

In work systems based on autonomous work groups, the effort of different autonomous groups needs to be coordinated to produce desirable system-wide effects. We refer to this coordination as inter-group coordination. Proponents of autonomous work groups have argued that inter-group coordination should be attended to by other means than traditional hierarchical control. Classical socio-technical theory, as formulated by Emery, Trist and Herbst, was highly critical of work designs that included foremen or supervisors, because such designs limit group autonomy. A literature review identifies two alternative organization structures for inter-group coordination, which are aligned with the general principles of socio-technical design: 1) A system of rotating group spokespersons; 2) a system of shared leadership, in which each group member is responsible for coordination with respect to one aspect of the labour process, such as materials handling, work procedures or maintenance.

The paper presents a case study of a company named "Tools", whose work system closely resembles the democratic ideal type. Groups enjoy high levels of autonomy and there are no supervisory levels between the groups and the production manager. The labour union is an active partner in organization development. During a time span of 10 years, the company has successively attended to inter-group coordination with rotating group spokespersons and distributed leadership. Our analysis reveals that in both cases

coordination is partly dysfunctional. In particular, informants reported challenges related to information sharing, conflicts, inventory management and sub-optimization. Attempts to resolve recurring production problems by changing work processes were often perceived as "illegitimate interference with the groups' right to self-manage". We argue that these challenges are explained by the design or the work system; they are not so much due to psychological factors or difficulties in implementing the designs.

Our argument that extensive group autonomy tends to create challenges of inter-group coordination have two important implications for organization theory. First, the common recommendation that organizations should be structured based on autonomous work groups because autonomous work groups yield increased performance needs to be qualified. Although autonomy has been found to increase performance at the intra-group level, this result cannot be straightforwardly aggregated to the work-system level because of the coordination challenges which are systemic. We anticipate this countertendency to increased performance to be stronger when tasks are highly interdependent, since high task interdependence creates greater need for coordination. Second, the inter-group coordination problem may help explain why work systems with high levels of autonomy are relatively uncommon, and why organizations choose to abandon such designs in favour of more traditional designs. Socio-technical theory typically presents the choice between autonomy-based work systems and non-autonomy-based work systems to be a matter of values; non-autonomy is "'traditional" or "managerialist" while autonomy is "emancipative" or "humanist". Although these ideas about clash of values have some explanatory power, they tend to obscure a deeper analysis of the challenges of autonomy-based work designs.

5.2 Summary of article 2

This paper argues that debates on organizational learning have been led astray by the popularity of the theory of communities of practice (CoP). The CoP position on organizational learning can be summarized in four propositions:

> (1) Much of the knowledge relevant for work is tacit in nature. Tacit knowledge is difficult or impossible to codify explicitly.
>
> (2) Workers' actual methods of working and division of labour typically differ from those that are formally prescribed. Performance of work depends on context-specific improvisation, which cannot effectively be pre-specified in formalized work designs.

(3) Workers acquire the tacit knowledge they need to perform their work through a process in which they are socialized into a "community" of workers. These socialization processes transform the workers' self identities and reproduce the community. Knowledge creation and learning are products of the collective "reflection in action" which takes place within and between these communities. This reflection in action produces new tacit knowledge, improves informal work methods and rearranges the division of labour between community members.

(4) The most productive role for management is to support and "cultivate" these communities: let the "natural" learning processes unfold and harvest the results.

CoP theory was initially proposed as an explanation of learning in handicraft apprenticeships, but has later morphed into a general theory of organizational learning. This generalization from handicrafts to modern capitalist organizations is largely unjustified. Specifically, CoP theory cannot account for organizational learning in capital-intensive and rationalized sectors such as manufacturing and process industry. To account for organizational learning in modern capitalist organizations, the paper proposes an alternative theoretical model. The alternative model builds on structural Marxism as outlined by P.S. Adler. Adler's interpretation of Marx emphasizes how the valorization impetus of capitalism drives a process of socialization in which collective labour power is developed through the technical division of labour and conscious application of science and technology. Based on structural Marxism, this paper argues in favour of four alternative propositions about organizational learning:

(1*) As capitalism develops, explicit knowledge becomes increasingly important. Explicit knowledge tends to replace tacit knowledge.

(2*) Formally designed work systems tend to replace the more informal organization of work. Formalized work designs can support learning.

(3*) Capitalist rationalization erodes traditional sources of identification. The fracturing of established identities may lead to alienation, but also to the emergence of new forms of work community.

(4*) Centrally planned reorganization of work and introduction of new technology become increasingly important drivers of organizational learning. These changes are largely prescribed by managers and technical experts.

Propositions (1*) – (4*) are tendencies, whose actualization may also be distorted by the profit motive. Specifically, the socializing tendencies are distorted by the externalization of

employment relations, neo-Taylorist rationalization, shop-floor micro-politics and surges of normative control strategies.

The fundamental problem with CoP theory is that it does not relate to issues of science, technology and the technical division of labour, and how the development of these forces reshapes work and direct local learning processes. By leaving out the consequences of technological advances, CoP theory becomes a theory of learning under pre-capitalist forms of work. Propositions (1*) – (4*) imply that the work systems replacing Fordism will not be characterized by the re-emergence of craft or extensive worker autonomy. Extensive worker autonomy has been advocated on the grounds that it enables the forms of learning associated with craftwork: that is, those forms of learning explored by CoP theory. Workers' local reflection in and on practice do lead to learning at the micro level, but these learning processes do not add up to improvements at the work-system level. Truly *organizational* learning requires centralized planning and integration of specialist technical knowledge. Centralized planning is dependent on predictable work processes, which can be made objects of calculations and refinement. This notion of (systemic) organizational learning does not exclude workers' active participation. Given that workers are technically trained and familiar with the technologies of rationalization, they may participate in work-system design.

5.3 Summary of article 3

The topic of this article is the supervisory hierarchy and supervisory control spans under lean production. Supervisors are lower-level managers responsible for operational control, who have day-to-day interaction with blue-collar workers. The structure of the supervisory hierarchy designates how authority, responsibilities and tasks are divided between workers and different layers of supervisors. Span of control designates the number of employees that report to a single manager or supervisor.

The paper specifically targets literature on operations management in which papers on lean production contain contradictory claims about how the supervisory hierarchy is structured. Several articles, among them frequently cited conceptual papers, explicitly or more implicitly argue that lean production implies the elimination of supervisory levels and broad spans of control. This assertion is primarily based on the classical psychological argument that elimination of supervisors allows for increased empowerment, which again makes workers more committed and more inclined to develop and utilize their skills. When workers are empowered, close supervision is superfluous. However, the claim that lean

implies broad control spans lacks proper empirical support, and tends to be re-iterated in a self-referring way.

The contrary claim that lean production is associated with narrow spans of control has far better empirical support. Case studies and survey research of Toyota and other automotive companies indicate that the prototypical supervisory hierarchy under lean production consists of one team leader for each team of five workers and one group leader for each second or third team. This finding has been reproduced over a period of several decades. The authors' description of the supervisory hierarchy of a Japanese automotive supplier visited in 2010 is strikingly similar to descriptions of the supervisory hierarchies in Japanese automotive manufacturing from the 1980s. Both control spans and role descriptions for workers, team leaders and group leaders are similar.

We proceed to argue that this configuration of the supervisory hierarchy is beneficial for the just-in-time labour process. A functional analysis of the supervisory hierarchy suggests that its main functions are: 1) coordination and control; 2) training and coaching of workers; 3) facilitating and leading kaizen activity; 4) constituting a buffer of manpower; 5) creating an internal labour market and career paths. Under just-in-time logistics with low inventories and rapid material flows, coordination and control are demanding. More striking in light of existing literature is our finding that supervisors play a very important role in relation to on-the-job training and coaching of workers, in addition to initiating and coordinating kaizen activities. These knowledge-related functions have received too little attention in prior accounts of lean-production management.

Taken together, our findings indicate that the performance of lean organizations is to an important extent due to a well-functioning supervisory hierarchy. A viable combination of lean production and broad control spans requires that the functions of the supervisory hierarchy can be distributed to other organizational units, preferably the work groups in order to allow for increased empowerment. However, it is far from obvious what these functional equivalents would be like. Empirical research gives few cues, since companies that practise lean production tend to be hierarchically organized. On theoretical grounds, we doubt that "lean production with broad control spans" will achieve the same level of performance as its more supervisor-centred counterpart.

6 Results and discussion

Based on elaborations of the independent articles and some auxiliary arguments, answers to the two research questions are developed in this section. The first section (6.1) deals with the first research question about the performance of autonomy-based work systems. The second section (6.2) deals with the second research question about combining lean production with industrial democracy.

6.1 Autonomy and performance

Lean production is advocated on the grounds that it leads to high efficiency in a technical-economic sense and enables organizational learning. Two of the main virtues of the lean-production work system are 1) its ability to create a stable coordination production flow, and 2) its ability to continuously and systematically refine its routines (Adler and Cole, 1993; Fujimoto, 1999; Ohno, 1988; Womack *et al.*, 1990). In chapter 3 I argued that the democratic work system would be a viable design alternative to lean production if it is plausible that a work system with extensive autonomy is also capable of achieving a stable production flow and high levels of organizational learning. The results presented in Ingvaldsen and Rolfsen (2012) and Ingvaldsen (2013) identify two fundamental technical weaknesses of autonomy-based work systems:

1. Extensive autonomy tends to upset work-system coordination.
2. Extensive autonomy tends to upset organizational learning.

Since work-system coordination is a necessary condition for a stable production flow, extensive autonomy upsets the work system's capability to achieve a stable production flow. These results do not make a strong case for work systems with extensive autonomy. My findings run counter to a body of theory that links autonomy-based work systems to high performance and organizational learning (cf. section 2.3). This includes classical socio-technical theory and contemporary HRM theories of motivation and commitment. Below, I will discuss my findings in light of these arguments. In section 6.1.1, I deal with the autonomy–performance relationship in general. First, I re-examine the classical technical-economical justification of autonomy-based work systems which is captured in the STS concept of "joint optimization" (Emery, 1959; Trist, 1981). I argue that this concept is theoretically inadequate. Second, I turn to more contemporary HRM literature, which predicts a positive relationship between autonomy and work-system performance. I argue that such a link has not been adequately demonstrated. In section 6.2.1, I deal with

the autonomy–learning relationship specifically. I will show that the learning arguments in favour of autonomy are another version of the handicraft arguments repudiated in Ingvaldsen (2013).

6.1.1 Joint optimization reconsidered

In the second phase of the Industrial Democracy Programme, autonomous work groups were the main instrument to *jointly optimize* the technical sub-system and the social sub-system (Emery and Thorsrud, 1976). Desirable systemic outcomes such as productivity, profitability, job satisfaction, quality of working life and shop-floor democratization were thought to be products of this joint optimization. Hence, the concept of joint optimization is fundamental to how classical socio-technical theory theorized the autonomy–performance relationship.

In Emery's (1959) formulation of joint optimization, both the technical and social sub-systems have "needs", to which organizational design finds the "best match" (see section 2.3.3). The "needs" of the technical system are induced by the economical structure, which demands that capital is allocated (reasonably) rationally and that production is (reasonably) efficient. The "needs" of the social system are only weakly induced by the social structure, and reflect a normative preference for "humane" work derived from humanist psychology. Arguably, this conceptualization involves some paternalism on behalf of workers. Workers might be expected to prefer that jobs are "psychologically rewarding", but may value other rewards and benefits such as high wages, job security or promotion opportunities more highly (Vidal, 2007a; Watson, 2008, p. 189-191) and be willing to substitute these for psychological job satisfaction. Emery and Thorsrud's (1976, p. 15) assertion that the psychological job requirement "cannot always be judged from their conscious expression" and be "forgotten" indicates that the socio-technical designers were looking after workers' real "objective interests" (Lukes, 2005).

In his review of socio-technical theory, Trist (1981, p. 10) explains the distinction between the social and the technical sub-system:

> "[A] conceptual reframing was proposed in which work organizations were envisaged as socio-technical systems rather than as social systems […]. The social and technical systems were the substantive factors – the people and the equipment. Economic performance and job satisfaction were outcomes, the level of which depended on the goodness of fit between the substantive factors."

The quotation begs the question of what exactly joint optimization is supposed to optimize. How do we find a "best match"? In his optimization problem, Trist seems to have two distinct objectives: 1) economic performance and 2) quality of working life. For the sake of consistency, I will refer to the latter as "psychological performance", indicating the degree to which the psychological job requirements (cf. section 2.3.3) are satisfied. I will also assume, consistent with Trist's (1981) framework, that psychological performance is a function of work-system design. This means bracketing the questions of paternalism and how workers' psychological needs may vary individually and socially.

The problem is that this is not really an optimization problem,[7] nor even a design problem, because what you are trying to achieve is unspecified. Optimization requires that "best" (match) is well defined (Elster, 2007, p. 193). In some cases, it will be possible to simultaneously improve psychological performance and economic performance, but in the general case, there will be trade-offs between the two stated objectives. Are economic performance and psychological performance *equally* important? If not, how should we weight the different objectives? Should the organization invest in excessive machinery if it enables longer cycle times? Should task variety be limited if one has good reasons to believe that limited task variety will raise productivity through specialization? Classical socio-technical theory is silent on how to deal with such trade-offs.[8]

In the absence of a rational way to make trade-offs between competing performance criteria, joint optimization makes little sense unless we introduce the additional assumption that such trade-offs are negligible or at least very minor. Arguably, classical socio-technical theory introduced the implicit assumption that what is psychologically optimal is also economically optimal. In this interpretation, the concept of "joint optimization" is based on the substantial claim that work systems with the better quality of working life are also the

[7] A standard micro-economic optimization problem has the following structure (Hillier and Lieberman, 2005, p. 12-13): A single objective function relates decision variables to some measure of performance (paradigmatically profits). Constraints indicate restrictions on which values can be assigned to the decision variables. Optimization means finding the values of the decision variables that maximize performance, subject to the stated constraints.

[8] There are ways to make joint optimization conform to the structure of a proper optimization problem. First, one could define an overall measure of performance which is a function of both economic performance and psychological performance. Then the two objective functions are combined into one, which explicates how trade-offs are made. Second, one of the objective functions could be recast as a constraint. Either economic performance is maximized subject to a constraint stating the minimum desired level of psychological performance ("we maximize profits, but treat people fairly well"). Or psychological performance is maximized subject to a constraint stating the minimum desired level of economic performance ("we create the best workplace, but keep investors reasonably happy"). More refined methods for working with decision problems with multiple objectives are explored in the fields of utility theory and operations research. Anyway, these methods involve weighting and trade-offs, topics that are consistently left out in classical socio-technical design. For an alternative critique of joint optimization, see Van Eijnatten (1993, section 6.4.3).

better economic performers. Since extensive autonomy creates the better quality of working life (Karasek, 1979) and the better job satisfaction (Hackman and Oldham, 1980), extensive autonomy also leads to increased economic performance. Or rephrased in the popular wording of the business press: "happy workers are productive workers". Such an interpretation of joint optimization is, I admit, inconsistent with Emery's (1959) explicit conceptualization of the concept, but as I will show in the following paragraphs, it is consistent with the theoretical trajectory of STS. The following quotation from Rice, highlighted in Emery (1959, p. 24), is illustrative:

> "A group consisting of the smallest number that can perform a 'whole' task and can satisfy the social and psychological needs of its members is, alike from the point of the view of task performance and for those persons forming it, the most satisfactory and efficient group."

Commenting on the development of socio-technical theory, De Sitter, cited in Van Eijnatten (1993, p. 133-134) makes the following assertion:

> "It seems that traditional socio-technical systems design [is] stressing the primary importance of the human conditions which production systems should meet: the 'Quality of Working Life'. It is this bias that has given a dominant branch in socio-technical design the image of a specialism in the area of QWL and Industrial Democracy. As such, it had to base its identity in fulfilling a critical function, by contending that the quality of work is important and should no longer be kept in disregard. […] As a partial theory with respect to a partial set of functions, socio-technical systems design would join the range of already too numerous managerial specializations such as informatics, production technology, logistics, auditing, maintenance, marketing, quality control and so on."

To my knowledge, the crucial assumptions that high QWL generally, and autonomous work groups specifically, leads to high economic performance was never adequately theorized or tested by socio-technical research. Rather, the assumption became ideological. According to De Sitter in Van Eijnatten (1993, p. 160-161),

> "one could legitimize the design of tasks on the basis of assumptions with respect to human needs without creating difficulties that would influence the structure formation […]. It became difficult to distinguish between philosophies about 'how things should be' and theory."

Symptomatic of the collapse of the distinction between theory–ideology are the prevalent references to "values", "philosophies" and "paradigms" in the later works of the

movement's key protagonists (e.g. Emery, 1980; Trist, 1981). The authors are right to state that organization design involves value-based judgment (Alvesson and Deetz, 2000). It is also fair to demand that designers of organizations should explicate and reflect on their underlying values (Greenwood and Levin, 2007). What is misleading is to weave together value-based judgments and substantial theoretical claims in such a way that it is impossible to identify which arguments are which. As an example, take the introduction chapter to Sandberg's (1995) book on Volvo's Uddevalla plant. Basically, the chapter argues that although the Uddevalla plant was closed, the socio-technical, "enriching", "human centred" work system was indeed economically viable, and even superior in comparison to lean production. Three quotations illustrate my point:

- "The double goal of enriching jobs and productivity is the essence of what we want to call *enriching production*. Production that is enriching to work and workers and to investors and owners. Lean production can never be the ultimate goal and form for human productive activity. Some 'fat' is needed to make the workplace a decent place for human activity, a place where you can unfold as a human being." (p. viii).
- "The Uddevalla plant was unique in its combination of good work and productivity." (p. 1).
- "In the socio-technical, or human-centred tradition, long work cycles and work autonomy is seen as an important value of its own, contributing to good jobs for human beings." (p. 24)

Such a presentation does not distinguish between a theoretical question about the economic performance of the plant's work system, and a normative question of which work system we should prefer based on some "humanist" criterion. If human-centred production shows itself to be more economically efficient than the lean alternative, things fall nicely together; in the new industrial panacea what is psychologically rewarding is also economically rewarding (Dunphy and Bryant, 1996). But what if human-centred production leads to inferior economic performance compared to lean production? Basically, it does not matter, the author tells us, because lean production is not a "place where you can unfold as a human being". But given that customers may not be willing to pay a premium for a car made by psychologically satisfied workers, what exactly is the humanist advocating? The latter parts of the chapter hint to some basic flaws of globalized capitalism (Sandberg, 1995, p. 26-28), but as it turns out, it is not necessary to be precise about the relationship between "humanism" and the structure of the political economy. Not surprisingly, the author concludes that human-centred production is highly productive.

Another illustrative example is a paper by Gardell and Gustavsen (1980). The argument starts out explicitly normative:

> "Scandinavian experience lends support to the notion that the organization of work *should* be based on production groups and not on individuals (Thorsrud and Emery, 1976). The group *should* be given the responsibility for planning and performing work within an area. The current division between planning and control on the one hand and execution on the other *should* be brought to an end, and planning and control restored to the primary work group. Foremen and technical experts *should* be geared to the needs and demands of the production groups – as resources for these groups – and not to functional requirements specified by a higher organizational level." (Gardell and Gustavsen, 1980, p. 8, italics added)

One page later, without any reservations or supportive arguments, it is stated:

> "The experiments and other efforts demonstrated the feasibility of autonomous work groups under varying technological conditions. Besides showing that this form of organization is a building block in the network of solutions involved in a reform of working life based on human and social values, they established that it may be superior even from traditional economic and technological points of view." (Gardell and Gustavsen, 1980, p. 9)

The authors *may* be right that socio-technical experiments succeeded according to conventional performance criteria. But according to Kelly's (1978) prior reappraisal of the socio-technical experiments, results were far from conclusive. He argues that what actually took place was work intensification, and that the basic principle of organizational choice was never acted on in practice. Furthermore, it had also been questioned whether the action research methodology applied in the experiments met conventional scientific quality criteria and allowed for generalization of results (Susman and Evered, 1978). My point is not that the critics are necessarily right, but that texts like Gustavsen and Gardell (1980) do not find it worthwhile to engage with reasonable, external counter-arguments to their propositions. Substantial criticism is rejected by belonging to another "paradigm", with different normative assumptions (Badham and Jürgens, 1998; Emery, 1980). Gardell and Gustavsen (1980, p. 4) explicitly state the need to build working-life research on "extra-scientific values". Hence, working-life research starts out with values and ethics, hardly a good point of departure for advancing theory. As argued by Thompson *et al.* (2000, p. 1156), "starting with ethics means finishing with nothing to argue about than each other's value preferences".

