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Safety learning, organizational contradictions and the dynamics of safety practice

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Abstract

Purpose – The purpose of this paper is to explore the enactment of safety routines in a transshipment port. Research on work safety and reliability has largely neglected the role of the workers' knowledge in practice in the enactment of organisational safety. The workers' lack of compliance with safety regulations represents an enduring problem that often involves first-level managers, who are willing to turn a blind eye toward divergent practices. The CHAT conceptual vocabulary and theoretical model is used to explore this issue.

Design/methodology/approach – A grounded, empirical study in a large transshipment port in the Mediterranean area is conducted. Ethnographic methods including participant observation and interviews are used, and emerging data are analyzed through an interpretive methodology. The paper explores 30 employees' narrated accounts of how safety rules are enacted or infringed while living and working in the field in a transshipment port. Data obtained through organisational shadowing provided secondary data. Interview data were analyzed using content analysis, using a CHAT framework. Constant comparison and theoretical sensitivity were pursued through an iterative analysis process.

Findings – This study documented the critical role the workers' knowledge played in practice in ensuring the efficient functioning of the port, and evidenced that the disconnect between safety procedures and technical productivity standards is the most important factor determining the erratic compliance with prescribed procedures. The selective application of safety norms was deliberate in nature, collectively shared and culturally regulated.

Research limitations/implications – This contribution fails to address probably the most important aspect of the activity theoretical approach: its developmental orientation. The initial analysis intervention was meant to lead to a longitudinal process of expansive learning and development in the activity system. The authors had planned to initiate a cycle of expansive learning laboratories involving representatives of the dockworkers, the port management and the safety certification firm, but this had to be postponed to an undefined time due to the significant changes occurred in the international maritime cargo industry and the decision of the multinational company who owns the transshipment port to cut down its cargo traffic and privilege other ports in the Mediterranean area.

Practical implications – The practical implications of the case study concern the conception and design of safety training and management for the port organisation. By acknowledging the disconnect between espoused safety routines and the constraints and affordances of the workers' everyday work practice, it is suggested that safety training could be more effective if it engaged the workers (or first-level supervisors) in the fine tuning of safety regulations. Workplace learning opportunities could enable the workers to learn and construct situated safety practices.

Social implications – This paper seeks to highlight how the consideration of local knowledge and context-dependent practices can achieve better comprehension of situated application of safety norms.

Originality/value – The paper contributes to understanding the complexity of enacting and translating safety procedures into everyday work practices.

Keywords Case studies, Corporate culture, Learning processes, Health and Safety

Paper type Research paper

1. Introduction

The purpose of this paper is to explore the enactment of safety routines in a transshipment port. The workers' lack of compliance with safety regulations represents an enduring problem that often involves first level managers, who are willing to turn a blind eye toward divergent practices.

The study puts forward the ongoing efforts of the practitioners to translate and incorporate safety prescriptions in everyday practice.

The implementation of safety routines corresponds to an organisational change effort. Safety routines and safety learning can play a critical role in the creation of new collective practices and in establishing ownership over them, shaping the object of the workers' activity. This study illustrates that such change efforts can lead to unexpected consequences in relation to different types of contradictions and the unconnectedness of different organisational levels and logics (Kajamaa, 2011). The study uses an interventionist and ethnographic methodology to investigate the incorporation and translation of safety routines in actual work practices and the ongoing process of negotiation during which practitioners become aware of contradictions and work out practical solutions in interaction.

Social scientific perspectives on occupational safety largely treat it as a disembodied phenomenon that can be readily separated from the social context of organizing (Barton and Sutcliffe, 2009). Health and safety management within organisations is still largely considered a science.

In many organisations, occupational health and safety is increasingly devolved upon statutory regulations, health and safety workplace manuals and bureaucratic control.

For example, in Italy, since the Testo Unico on safety (Legislative Decree 81/2008) was issued, OSH laws have emphasized the role of inspections, as carried out by enterprise safety managers and labor safety inspectors (who are local employees of the National Health Service) over safety training (Papaleo *et al.*, 2013).

A large body of organisational studies and on health and safety goes in the opposite direction. The liabilities of poor organisational safety management have generated great concern among scholars and practitioners of safety and risk analysis (Perrow, 1983, 1999; Reason and Reason, 1997, Gherardi *et al.*, 1998; Weick and Roberts, 1993; Weick and Sutcliffe, 2001).

Applied psychology studies have addressed the relation between workplace safety and organisational knowledge and learning (Starbuck and Farjoun, 2005; Zacharatos *et al.*, 2005). When discussing the Space Shuttle Columbia disaster occurred in 2003, Starbuck and Farjoun advance the need of adding the management of organisational learning to traditional safety practices (regulation and inspections).

Safety studies adopting an organisational point of view have for some time been advocating that compliance with safety rules must be considered as the result of multiple organisational factors rather than individual behavior. The traditional scientific approach to rule system management has been coupled and confronted with the concepts of organisational safety culture (Pidgeon, 1991; Peterson, 1993; Ray *et al.*, 1993), safety climate (Griffin and Neal, 2000; Probst, 2004) and safety learning (Gherardi and Nicolini, 2000).