A final example of a work-design theory turned ideology is the following quotation from another researcher involved in the design of the Uddevalla plant:

> "A person who does not accept the principles underlying the 'Reflective Production System' realized in the Uddevalla plant, of course cannot see its immanent potentials, since the 'Reflective Production System' as a whole contradicts his basic assumptions. These potentials, however, are immediately clear to a person convinced of the correctness of the basic principles of the Uddevalla factory." (Ellegård, 1995, p. 57-58)

Beyond the slightly ecclesiastical reference to "immanent potentials", the quotation echoes the teaching of St. Augustine on the relationship between faith and reason: *credo ut intelligam*.[9]

Ideological assumptions are by themselves not trustworthy, but they could still be right. Does organization theory give support to the proposition that work systems based on autonomous groups lead to high operational performance? Most relevant studies have been conducted by HRM researchers and followed an empiricist methodology (Guest, 2011); some measure of autonomy has been correlated with some measure of performance. This kind of "black box" research means that we know little about which mechanisms are involved and what are the causal linkages accounting for the findings (Delarue *et al.*, 2008; Ramsay *et al.*, 2000). Hence, the autonomy–performance linkage remains under-theorized (Fleetwood and Hesketh, 2006; Thompson, 2011). Given the psychological focus of classical socio-technical theory and modern HRM, the relevant mechanisms are likely related to quality of working life and job satisfaction, which create commitment and encourage productive behaviour. However, as emphasized by Thompson (2011, p. 359), such a causal chain involves many "unproven links". A fundamental problem with these psychological models is that workers' subjective experience of job satisfaction may be relatively independent of the objective level of autonomy or participation. Vidal (2007a, p. 247) found that "workers can be satisfied under relatively traditional Fordist arrangements and that increasing employee involvement does not necessarily lead to increased satisfaction". In a recent review article, Guest (2011, p. 8) points out that "research on HRM and performance has largely neglected theories of workers' values and motives and individual differences […]". In addition to these psychological mechanisms, Delarue *et al.* (2008) propose a structural mechanism relating autonomous work groups to performance: autonomous work groups mean decentralized decision making. Decentralized decision making reduces organizational complexity. Less complex organizations are more responsive and flexible. A precondition for decentralized decision making is that sub-processes are de-coupled through buffering or parallelization (De Sitter *et al.*, 1997).

[9] Latin: "I believe so that I may understand". St. Augustine (354-430AD) was a Father of the Church, highly influential on Christian philosophy.

Unless this is the case, the need for inter-group coordination will make complex structures for inter-group decision making re-emerge (Ingvaldsen and Rolfsen, 2012). Buffering and parallelization increase inventory-carrying costs and more capital is needed for investment in tools and machinery. Whether or not de-coupling is economically viable cannot be settled theoretically. Unfortunately, with the exception of the Volvo Uddevalla case, no studies of industrial work system with extensive de-coupling are known to the author. Even Volvo, once the champion of parallel assembly, has returned to traditional line assembly (Engström *et al.*, 2004; Wallace, 2008). This lack of studies may indicate that de-coupled production is very uncommon, and that work-design practitioners consider them inferior to traditional designs. Anyhow, the structural mechanism relating autonomy to performance is hard to evaluate.

Although the autonomy–performance link is under-theorized, empiricist research may indicate that there are causal relations, although these are poorly understood (Lawson, 1998). With reference to recent reviews, Ingvaldsen and Rolfsen (2012, p. 876) conclude that the relationship between group autonomy and organizational performance remains relatively unexplored. A notable exception is Glassop (2002), who found a marked benefit in overall labour productivity explained by self-managing work groups. However, there is one important methodological caveat to this study: the presence of self-managing work groups was measured by a single survey entry, where respondents answered "yes" or "no". No questions were asked testing for actual involvement or group autonomy (Glassop, 2002, p. 234). In practical, non-technical language "self-managing work group" is a very ambiguous concept (Benders *et al.*, 2002; Rolfsen *et al.*, 2012), hardly distinguishable from normative notions of "teamwork" and "cooperation". Given these objections, it is hard to know what kind of work systems Glassop (2002) was actually testing.

Several studies have found a positive association between group autonomy and intra-group performance (Cohen and Bailey, 1997; Cohen *et al.*, 1996; Cohen and Ledford, 1994; Stewart, 2006). These studies indicate that an autonomous group performs better than a non-autonomous group, other things being equal. A methodological weakness of these studies is that performance is almost exclusively measured by team members' or team supervisors' subjective assessments. Given that autonomy has been found to have a more positive effect on attitudes than behaviours (Cohen and Bailey, 1997, p. 249), subjective assessment more likely overstates than understates performance. Another objection to these findings is that the relationship between autonomy and performance may be curvilinear (Jürgens, 1995, p. 210); a little autonomy may be better than no autonomy, but the work systems in question are those with extensive autonomy. Extensive autonomy may be way beyond the "optimum" level of autonomy with respect to group performance. Still, the more important objection is that these positive intra-group effects of autonomy do not scale

up to the inter-group, work-system level (Ingvaldsen and Rolfsen, 2012, p. 876-877). As also emphasized by Adler and Cole (1993), the problems of autonomy-based work designs are systemic, and may not be experienced as such on the level of the individual or the work group.

The autonomous work group can be interpreted as a special case of worker participation (Cohen and Bailey, 1997; Emery and Thorsrud, 1976). Despite extensive research, organization theory has not come up with any decisive evidence supporting the claim that participation boosts performance (Godard, 2004; Guest, 2011). In a review on the relationship between participation and performance, Wagner (1994, p. 325) concludes regarding the participation–performance relationship that, "though statistically significant, the average effects revealed in this article are so small as to raise questions about practical significance". Supporting an earlier study of MacDuffie (1995), Kim *et al.* (2010) found a positive relationship between work groups' direct participation and labour productivity, but the kind of participation in question was with highly structured problem solving, and not worker autonomy.

Finally, the limited practical adoption of autonomous work groups is indicative. If work systems based on such groups were highly productive, we would expect widespread adoption. In the UK Gallie *et al.* (2012) found that although "teamwork" was prevalent, few of these teams enjoyed any substantive autonomy:

> "While our evidence confirmed that there has been a market growth in teamwork from the early 1990s to 2006, this did not mean a growth in the proportion of employees in teams with any significant control in their work activities. Rather, there has been a decline in the prevalence of self-directive teamwork and a growth in teams largely dependent on external control." (p. 18)

A European survey finds similar results:

> "On the basis of the measure of intensity, which explicitly takes into account autonomy and the issues which groups are allowed to decide, there appears to be little evidence for the adoption of semi-autonomous group work associated with the Scandinavian model; if there was a tendency, it seemed to be towards the Toyota model." (Gill and Krieger, 1999, p. 583)

The ability of the competitive mechanism to single out the more productive work system should not be overestimated (Nelson and Winter, 1982). It could be that neo-liberal institution environments tend to promote more low-road forms of teamwork (Godard, 2004; Thompson, 2003) or that managers are simply reluctant to give up their control of the

labour process (Edwards, 1990; Emery, 1980). But given the strong rhetoric of classical socio-technical theory, it is indeed odd that the work systems advocated only have limited prevalence in Scandinavia. Twenty years after the Uddevalla plant was shut down, no similar experiments have been reported.

According to the theory informing the design of democratic work systems, extensive autonomy would lead to high operational performance. Consistent with the argument of Ingvaldsen and Rolfsen (2012), a review of both classical and contemporary literature on the autonomy–performance relationship indicates that this proposition lacks both proper theoretical and empirical support. "Psychological efficiency" does not necessarily improve "economic efficiency". Happy workers are not necessarily productive workers.

6.1.2 Autonomy and organizational learning

In this section, special attention is paid to the relationship between autonomous work groups and organizational learning. On the one hand, learning is an aspect of the performance construct as a determinant of long-term competiveness. On the other hand, performance is usually measured by productivity, which at least in cross-sectional designs does not take into account development over time. A separate treatment of the autonomy–learning relationship is also instructive because socio-technical theory in recent years has put more emphasis on learning than productivity. Supposedly, the increased need for organizational learning implies the resurgence of work systems based on autonomous work groups (Gustavsen, 2007). I will show that this proposition is not trustworthy, because the learning mechanisms associated with autonomous work groups are exactly those archaic handicraft mechanisms targeted in Ingvaldsen (2013).

Ingvaldsen (2013) criticizes the theory of communities of practice. Autonomous work groups and communities of practice are not the same constructs (Wenger and Snyder, 2000). An autonomous work group may also be a community, but communities also include larger entities, possibly consisting of members from different groups. The important similarity between the constructs is the focus on autonomous craftwork. As we have seen, critics of socio-technical design referred to it as "craftlike" or "neo-craftsmanship" (Adler and Cole, 1993; Womack *et al.*, 1990). These labels are not pejoratives, but also used by the work systems' advocates. Ellegård (1995, p. 43) describes Uddevalla as "craftsman-like assembly on a large scale". Berggren (1992) refers to "competitive craft work". Nilsson (1995, p. 79) explicitly relates the learning principles of the Uddevalla plant to the "old Western European handicraft tradition, which is also

applicable in the 'New World' in the aftermath of the Taylorist phase of the industrial area".

From its onset, socio-technical theory was concerned with the virtues of pre-Taylorist, pre-mechanized forms of work. The English mining studies made reference to "craft pride" and "artisan independence", and how appropriate work forms "evolved from the experience of successive generations" (Trist and Bamforth, 1951, p. 6-7). The miners' work forms were in "equilibrium" with the social customs and traditions of the mining community. With mechanization this "social balance" came to an end, with deteriorating consequences for the miners and their communities (Trist and Bamforth, 1951). The theory of organizational choice later developed by Trist and Emery was very much a theory of how the rationalization tendencies explored in Marxian and Weberian sociology could be contained and "natural", "humane" work could be restored, by lengthening work cycles, integrating manual work with mental work, and creating the conditions for small-group organic solidarity. While socio-technical design today is referred to as post-Tayloristic (Sandberg, 1995; Vidal, 2011), it remains committed to work forms that historically speaking are pre-Tayloristic. The assertion that "humane work" resembles craftwork is not exclusive to the socio-technical movement. It is also found in labour process theory (Braverman, 1974) and in human relations theory (Sewell, 2001). But socio-technical theory, more than the others, is committed to a positive project of restoring what was once lost in the course of rationalization.

More analytically, classical socio-technical theory conforms to Ingvaldsen's (2013) propositions about craft-based learning. The propositions are repeated below.

> (1) Much of the knowledge relevant for work is tacit in nature. Tacit knowledge is difficult or impossible to codify explicitly.
>
> (2) Workers' actual methods of working and division of labour typically differ from those that are formally prescribed. Performance of work depends on context-specific improvisation, which cannot effectively be pre-specified in formalized work designs.
>
> (3) Workers acquire the tacit knowledge they need to perform their work through a process in which they are socialized into a 'community' of workers. These socialization processes transform the workers' self identities and reproduce the community. Knowledge creation and learning are products of the collective 'reflection in action' which takes place within and between these communities. This reflection in action produces new tacit knowledge, improves informal work methods and rearranges the division of labour between community members.

(4) The most productive role for management is to support and 'cultivate' these communities: let the 'natural' learning processes unfold and harvest the results.

Conformance to propositions (1) and (2) follows from the principle of "minimal critical specification" (Cherns, 1976). When work is not standardized and not broken down into its constituent movements and timings, job design is only very generic and task execution remains dependent on tacit knowledge. While socio-technical theory may not follow practice theory in arguing that work *cannot* be broken down and standardized, it obviously states that it *should not*. Conformance to proposition (3) follows from Nilsson's (1995, p. 83) ambition to restore the "old apprentice-journeymen relationships in the guild system". One way of achieving this was to reconstruct the professional identity of the "car builder", the single blue-collar job description found at Uddevalla (Nilsson, 1995). That learning is socially situated is also evident in Trist and Bamforth's (1951) description of how the mining community is reproduced by socialization of new members. Conformance to proposition (4) follows from socio-technical theory's rejection of formal authority and industrial engineering (Elden, 1986; Emery, 1980). Within the boundaries of the autonomous group, workers make the improvements and innovations.

Since socio-technical theory re-produces the propositions of craft-based learning, it follows that Ingvaldsen's (2013) critique of craft-based learning applies. The argument will not be reproduced in full here. According to Adler and Cole (1993), work designs based on autonomy promote individual learning, but in the absence of mechanisms to identify and diffuse this individual learning, organizational learning does not follow. Ingvaldsen (2013) makes the additional point that when the labour process is not explicated in formal procedures to which work execution conforms, system-wide rationalization becomes impossible. Application of industrial engineering techniques requires that the details of timings, task dependencies, capacity utilization, etc. are known. When workers are free to organize work informally, these parameters are unknown, and calculation is futile. Above (section 6.1.2) it was argued that high intra-group performance does not aggregate to high organization performance. The same applies to learning: high levels of individual or group learning do not necessarily lead to high levels of organizational learning. This problem of aggregation is completely overlooked in classical socio-technical theory and other versions of craft-like learning.

In a recent article about Scandinavian work organization, Gustavsen (2007) argues that "the term learning organizations […] correspond[s] to the notion of autonomy in work" (pp. 650-651). This correspondence is established through the following argument: organizational learning is contingent on trust between management and workers. Trust is contingent on the basis that the social partners "grant each other a certain amount of

freedom" (p. 651). Freedom, on the workers' behalf, implies autonomy. The first step of the argument is consistent with other literature on organizational learning (Adler and Borys, 1996; Bessant and Francis, 1999). Unless there is trust or at least a sense of shared purpose, workers are likely unwilling to participate in improving technical-economic performance for fear of work intensification or redundancies (Ackroyd and Thompson, 1999; Bacon and Blyton, 2006). The second step of the argument is more problematic. Autonomy, understood as freedom and independence, does not necessarily lead to or reinforce trust. Workers' independence from management *may* reflect and re-produce a relationship of trust, e.g. when management trust workers to display discretionary effort. But workers' independence from management may equally well be a result of and reproduce antagonistic labour–management relations (Bélanger *et al.*, 2003; Ezzamel *et al.*, 2004). Furthermore, extensive autonomy tends not to support coordinated collective action, which is required for organizational learning (Ingvaldsen, 2013). Psychologically, it seems far more reasonable to suggest that trust and organizational learning are contingent on a motivational orientation that appreciates mutual interdependence (Adler and Chen, 2011). By "freedom" Gustavsen (2007) may refer to organized labour independence from management, that the social partnerships are symmetrical and not employer dominated (Kelly, 2004). But then he is mixing up levels of analysis when arguing that shop-floor autonomy is the implication (Gustavsen, 2007, p. 651). The structure of industrial relations is distinct from the structure of the work system. There is no reason to uphold that there is a causal relationship between autonomy and organizational learning, mediated by trust. Organizational learning is supported not by independence but by a mutual recognition of interdependence. A recognition of interdependence calls for participation in collective decision making, not autonomy.

6.1.3 Letting go of autonomy

The findings and discussions of the previous sections cast serious doubts on the performance of work systems based on extensive autonomy. The independent articles argue that extensive autonomy upset both production flow and organizational learning (Ingvaldsen, 2013; Ingvaldsen and Rolfsen, 2012). Both challenges are systemic, and have not been adequately theorized in previous literature. Counter-arguments to my findings, which relate extensive autonomy to high performance and learning, may be trustworthy with respect to individual- and group-level analysis. However, they are not trustworthy with respect to the work-system level of analysis. Although extensive autonomy may be socially and psychologically desirable, we have no good reasons to believe that work systems based

on autonomy will achieve the same level of technical-economic performance as a lean-production system.

By arguing that alternatives are inferior, my findings give support to Womack *et al.*'s (1990) claim that there is "one best way" of organizing large-scale industrial production. The bold claim of Womack *et al.* (1990) is (deliberately) sweeping and imprecise. A relevant technical objection is that not all practices of the lean-production work system are applicable in all production settings. For instance, just-in-time may make little sense or add little value in the highly automated, continuous chemical process industry. But more generically, it is highly plausible that the systematic elimination of operational variability will lead to better performance (de Treville and Antonakis, 2006; Shah and Ward, 2003). First, elimination of variability leads to fewer deviances and less re-work. Second, and even more important, variability reduction unleashes the power of systematic continuous improvement and system-wide rationalization (Ohno, 1988). Interpreted this way, lean production is the historical successor of previous forms of rational management (Barley and Kunda, 1992). There is continuity from Smith's pin-makers, Babbage's tabulations, Taylor's Scientific Management and Ford's assembly line, to the system-wide rationalization of Ohno (see also Boyer, 1998, p. 23-24). Marx (1976, p. 616-617) wrote:

> "It is characteristic […] that, right down to the eighteenth century, the different trades were called 'mysteries' (mystères), into whose secrets none but those initiated by their profession and their practical experience could penetrate. Large-scale industry tore aside the veil that concealed from men their own social process of production and turned the various spontaneously divided branches of production into riddles. […] The varied, apparently unconnected and petrified forms of the social production process were now dissolved into conscious and planned applications of natural science, divided up systematically in accordance with the particular useful effects aimed at in each case."

Leaving aside the early rationalization movement's technocracy and moral contempt for workers' natural laziness (Bendix, 1956), this is fundamentally a story about how man learn to master his natural environment through the application of science and technology (Cohen and Kymlicka, 1988). In light of this development, the desire to return to craft like production is romantic and reactionary (Adler, 2007; Ingvaldsen, 2013).

It follows that Trist's (1981) concept of radical "organizational choice" is rejected. This was really not a question of choice anyway, but rather the substitution of the "one best way" of Taylorism to the "one best way" of autonomous work groups (Kelly, 1978). As

will be discussed in section 6.2, I do not suggest that technology determines all aspects of the work system. But the proposition that industrial work systems producing at a large scale can be organized *radically differently* (Herbst, 1976; Trist, 1981) from the basic principles of Ford and Ohno, and still be highly productive remains ideological and lacks theoretical support.

According to Adler (2007), organization theory's obsession with autonomy as a descriptive and prescriptive construct precludes a scientific analysis of the long-run changes of industrial-work organization. Socio-technical theory and labour process theory both assume that absence of autonomy is alienation. Mainstream theory considers autonomy to be a main predictor of motivation and quality of working life (Hackman and Oldham, 1980; Karasek, 1979). When autonomy is the yardstick, research is led into nostalgia when confronted with evidence that autonomy is declining (Adler, 2007; see also section 6.1.1). Scandinavian organization and working-life research is particularly prone to this nostalgia (Ingvaldsen *et al.*, 2012; Johansson and Abrahamsson, 2009; Oudhuis and Tengblad, 2013; Sandberg, 1995). Recent developments and contemporary forms of work organization always fall short of the golden past of the 1960s' democratic workplaces.

The implication of this thesis is that practical work design should let go of autonomy as a normative principle for the structuring of work systems. Rather than restoring the democratic work system of the 1960s as the organizational blueprint, work design should seek out viable combinations of lean production and industrial democracy.

6.2. The possibility of democratic lean

If the traditional democratic work system is not a viable alternative to lean production, the second approach to resolving the lean-democracy tension becomes highly relevant (cf. section 3). Increased competitive pressure along with organizational isomorphism make Norwegian industry adopt technical lean practices such as standardized work, just-in-time, total productive maintenance and systematic continuous improvement. But what then will happen to worker participation and industrial democracy?

Analytically, the core issue is that of work-system coherence. Will a "lean" configuration of the technical dimension of the work systems be poorly aligned with how the governance dimension, the normative dimension and the support systems are typically configured in Norwegian industry? To what extent can the existing configurations of the governance dimension, the normative dimension and the support systems be retained if the labour process turns lean? The pressing question is whether or not a work system can be

participative and democratic when worker autonomy is limited. Unless a combination of lean production and industrial democracy is coherent, both worker participation and work-system performance are likely to be undermined (Boyer, 1998; Pardi, 2005).

I will show that a coherent combination of industrial democracy and lean production is indeed possible. First (section 6.2.1), I argue that lean production does not necessitate the autocracy attributed to it by critics. Lean production may or may not be accompanied by substantive worker participation. Second (section 6.2.2), I discuss the tensions that a combination of lean production and the traditional conception of industrial democracy give rise to. I argue that the combination will not be coherent unless the governance dimension and the normative dimension are also to some extent reconfigured. Third (section 6.2.3), I summarize the content of a democratic lean work system.

6.2.1 Different forms of lean production

On the face of it, mainstream lean-production literature gives reason to optimism. According to its advocates, lean production yields the better performance when backed by workers' direct participation (e.g. Hines *et al.*, 2004; MacDuffie, 1995; Shah and Ward, 2003; Womack *et al.*, 1990). Furthermore, these forms of direct participation are supported by broadening of workers' skills through job rotation and on-the-job training. However, the participation in question is small-group problem solving, aimed at improving work standards (Adler, 1993a; MacDuffie, 1997). This participation is typically consultative (Vidal, 2007b), and aims to improve conventional business indicators such as productivity and product quality (Busck *et al.*, 2010). Critics argue that although these forms of participation may be an improvement vis-à-vis Fordism, they fall short of the substantive and extensive forms of participation traditionally practised in Scandinavia (Berggren, 1992; Ingvaldsen *et al.*, 2012; Oudhuis and Tengblad, 2013). In lean-production literature, representative- and union-based participation is usually not addressed. In general the lean concept does not encompass the influence of social and political institutions (Cooney, 2002). A notable exception is Kim *et al.* (2010), who find that union-based, indirect participation is related *negatively* to continuous improvement and labour productivity.

Empirical research has documented that lean production is seldom accompanied with substantive and extensive worker participation. Supposed "decentralization of decision making" (e.g. Karlsson and Åhlström, 1996) in practice means empowerment of team leaders and foremen, not of ordinary production workers (Benders and Van Hootegem, 1999; Delbridge *et al.*, 2000). Even workers' extensive involvement in continuous

improvement seems to be limited to a few celebrated cases, such as GM Saturn and GM/Toyota NUMMI (Vallas, 2003b, p. 224). In a recent literature review, Jones *et al.* (2012) find that there is a striking discrepancy between the rhetoric of empowerment and actual lean-production practice:

> "[W]e have presented a range of evidence from the literature about how employee empowerment is effectively silenced in lean production automobile plants whilst management control and surveillance have increased, despite claims of management of the opposite. An illusion is created which makes autocratic decision making appear like employee empowerment." (Jones *et al.*, 2012, p. 1643)

Case studies of lean production in Japan, the US and Europe document work intensification and tight managerial control (Berggren, 1993; Graham, 1995; Lewchuk and Robertson, 1997; Nomura and Jürgens, 1995; Pardi, 2007; Parker and Slaughter, 1988; Rinehart *et al.*, 1997; Sewell and Wilkinson, 1992; Vallas, 2003b; Vidal, 2007b). Further negative consequences for workers are employers' hostility to labour unions and deteriorating quality of working life under lean production (Cusumano, 1985; Graham, 1995; Landsbergis *et al.*, 1999; Parker and Slaughter, 1988).

The evidence linking lean production to autocracy is suggestive, but does not necessarily imply a causal relationship (Fleetwood, 2001). For instance, it could be the case that early adopters of lean production were companies caught in ruthless cost-competition, which demanded radical cost-savings measures. This is not implausible, since automotive manufacturing is a highly competitive sector. Then, work intensification and tightened managerial control would reflect the tendencies of globalized capitalism (Thompson, 2003) more than any specific tendencies of the lean work system. An alternatively organized work system, e.g. one based on autonomous groups, may under the same external conditions also respond with work intensification, increased stress and injuries (Godard, 2004; Ramsay *et al.*, 2000). Hence, a proper analysis of the relationship between lean production and worker participation should be sensitive to how the lean labour process is embedded in a wider political economy (Smith and Meiksins, 1995; Vidal, 2011), which may or may not promote participative organizational forms.

At the company level, labour process theory has explored how lean production reproduces and reinforces managerial control. Sewell and Wilkinson (1992) argue that when buffers are eliminated (JIT) and deviances systematically kept track of (TQM), the labour process becomes more transparent. Increased transparency enables better managerial control and reinforces traditional patterns of authority. Automatic electronic monitoring, enabled by modern ICT, further increases managerial surveillance. When coupled with peer

pressure resulting from corporate socialization (Casey, 1999), control becomes internalized and ubiquitous (Sewell, 1998). Whether or not management could succeed in creating this form of total control is contested (Thompson and Ackroyd, 1995), but it is fair nonetheless to suggest that compared to other work systems (Fordist, autonomy-based), the lean work system is easier for management to monitor and control. Labour process theory has also interpreted continuous improvement not as a form of participation, but rather as self-rationalization (Bacon and Blyton, 2006; Lewchuk and Robertson, 1997; Moldaschl and Weber, 1998). This critique runs deeper than the empirical finding that continuous improvement often does not involve substantive participation, as the real decision-making power resides with managers and industrial engineering (Vallas, 2003b; Vidal, 2007b). Rather, it suggests that through involvement in continuous improvement workers internalize managerial rationalities (Contu *et al.*, 2003), and by "improving" the labour process they make themselves redundant or contribute to their own work intensification. Again, this internalization of managerial rationalities is dependent on normative control through corporate socialization (Casey, 1999; Vallas, 2003a). Finally, the hierarchical organization of lean-production plants (Ingvaldsen and Benders, 2013) is interpreted as a further sign that lean production is contradictory to worker participation.

Labour process theory may be right that lean production lends itself to better managerial control and work intensification. But a major theoretical shortcoming of the argument is the assumption that lean production reflects the managerial imperative to maximize labour control, either directly or normatively (Edwards, 1990; Friedman, 1977). *A priori*, this assumption rules out the possibility that lean-production practices may be used to advance the interests of labour, or more generally be anything else than a means to valorize capital. Why cannot improved transparency be used to design jobs with a more balanced workload leading to less stress? Why cannot continuous improvement also target ergonomics, safety and working conditions? If they cannot, it is because of economic or normative reasons and not because the technical practices are restraining. Behind labour process theory's critique of lean production is a more fundamental critique of capitalism. But the former is not a simple reflection of the latter. Lean production is also a way of making things, independent of the predominant relations of productions (Adler, 2007).

According to Adler (1993a; b; 2007; Adler and Borys, 1996), lean production can be understood as an "organizational technology". Similar to what we conventionally understand as technology (tools, machinery), organizational technology can be designed either to coerce effort and compliance, or to enable employees to better master their tasks. The former form of organizational technology is referred to as "coercive", the latter as "enabling" (Adler and Borys, 1996). The prime example of Adler (1993a; b) is the

Tayloristic "technology" of work standardization and time-and-motion studies. In a conventional interpretation, these are managerial technologies enforced upon workers in order to intensify effort. However, Adler argues that if work standardization is carried out by the workers themselves, it becomes an instrument for better mastery of tasks. Adler's distinction de-couples the organizational technologies from the rationalities guiding their application. Lean practices such as standardized work, short cycle times, quality controls and housekeeping standards may be applied as coercive tools of management, but may also be applied to unleash the productive power of collective labour under non-coercive labour–management relations. It follows that lean production is theoretically compatible with substantive participation, such as workers' direct participation in work design and union-based, representative governance. This kind of participation does not equal self-rationalization, since the co-operative design of the lean work system may take into account workers' interest in ergonomics, safety, etc. or concerns for "fair" distributions of workloads and rewards. Adler's main point is also implicitly acknowledged by Sewell and Wilkinson (1992, p. 287) when they argue that managerial power is reproduced in virtue of management's control over the "means of surveillance". If the power distribution was less asymmetrical, the knowledge gathered through shop-floor "surveillance" could be shared with labour representatives and acted on also in the interest of labour. This suggestion may seem naïve, but illustrates the crucial point: the mode of governance and decision making may be participative even though the work system is lean. Stretching the argument, it can even be proposed that improved transparency leading to better information will enable labour representatives to make better decisions given disclosure of the information.

Adler and Borys' (1996) coercive/enabling distinction can account for recent findings that worker participation is neither a necessary part of, nor incompatible with, lean production (Pardi, 2005; Vallas, 2003b; Vidal, 2007b). Although the coercive form with limited participation is predominant, other cases of more participative forms of lean production have also been documented (Adler, 1993a; Shaiken *et al.*, 1997). Then, according to Vidal (2011, p. 283), the central question becomes "the contextual sources of different forms of lean production, both local context and how it is implemented within different (national and regional) formations and employment relations". In an earlier paper, Vidal (2007b) suggests that the nature of worker participation under lean production is a negotiated outcome of the restructuring processes taking place in concrete plants. The key variables in this process are the strategic orientation of management, organized worker power and workforce dispositions. Empirically, he finds that management prioritizes those technical changes (logistics, standardization, process controls) that give the largest and most immediate performance benefits. Management tends not to prioritize increased worker participation as its performance benefits are uncertain and the social transformation away

from Fordist social relations is difficult. A similar technocratic disposition of management is reported by Vallas (2003b) and also by Lewchuk and Robertson (1997, p. 60) when they write that "[management] may pay lip service to empowerment, but the real focus is process control". Vidal (2007b) argues that union–management partnerships may facilitate substantive shop-floor participation, given that unions and workers desire these forms of direct participation. Labour unions in liberal economies often perceive direct participation as a threat to union power (Gill and Krieger, 1999; Gonzalez, 2010). This is also the explanation offered by Kim *et al.* (2010) as to why union-based participation is found to undermine the efficacy of direct participation in the automotive industry.

Consistent with Vidal's framework, Adler and Borys (1996) argue that institutionalized union voice promotes enabling forms of work organization. They also add two additional contingencies promoting the enabling form: automation and competitive pressure. Automated production requires more skilled workers (Adler, 1992; Kern and Schumann, 1987) who are better qualified to engage in work design and continuous improvement. In addition, automation tends to make conflicts over work intensity less salient, so management will be less inclined to coercion. Competitive pressure provides a "reality check" that aligns the goals of labour and management. Of course, too much competitive pressure and threats of plant closure may lead to social conflicts and labour militancy (Bacon and Blyton, 2006). If the company is forced to prioritize short-term cost cuts over long-term competitiveness, management may intensify work and cut back on continuous improvement, leading to what de Treville & Antonakis (2006) refers to as "excessive leanness" (see also Inamizu *et al.*, forthcoming)**.** Then, there may be little room for direct participation. An additional factor discouraging the enabling form of lean production is externalized employment relations (Thompson, 2003; Vidal, 2011). A non-stable workforce may be cheaper but less skilled and not qualified to take part in job rotation and continuous improvement. Pardi's (2005) case study of Toyota UK documents how young agency workers seriously disrupted the flow of the work system. When management has no incentive to invest in training, they will resort to traditional Tayloristic work simplification and narrow the specialization of workers.

Finally, the enabling form of lean production is promoted by labour legislation and national labour institutions (Adler, 1993a). "High road" forms of work organization tend to be realized within coordinated market economies more than within liberal market economies (Godard, 2004; Martinez Lucio and Stuart, 2004). For instance, high wage levels create incentives for automation, which again promotes enabling work organization. Protections against lay-offs create incentives for employers to invest in employees' skills.

This section has established that lean production can take different forms, depending on internal and external contingencies. On the one hand, lean production can be coercive. When worker participation is excluded, lean production becomes the critics' notion of neo-Taylorism. Alternatively, lean production can be enabling, and accompanied by substantive worker participation.

6.2.2 Democratic lean: Tensions and contradictions

If the factors promoting an enabling form of lean production are compared to the qualities of the Norwegian working life (see section 2.3), it follows that the Norwegian working life promotes an enabling form of lean production. Partnerships between labour unions and management are widely institutionalized. Workers and their representatives usually take part in organization development, and are obligated to do so. Established structures of representative participation create a forward synergy of participation (Butler *et al.*, 2013), which enables more direct participation on the shop floor. Labour unions do not perceive direct participation as a threat, but rather as complementary to their own influence (Gonzalez, 2010; Toulmin and Gustavsen, 1996). High skill levels and permanent employment imply that workers are well positioned to take part in job rotation and continuous improvement. High wages have led to extensive automation, which also promotes the enabling form of lean. Compared to the US case studies of Vallas (2003b) and Vidal (2007b), the ambition to combine lean production with substantive participation in Norway is not a matter of overcoming Fordist social relations, since the social relations in question are not Fordist to begin with. The politics of restructuring would take a different form, and likely be less conflictual because industrial relations are predominantly cooperative. Normatively, both labour and management share a commitment to finding workable solutions.

The combination of the technical aspects of lean production with the participative institutions of the Norwegian working life will be referred to as "democratic lean". Democratic lean is an extrapolation of Adler's (1993a) concept of "democratic Taylorism". While "democratic Taylorism" applies to job design, "democratic lean" applies to work-system design. This is analogous to the difference between the task focus of Taylor (1967) and the systemic focus of Ohno (1988).

Crudely and preliminarily, democratic lean means substituting the content of the technical dimension in the democratic work system (table 1) with the content of the technical dimension in the lean-production work system (table 2). However, this

substitution gives rise to tensions, which may undermine work-system coherence. Specifically, three tensions require further elaboration:

1. If "good work" implies autonomous work, the demands of the normative dimension contradict the content of the technical dimension.
2. If autonomy is a pre-condition for a reverse synergy of participation, as argued by Emery and Thorsrud (1976), then the content of the technical dimension contradicts the nature of the whole-organization decision-making process.
3. If hierarchical governance best supports the lean labour process (Ingvaldsen and Benders, 2013), then the traditional form of non-hierarchical governance contradicts the content of the technical dimension.

The first tension cannot really be resolved. If we demand that industrial work should be autonomous work because it is "good work", a roll back to craft production is inevitable. Still, lean production does not completely exclude autonomy in a weaker sense of the term (Ingvaldsen *et al.*, 2012; Rolfsen and Langeland, 2012). Although work methods are standardized and scheduling is tight, workers may enjoy semi-autonomy with respect to the other work-related decisions (Murakami, 1997). Rolfsen and Langeland (2012) find that if work groups enjoy some autonomy with respect to maintenance decisions, machine deviances can be more quickly responded to "without calling on the maintenance experts" (p. 315). The more general point is that even though the work design *aims* to eliminate process variability (Shah and Ward, 2007), production technology remains unstable (Kern and Schumann, 1987), so in practice there will be unpredictable disturbances and deviances which call for operational regulation (De Sitter *et al.*, 1997). Empowering workers to quickly resolve these deviances and disturbances makes sense even when we accept the fundamental logic of Ohno (1988).

An alternative approach to the lean–"good work" tension would be to call for some kind of compromise between autonomy and standardization. Oudhuis and Tengblad (2013) propose that in Scandinavia work standards could be more "wide" or "robust" and thereby allow for greater variations in work execution. Ingvaldsen *et al.* (2012) also describe a Norwegian lean work system where standardization is less rigid, and the on-line work groups are also responsible for improving the standards. The latter arrangement implies that work standards vary across shifts which perform the same tasks at different times. Such compromises may ease the implementation of lean production in companies where workers are accustomed to high levels of autonomy. Still, the drawbacks are obvious. Small-scale improvements require probing into the details of task executions in a rigorous fashion (Adler, 1993b; Ohno, 1988). If there are several standards for the same task, some are suboptimal. Introducing variability means that system-wide rationalization is made difficult

(Ingvaldsen, 2013). Commenting on the future development of "good work" in Scandinavia, Johansson and Abrahamsson (2009, p. 779) write:

> "The development toward Lean is neither possible nor desirable to stop. The global market requires rational production, and we need to find forms of "the good work" that fit into the framework of Lean".

This assertion may be slightly defeatist, but still realistic. Some evidence indicates that the traditional champions of "good work", the labour unions, are opting for this pragmatic route. Rolfsen and Ingvaldsen (2013) find that both the LO and private-sector labour unions[10] are generally fairly positive to lean and argue that quality of working life can be decent, given that unions are involved in work design. Hence, it seems likely that the tension between a lean labour process and traditional preferences for good work can be worked out in practice.

The second tension is related to the crucial argument informing the second phase of the Industrial Democracy Programme. The researchers found that representative participation was hardly efficacious in advancing industrial democracy unless backed by extensive autonomy on the shop floor (Emery and Thorsrud, 1976; Qvale, 1976). The mechanism creating this backward synergy of participation is psychological (Pateman, 1970); autonomy at the task level prepares workers for involvement in company-level decision making. I will argue that the psychological pre-condition for wider participation is not autonomy per se, but rather direct participation backed by task identity. Within a lean-production system these requirements can be attended to.

As with the relationship between autonomy and organizational learning (section 6.1.2), it is questionable whether autonomy in fact creates the psychological climate for wider participation. While the latter requires a motivational orientation that appreciates interdependence, the former is associated with an individualistic, independent motivational orientation. Based on Adler and Chen's (2011, p. 69-70) distinction between independent and interdependent self-construal, it is reasonable to expect that highly autonomous workers may identify strongly with their own work area, but identify less with the overall work processes. Ingvaldsen and Rolfsen's (2012) finding that autonomous work groups tend to sub-optimize production flow is an example; the highly individualistic and competitive attitude often ascribed to autonomous university professors is another. Still, there is something to Emery's (1980) argument that a person who is accustomed to obey

[10] The public sector is a different story. Public-sector unions are more negative, arguing that lean undermines traditional patterns of trust and implies Taylorism. Illustratively, one circulated pamphlet is entitled "YES to participation and trust – NO to lean."

will find it hard to suddenly voice his opinion. Combining these arguments, it seems that the pre-condition for participation in collective decision making on a broad scale is participation in collective decision making on a more narrow scale. In a lean work system, participation in group-based problem solving and continuous improvement is such a micro-level arena for collective decision making. Especially if the participation is substantive, not only consultative, it will have the desired psychological benefits. Furthermore, it is plausible that the systematic methodologies typically applied in continuous improvement groups (MacDuffie, 1997) will accustom the workers to rational problem solving. These experiences may be valuable when workers enter higher-level arenas of decision making, as these arenas are dominated by an instrumental rationality. There is a risk of co-optation involved here (Casey, 1999; Contu *et al.*, 2003), but extensive representative participation may ensure that continuous improvement is not solely an instrument of managerial rationality.

According to Emery and Thorsrud (1976), the backward synergy of participation is not only about accustoming workers to decision making but also about increasing their awareness of the relationship between their tasks and the compound labour process. When cycle times are long, workers see the relationship between their job and the end product. In a modern work-design vocabulary, this argument points to high task identity: that is, tasks are rounded off, and the individual's contribution is visible in the final product (Hackman and Oldham, 1980). High task identity enables the worker to have an overview of the compound labour process, which is the object of higher-level decision making. However, task identity does not require long cycle times, and can also be achieved in a lean work system (de Treville and Antonakis, 2006). Job rotation enables the individual to follow the different stages of production. Absence of buffers will make the interdependencies in the work system more visible. Delegation of indirect tasks – such as machine setup and maintenance – to the shop floor also raises awareness of how the functionally differentiated work system is integrated. Summing up the argument, tension 2 is only a superficial tension. The lean work system, in an enabling form, offers sufficient arenas for micro-level decision making and task identity to support representative participation.

We now turn to the third tension. The advocates of industrial democracy were highly critical of hierarchical governance, and in particular the roles of foremen and supervisors. Emery (1980, p. 20) was categorical:

> "The role of the foreman is so central to the traditional authoritarian system that the first question to ask of any proposed schema for democratization of work is, what does it do to the foreman's role? If it leaves that role intact then the schema is fraudulent, at best mere icing on the cake."

However much we may prefer non-hierarchical to hierarchical relations, the problem is the following: non-hierarchical coordination is challenging enough in work systems based on autonomous work groups (Ingvaldsen and Rolfsen, 2012). In a lean work system, where tasks are highly interdependent and just-in-time creates fragile logistics, coordination is even more challenging (Lowe *et al.*, 1997). Furthermore, Ingvaldsen and Benders (2013) argue that absence of supervision will upset the work system's capability for on-the-job training and continuous improvement. Although it is theoretically possible to envision a work system where both coordination- and improvement-related functions are distributed non-hierarchically to work groups (Van Amelsvoort and Van Amelsvoort, 2000), only one well-known case study of such a work system has been published (Barker, 1993). However, Barker's (1993) work system is neither democratic nor humanist, but rather characterized by extreme peer pressure and the rule of informal group leaders.

The understanding of hierarchy informing classical socio-technical theory is too limited and unreasonably negatively biased. Following Weber, hierarchical authority is an instrument of domination, but it is simultaneously an instrument of rational decision making, coordination and knowledge development (Adler, 2012; Nonaka, 1994). As shown by Ingvaldsen and Benders (2013), the prototypical lean-production supervisory hierarchy is to a large extent concerned with training, feedback and facilitating improvement activity: that is, with tasks related to the management of skills and knowledge.

Given this ambivalence of hierarchy, the question about the relationship between hierarchical governance and industrial democracy can be reframed. According to Adler (2012, p. 254)

> "[The] progressive socialization of this dimension of organization structure does not consist of flattening the hierarchy in the romantic–reactionary pursuit of a primordial, undifferentiated unity, but consists instead of ensuring that the authority is endorsed from below rather that imposed unilaterally from above."

The lean-production labour process is best supported by hierarchical governance (Ingvaldsen and Benders, 2013). The challenge when designing democratic lean work systems is to institutionalize legitimate hierarchical governance which allows for participation and prevents arbitrary domination by supervisors and foremen.

The prototypical Japanese supervisory hierarchy may form a starting point for identifying the content of democratic lean governance. Structurally, there are few limitations to supervisors' powers. Given the company-wide distribution of decision-making powers, the Japanese supervisors are more powerful than their Fordist counterparts (Fujimoto, 1999; Lowe, 1993). However, the behaviour of supervisors (and subordinates) is

constrained by strong social norms (Benders *et al.*, 2000). The Japanese supervisor is expected to involve his subordinates in decision making and build consensus. Being the most experienced and skilled worker in the group, the supervisor is supposed to act like a "benevolent father": he deserves status and respect, but he is simultaneously obliged to pass on his knowledge and skills to his subordinates. In light of these findings, the Japanese style of management shows itself to be less autocratic than a simple analysis of organizational structure would indicate. Still, the paternalistic relations are obviously not consistent with democratic ideals. The darker side of these social norms is that "harmony-seeking" subordinates are restrained from voicing their opinions. Supervisors have also been found to engage in favouritism and arbitrary personnel management (Endo, 1998).

This brief description of the Japanese supervisory hierarchy shows that hierarchical authority may be limited by behavioural norms. An example from the Norwegian working life is presented in a recent paper by Ingvaldsen *et al.* (2013). The paper deals with "systematic work observations", which refers to a "process in which task execution according to a standard procedure is carefully observed by a nonparticipant observer, and the result of the observation is acted on". On the face of it, this is traditional Tayloristic task control. However, Ingvaldsen *et al.* (2013) find that if the supervisor acting as observer engages in a two-way dialogue with the worker being observed, the work observation becomes an instrument both to identify training needs and to improve the standard operating procedure. Paraphrasing Adler and Borys (1996), the work observation becomes enabling. The supervisors were obliged to engage in a two-way dialogue because the official company principle of "visible leadership" demanded such behaviour. What made this principle more than leadership mockery (Alvesson and Sveningsson, 2003), was workers' insistence that the principle was actually acted on. Supervisors' failure to engage in dialogue was voiced directly by workers or indirectly by their labour union. Hence, there was a system of "checks and balances" that ensured participative worker–supervisor interaction on the micro level. The expectations were reinforced by structural arrangements enabling workers to raise their voices in cases of misbehaviour.

Generalizing the argument of Ingvaldsen *et al.* (2013), the important requirement for democratic lean governance is that expectations for supervisors' behaviour are clearly stated, and that there are control loops aligning their behaviour with those expectations. The latter demands institutionalized worker participation, which is indeed a quality of the Norwegian working life. As pointed out by Qvale (1976, p. 465), highly skilled workers who are accustomed to participative decision making have a better check on experts, including foremen and supervisors. To build legitimacy and commitment, expectations to supervisors may be a result of a joint decision-making process involving workers and their representatives. A participative process can result in an explicit "psychological work

contract" between supervisors and the work groups (Marks, 2001). This would be aligned with the general normative demands for partnership and democratic values, and would exemplify a forward synergy of participation. An alternative way of creating supervisor legitimacy would be to involve workers or their representatives in the selection of supervisors (Durand *et al.*, 1999). The radical approach would be to allow workers to elect their supervisors. Such an arrangement may create difficulties with respect to the supervisors' accountability (Jaques, 1990) and disciplinary functions (Ingvaldsen and Benders, 2013). Still, in practice, it may be possible to find workable solutions where workers have a fair influence over who are made supervisors.

Similar to autonomy, non-hierarchical governance tends to upset the technical performance of the work system. Democratic lean governance means harnessing the positive aspects of hierarchy while preventing it from becoming autocracy.

6.2.3 A democratic lean work system

Lean production can be combined with industrial democracy to create a coherent work system. Summarizing the previous sections, table 6 shows a work system that is democratic lean and internally coherent.

Main dimensions	
Technical	Short cycle times Standardization of tasks Just-in-time labour process with tight dependencies Job rotation Integration of indirect tasks Systematic continuous improvement
Governance	Hierarchical coordination and control Narrow spans of control Expectations for supervisors' behaviour are decided through a participatory process Continuous improvement also targets ergonomics, safety and working environment
Normative	Social partnership; balance of power Democratic values
Support systems	
Whole-organization decision-making process	Labour representation on company boards Labour representation in committees
Training and development	Jobs are designed to allow for learning Job rotation for multi-skilling On the job training by supervisors
Industrial relations	All workers organized in a single labour union Collective bargaining Union–management cooperation in rationalization and organizational development Unregulated representative participation
Selection, reward and appraisal	Permanent employment Seniority- and competence-based pay

Table 6: A democratic lean work system

Compared to the traditional democratic work system (table 1), the technical and governance dimensions have been modified to incorporate lean-production practices. In the normative dimension, "good work" is left out in anticipation of a concept that indicates decent quality of working life within the framework of rational production (Johansson and Abrahamsson,

2009). Systematic job rotation and on-the-job training by supervisors have been added to the "training and development" support system. The democratic lean work system is distinct from the lean work system (table 2), with its emphasis on representative participation and limitations to managerial powers. The industrial-relations system remains traditionally Norwegian, along with the support systems' "whole-company decision-making process" and "selection, reward and appraisal".

The possibility of democratic lean supports the optimistic thesis about the human consequences of rationalization (Adler, 1992). There is a trade-off between rationalization and autonomy, but not necessarily between rationalization and worker participation (Ingvaldsen, 2013). Consistent with the thesis about "technization of work" (Barley, 1996; Kern and Schumann, 1984), technological development will lead to more-skilled workers and reintegration of manual and mental labour. However, contrary to the thesis' prediction, this reintegration will follow from workers' participation in the design of work systems and collective procedures (Adler, 1993b; Springer, 1999), not through the re-emergence of autonomous work (Schumann, 1998).

Democratic lean is distinct from the high-performance work system (HPWS) model advocated by labour reformers in Europe and the US (Appelbaum and Batt, 1993; Boxall and Macky, 2009). While the HPWS model suggests that high performance is attained through psychological mechanisms of motivation and commitment (Evans and Davis, 2005; Ramsay *et al.*, 2000), democratic lean emphasizes the importance of a technically rational work organization (Ohno, 1988; Taylor, 1967). A strong emphasis on motivation and commitment tends to reproduce prescriptions of autonomy and elimination of supervisory positions (Bacon and Blyton, 2000; Evans and Davis, 2005). As shown in this thesis, this is hardly the way forth for large-scale industrial production. While some forms of direct participation are directly related to technical performance (Kim *et al.*, 2010), the extensive and substantive participation of democratic lean is justified socially, not economically. It is about retaining the democratic qualities of the Norwegian working life, including decent quality of working life, high wage levels and cooperative industrial relations. While there is "one best way" of organizing the technical dimension of the work system (Womack *et al.*, 1990), and this technical work organization to some extent determines the mode of governance (Ingvaldsen and Benders, 2013), the broader social organization and mode of decision making is not technologically determined (Boyer *et al.*, 1998). As argued by Lowe *et al.* (1997, p. 796), while "there may be generic advantages from operating with technical systems that have low buffers and produce right first-time, the social systems which support this may be highly varied." Hence, the scope of organizational choice, although not so broad as Trist (1981) envisioned, can be used to design work systems with extensive participation.

The concept of democratic lean resonates the most with the socialization thesis of Adler (2007; 2012; Adler and Heckscher, 2006; Ingvaldsen, 2013). In the course of technological development and rationalization, the scope of collaborative decision making expands, albeit unevenly. As an instance of socialization, democratic lean may also be threatened by global capitalism. The concluding section suggests how future research may empirically investigate democratic lean in the Norwegian working life, and the forces that encourage and discourage its realization.

7 Conclusion and implications

The Norwegian model of work organization based on industrial democracy and worker autonomy is celebrated. But in the spirit of the protestant ethic, the celebration should be temperate. Work systems based on extensive autonomy tend to upset production flow and organization learning. Hence, the democratic work system of the 1960s should not remain the ideal for how to organize operations in Norwegian industry.

Best practice for large-scale production was pioneered by Toyota Motor Company. Lean production may not be the "end of history" (Berggren, 1993). But Ohno's (1988) imperative to continuously and systematically scrutinize the labour process for improvements cannot be dismissed as managerial fashion or an outcome of capitalist irrationality; it is the preliminary culmination of the scientific-technical rationality which has taken us from petty handicraft production to high-quality mass production. Norwegian industry is in the process of adopting lean-production practices. Coupled with strategic differentiation, innovative product design, extensive automation and rational value-chain management, lean-production practices will help Norwegian industry thrive in global competition.

Lean production does not imply the end of industrial democracy. On the contrary, the combination of a tightly coupled lean labour process and Norwegian labour institutions will enable workers to participate in work design and company governance. A democratic lean work system not only reflects a socially desirable compromise between capital and labour and is a safeguard against autocracy and coercive management; democratic lean implies high skills, high wages and a decent quality of working life.

7.1 Limitations and future research

Finally, some limitations should be acknowledged. These limitations may inform the direction of future research. First, a boundary condition of this study is the focus on large-scale industry where products are standardized and volumes are high. I have said nothing about knowledge work (Alvesson, 2001) or even low-volume, customized industrial production, such as ship building or software engineering. If we keep the institutional context constant by focusing on Norway or Scandinavia, the applicability of democratic lean is very much a question of the applicability of lean. According to Vidal (2011, p. 282), lean production applies whenever a labour process can be broken up into a multi-step procedure. Investments in process rationalization and standardization will have the most obvious returns when the labour process is repetitive and routine. Hence, lean production

applies to routine service operations such as call centres, aviation, hotels and restaurants and high-volume financial services, education, healthcare and public services (Bowen and Youngdahl, 1998; Suárez-Barraza *et al.*, 2012; Womack and Jones, 1996). Labour processes which are less routine can possibly be made more routine through standardization of modules and components. At the far end of non-routine labour, "lean fine arts" or "lean basic research" are probably rationalization on overdrive. Exactly where to draw the line between where lean production applies and where it does not should be a topic for future research.

A major limitation to the argument is that democratic lean is derived theoretically as a *possibility*. Without empirical support, one should be extremely careful in extrapolating patterns of industrial development (Hayek, 1964). Although some Scandinavian research describes work systems that bear resemblance to the democratic lean ideal type (Ingvaldsen *et al.*, 2013; Ingvaldsen *et al.*, 2012; Oudhuis and Tengblad, 2013), more empirical research is clearly needed to establish its actualization. Actualization may be distorted or limited by several factors. First, fundamental counter-tendencies are associated with the capitalist mode of production. The short-run profit motive induces managers to withhold investment in technology, rely on neo-Taylorist rationalization and externalize employment relations (Ingvaldsen, 2013). Although Norwegian labour institutions would partially counteract these tendencies, they are still features of global capitalism (Thompson, 2003). Second, there may be transition difficulties. As argued in labour process theory, autonomy is not only a matter of the technical division of labour; it also reflects the distribution of power between workers and management (Ackroyd and Thompson, 1999; Bélanger *et al.*, 2003). Will autonomous workers freely give up their autonomy in return for higher productivity and other forms of direct participation? Hopefully, union–management partnerships along with competitive reality checks (Adler and Borys, 1996) mean that they will, but how this tension plays out during restructuring should be the object of empirical studies. Vidal's (2007b) framework for "organizational political economy" may serve as the theoretical starting point for empirical research on these change processes.

Another question for further research originates in the paper of Ingvaldsen and Benders (2013). Although we find it hard to imagine a viable combination of lean production and non-hierarchical governance, the possibility of such cannot be entirely excluded, although organization theory has yet to document it. Anyhow, our prediction that non-hierarchical lean would be inferior to hierarchical lean with respect to performance would benefit from empirical testing. It is not unlikely that Scandinavian companies will experiment with such hybrid forms of work systems.

Finally, an interesting question is whether or not democratic lean could be viable outside Norway and Scandinavia. Intuitively, similar work systems may emerge within other coordinated market economies such as those of continental Europe. A comparison of industrial-relations systems and structures for representative participation may be the starting point for such investigations. In liberal market economies, functional equivalents for the Norwegian labour legislation and institutions may be harder to establish. Research from the US has documented cases of extensive union–management partnerships (Adler, 1993a; Rubinstein, 2001). However, in the absence of extensive labour rights, management may be more inclined to switch to low-road forms of work organizations. The typical low-trust, adversarial industrial relations of Anglo-Saxon countries (Marks *et al.*, 1998; Martinez Lucio and Stuart, 2004) may impede institutionalization of representative participation, which is a prerequisite of democratic lean. Implementation of lean production may include some direct participation in order to raise employee motivation and elicit improvement suggestions, but would typically fall short of industrial democracy (Vallas, 2003b; Vidal, 2007b).

If democratic lean shows to be a viable high-road post-Fordist alternative, Scandinavian working-life research is challenged to document its virtues, tensions and contradictions. Such a research programme means overcoming the strong value-based preference for autonomy, to which every desirable quality of the work system (participation, democracy, humanism, quality of working life, motivation, productivity, quality, organizational learning, etc.) used to be attributed.

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Autonomous work groups and the challenge of inter-group coordination

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Abstract
In work systems based on autonomous work groups, the effort of different autonomous groups needs to be coordinated to produce desirable system-wide effects. The existing literature on organizational structures for inter-group coordination is limited. In this article, the authors explore two different structures for inter-group coordination, which are alternatives to traditional hierarchical control. These structures are rotating group spokespersons and shared leadership. The main conclusion of this article is that inter-group coordination becomes a major challenge when groups enjoy high levels of autonomy. Our argument builds on a case study of a manufacturing company, analysed through the lens of modern socio-technical theory. The difficulties associated with inter-group coordination have implications for debates on organizational performance and may help explain why autonomous work groups are not widely used in industry.

Keywords
autonomous groups, case study, organization design, participative democracy, shared leadership, socio-technical theory, team work

Introduction

The autonomous work group, alternatively referred to as a semi-autonomous work group, self-regulating work group, self-managing team or self-directing team, is a cornerstone

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of work designs, which aim to transcend the detailed technical division of labour. Autonomous work groups are a common point of reference for debates on high performance work systems (Appelbaum and Batt, 1993), cellular manufacturing (Hyer et al., 1999), team organization (Mueller et al., 2000), socio-technical systems (Van Eijnatten, 1993) and workplace democracy (Emery and Thorsrud, 1976). According to a standard definition, autonomous groups are 'responsible for a complete product or service, or a major part of a production process. They control members' task behaviour and make decisions about task assignment and work methods' (Cummings and Worley, 2005: 341).

In *work systems* based on autonomous work groups, the effort of different autonomous groups needs to be coordinated to produce desirable system-wide effects (Ancona and Caldwell, 1992; Cummings, 1978). We refer to this function as *inter-group coordination*. Compared with job design, inter-group coordination has been under-theorized (Cordery and Wall, 1985; Stewart and Manz, 1995). Literature on 'external team leadership' (Manz and Sims, 1987; Stewart and Manz, 1995) has explored the behaviour of supervisors in relation to autonomous work groups. More recently, literature on 'team boundary spanning' has explored how group members act in order to 'establish linkages and manage interaction with parties in the external environment' (Marrone, 2010: 914). Coordinating behaviour of supervisors and team members is conditioned on the choice of organizational structure (De Sitter et al., 1997). However, our knowledge about organizational structures for inter-group coordination is limited.

According to the advocates of autonomous work groups, inter-group coordination should be solved by other means than hierarchical control (e.g. Emery, 1980; Herbst, 1976; Pruijt, 2003; Van Amelsvoort and Van Amelsvoort, 2000). Our main thesis is that inter-group coordination becomes a major challenge in work systems where groups enjoy high levels of autonomy. Our argument builds on a case study in a manufacturing company, whose experiences are analysed through the lens of modern socio-technical theory (STS) (De Sitter et al., 1997). The company has successively experimented with two alternative structures for inter-group coordination: a system of rotating group spokespersons (Berggren, 1992; Schumann, 1998) and of distributed leadership (Carson et al., 2007; Gronn, 2002). Our analysis points to major challenges of both systems.

The difficulties associated with inter-group coordination have implications for long-standing debates about autonomous groups. First, although autonomous work groups have been found to outperform traditional groups (Cohen and Bailey, 1997; Cohen and Ledford, 1994; Delarue et al., 2008), we suggest that difficulties in inter-group coordination may counteract performance improvement at the organizational level. Second, we suggest that the difficulties of inter-group coordination may help explain why autonomous work groups, despite their benefits (Delarue et al., 2008; Glassop, 2002), are not widely used in industry (Benders et al., 2001; Gallie et al., 2010; Nijholt and Benders, 2010).

Theoretical framework

Our analysis of inter-group coordination builds on modern STS (Achterbergh and Vriens, 2010; De Sitter et al., 1997). Historically, the concept of autonomous work groups was developed in the context of STS (Cherns, 1976; Cummings, 1978; Emery, 1959; Trist and Bamforth, 1951). STS has over several decades been shown to be a robust theoretical

framework (Pasmore, 1995). Owing to their grounding in systems theory (Achterbergh and Vriens, 2010), socio-technical concepts are particularly suitable for illuminating issues of control and coordination. STS establishes the distinctions between systems, sub-systems and aspects systems (Van Eijnatten and Van Der Zwaan, 1998) and addresses how these different levels of analysis are related.

Socio-technical theory (STS)

The classical formulation of STS was developed by E Trist and his colleagues at the Tavistock Institute of Human Relations, following their discovery of autonomous work groups in British coal mines (Trist and Bamforth, 1951). Emery and Trist (1965) conceptualized the organization as an open system interacting with its environment. Emery (1959) further decomposed the organization into a technical and a social subsystem and stated that these subsystems should be jointly optimized, by paying attention to both technical aspects of work as well as the psychological and social needs of the workers. Introduction of autonomous work groups was the prime means of achieving joint optimization. A summary of the classical principles of socio-technical design is found in Cherns (1976).

STS later split into several trajectories (for an overview, see Van Eijnatten, 1993). Two of those concern us here: the Scandinavian and the Dutch. The Dutch version is our analytical framework. The Scandinavian trajectory is relevant because it informed the organizational choices made in our case company. In Scandinavia, field experiments with new organizational forms were carried out during the 1960s (Emery and Thorsrud, 1976). Socio-technical design was seen not only as a means for increasing industrial productivity and quality of work life, but also to enable industrial democracy (Qvale, 1976). Autonomous work groups allowed for blue collar workers' direct participation in decision-making. Hence, the Scandinavian STS was highly ideological, grounded in an attempt to advance participatory democracy in the workplace (Pateman, 1970).

'Modern socio-technical design' (STSD), developed in the Netherlands, is more theoretical and expert oriented than its Scandinavian counterpart (Van Eijnatten and Van Der Zwaan, 1998). According to De Sitter et al. (1997), the key challenge for organizations is to deal with variability and disturbances, from both the external environment and internal operations. An organization which is able to achieve a range of objectives, despite variability and disturbances, is said to be *controllable* (De Sitter et al., 1997: 506). De Sitter's design theory states what requirements are needed for an organization to be controllable. The concepts 'control' and 'controllable' is used by De Sitter in a very distinct sense:

> Control does not refer … to specific goals or interests to be attained, but rather to shaping structural conditions for opportunities to formulate and implement goals. The basic socio-technical question is therefore not to improve a system's capacity to achieve a certain goal according to a prescribed criteria … but to improve a systems 'controllability': the ability to achieve a range of objectives. (De Sitter et al., 1997: 506)

Complex organizations with an extensive functional division of labour are not adequately controllable. Internal complexity tends to amplify disturbances. Instead of

internal complexity, De Sitter advocates simplification of the organizational structures and de-centralized control. Disturbances and variability should be solved as close to the source as possible, by self-contained, autonomous work units.

STSD proposes a two-step procedure for designing controllable organization (De Sitter et al., 1997). First, technical complexity should be reduced. Parallel product flows are the ideal. If parallelization is not possible, sequential flows should be segmented, in such a way that highly interdependent activities are clustered, while dependencies between the clusters are minimized (De Sitter et al., 1997: 511). If there is no natural way to cluster activities, buffers can be inserted to increase independence. Second, autonomous work groups are assigned to control each flow or segment. Each group should take care of necessarily direct and indirect functions. Management may set output goals, but it is up to the group to decide how these goals are realized. If a disturbance occurs, the relevant group should be able to take corrective action. This ensures that the problem, if not very severe, does not cascade to other groups.

Inter-group coordination

'Inter-group coordination' refers to the function of coordinating dependencies between different autonomous groups. The issue of inter-group coordination arises because the autonomous groups within a work system are never fully independent. In principle, all dependencies, and hence the inter-group coordination problem, can be eliminated if all technical dependencies between groups are eliminated. In practice there are several good reasons for retaining inter-group dependencies (Achterbergh and Vriens, 2010: 277):

- If the product mix is broad, parallelization may lower overall capacity utilization to a point where it is economically infeasible.
- Buffers are undesirable because inventory carrying costs are increased.
- Some knowledge and competencies are better utilized as shared resources.

Inter-group coordination can be modelled as an instance of the control cycle at the inter-group level (De Sitter et al., 1997: 516). This enables us to state a set of functional requirements for inter-group coordination. According to De Sitter et al. (1997: 513), a control cycle consists of four interrelated functions: (a) perception, (b) evaluation per aspect, (c) integral evaluation of aspects and (d) choice of control activity. This means that, when a disturbance is perceived, the choice of control activity should be based on an integral evaluation of the problem. Integral evaluation requires that all relevant aspects of the production process and the interrelationship between these aspects are evaluated. A non-integral evaluation would either focus on only some aspects, like logistics, maintenance or personnel, or fail to evaluate how these aspects are related. Such an omission would result in piecemeal problem solving, which is likely to introduce new disturbances (De Sitter et al., 1997). Control activities can be classified as routine or non-routine (Achterbergh and Vriens, 2010: 236−237). Routine control activities are reactive − they deal with variability and disturbances without redesigning the organization's structure and processes. Non-routine control activities are proactive − they alter the organization's structure or processes to eliminate recurring disturbances. According to the principle of

unity of time, location and action (De Sitter et al., 1997: 512), control activities should be executed as close to the source of the problem as possible.

Having clarified inter-group coordination as an instance of the control cycle at the inter-group level, we now turn to the question of how this function can be organized in practice. Existing literature suggests three answers. The traditional answer is an appointed group leader or a foreman. Foremen were a hallmark of classical Fordism, and the role is still important to neo-Tayloristic work systems (Delbridge et al., 2000; Pruijt, 2003). The foreman system typically builds on a vertical division of labour, where group members are responsible for execution, but not regulation, of tasks. The objection to the foreman structure is that it severely limits group autonomy (Benders and Van Hootegem, 1999). Socio-technical research has opposed the foreman structure (e.g. Emery, 1980; Herbst, 1976; Trist, 1981): 'in the new model of work (i.e. STS) there is no place for the role of the foreman' (Emery, 1980: 19).

A second solution is a system of rotating spokespersons. A spokesperson represents the group to other members of the organization, performing inter-group regulation on behalf of his/her group. Systems with rotating spokespersons have been used in Swedish and German manufacturing (Berggren, 1992; Engström et al., 2004; Schumann, 1998) as part of work humanization initiatives.

A third solution builds on shared leadership, defined as 'an emergent team property that results from the distribution of leadership influence across multiple members' (Carson et al., 2007: 1218). If the principle of shared leadership is combined with functional models of leadership (Morgeson et al., 2010), group leadership can be conceptualized as a set of functions distributed to group members on a permanent basis. The single group leader is removed altogether. Van Amelsvoort and van Amelsvoort (2000: 43−45) present the 'star-model' for internal and external coordination of autonomous groups, where 'planning', 'financial', 'quality & safety', 'maintenance' and 'human resources' are the functions to be distributed. The advantage of the star model is 'that the competence of numerous team members can be used and developed, while at the same time more team members have an active leadership role' (Van Amelsvoort and Van Amelsvoort, 2000: 45). The point to emphasize is that each member of an autonomous group is involved in inter-group coordination with respect to one area of responsibility. This way of organizing allows for broad participation in decision-making for all members of the autonomous groups.

We have argued that inter-group coordination can be understood as a control cycle at the inter-group level. As a normative design theory, the STSD states the functional requirements for inter-group coordination. The literature suggest three ways of organizing this function in practice: dedicated group leaders (foremen), rotating spokespersons and shared leadership. Only the latter two are consistent with the general principles of socio-technical design (Cherns, 1976; Emery, 1980). Based on a literature review, the authors did not identify other structural alternatives for inter-group coordination.

Method

In order to explore organizational structures for inter-group coordination, a single-case-study approach was chosen (Dyer and Wilkins, 1991; Stake, 2005). Data collection and

analysis were carried out in accordance with the qualitative, interpretative tradition (Guba and Lincoln, 2005). In general, interpretative analysis builds on a social constructivist ontology, and aims to grasp the subjective meaning of social action (Bryman, 2008). The range of possible meaningful actions is influenced by social structures, which become objectified and reproduced through interaction (Berger and Luckmann, 1967). Formal organizational structures are one instance of such social structures. We focus on how the formal organizational structures influenced inter-group coordination. However, we do not propose that all our findings can be accounted for by the company's choice of organizational structure. In particular, themes related to individual differences and ideology were shown to be important. These themes are included in order to supplement the largely structural analysis.

Single-case-study design aims to explore an interesting phenomenon in context. The goal is to provide a rich description of the social scene, describe the context in which events occur, and explore the extent to which existing theories help us to understand the case or require modification (Eisenhardt and Graebner, 2007). The case company, named 'Tools', was chosen for two reasons. First, it is an extreme case (Eisenhardt, 1989: 537), because group autonomy is particularly high. The work organization had no foremen or formal group leaders, so it resembles the form of work organization advocated by classical socio-technical design (Herbst, 1976). Following Starbuck (1993), we suggest that the specifics of this case will contribute to important perspectives on, and novel understanding of, inter-group coordination. Second, Tools was chosen because the company had successively experimented with different structures for inter-group coordination. In that period, technology and production layout had remained largely the same, although different in scale. This enables comparison of the different coordination structures within the same case (Eisenhardt, 1991).

The main limitation of the single-case-study design is its inability to generalize findings inductively (Eisenhardt, 1989). However, by providing a 'rich description' and identifying both what is 'common' and 'particular' about the case (Stake, 2005), possible transferability and analytical generalizations can be assessed systematically (Gomm et al., 2000).

Empirical material was collected using different techniques: structured interviews, semi-structured interviews, semi-structured group discussions, document collection and non-participant observation. Table 1 gives an overview of the material. The material was collected in several iterations (see Figure 1). Results were frequently fed back to the company and discussed with informants, so credibility was strengthened by respondent validation (Bryman, 2008: 377). Data analysis was performed in a two-step procedure. First, field notes and transcribed interviews were coded for recurring themes (Corbin and Strauss, 2008). Second, the material was re-interpreted through the lens of modern STS. This analytical step aimed to understand how the choice of organizational structure influenced the experience of our informants, as reported in our transcripts and field notes. In particular, we looked at themes related to the control cycle, regulatory action and the unity of time, location and action (De Sitter et al., 1997).

Figure 1 shows the detailed timing of data collection related to important events at Tools. The empirical sections on the two main coordination structures draw primarily on data

Table 1 Sources of empirical material

Interviews	Number of informants	Number of interviews each informant
Interviews top managers	3	5–6
Interviews middle managers	5	5–6
Semi-structured interviews blue collar workers	25	1–2
Semi-structured interviews white collar workers	15	1
Group discussions	**Number of groups**	**Number of meetings each group**
Semi-structured group discussions in white collar groups, 5–15 participants	2	7
Semi-structured group discussions in blue collar groups, 5–15 participants	11	8–10
Observations	**Number of groups**	**Number of times**
Non-participant observation of blue collar groups	11	3–4

clusters 2 and 3, respectively. The general introduction to the case study and the section on the labour union's role draw on all clusters in combination. At each point in time our interview data were a mix of the informants' accounts of current practices and more retrospective accounts. By having a long-standing relation with the case company, the researchers could validate retrospective accounts by comparing them to the data from cluster 1.

Empirical findings: Tools

'Tools' is a Norwegian manufacturer of equipment for milling, turning and boring. During the last 25 years the company has strongly emphasized product innovation,

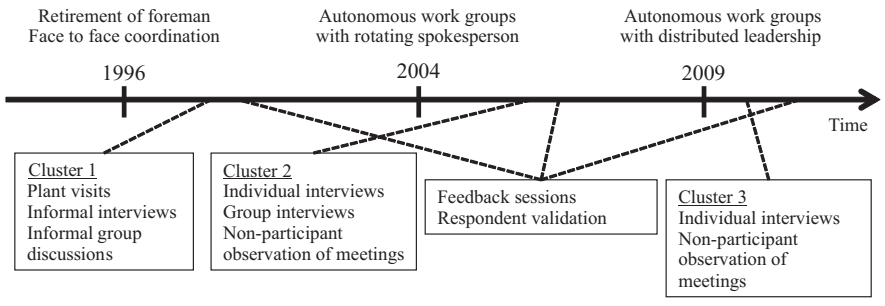

Figure 1 Timing of collection of empirical material.

and grown both in number of employees and in annual sales. They have two basic products, which come in different sizes and with different technical specifications. In addition, they make customized products. The core technologies of both products are patented. The patents have been a major source of competitive advantage within their small market niche. In production, most tasks are semi-automated and involve CNC-machining. In final assembly, tasks are more labour-intensive. Nearly all workers have a skill certificate in mechanics or some other related craft. During the time span we are studying, only minor changes in technology and production layout took place. In the presentation below, the nature of the technological dependencies will be treated as fixed.

The workers are organized in autonomous groups. The technical dependencies between the groups are quite low. Each product passes through two groups before arriving at final assembly. The technical dependencies are thus sequential. In addition there are reciprocal dependencies (Procter and Currie, 2004), especially related to staffing; workers move between groups in order to balance workload. Orders are primarily forecast-driven and produced in small batches. For some products the planning horizon is 3 months, so there is some slack with respect to scheduling. Although an ICT system keeps track of orders and tries to optimize product flow through setting priorities, the groups may decide to merge similar orders into bigger batches or modify the scheduling for orders with the same priority.

Until 1996, about 25 people worked in production. There was no formal group structure, and people worked individually at different stations. Delegation of tasks and coordination of production were the foreman's responsibility. When the foreman retired, a discussion was raised by the labour union. The union argued that a new foreman was not needed, because 'workers themselves were able to coordinate production'. Although managers agreed that a flat organization structure would increase employee motivation, they were initially reluctant:

> [T]hey did not think it would work without a foreman. But the CEO was interested, and at that time, the production manager had been off sick, and still operators worked well. That incident was important for the final decision; we had proven it was possible. (Shop steward)

The practical experience suggested that the flat organization, backed by the ICT system, could produce satisfactory output. During the first 6 months, productivity and quality were reduced, but later returned to their former levels. According to our sources, the flat organization was successful owing to 'highly skilled, highly committed workers'. Tools' initial experience with a 'flat, leaderless structure' created a strong company narrative about how highly skilled workers could themselves coordinate production in the absence of managers. This narrative was frequently referred to in later interviews with workers and labour union representatives. The following quote from a worker is illustrative. The foreman system is phrased in pejorative terms:

> I think we can run production without a production manager. We have done it before. […] The flat structure has come to stay. We won't return to the foreman system, where someone points the finger and tells you what to do. (Production worker)

Autonomous groups with rotating spokespersons

By 2004, the number of employees had nearly doubled, and informal face-to-face coordination became difficult. The production manager wanted to reorganize production into groups with permanent leaders. The labour union had an alternative suggestion: to introduce autonomous groups with rotating spokespersons. Their rationale was to retain a system where every operator had 'equal responsibility and equal opportunities for development'. A joint union–management committee decided to reorganize production into six autonomous groups of six to eight members. The groups were free to organize internally as long as production goals were fulfilled. The groups decided on work methods, internal division of labour and the sequence in which they processed incoming orders. When the workload was unequally distributed, the groups negotiated about moving workers temporarily from one group to another.

Each group had a spokesperson. The spokesperson's task was to represent the team to management and other groups. The role rotated among all group members on a weekly basis. Only three of the operators in the workforce did not take part in rotation, owing to disability. The different spokespersons met twice a week to coordinate utilization of production capacity and human resources. In addition, they met weekly with the production manager. Each group also had internal meetings. The assembly group had a regular meeting every morning, while others groups met once a week.

In interviews and group discussions several issues were raised in relation to the spokesperson structure. The issues revolved around two main themes: *poor information sharing* and *conflicts*. Regarding information sharing, workers complained about frequent misunderstandings and lack of information; it was difficult to get an overview of what other groups were struggling with. Researchers who observed both inter-group spokesperson meetings and intra-group meetings found that sometimes important information was not passed on to the operational groups. Information sharing varied a lot according to which group member was spokesperson. Some workers were eager to inform the rest of the group of what they had learned in the inter-group meetings, while others forgot to mention some of the important issues. Some individuals were uncomfortable with leading a meeting, and tried to do it as quickly as possible, with the result that important things were left out. Our interpretation was affirmed by the HR manager. According to her, some people took their responsibility as spokespersons 'very seriously', while others 'just waited for their week to end'. In addition, several workers considered the meetings to be ineffective; they often 'lasted too long, without ever getting to the point'.

The other main theme was conflict. First, there were conflicts within groups. Workers complained about their group's internal decision-making process; some of the members participated less than others even if the decisions would have an equal impact on all members; 'some people are more big-mouthed and will get it their way' (interview, operator). Second, there were conflicts between groups. In particular, the assembly group complained about lack of understanding from the other groups. Materials tended to come in late, and they were forced to work overtime. By being at the end of a chain of sequentially dependent groups, assembly was particularly susceptible to variability in the product flow (see Christopher, 2005). The organizational structure had few formal mechanisms

to resolve conflicts. In group interviews, disappointment was expressed about the lack of managerial involvement in the 'difficult issues'; 'we never see them [management], they just leave us alone, they do not care' (interview, operator). Rather, the labour union was called upon to arbitrate and resolve conflicts. In the words of the shop steward: 'When nobody wants to talk straight, I am asked to participate. As a representative, I will take the uncomfortable decision' (interview, shop steward).

About the same time, a new production manager was hired. From his perspective, the main challenge in production was *inventory management*. Operators and groups tended to prioritize orders so that the number of machine changeovers was minimized. This created an uneven product flow and build-up of stock of intermediate products. He attributed the poor product flow to the decentralized character of decision-making:

> Self-management ends up with what is optimal for each individual, and that is comfort. […] If the 'self-management' had run this factory […] the plant would have been full of semi-finished productions everywhere, so people could pick whatever they wanted. (Production manager)

The production manager experienced that it was difficult for him to get inventory management on track; workers would resist his 'interference with the groups' right to manage themselves'. In order to mitigate the challenges of coordination, management decided to launch a training project in 'communication and information sharing'. Consultants were hired to develop informal standards of proper communication and clarify role expectations within the groups. Although the training project was perceived as successful, a new structural reorganization was soon started after the initiative of the new production manager. The rotating spokesperson system was replaced by a new system of inter-group coordination based on distributed leadership.

Distributed leadership: 5M

In 2009, the production manager approached the issue of inter-group coordination from a new perspective:

> Back then, I thought: what knowledge must a group leader have in order to manage a group of operators? When we don't have this leader, the joint knowledge of group members must be equal to that of the non-existing foreman. (Production manager)

His solution, entitled 5M, was intended to gain both more direct involvement and specialization of operators. Within 5M, 'leadership' was divided into five technical functions:

1. **Man**: allocation of human resources, balancing the staffing in and between groups.
2. **Method**: the way work is performed. Important issues are visual management, machine set-up and capacity utilization.
3. **Machine**: equipment and tools. Key factors are maintenance, cleaning, measuring equipment and technical status.

4. **Milieu** (environment): the surroundings in which work is performed. Key factors are cleanliness, work environment, emission, light and air.
5. **Material**: raw materials and intermediate products. Key words are quality of products and input material.

Responsibilities for the different M-functions were distributed among the group members. Each function permanently became the responsibility of one person in each group. To compensate for absence of individual workers, the groups also appointed a deputy responsible for each function. A perceived benefit was specialization of knowledge and skills among workers. Each operator 'would become an expert in his function'. In addition, workers would now be 'permanently responsible' for one function. Hence, the fragmentation of responsibilities, which had been a problem under the spokesperson system, would be mitigated. The labour union supported the 5M system. The union perceived 5M as a way to further develop and strengthen the work organization based on autonomous groups.

> 5M is the next step. It's a way to sharpen our focus on what's important. […] Sometimes [during the spokesperson period] it happened that people did not perform 'first priority issues', things we had agreed to do. It happens in all organizations; people forget the overall goals. OK, so 5M is a little bureaucratic, but it does not remove responsibilities away from the groups. We used to do all these things anyway, but now we have categorized 5 areas of attention. Then the follow-up of each area become more personal. (Shop steward)

M-meetings were set up to enable inter-group coordination. Weekly or biweekly, members of different operational groups with the same M-responsibility met in order to coordinate the work system as a whole with respect to one particular function. In each M-meeting, a permanent representative for the technical staff was present. The production manager was also present in the man-meeting and milieu-meeting. Meetings typically lasted for between 30 and 60 minutes. None of the M-groups had formal leaders. The technical personnel may have had some power based on their expert knowledge, but they did not have the right to make decisions on behalf of the M-groups. Decision-making in M-groups was consensus-based.

The authors observed several M-meetings. The meeting agenda was set by the operators, who presented an M-issue. In addition, prior issues were followed up systematically. We observed that many issues were discussed, and most workers were eager to express their opinions. Still, few actual decisions were made. The following example is illustrative: in a milieu meeting, one operator suggested that they should make a common checklist for simple machine maintenance (oil shifts, cleanliness etc.). He also brought along a suggestion for such a list, which they used in his operational group. Another operator immediately supported the idea, and asked for a copy of the list. Another was more sceptical; he thought that such a list was unnecessarily bureaucratic. In his opinion, 'people ought to keep in mind maintenance anyway'. The rest of the operators had a more wait-and-see attitude; they needed to discuss it with the rest of the workers in their operational group. No conclusion was made whether to introduce a checklist or not.

Whenever an issue was raised, the M-group often spent some time discussing whether this was really an issue for this M-meeting or whether it should be solved by 'another M'. For instance, an issue relating to a forthcoming change in production layout was raised. The operator who raised the issue claimed that it was man-issue ('where do we need manpower?'). Others argued that it was actually an issue for materials ('since it related to product flow') or method ('since it was about how we do things'). After a while an operator ironically remarked: 'how about sending the issue to every M-meeting? Then everyone can reject it, and the production manager has to make the decision himself'. In a similar situation in another meeting, an operator compared 5M to 'firing a shotgun'; 'you have a lot of projectiles (i.e. meetings), but you can never be sure you'll actually hit the mark (i.e. the real problem)'.

The role of the labour union

All production workers were members of the blue collar labour union. Through an institutionalized partnership, the labour union played an important role as initiator and premise provider during the organizational changes. As we have seen, the union was the driving force behind autonomous work groups and the spokesperson system, and the union was highly supportive of the transition into distributed leadership. We now proceed to look more systematically at the role of the labour union. According to the union representatives, extensive employee participation and autonomy were a precondition for a 'good workplace' (see also Johansson and Abrahamsson, 2009). Autonomy enabled 'individual job satisfaction, learning and development'. Additionally, they thought it was good for business:

> High tech production requires that the human resource is made the most of. […] The gain of designing an organization which creates involvement and feeling of responsibility is tremendous. […] When management interferes too much, workers lose their energy and engagement. Man is created in that way, right? (Shop steward)

The shop steward's arguments are largely consistent with modern human resource theories of empowerment (Wilkinson, 1998). The shop steward grounded his statements in ideas about the 'Norwegian model of partnership', which builds on the Scandinavian STS tradition of industrial democracy (Emery and Thorsrud, 1976; Gustavsen, 2007):

> Cooperative industrial relations are ingenious for the company. […] We must reach agreements to preserve job satisfaction. […] The more you depend on the power of the hierarchy, according to my head, the worse the cooperation is. If you need contribution from management in order to make decisions, then [management-union] cooperation is poor. (Shop steward)

We interpret these references to participation, autonomy and management–union partnership as an ideological force, which constituted group autonomy as 'good' and managerial interventions as 'bad'. This ideology is consistent with the earlier findings that workers resisted 'managerial interference' and expressed that production could be coordinated 'without the need for management'.

As the main advocate for autonomous work groups, the labour union had a large stake in its success. 'I wanted to prove that workers could be as responsible as engineers, there is no reason why they shouldn't', the shop steward explained. To achieve this, he invested a huge amount of time and energy to make people take responsibility and perform well. One former shop steward reported that he 'was close to start behaving like a foreman, to make workers prove to be responsible'. As we have seen, the union also became involved as a mediator for conflict resolution within or between groups.

> If there is something the groups can't solve themselves, they should ask the union representatives for advice. […] Only if the problem is still unsolved after discussion with the union, management should be called on. (Shop steward)

Discussion

At Tools, two systems for inter-group coordination were tried out: rotating spokespersons and distributed leadership. Both proved to be challenging. Regarding the rotating spokesperson system, our informants reported challenges related to information sharing, conflict and inventory management. A socio-technical reinterpretation explains how these challenges are conditioned on the coordination structure. The information challenge was attributed to the fact that some workers did not handle the spokesperson role properly. At one level, this is a question of psychology. Given individual variations in both cognitive capacity and aspiration levels (Cummings and Worley, 2005: 253−254), it may seem overly optimistic that every blue collar worker is able to fill the role in an appropriate manner. However, the spokesperson role is itself problematic; each member of each group is required to have an updated view of all relevant aspects in his group and an overview of the challenges of the other groups. In addition, he should perform his day-to-day duties. When the role is not practised for several weeks at a time, it becomes even more difficult to keep updated. In the face of bounded rationality (March and Simon, 1958), this represents a major information challenge. Through frequent rotation, the unity of time, location and action (De Sitter et al., 1997: 512) is broken. There is a time lag between perceiving a disturbance, taking regulatory action and receiving feedback on the action. When roles rotate before the control cycles are closed, both knowledge of the disturbances and responsibility for following up the disturbances are fragmented. Lack of integral knowledge and unclear responsibilities makes it desirable for workers to 'transfer the difficulties to next week's spokesperson'.

Conflict between groups and poor inventory management can be explained by lack of proper non-routine regulatory action; few actions were taken to eliminate recurrent problems or conflicts through re-design of structures and processes. In some cases this relates directly to poor information sharing, as information from the spokesperson meetings was not passed on to the operational groups and acted upon. In other cases, individual groups were routinely allowed to make decisions that affected other groups or the work system as a whole negatively, despite sufficient information about the challenges (e.g. the case of uneven workload in final assembly). The fundamental issue is that what is perceived as desirable from the point of view of a subsystem (e.g. minimizing changeovers) is not desirable for the compound system (e.g. minimizing inventory carrying costs). Why was

it difficult to take regulatory action despite sufficient information? One reason is that the spokespersons did not have the authority to enforce unpopular decisions which would compromise the groups' autonomy and priorities, for instance by demanding a change in scheduling policies. A spokesperson represented his group and not other groups or 'management'. Direct interference of the production manager was considered to be 'illegitimate' and in conflict with the principle of 'self-management in the groups'.

Distributed leadership mitigated the problem of bounded rationality by specializing operators at one particular function, but created new structural challenges. In our case, the 'leadership functions' were defined as different technical functions. In STS terms they cover different *aspects* of the production system (Van Eijnatten and Van Der Zwaan, 1998: 295). These aspects do not form subsystems of their own, since at every point in production these aspects are integrated. For example, a worker (*man*), applies a *method* to a *machine* in order to transform raw *materials* into something useful. The transformation takes place in a concrete environment (*milieu*). In principle, aspects can be defined arbitrarily. 5M is one possibility; the 'star model' of van Amelsvoort and van Amelsvoort (2000) is another. The theoretical point to emphasize is that the differentiation of aspects is independent of the decomposition of the production system into subsystems (i.e. flows and segments). Inter-group coordination is defined as a function of coordinating subsystems. When 5M or other instances of shared leadership are applied it also becomes a problem of coordinating aspects. In the case study, we saw how the M-groups struggled with the problem of grouping the real life problems according to the M-structure.

Because of the aspectual differentiation, 5M made it difficult to perform integral evaluation at the inter-group level. Each M-group had the responsibility for coordinating one particular aspect of the production process. Although the different M-functions were coordinated within each operational group, there is a lack of coordination of functions at the inter-group level. In so far as the different M-functions are interrelated at the inter-group level, these interrelations were not tackled in a systematic fashion.

An additional difficulty with 5M relates to the authority structure. In practice, the M-groups did not have authority over the operational groups. Rather, they were consultative. Because of this, the M-groups were good arenas for dealing reactively with concrete problems, which had been experienced in operations. The capacity to perform routine regulation was therefore good. However, the structure of decision-making implied that non-routine regulation was likely to be hindered by lack of consensus either in the M-group or in the operational group. It was easier to decide how to solve a concrete, urgent problem than to decide on how the work process could be redesigned in order to prevent the problem from recurring.

The socio-technical analysis has shown that two challenges were common for both the spokesperson system and distributed leadership. These are related to the third and fourth steps of the control cycle (De Sitter et al., 1997). First *integral evaluation* was difficult to achieve across groups and aspects. Second, it was difficult to perform *non-routine regulation*, which interfered with the group's 'right to self-manage'. The role of the labour union helps explain why autonomous work groups persisted despite the coordination difficulties. To restrict autonomy by establishing roles of formal authority was never discussed as a feasible option. Also, the analysis shows that informal union involvement helped resolve some of the issues related to poor external regulation. The

formal system of inter-group coordination was supplemented by the union's informal role as conflict mediator and disciplining force. Although the case study involved several organizational changes, there are no indications that 'resistance to change' can explain any of the reported difficulties (see Dent and Goldberg, 1999). Management, the labour union and workers in general were all positive to both organizational changes.

With respect to analytical generalization (Gomm et al., 2000), the question is whether these findings are particular to the case company or have a more general relevance. What is particular to the case company is the power of the labour union, and their demands for autonomy and participation, which were perceived as legitimate by other organizational actors. The power of the labour union was enabled by institutionalized partnership and a high degree of organization among blue collar employees. These traits are typical of the Scandinavian work life (Gustavsen, 2007; Johansson and Abrahamsson, 2009). In other industrial relations contexts, the union's role in organizational change and their demand for worker autonomy would be unlikely to be equally legitimate. Another idiosyncrasy about the case is the strong company narrative about how production could be 'run without management'. This narrative emerged as a reflection on the period when the foreman retired and the production manager was absent. Also, other studies have pointed to the power of company narratives of 'the golden past' and how they enter into company politics (Carlsen, 2006; Ezzamel et al., 2004). In the absence of this narrative, the idea that workers could themselves coordinate production would likely not have been equally plausible.

While the legitimacy of group autonomy was particular to the company, the work organization as such is not. Our general finding that inter-group coordination is an important challenge in these settings has support in recent operations management literature. In surveys of manufacturing companies who have implemented team-based cells, both Fraser et al. (2007) and Bidanda et al. (2005) found that communication was the most important 'human problem'. Communication was defined as 'methods to enhance inter-cell communication (between cells), intra-cell communication (within cells) and 'manager-cell' communication (between management and workers)' (Fraser et al., 2007: 718). Good communication is a precondition for integral evaluation, so if communication is difficult, inter-group coordination will be difficult. In a case study of autonomous work groups at a Volvo assembly plant, Kuipers et al. (2004: 850) reported that the company experienced 'fundamental difficulties in managing teams', although they do not analyse in depth why 'team management' was difficult. From the same company, Wallace (2008) reports that the work system became 'unmanageable' with respect to productivity levels. Similarly to the Tools case, de-centralized decision-making tended to upset production flow:

> In practice, even though there were fixed cycle times for each cab, in actuality, cycle times were fluid within and between the flows and ordered to suit the needs of the teams rather than the need of production. (Wallace, 2008: 116)

The combined results of these studies give support to the notion that inter-group coordination is indeed an important challenge in manufacturing work systems based on autonomous groups. Our contribution in this article is to highlight the specific mechanisms that

make inter-group coordination difficult. In particular, we have emphasized challenges related to integral evaluation and non-routine regulation.

Are the findings also transferable to work systems with autonomous groups in non-manufacturing settings? Based on our theoretical framework, the important boundary condition of the study is not the sector as such, but rather the nature of inter-group dependencies. When these dependencies are extensive and complex, coordination becomes more challenging (Procter and Currie, 2004). Compared with services, manufacturing may be characterized by complex inter-group dependencies, since the transformation process is typically broken down into a series of sequentially dependent sub-processes, with high demands on logistics and capacity utilization. Service delivery may more easily be parallelized, e.g. when different autonomous work groups independently serve different customers. On the other hand, complex services such as telecom services or surgery require coordination of reciprocal dependencies related to the utilization of shared resources. Hence, the challenge of inter-group coordination is also relevant to complex services. In these sectors, we welcome more research that would shed light on the transferability of our specific findings related to coordination structures based on rotating spokespersons and distributed leadership.

Conclusions and implications

In this article we have used STS to analyse inter-group coordination in work systems with autonomous work groups. According to the advocates of autonomous work groups, inter-group coordination should be solved by other means than hierarchical control (e.g. Emery, 1980; Herbst, 1976; Pruijt, 2003; Van Amelsvoort and Van Amelsvoort, 2000). The main contribution is that inter-group coordination becomes a major challenge in work systems where groups enjoy high levels of autonomy. Inter-group coordination is challenging because the alternative organizational structures for inter-group coordination, i.e. rotating spokespersons and shared leadership, tend to upset the works system's capacity to perform integral evaluation and non-routine regulation.

The difficulties associated with inter-group coordination have two theoretical implications. First it has implications for debates on the performance of autonomous work groups. Second it may help explain the relative lack of popularity of autonomous work groups in industry. In a recent review, Delarue et al. (2008) found a positive association of autonomous groups to organizational performance through both structural and motivational mechanisms. Still, they argue that the causal mechanisms involved are poorly understood and 'that we need more complex models building of how teams contribute to organizational performance' (p. 145). According to the recent review of Mathieu et al. (2008), the relationship between autonomous groups and aggregated organizational performance is relatively unexplored. Our suggestion for model building is to distinguish sharply between the intra-group and inter-group level of analysis when assessing performance. Group autonomy has been found to increase performance at the intra-group level (e.g. Cohen and Bailey, 1997; Cohen and Ledford, 1994). However, difficulties of inter-group coordination may counteract performance improvement on an overall level. Based on our analysis, we anticipate the countertendency to increased performance caused by the inter-group coordination problem to vary with the intensity

and complexity of inter-group dependencies. In a low dependency production structure we expect increased intra-group performance to directly increase inter-group performance. In a high dependency production structure, inter-group performance may decline with increased group autonomy because of the challenges of inter-group coordination. Hence, the common recommendation that organizations should be structured based on autonomous work groups because autonomous work groups yield increased performance must be qualified with respect to the nature of inter-group dependencies. We encourage empirical research in which these effects are measured and quantified.

Despite the benefits associated with autonomous work groups (Delarue et al., 2008; Glassop, 2002), survey research has shown that autonomous work groups are not widely used (Benders et al., 2001; Gallie et al., 2010; Nijholt and Benders, 2010). There is a mismatch between praise for autonomous work groups in the literature and their relative absence in practice. Within STS, the standard explanation is conflicts between 'traditional' and 'emancipative' values or design paradigms (e.g. Emery, 1980; Jonsson et al., 2004; Trist, 1981). These ideas about a clash of 'values' or 'design paradigms' have explanatory power. On the other hand, the explanation offered is too simplistic, and tends to obscure a deeper analysis of the merits and challenges of each perspective on work design. In general, the costs and challenges of autonomous groups are far less explored than the benefits (Dunphy and Bryant, 1996). In particular, the inter-group level of analysis remains under-theorized (Cordery and Wall, 1985; Stewart and Manz, 1995). Often, the elimination of managerial positions is perceived to be a major benefit of work systems with autonomous groups (e.g. Bacon and Blyton, 2000; Evans and Davis, 2005). On the contrary, we have shown that elimination of managerial positions creates important challenges related to inter-group coordination. If we want to promote emancipative workplaces and alternatives to Taylorism in its traditional and modern form, we need to address these challenges. Only then can we promote viable alternatives to Taylorism.

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Organizational learning: Bringing the forces of production back in

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Abstract

Under the influence of the 'communities of practice' perspective, research on organizational learning has lost sight of the role of science and technology. As a result, theory development in this field too often takes archaic work forms as its starting point. Based on a structural and materialist interpretation of Marx, this paper proposes an alternative approach that theorizes organizational learning as an outcome of contradictory processes in which the productive forces are progressively socialized, albeit unevenly. This approach leads to a very different perspective on tacit/explicit knowledge, work formalization, identify formation and the roles of managers and engineers. This structural-Marxist theory of organizational learning offers a more fruitful account of learning in technologically advanced, competitive sectors such as the manufacturing and process industries. Increasingly, it also applies to private and public service provision.

Keywords

organizational learning, communities of practice, Marxism, capitalist rationalization.

Introduction

In 2000, Easterby-Smith, Crossan, and Nicolini (2000, p. 784) described the heightened interest in organizational learning as a 'volcanic eruption'. In the past decade organizational learning has remained one of the most important topics within organization studies. Argyris and Schön (1978, 1996) pioneered the idea that learning can be collective, opening up space for group- and organizational-level analysis of learning. Organizational learning, including the creation and management of knowledge, is widely considered to be pivotal for firms' survival in the 'knowledge economy' (Barney, Wright, & Ketchen, 2001; Nicolini, Gherardi, & Yanow, 2003; Nonaka & von Krogh, 2009). According to Argyris and Schön (1996), organizational learning transforms the organization's pattern of activity and people's assumptions implicit in the performance of that pattern of activity. Organizational learning thus indicates systemic changes; its 'parts' (individual and group learning) are seen in relation to the 'whole' (organizational transformation). The discourse of organizational learning addresses several interrelated issues: the nature of knowledge in organizations, the nature of work in organizations, how new knowledge is developed, and the role of management.

A widely popular perspective for understanding organizational learning is the theory of 'situated learning' or 'communities of practice' (in the following abbreviated CoP). Within this perspective, organizational learning is most often analysed at the level of the work group (Easterby-Smith et al., 2000). Work groups include formal work teams, but usually informal 'communities' of workers are the locus of attention. For the purpose of this paper, the CoP position on organizational learning can be summarized in four propositions:

> (1) Much of the knowledge relevant for work is tacit in nature. Tacit knowledge is difficult or impossible to codify explicitly.
>
> (2) Workers' actual methods of working and division of labour typically differ from those that are formally prescribed. Performance of work depends on context-specific improvisation, which cannot effectively be pre-specified in formalized work designs.
>
> (3) Workers acquire the tacit knowledge they need to perform their work through a process in which they are socialized into a 'community' of workers. These socialization processes transform the workers' self identities and reproduce the community. Knowledge creation and learning are products of the collective 'reflection in action' (Schön, 1983), which takes place within and between these communities (Gherardi, Nicolini, & Odella, 1998). This reflection in action

produces new tacit knowledge, improves informal work methods and rearranges the division of labour between community members.

(4) The most productive role for management is to support and 'cultivate' these communities: let the 'natural' learning processes unfold and harvest the results (Wenger & Snyder, 2000).

CoP theory was initially proposed as an explanation of learning in handicraft apprenticeships (Lave & Wenger, 1991), but later morphed into a general theory of organizational learning (Gherardi et al., 1998; Nicolini et al., 2003; Wenger, 1998; Wenger & Snyder, 2000). Its generalization is based on the notion that 'all types of organizations […] increasingly depend on their capacity to effectively mobilize and manage knowledge' (Nicolini et al., 2003, p. 5). However, we are not offered any convincing argument as to why the particular mechanisms associated with CoPs are the most important mechanisms of organizational learning in settings beyond handicraft.

The core argument of this paper is that the CoP literature's generalization from handicrafts to modern capitalist organizations is largely unjustified. I will demonstrate that CoP theory explains only very poorly organizational learning in capital-intensive and rationalized sectors such as the modern manufacturing and process industries. In these sectors, CoP theory may have some applicability to certain forms of white-collar work, such as product design and development, but is largely irrelevant to the companies' core labour processes. This is because capitalism as a mode of production generates tendencies which make Propositions 1–4 increasingly implausible. Insofar as capitalist rationalization also penetrates the service economy (Suárez-Barraza, Smith, & Dahlgaard-Park, 2012; Vidal, 2011), CoP theory will also be of limited relevance here. To account for organizational learning in modern capitalist organizations, I offer an alternative theoretical model based on Adler's 'structural' reading of Marx (Adler, 2007). This interpretation of Marx emphasizes how the valorisation impetus of capitalism drives a process of socialization in which collective work activity is developed through the technical division of labour and the conscious application of science and technology. Based on structural Marxism, this paper argues in favour of four alternative propositions about organizational learning in its historical development:

(1*) As capitalism develops, explicit knowledge becomes increasingly important. Explicit knowledge tends to replace tacit knowledge.

(2*) Formally designed work systems tend to replace the more informal organization of work. Formalized work designs can support learning.

(3*) Capitalist rationalization erodes traditional sources of identification. The fracturing of established identities may lead to alienation, but also to the emergence of new forms of work community.

(4*) Centrally planned reorganization of work and introduction of new technology become increasingly important drivers of organizational learning. These changes are largely prescribed by managers and technical experts.

These propositions are statements of tendencies, which are likely to manifest only partially, because their realization is simultaneously promoted and frustrated by the valorisation process (Adler, 2007). The search for short-run profits may induce capitalists and managers to withhold investments, rely on peripheral workers and intensify work without refining the labour processes (Braverman, 1974; Thompson, 2003, 2007).

The alternative Propositions 1*–4* are not diametrically opposed to the original Propositions 1–4. Rather, they posit that the original ones tend to lose their pertinence as capitalist industry progresses. If 1*–4* are valid, much current organizational learning discourse misses the mark. A preoccupation with tacit knowledge, informal work practices and traditional sources of social identity will tend to obscure (and obscure increasingly over time) how new knowledge is created as people learn to master their material environment through the applications of science, technology and conscious planning.

The paper has the following structure. The first section outlines the theory of communities of practice. In the second section, I recapitulate Adler's 'structural' interpretation of Marx. The third section discusses the implications of structural Marxism for organizational learning, presents arguments in favour of Propositions 1*–4* and some illustrative material, and reviews these propositions' implications. In the fourth section, I identify the boundary conditions for the structural-Marxist theory of organizational learning, and suggest some implications for future research.

The communities of practice perspective

Over the years since the publication of Lave and Wenger's (1991) *Situated learning: Legitimate peripheral participation,* CoP has become a widely popular concept and its original meaning has become somewhat diluted (Amin & Roberts, 2008; Cox, 2005; Handley, Sturdy, Fincham, & Clark, 2006). Today the concept is used to refer to a broad range of related but distinct forms of group-based learning. In this paper, the concept is used in a narrower sense, closer to its original meaning (Brown & Duguid, 1991; Lave &

Wenger, 1991). This is what Amin and Roberts (2008) refer to as 'task/craft-based communities': it is this theory that I have summarized in Propositions 1–4.

My return to the more precise, but more restrictive understanding of the concept is necessary for two reasons. First, it is this theory of task/craft-based communities that has been generalized in the later works of Wenger and others. Although a less restrictive understanding of CoPs probably makes it easier to support claims for universality, Wenger's (1998; Wenger & Snyder, 2000) use of the concept has remained consistent. Second, as Amin and Roberts (2008, p. 365) convincingly argue, 'the dynamics of the task or craft-based communities studied by the originators of the term seem to be barely replicated in settings of high creativity, epistemic, professional, or virtual learning and knowledge formation'. Hence, other forms of 'CoPs', such as the professional, expert/epistemic or virtual communities, are distinct forms of group-based learning which would require a separate theoretical treatment.

CoP theory was initially proposed as an explanation of learning in handicraft apprenticeships. Lave and Wenger's (1991) main illustrative cases are midwives, tailors, quartermasters and butchers. In later expositions, CoP theory has been generalized and applied to a wide range of work settings (Gherardi et al., 1998; Nicolini et al., 2003; Wenger, 1998; Wenger & Snyder, 2000). Wenger (1998, p. 11) explicitly states his intention to construct a 'general theory of learning' based on the studies of apprenticeships. In a later article by Wenger, large, bureaucratic organizations are the focus of attention: 'During the past five years, we have seen [CoPs] improve organizational performance at companies as diverse as an international bank, a major car manufacturer, and a U.S. government agency' (Wenger & Snyder, 2000, p. 140). While Wenger has shifted focus to large organizations, other theorists of the 'practice turn' (Gherardi, 2009) continue to focus on craft-like forms of work. For instance, in Nicolini et al.'s (2003) anthology we find chapters on flute-making, roofing, cooking, organic agriculture and nursing. Theoretically, however, proponents of the CoP perspective identify no boundary conditions. Rather, the relevance of practice-based learning and knowing are justified with reference to the notion that 'all types of organizations […] increasingly depend on their capacity to effectively mobilize and manage knowledge' (Nicolini et al., 2003, p. 5).

The core references for the theory of communities of practice are Lave and Wenger's (1991) cases of apprenticeships and Brown and Duguid's (1991) 'unified theory of working, learning and innovation', which builds on Orr's (1996) ethnography of service technicians. As shown by Cox (2005), these two texts have different foci, but their core theoretical propositions are complementary. CoP theory is positioned against the cognitivism and individualism of much classical organization theory, and in

particular against the idea that knowledge, reified as a property of the individual, can be transferred through formal training. Rather, it seeks to understand 'the process through which identities, artefacts, ideologies, rules, language, morality and interest are woven together and affect each other in the process of collective learning' (Easterby-Smith et al., 2000, p. 788). Knowing and learning are situated in this complex web of relationships. Lave and Wenger's (1991) concept of 'legitimate peripheral participation' links the mastery of skills and knowledge to the development of social identity:

> A person's intentions to learn are engaged and the meaning of learning is configured through the process of becoming a full participant in a sociocultural practice. This social process includes, indeed it subsumes, the learning of knowledgeable skills. (Lave & Wenger, 1991, p. 29)

The novice, peripheral participant aspires to become a full member of a particular community of practice. A community of practice is defined as 'a set of relations among persons, activity, and world, over time in and in relation with other tangential and overlapping communities of practice' (Lave & Wenger, 1991, p. 98). These communities are seen as the condition for knowledge and learning, by structuring interaction and sense-making and by reproducing and developing 'noncanonical practice'. Brown and Duguid (1991) explain the centrality of noncanonical practice, by arguing that canonical practice – that is, work routines described by formal standards and procedures – is insufficient for the practical task of conducting work. Because of the 'dilemmas, inconsistencies and unpredictability of everyday life' (Brown & Duguid, 1991, p. 42), formal standards and procedures must be complemented by noncanonical practice – the repertoire of tacit knowledge and practical know-how. Noncanonical practice develops from workers' real-life experience and reflections in action (Schön, 1983). It is transmitted through storytelling within the communities (Brown & Duguid, 1991).

The CoP literature draws primarily on micro perspectives on social interaction (Gherardi, 2009). The focus is on everyday, mundane processes, and formal organization structure and design are ignored or disparaged. CoP proponents argue that the communities of practice are fragile and easily undermined by managerial attempts at formalization, standardization and rationalization (Brown & Duguid, 1991; Gherardi et al., 1998; Wenger & Snyder, 2000). According to Brown and Duguid (1991, p. 53), these communities 'must be allowed some latitude to shake themselves free of received wisdom'. Gherardi et al. (1998, p. 294) elaborate:

> Any attempt to promote and foster learning in organizations requires account to be taken of the manner in which the 'natural' process unfolds. […] Both the

> division of labour and the design of the task and work process must constantly take into account their effects on the communities of practice in general and the situated curriculum in particular. Altering the integrity of the curriculum by modifying the patterns of socialization and the criteria of inclusion, or simply overly formalizing the novices' socialization path, can produce unintended and undesirable effects.

CoP theory has been criticized for ignoring issues of power (Contu & Willmott, 2003; Roberts, 2006). First, socialization and the negotiation of practice within the communities are laden with interests and power asymmetries. Second, the development of the communities is directed and restricted by wider corporate relations of power and elite decision-making. Accordingly, if communities of practice are socially situated, they are also situated in relations of power and domination (Contu & Willmott, 2003). CoP theory has also been criticized for harnessing positively connoted words such as 'community', 'participation' and even 'learning' to a managerialist agenda of increased control over learning processes (Contu, Grey, & Örtenblad, 2003; Cox, 2005; Pemberton, Mavin, & Stalker, 2007).

The critique put forth in this paper acknowledges that a theory of organizational learning should incorporate the concepts of power and discourse, but extends the critique along Marxist lines. CoP theory is limited by ignoring not only power (relations of production) and discourse (ideology) but also science, technology and the technical division of labour (forces of production). In particular, CoP theory blinds us to the impact of the development of these forces of production on work and learning processes. Cox (2005, p. 533), briefly acknowledges a tension between CoP formation and capitalist rationalization: in the sections below, I develop the critique at greater length.

Structural Marxism[1]

> Modern industry never views or treats the existing form of a production process as the definitive one. Its technical basis is therefore revolutionary, whereas all earlier modes of production were essentially conservative (Marx, 1976, p. 617).

The term 'structural Marxism' is used by Adler (2007, 2012) to designate a reading of Marx that differs from the more common conflict-centred reading, and that differs too from both labour process theory (Knights & Willmott, 1990; Thompson & Smith, 2010) and the post-structuralism prevalent in critical management studies (Alvesson, Bridgman, & Willmott, 2009). In his presentation of structural Marxism, Adler (2007) draws on Cohen's (2000) defence of historical materialism. Following Marx (1976),

Cohen argues that over long historical time frames the forces of production tend to develop towards higher productivity. The forces of production consist of human capabilities and the means of production (raw materials and technology). The rate of development of the forces of production is conditioned by the prevailing relations of production. Relations of production characterize the ownership and control of the forces of production. Under capitalism, the means of production are owned and controlled by the capitalists and their agents. Workers control their labour-power (i.e. capacity to work), but must sell this labour-power to capitalists in order to take part in production, earn wages and thereby provide for their subsistence. In capitalist society, labour-power is thus a commodity, bought and sold on the labour market. The forces and relations of production together form society's 'base', as distinct from society's 'superstructure' of law, state politics and ideology. This reading of Marx is materialist insofar as in the overall historical process – over larger social aggregates and longer time periods – causality flows primarily (but not exclusively) upwards from the forces of production to the relations of production, and from the base to the superstructure[2].

The key point for my argument is that the productive forces tend to develop under capitalism, and that this development takes a form that reflects the structure of capitalist relations of production. This form of development expresses the contradictory relationship between the processes of valorisation and socialization. The valorisation process is the process in which profit is created. Competition among capitalists pushes them continually to increase the profitability of the their production activities by extending the working day, intensifying work or reorganizing the labour process (Marx, 1976). According to Adler (2007) this valorisation process both stimulates and undermines the progressive 'socialization' of the labour process. The stimulation aspect predominates over the longer term: as a result, the long-term trend in the labour process is not deskilling and the degradation of work (as described, for example, by Braverman, 1974), but rather a process of socialization in which workers' skills are upgraded and the individual worker is replaced by an interdependent 'collective worker'. As Marx (1976, p. 469) wrote, 'The one-sidedness and even the deficiencies of the specialized individual worker become perfections when he is part of the collective worker'. The division of labour is redesigned without respect for traditional values and status differentiations. Traditionalistic communities, built around inherited norms and a 'mechanical' division of labour, are eroded (Adler & Heckscher, 2006). The use of machinery is the hallmark of large-scale, capitalist industry. Machinery can automate simple labour tasks, and tremendously increase productivity. The socialization of the labour process is driven increasingly by the mobilization of science. Marx (1976, p. 508) wrote, 'As machinery, the instrument of labour assumes a material mode of existence which necessitates the replacement of human force by natural forces, and the replacement of the rule of thumb

by the conscious application of natural science.' Machinery and its relation to raw materials are the classical concerns of mechanical and chemical science. Developments in cybernetics and computer science have further increased our ability to automate and control the operation of machines and of interconnected systems of machines. The less exact, but still important science of work design has developed in parallel. Taylor's (1967) principles of scientific management were a major breakthrough. Japanese manufacturing has taken scientific management further, by focusing on the synchronization of tasks under just-in-time manufacturing (Fujimoto, 1999). The science of organization is of course not politically and ethically neutral – this critique is well rehearsed (e.g. Braverman, 1974; Klein, 1989) – but its rational core cannot be ignored: humanity has developed a great store of knowledge about how to organize complex integrated processes.

While valorisation drives socialization, the search for profits also distorts that socialization and fetters the development of the productive forces (Adler, 2007). As shown by labour process theorists, capitalist rationalization sometimes leads to the degradation of work as competition induces employers to rely on low-skill, low-wage employment strategies (Braverman, 1974; Knights & Willmott, 1990). Financialized capitalism generates renewed pressure for wage-based competition and re-commodification of labour through externalized employment relations (Thompson, 2003; Vidal, 2011). Simultaneously, companies have sought to intensify work through new strategies of hegemonic or normative control (Barker, 1993; Barley & Kunda, 1992; Knights & McCabe, 2000; Vallas, 2003a), in which work is intensified independent of technological advances.

Hence, in a structural-Marxist interpretation, capitalist rationalization is a fundamentally contradictory process. Valorisation simultaneously drives and fetters socialization. As a corollary, capitalist rationalization will have contradictory outcomes for organizational learning.

Organizational learning as viewed through structural-Marxist lenses

The implications of structural Marxism for organizational learning were summarized in the four alternative Propositions 1*- 4* presented in the Introduction. In this section, I explain and justify these propositions. These propositions designate tendencies whose effects may or may not be salient in any specific organization. As I see it, these tendencies reflect the 'causal power' of socialization, where the concept of causal power is one I take from critical realism (Bhaskar, 1978, 1979) as the 'philosophical underlabourer' to Marxism (Collier, 1998; Joseph, 1998):

> Critical realism argues that the social world is structured in a certain way and that it contains dominant generative mechanisms which exert a powerful influence over the social formation. Critical realism can happily point out that society is founded on basic material relations and operates through material production, appropriations and labour. From here it is a short step to Marxist analysis of the specific form of these basic relations. (Joseph, 1998, p. 84)

The asymmetrical interaction of society's base and superstructure generates tendencies that conjoin to create the flux of events we experience (Fleetwood, 2001; Reed, 2005). Different tendencies may influence or counteract each other, so there is no one-to-one correspondence between tendencies and empirical observations. Propositions 1*–4* summarize the socializing tendencies of the capitalist mode of production. Although dominant in the long run (Adler, 2007), they give only a partial account of the actual trajectory of capitalism. Theoretically, their realization is limited by counter-tendencies – in particular, by the ways in which socialization is fettered by valorisation pressures. The socializing tendencies can be undermined or distorted by short-run profit pressures, such as when productive work collectives are dismantled during economic and financial crises, or when work is outsourced to undermine unions rather than to benefit from the emergence of new competencies in specialized branches of industry, or when unproductive work systems are retained at the whim of despotic supervisors.

Moreover, as shown in the literature on comparative political economy (e.g. Deeg & Jackson, 2007; Smith & Meiksins, 1995), national and regional institutions influence how the fundamental tendencies of capitalism combine to manifest empirically. These effects further complicate the relationship between the underlying tendencies and actual historical trajectories. While acknowledging national and regional differences, this paper is concerned with the general tendencies of the capitalist mode of production which operate at a deeper layer of causality (Adler, 2007; Collier, 1998). Hence, the paper does not make strong claims about the short-run realization of those tendencies. Such claims would require extensive empirical enquiry and are therefore beyond the scope of this paper.

However, in the following paragraphs, alongside my theoretical exposition of Propositions 1*-4* I offer empirical examples to illustrate how these tendencies make themselves felt. The examples are drawn from the manufacturing and process industries. These are technologically advanced, capital-intensive business sectors producing commodities for a deregulated global market.

Proposition 1:* *As capitalism develops, explicit knowledge becomes increasingly important. Explicit knowledge tends to replace tacit knowledge.*

The forces of production develop through the application of science. Scientific knowledge is explicit and analytical; complex phenomena are reduced to simpler parts and explained by a set of logically related statements (Elster, 2007). Similarly, complex transformation processes can be analysed and optimized as sequences of less complex steps. This is the 'science' of scientific management (Taylor, 1967). Through careful time and motion studies, workers' tacit knowledge is measured, analysed, refined and codified in explicit procedures. While practice theorists are right that accumulated experience and purposeful reflection in action (Schön, 1983) refine work routines in important ways, 'externalization' of this tacit knowledge in explicit, codified form makes it far more powerful as a productive force. First, explicitness allows for rational comprehension and improvement of work tasks. Second, explicit knowledge is far easier to transfer across different contexts. While direct transfer of tacit knowledge requires the 'master' and 'apprentice' to work closely together over time, externalization of knowledge in work routines and training manuals allows the knowledge to be transferred more rapidly and on a greater scale (Adler & Cole, 1993). Third, explicit knowledge can be synthetically combined to create new knowledge about more complex processes (Nonaka, 1994). Such combination is required for system-wide rationalization (see Proposition 2*).

Even more important than rationalizing manual labour, science transforms the nature of work through machinery and automation. The tools used in the labour process are thereby socialized: they are no longer only the fruit of locally-accumulated tacit craft knowhow, but increasingly shaped by humanity's accumulated body of explicit scientific knowledge. This 'technization of work' has been a megatrend in Western industries (Barley, 1996). The use of machinery and ICT put new demands on workers' knowledge – drawing workers too away from reliance on tacit craft skills towards increasing reliance on scientific and engineering knowledge. This is one of the main results from Kern and Schumann's (1984) study of German industry in the 1980s, and various more recent studies (see Adler, 2007; 1992, and the citations therein). Up-skilling does not mean the re-emergence of craft; rather, it means a new kind of professionalization, where theoretical knowledge is integrated with practical know-how:

> The need for theoretical competence is rather high – too high, at least for getting trained on the job. What is necessary is professional training in the form of a modernized apprenticeship. […] The high-skilled blue-collar workers we are looking at integrate different traditional areas of expertise. They are less

> material-oriented; the greater part of their qualifications concerns technical and organizational procedures. (Kern & Schumann, 1987, pp. 162-163)

Kern and Schumann (1987, p. 162) note that 'empirical knowledge, gained by working with machinery and materials, remains relevant', but their research clearly shows that the main tendency is the increased importance of theoretical knowledge. Barley (1996) makes a similar point: contextual knowledge and sensitivity to local idiosyncrasies remain important, but technical work requires increased knowledge of mathematics, science and technology; that is, a formalized body of knowledge. As such, Proposition 1* does not imply that tacit knowledge is removed from the labour process altogether. Tacit knowledge and its direct refinement through individuals' hands-on experience continue to play a role as the raw material of scientific rationalization (Nonaka, 1994). Rather, Proposition 1* states that the relative importance of explicit knowledge is increasing, as work is systematically analysed and transformation tasks are automated.

On the other hand, the valorisation impetus also tends to limit the scale and scope of the expansion of explicit knowledge. Machinery, training of workers and creating an infrastructure for managing knowledge require investments. Short-run cost pressures induce management to withhold those investments and rely instead on low-skill (and low-wage) labour even when productivity may suffer as a result (Bacon & Blyton, 2000; Thompson, 2003). In those cases, management might continue to rely on informal work organization and workers' tacit knowledge, and seek to maintain profits by intensifying work. This can be done coercively under threats of closure or off-shoring, or normatively, when workers internalize managerialist definitions and values (Barker, 1993; Vallas, 2003a), inducing them to work harder.

A likely result of these combined mechanisms is that the expansion of explicit knowledge takes an uneven form. Explicit knowledge about work processes may be monopolized by the few, and turned against workers as an alien and alienating force, for instance, when scientific management replaces craft work with simple operations, when machinery is designed for fool-proofing rather than to leverage workers' capabilities, or when the workforce is segmented into core (high-skill) and peripheral (low-skill) employees (Adler, 1992; Braverman, 1974). In all these cases, there is a real expansion of explicit knowledge, but this expansion is reserved for a limited number of employees (core employees, industrial engineers, machine designers, etc.).

One illustration of Proposition 1* comes from the mechanical industries, where, over the last decades , manually-guided machine-tools have largely been replaced by CNC (computer numerical control) machining for the shaping of metal parts. When working with manually-guided machine-tools, workers primarily rely on

their tacit knowledge about the tools and materials. Their knowledge is embodied in their movements. In a CNC machine, the physical transformation of the raw material is automated. Machine operators interact with the machine – and, indirectly, the raw material – through a computerized interface. Thus, workers are confronted with an abstract and symbolic representation of the raw materials and the transformation process. The tacit knowledge required for the actual physical transformation of the material is now codified and embedded in the machine, based on the combined technical knowledge of machine designers, part programmers, and shop-floor workers. Shop-floor CNC workers enter commands, write and edit part programs and interpret the machine's physical and symbolic feedback. These are primarily cognitive and theoretical tasks, relying on the workers' considerably expanded repertoire of explicit knowledge (Bartel, Ichniowski, & Shaw, 2007).

A second illustration comes from my fieldwork in an aluminium-smelting plant. The modern smelting process (building on so-called 'prebake' technology) takes place in large, closed furnaces. Operators' main operational tasks are periodically to supply raw materials, remove finished products and monitor the process. Monitoring means measuring key process parameters and taking regulatory action when deviations occur. Regulation of the furnaces is complex for two reasons. First, key process parameters, such as temperature, pressure, voltage and volumes, are related in non-linear ways. This implies that there is no simple one-to-one relationship between a deviation and a regulatory action. Second, feedback loops following regulatory actions are often very slow to materialize. As one informant explained, an error in the placement of the anode may not be observed as a process deviation until 20 days after the misplacement occurred. It follows that operators, in order to interpret deviations and take regulatory action, must have an elaborate theoretical understanding of how the furnaces work and how they will respond to changes in control parameters, taking time lag into account. They must be able to run computer simulations in order to predict the consequences of possible actions. Conversely, the relatively minor role of tacit knowledge is no less striking: in this setting, it is impossible to rely on tacit knowledge or an intuitive 'feel' of how the furnaces will respond – explicit theoretical models relating to process parameters are required. According to the HR manager of the plant, the introduction of prebake technology was followed by a major training program for operators. General numerical and computer skills had been raised. About two-thirds of the workers now hold a formal, non-company-specific skill certificate. In addition, the company had invested heavily in e-learning. E-learning makes possible the transfer of de-contextualized, theoretical knowledge relating to the operation of furnace technology.

Both these illustrations show the increasingly important role of explicit knowledge in automated and semi-automated settings. In both cases, the operators'

hands-on experience of tools and raw materials is progressively displaced by computerized, symbolic interfaces. Manipulation of these symbolic interfaces (programming, process controls) requires explicit theoretical models of the transformation process.

Proposition 2:* *Formally designed work systems tend to replace the more informal organization of work. Formalized work designs can support learning.*

In the early handicraft industries of the nineteenth century, work was organized informally and coordinated by traditional norms (Adler & Heckscher, 2006). The rise of the factory system, with its detailed technical division of labour and the use of machinery, created enormous challenges for coordinating different sub-processes. As described by Marx (1976), the capitalists' answer to this challenge is to take control of the labour process in order to ensure that efforts were more systematically directed towards the goal of profitable production. Herein lies the genesis of professional industrial administration and industrial bureaucracy. Critical sociologists have for long recognized the dual function of industrial bureaucracy (Adler, 2012; Gouldner, 1954). On the one hand, bureaucratic formalization and standardization are means to subordinate labour and reproduce capital's domination in the sphere of production; this is management by discipline. On the other hand, bureaucratic formalization and standardization are techniques for coordinating interdependent tasks; this is management by expertise. As such, bureaucracy is simultaneously an instrument of the class struggle and a productive force (Adler, 2012).

Labour process theory highlights the first of these functions and its inherent social antagonism. A large body of literature deals with managerial control strategies and workers' resistance responses – that is, how the labour process becomes a contested terrain (e.g. Ackroyd & Thompson, 1999; R. Edwards, 1979). Formalization, standardization and hierarchical authority are forced upon recalcitrant labour in order to intensify work and undermine craft workers' control of the labour process.

While acknowledging this social antagonism, structural Marxism departs from LPT by highlighting as equally important the socializing tendencies of bureaucratic rationalization. Most scholars, both critical and mainstream, agree that bureaucratic structures are good at harnessing the productive forces on a large scale[3]. As Weber noted, bureaucratic organizations are more predictable, reliable and efficient than their traditional counterparts. Although managerial techniques such as time studies and

process standardization may be perceived as alien forces by the individual workman, they dramatically raise the productive power of labour as a collective activity. Despite contemporary tendencies for horizontal and vertical disintegration of large companies and conglomerates, bureaucracy remains the dominant organizational form for coordinating operations when they grow beyond the entrepreneurial scale (Adler, 2012; Walton, 2005).

The argument developed here is that bureaucratic rationalization, in addition to harnessing the existing forces of production, tends also to develop those forces. Organizational learning does not necessarily rely only on craft or more informal forms of work organization, as argued in CoP literature. Rather, organizational learning can also be stimulated, organized, given more scientific direction, assured more cumulative advances, and indeed routinized under bureaucratic administration. Organizational learning is fundamentally about developing the organization as an interdependent system (Argyris & Schön, 1996); but if learning is managed only informally and enacted only locally, important system-level improvement opportunities are typically lost. When local practices are systemically interrelated, improvements that seem locally optimal may not be optimal for the overall, compound process. The development of the collective labour process requires an equally collective learning process. As emphasized by Nonaka (1994), middle managers can orchestrate these collective learning processes by structuring flows of information and aligning shop-floor activities with strategic priorities.

One example of the positive relationship between formalization and organizational learning is found in the better implementations of lean production (Adler & Cole, 1993; Fujimoto, 1999), where it has given rise to what can be described as a 'learning bureaucracy' (Adler, 1993) or an 'enabling bureaucracy' (Adler & Borys, 1996). In these systems, work is highly standardized, but the standards are objects of continuous refinement by a set of hierarchically organized improvement groups with broad participation from blue-collar workers, as well as active engagement from technical staff personnel.

Another example of bureaucratic learning mechanisms can be drawn from the smelting plant referred to above, where a version of lean production had been implemented. According to plant management, productivity and quality at the plant were fundamentally a function of 'process stability', meaning that the furnaces continuously produced output with sufficient quality. Machine breakdowns and quality deviations were the main threats to operating results. Management's approach to creating process stability was that of modern quality management (Dean & Bowen, 1994): 'what you do not control, you cannot improve'. Here 'control' does not mean 'control of labour' (P.

K. Edwards, 1990), but rather control over the production system in a cybernetic sense (Achterbergh & Vriens, 2010), meaning that production plans could be realized without deviations. To achieve control and arrange for improvements, management had defined a company-specific production system. In a formal manner the production system defined: (a) the roles in each work team, including responsibilities for operations, maintenance and continuous improvement; (b) the interfaces between the different work teams (volumes, quality, and delivery times); (c) standard operating procedures; and (d) a toolbox for analysis and improvement of work flow. In interviews, managers, workers and engineers all described the new production system as more 'formal and bureaucratic' compared to earlier work practices at the plant. While some workers pointed to the constraining nature of the standard operating procedures, the general attitude was more positive: 'responsibilities had been clarified'; 'there were fewer production "crises"'; 'less re-work'; and 'fewer safety hazards'. Organizational learning at the plant tended to follow systematic procedures like 'value stream mapping' or 'network analysis'. Typically, a group of workers led by a process engineer or a 'continuous improvement champion' would analyse a sub-process with respect to material handling, processing time and waiting time. Based on experiments with different arrangements, 'best practice' would be codified as an operating procedure. Refinement of the standards was the responsibility of a hierarchy of improvement groups. Work-station standards were regularly revised by groups of blue-collar workers along with more skilled technicians. Compound processes, such as inter-departmental logistics, were the responsibility of permanent specialist groups. In these latter cases, calculations were made based on detailed knowledge about the sub-processes, as codified in the operating procedures.

This example illustrates the mechanism linking socialization, formalization and organizational learning. Process stability is achieved through process standardization, and that standardization is facilitated by the formalization of organizational roles and responsibilities. This formalization represents socialization insofar as it makes visible and public knowledge what was previously either absent or local and private; and when processes are formalized, system-wide improvement is accelerated. These results run counter to the CoP thesis that learning is best facilitated when workers rely on tacit knowhow and enjoy extensive discretion and autonomy (e.g. Brown & Duguid, 1991; Gherardi et al., 1998).

Some commentators argued that the up-skilling and re-professionalization of work found by Kern and Schumann would obviate the need for formalization and standardization and would lead to greater worker autonomy (see Schumann, 1998). Consistent with the socialization argument, however, Springer (1999, p. 135) argues that:

> Professionality does not arise from self-organized improvisation when directly working on (assembling) the product, but from cooperating in creating process stability throughout the flow of production. Optimization of individual work stations is only part of a comprehensive system optimization by reducing system complexity, or at least, by making it controllable via standardization.

In a recent case study of manufacturing, Ingvaldsen and Rolfsen (2012) show how extensive individual and group autonomy tend to upset the organization's capacity to identify and implement system-wide improvements. Taken together, the re-professionalization of work implies neither a rejection of managerial techniques, nor a re-emergence of informal work organization.

Proposition 2*'s focus on socialization does not deny the fettering effects of valorisation pressures. Citing numerous U.S. case studies, Vallas (2003b) and Vidal (2007) show that the 'learning bureaucracy' is seldom fully realized. Technocratic management rationalizes production systemically through formalization and calculation, but allows only very limited participation by the workforce. Hence, lean production tends to collapse into internally contradictory forms of neo-Taylorism, in which work continues to be a contested terrain. In Bacon and Blyton's (2006) case studies, workflow analysis and joint worker-management problem solving became a highly political issue when management used the results as the basis for layoffs. Shop-floor power struggles and emerging patterns of indulgency may lead to bureaucratic forms where rules and procedures are neither respected nor enforced (Ezzamel, Willmott, & Worthington, 2004; Gouldner, 1954). Theoretically, the realization of the 'learning bureaucracy' potential seems to be contingent on a social compromise of union-management partnership or other forms of participative governance (Adler & Cole, 1993; Vallas, 2003b), which may be harder to establish in the context of financialized capitalism and externalized employment relations (Thompson, 2003). On the other hand, since 'high road' forms of lean production have been shown to boost productivity more than its neo-Tayloristic counterpart (Bacon & Blyton, 2000; MacDuffie, 1995), we might expect their gradual, rational adoption.

The empirical evidence shows contradictory forms of bureaucratic rationalization. As predicted by Propositions 1* and 2*, organizational learning is supported by formalization and the development of explicit knowledge, but the broader professionalization of work is unevenly realized.

Proposition 3:* *Capitalist rationalization erodes traditional sources of identification. The fracturing of established identities may lead to alienation, but also to the emergence of new forms of work community.*

Following Giddens (1991), we can understand identity as a reflexive narrative of self. Identity reduces existential anxiety by bridging past, present and future. As we have seen, Lave and Wenger's (1991) concept of legitimate peripheral participation intimately links learning with identity development. Indeed, the latter subsumes the former (p. 29), so the processes are inseparable. When individuals learn new skills and become members of communities of practice, they also secure existential continuity by becoming midwives, tailors, quartermasters, etc. Identity is linked to an established division of labour and established means of production.

Structural Marxism, in contrast, emphasizes the tendency of capitalism to continuously revolutionize the labour process. Changes in the labour process give rise to new tasks, new work roles and new skill requirements. Knowledge that was personal and local becomes externalized and universal. Under such conditions, how can work-related identity emerge? The answer of classical sociology is that it cannot: when traditional bases of identification (craft, profession, particular tools and skills) are destabilized, people cannot form stable identities and instead experience anomie (Durkheim) or alienation (Marx). Cohen (1974) argues that under pre-capitalist forms of work, there is an organic unity between the labourer and the instruments of labour. This provides people with readymade identities, handed down from previous generations. With the rise of capitalism, this unity is broken. Under the real subordination of labour, exchange-value takes precedence over use-value in fact and in consciousness. Confronting each other as buyers and sellers of labour power, 'it matters neither to the labourer nor to his employer what concrete labour is performed. Each cares only about how much exchange-value he will obtain from its performance' (Cohen, 1974, p. 246). While workers may be able to construct identities as consumers, wielding their purchasing power to assemble consumer goods in a way that expresses some kind of identity, their work-life affords no such opportunity for identity construction since the concrete labour they perform is rendered so contentless. Scholars of identity have called attention to the way that late capitalism renders identities more fluid and fractured (Giddens, 1991; Thomas, 2009). In some cases, management has attempted to exploit this insecurity by strategies of normative control or 'cultural engineering' (Barker, 1993; Casey, 1999; Kunda, 2006). In particular, notions of 'teamwork', 'participation' and 'quality' have been harnessed to serve ideological functions (Findlay, McKinlay, Marks, & Thompson, 2000; Vallas, 2003a). Empirical studies of normative control have highlighted workers' contradictory or resistant responses. Workers refuse to accept management's definitions

of their work situation or point to the gap between rhetoric about participation and autocratic practice (Knights & McCabe, 2000; Vallas, 2003b).

While acknowledging this tendency for alienation and contested identities, Adler (2007) argues that the development of capitalism also generates a progressive tendency of 'subjective socialization'. As the forces of production become socialized in an objective, technical sense, workers come to see themselves as part of an interdependent labour process, part of the 'collective worker' (Adler, 2007, p. 1322). This subjective socialization enables the creation of labour process communities in which people consciously coordinate their collective effort (Adler & Heckscher, 2006; Adler, Kwon, & Heckscher, 2008). These communities are different from the traditionalistic, conservative, parochial communities of the pre-capitalist workplace: capitalist development encourages the emergence of a distinctive, 'collaborative' kind of labour-process community. Marxists have traditionally argued that this new kind of community can come about only with the end of the capitalist mode of production (e.g. Cohen, 1974). Adler (2007), on the other hand, sees its development 'in the womb' of the current mode of production.

This development is not only driven by the valorisation impetus, but simultaneously fettered by it, in particular when rationalization creates new divisions of the workforce and new barriers to large-scale cooperation (Adler & Heckscher, 2006, pp. 64-65). At the shop-floor level, externalized employment relations and individual incentives plans undermine trust and promote individualistic behaviour. Furthermore, even when the forces of production are socialized in an objective sense, there is no direct path to subjective socialization. As with other workplace changes, objective socialization may trigger shop-floor politics and a renegotiation of power between groups of workers and managers (Vallas, 2003b; Vidal, 2007). Prerogatives of middle managers and specialists may be threatened, and these groups may as a result try to buttress their power by monopolizing the tools of advanced bureaucratic rationalization, as discussed in relation to Propositions 1* and 2*. Only in the long run, and under strong external pressure to perform (Adler & Borys, 1996), should we expect the collaborative form of community to be realized.

This complex relationship between socialization, learning and identity can be illustrated by the relationship between the machine operator and the maintenance worker in contemporary manufacturing. This example is drawn from my research in a Norwegian automotive supplier. Traditionally, maintenance and repair workers enjoyed special status due to their unique knowledge of the production machinery (see also Crozier, 1964, for a similar, much older case). The operational departments were highly dependent on their competence, and one production manager even described the

maintenance manager as ‘the strong man of the plant’. The status and power of the maintenance department were reflected in a proud ‘maintenance worker’ identity. The maintenance personnel perceived themselves to be somewhat superior to the ‘ordinary production workers’, who were just ‘told what to do’. Correspondingly, machine operators would often refuse to have anything to do with machine maintenance, because their job was ‘to produce parts, not to fix the equipment’. Even simple maintenance tasks such as oil replenishment were ‘left to the reps’, even though the machine operators were competent to perform them. Motivated by the need to increase the overall equipment efficiency (reduce downtime of machines), management decided to implement so-called ‘total productive maintenance’ (TPM). TPM meant that many of the simpler repair and maintenance tasks were transferred to the machine operators. In addition, workers became more directly involved in machine set-ups and changeovers. Through a participatory process involving machine operators, maintenance personnel and first-line managers, routines for maintenance and changeovers were developed for each work station. Finally, maintenance personnel such as electricians and skilled mechanics became permanently assigned to the operational departments, creating what management labelled ‘multifunctional teams’.

These changes can be interpreted as socialization of the knowledge of the maintenance personnel and as an instance of organizational learning. However, this process did not reinforce established identities or reproduce existing communities. On the contrary, the distinction between maintenance worker and machine operator – the basis of (dis)identification – was blurred. The machine operator now performs maintenance work without ever becoming a ‘maintenance worker’. The maintenance worker is likely to perceive these changes as an attack on his status and autonomy (see Ackroyd & Thompson, 1999). When knowledge is socialized, the power balance between the two groups is altered. At the plant, maintenance personnel voiced some resistance, but nevertheless recognized that something had to be done to improve equipment efficiency if the company hoped to remain a ‘preferred supplier’ to major European automotive companies. Some workers also complained about work intensification, since the ‘TPM tasks’ had been added to their ‘ordinary work’ without any extra compensation. On the other hand, new arenas for interaction between maintenance workers and machine operators may be the genesis of a new kind of collaborative community. While in the ‘old days’ machine operators were ordered to ‘clean the floor or do other tasks’ when the maintenance workers arrived, now the two groups collaborate to decide on maintenance standards and the appropriate division of labour between them. Although the new forms of ‘teamwork’ and ‘cooperation’ were imposed by management, they set in motion the subjective socialization of the two groups.

Proposition 4:* *Centrally planned reorganization of work and introduction of new technology become increasingly important drivers of organizational learning. These changes are largely prescribed by managers and technical experts.*

By now it should be obvious that structural Marxism attributes a much more active role to management and technologists than is acknowledged by CoP theory. Workers' local reflection in and on practice (Schön, 1983) leads to learning, but these efforts rarely lead to revolutionary changes in production's technical base; such learning processes cannot account for the extraordinary technological dynamism of advanced capitalism. To understand this dynamism, our theory needs to recognize the role of centralized planning. According to Nonaka (1994, p. 29), 'the role of top and middle management for knowledge creation […] has been almost neglected in traditional accounts of managerial structure' – and, I would add, in CoP theory.

The critical role of central planning is visible, for example, in the introduction of just-in-time logistics. Such a systemic change does not come about through piecemeal adjustments at each workstation. Central planning is also critical in the design of machinery where engineering staffs play a pivotal role. In manufacturing, specialist functions such as production engineering and industrial engineering often have the main responsibility for preparing the organization for making new products. Their effort in turn drives local learning, since it dictates which new skills and what new knowledge operators are required to master.

My point here is not to make managers and industrial engineers the heroes of progress and development. Voluntarily and involuntarily their efforts promote socialization, but simultaneously they alienate labour and pursue their own sectional interests. The real contradiction between valorisation and socialization is reflected in the contradictory functions of management and technologists (Adler, 2012).

Given these contradictory functions of management, it is inevitable that workers' responses to the real process of technological and organizational change will also be contradictory. On the one hand, traditional patterns of solidarity and informal work-place community may promote more advanced forms of conscious interdependence (Bélanger, Edwards, & Wright, 2003; Vallas, 2003b). On the other hand, workers defending their vested interest in autonomy and craft-like arrangements (Ackroyd & Thompson, 1999) may impede socialization of the productive forces. Ezzamel et al. (2004) provide an example of workers' militant defence of their 'unplanned responsible

autonomy'. Indeed, socialization under capitalist conditions often proceeds only by riding roughshod over workers' interests: 'For Marx the goods can be brought forth only in the train of the evils' (Cohen, 1974, p. 254). In the long run, centralized planning does not necessarily marginalize workers' initiative; but in the short run, some categories of workers do indeed suffer such marginalization.

Socialization of knowledge and the emergence of the collective worker prepare the ground for workers' participation in large-scale restructuring. Progressive learning does not happen only or mainly as workers discover loopholes in control systems or abandon canonical practice in favour of noncanonical (as argued by Brown & Duguid, 1991; see also Cox, 2005, p. 533). As capitalism develops, learning is increasingly a function of centralized structures and canonical practices that are redesigned to allow for the realization of the productive potential of collective labour.

This proposition can be illustrated with additional data from the automotive supplier discussed above. Over the course of its three-year implementation cycle, the TPM initiative substantially improved equipment efficiency and reduced machine set-up times, so it is clearly an instance of organizational learning. The TPM implementation was driven by management's concern to maintain productivity in the face of a broadening product mix (implying more frequent machine changeovers). TPM was chosen as the improvement methodology because it was considered to be 'best practice' within their industry, based on some well-known reference cases. Implementation was led by managers and maintenance experts. A consultant company specializing in TPM was contracted to assist management and train local 'TPM coordinators', who should in turn train and assist the workers. For the workers, the outcome of the process was somewhat contradictory. On the one hand, workers' knowledge and responsibility were broadened, as explained above. The local labour union, of which all blue-collar workers were members, approved of the changes and even participated in planning the implementation. Specifically, they decided who would be recruited as TPM coordinators, and together with management they defined a company-specific 'TPM ladder', which each department would have to 'climb' in order to become 'world class in maintenance'. (Note that the Norwegian system of industrial relations supports strong independent labour unions, rather than Japanese style 'company unionism' (Gustavsen, 2007)). The results were favourably assessed by worker, who cited 'improved quality', 'an orderly workshop' and 'improved cooperation'. On the other hand, workers also reported scepticism and resistance to TPM. Increased measurement of operational performance made workers report that they were kept under closer surveillance. Workers also complained that TPM standards were enforced too rigorously, and prevented them from 'doing their work in a simple, practical manner'. In particular, standards for work area 'order and tidiness' were by some perceived as insulting and

counter-productive. Being accustomed to relatively high levels of individual autonomy, workers expected managers to continue to rely on their experience and judgment and not interfere so much in the details of the labour process. As a result, one TPM coordinator described his mission as an 'uphill battle'. Some workers perceived his role as illegitimate. Over time, however, he gradually 'convinced' the workers of the benefits of working systematically and proactively with maintenance, using a mix of training, persuasion and straightforward enforcement of labour discipline through regular 'TPM revisions' on the shop floor.

This example illustrates the active role taken by management, supported by internal and external technical specialists, in system-wide organizational learning. It also demonstrates the tension between socialization and workers' interest in autonomy as a way to keep management's priorities at arm's length. Technical competence was socialized through its codification in procedures for maintenance and machine changeovers. Directly and indirectly through the labour union, workers actively supported the change process, but nevertheless resisted increased measurement and standardization. While acknowledging the productive powers of bureaucratic standardization, workers were simultaneously sensitive to how measurements could become a coercive tool in the hands of management (see also Adler, 2012). In sum, socialization of maintenance competence became contested, and involved a mix of consensus building, negotiation and top-down enforcement.

Discussion and conclusion

The goal of structural-Marxist theory of organizational learning is to clarify the relationship between technological change and learning processes in organizations. Learning, of course, happens when 'people come together' (Barton & Tusting, 2005, p. 1), but this coming together is structured by the level of the productive forces and the prevailing relations of production.

The premise of the arguments supporting Propositions 1*–4* is the causal powers of society's material base, specifically how the forces of production develop under capitalist relations of production. First, technological development leads to an expansion of explicit knowledge, which is required in order to exploit advancing science and to regulate advanced technology (1*). Second, when technology is integrated with human labour in a complex socio-technical system, formalization is required to make the system controllable (2*): unless formalized, the system cannot be made the object of conscious planning and refinement. Third, changes in the labour process mean that traditional, work-related sources of identification are eroded, but new sources emerge

(3*). Forth, under capitalist relations of production, conscious planning on an aggregated level is the domain of management (4*), who aligns the sub-process towards the goal of valorising capital and sets the agenda for learning at the level of the work group and individual worker, and as a result, socialization often proceeds notwithstanding important worker opposition.

These results imply that the CoP theory's generalization from handicrafts to modern capitalist organizations misses some critical features of organizational learning in advanced capitalism. As the forces of production develop, work is increasingly formalized and less dependent on tacit knowledge. Only in extraordinary cases is organizational learning subsumed under the formation of stable identities. When management's active reorganization is dismissed as counterproductive (Gherardi et al., 1998; Wenger & Snyder, 2000) and when traditional work-place communities are seen as the prime source of innovation (Brown & Duguid, 1991), the CoP literature turns into a celebration of tacit knowledge, noncanonical practice and traditional Gemeinschaft (Adler & Heckscher, 2006) – in summary, craft romanticism.

The structural-Marxist account highlights both socialization and the contradictory effect of valorisation, which both stimulates and fetters socialization. From this starting point, we expect to find only an uneven realization of 1*–4*. As a result, we should expect to find some instances where the CoP perspective is relevant after all, as a way of understanding at least some forms of learning that emerge in the turmoil created by the interaction of these contradictory forces. Task- or craft-based communities may continue to be relevant when an organized workforce succeeds in containing capitalist rationalization (Bélanger et al., 2003; Ezzamel et al., 2004). Also, when management relies on normative control, work may be organized informally and remain dependent on workers' tacit knowledge. Examples of such arrangements include Barker's (1993) study of 'concertive control' and experiments with 'humanistic', neo-craft work designs (Sandberg, 1995). However, such high-autonomy work systems fail to capitalize on opportunities for system-wide rationalization (Adler & Cole, 1993; Ingvaldsen & Rolfsen, 2012) and as a result, they compete at a disadvantage. Politically, globalization and financialized capitalism undermine the bargaining power of labour (Thompson, 2003).

In contemporary industry, the far more relevant counter-tendencies are those associated with neo-Taylorism and externalized employment relations (Thompson, 2003; Vidal, 2011). These tendencies limit the actualization of 1*–4*, but they do not provide much support for 1–4. Coercive formalization is still formalization, and is still led by managers and technologists. Use of peripheral and temporary workers creates new barriers to cooperation and does not support the reproduction of communities. Even

when the counter-tendencies to socialization are dominating, the assumptions underlying CoP theory are undermined by capitalist rationalization.

Implications for future research

Since the structural-Marxist model aims to capture the dynamic quality of capitalism, it will have the strongest explanatory power where this dynamism is most intensively actualized. High-volume manufacturing and process industries, which have provided the illustrative examples throughout this paper, are the sectors where the theory's application is most straightforward. However, capitalist rationalization is not restricted to these sectors, and future research on organizational learning might usefully test the fruitfulness of Propositions 1*-4* in other sectors. Consider the spread of lean production beyond large-scale manufacturing:

> With respect to the service sector, the general principle seems to be that wherever a labour process consists of a multiple-step process, lean tools can be applied. It is hard to conjure a reason why lean will not continue to diffuse throughout the service sector wherever multi-step processes exist. (Vidal, 2011, p. 282)

A recent review reports an increased popularity of lean and total quality management (TQM) in such diverse sectors as healthcare, financial services, education, aviation, hotels and restaurants (Suárez-Barraza et al., 2012). Call centres and fast food are other well-known examples of capitalist rationalization of services (Bain & Taylor, 2000; Bowen & Youngdahl, 1998). New public management doctrines aim to rationalize public services by mimicking practices from the private sector (Hood, 1995).

The applicability of structural-Marxist ideas is less obvious in some other sectors. In particular, high-end services such as those of traditional professionals (medical doctors, lawyers, accountants etc.) may not easily conform to the multi-step process required for their rationalization. In these contexts, variants of the CoP perspective, in particular the epistemic or professional community (Amin & Roberts, 2008), may be more explanatory. Adler et al. (2008) argue that these professional activities are indeed under socialization pressures, but we lack detailed empirical studies that test that hypothesis. Similarly, it is not yet clear how much insight is afforded by the structural-Marxist theory of organizational learning in very turbulent, fast-changing business environments. It is possible that more informal learning will be relevant in such settings, although the reproduction of stable task/craft-based identities will likely be undermined.

Beyond these boundary conditions, the other big challenge facing structural Marxism is to develop a better account of the various configurations that emerge through the socialization/valorisation contradiction. Structural Marxism offers a very high level account of the dynamics of capitalist development, but offers few hypotheses about how these dynamics are likely to play out in given local contexts characterized by various levels of automation, by various degrees of competitive pressure, and by various patterns of relations between workers, managers and specialists. Management's strategic orientation and workforce disposition are surely key variables in explaining how socializing and alienating tendencies conjoin to create different forms of organizational learning (Vallas, 2003b; Vidal, 2007). This paper has discussed the fundamental tendencies of capitalist rationalization. Future research should explore how these fundamental tendencies are influenced by sector-, market- or firm-specific characteristics.

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[1] Originally, Adler labelled his interpretation ironically as 'paleo-Marxist'; later as 'structural Marxist'. 'Structural' should not be confused with 'structuralist' and the works of Althusser and his followers.

[2] Cohen (2000) upholds the primacy thesis of classical Marxism, stating that the superstructure can be explained (functionally) by the base, and that the relations of production can be explained (functionally) by the forces of production. This opens up a philosophical discussion about the nature of functional explanations. This paper follows Collier (1998) and Joseph (1998) in treating the Marxist stratification of society as a special case of critical realist ontology. Thereby the question of primacy is bracketed.

[3] Some sceptics, such as Marglin (1974), deny even this, but their argument seems more provocative than substantive and has little empirical foundations (Landes, 1986).

Paper 3

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