The system view of organisational safety advances that because organisations and workplaces are highly complex systems, system failures, errors and accidents constitute a risk that cannot be put under complete control (Reason, 2005). High reliability

organisations (HRO) studies (Rochlin *et al.*, 1987; Weick and Roberts, 1993) have focused on highly complex organisations that function reliably despite complexities and uncertain conditions of operation. According to HRO theory, these organisations achieve safety, thanks to dynamic organizing; human processes and relationships reveal themselves to be as important as system planning (Roberts *et al.*, 1994). Research has shown that workplace safety cannot be explained as a set of rules or procedures; of simple, empirically observable properties; of externally imposed procedures; or of consistent behavioral routines. A great part of the conditions that allows workers to perform their work tasks safely are a property of the "interactions, rituals and myths of the social structure and beliefs of the entire organisation, or at least of a large segment of it" (Rochlin, 1999). Interventions aimed at eliminating or reducing "human error" through external control do not take into account the importance of the processes by which safety is created and maintained in practice and are liable to cause disruption or distortion (Rochlin, 1999).

> Safety is an emergent property of social systems. However intersubjective, socially constructed and collective these descriptors may be, they are central to understanding the role of agency in providing safety as a positive effect that is centrally important in understanding the reliable operation of complex, potentially hazardous socio-technical systems. To the extent that regulators, systems designers, and analysts continue to focus their attention on the avoidance of error and the control of risk, and to seek objective and positivistic indicators of performance, safety becomes marginalized as a residual property (Rochlin, 1999).

Bruns (2009) documented the divergence of safety regulations and actual routine performance in a molecular biology laboratory. Safety regulations and training attempt to construct uniform practice in an effort to ensure workplace safety, prescribing routinized scripts of action (Mody, 2001; Bruns, 2009). Organisational routines are traditionally considered the basis for operational knowledgeability of organisational members, being patterns of behavior that incorporate knowledge which has proven effective for organisational performance (Nelson and Winter, 1982). They do not guarantee stability or predictability, as the actors' enactment of routines varies according to situational contingencies and the actors' intentions (Feldman, 2003). The actors develop a mutual understanding and shared interpretation of the objective of a routine, and develop accepted practice in response to standardized rules (Feldman and Rafaeli, 2002). Actors need to draw from this shared knowledge, for example, to decide when to perform which routine or which parts of a routine (Nelson and Winter, 1982).

It is a current practice for safety experts to treat safety, danger and accidents as a technical issue, feeding technical databases and event report systems to assess the organisational factors that determine the workers' safety. Often those who collect and treat data are not managers in charge of taking decisions on work organisation, have little direct knowledge of actual work practices (Bourrier, 2002).

Frequent deviations in the work processes plays a role in determining workers' propensity to deviate from safety rules (Simard and Marchand, 1997). Due to emergent complexities in work practice, safety procedures are sometimes not applicable as designed. Their users interpret and modify such procedures daily, building on the largely tacit knowledge of the practical implications and risks associated with their actions (Gherardi and Nicolini, 2000).

The assignment of tasks and design of responsibilities in the workplace is of great importance to ensure an effective implementation of designed safety routines.

The possibility for the workers to comply with safety procedures is not only linked to the design of such procedures, it is also linked to the open recognition of the need and possibility for their users to adapt them. This, in turn, is influenced by the design of responsibilities in the organisation.

If safety regulations users are too far away from those responsible from safety regulations design, and they cannot contact them and work out practical solutions with them, it is more likely that such measures will be systematically violated (Bourrier, 2002).

If the workers only receive perfunctory training, they are more likely to refer to their safety knowledge (knowledge of risks and coping strategies developed over time as a part of their work identity; Gherardi and Nicolini, 2000) over what they might perceive as bureaucratic rules of conduct. This can invalidate the workplace safety system and design and put workplace safety at danger. The implementation of a wide array of actions to improve safety can paradoxically bring on the risk of overlooking the importance of creating direct experiential learning opportunities (Lukic *et al.*, 2010).

Research on work safety and reliability has often neglected the role of the workers' knowledge in practice in the enactment of organisational safety. This form of tacit knowledge is challenged by more bureaucratic procedures codified in Health and Safety manuals and formal training.

We explore the significance of this ambivalence and advance that the separation of safety learning from everyday work practices cast the safety of the workers into an uneasy position.

The workers' lack of compliance with safety rules, rather than a pattern of faulty individual behavior, can be conceptualized as a collectively shared, historically developed and well-recognized aspect of local work practice.

Activity theory offers a powerful conceptual vocabulary that helps us to recognize the introduction of new safety rules as a process of organisational change (when safety regulations impact upon the configuration of the activity system) and to study the continuous process of change in work practice.

2. Theoretical background

2.1 A practice-based view

The theoretical framework we draw upon is related to the theories of practice, the activities through which organisations accomplish work or "the situated recurring activities of human agents" (Orlikowski, 2002), focusing on the improvisational and potentially generative role of practices that emerge in everyday activity: what people actually do in their work.

Practice-based theories have afforded us conceptual resources that allow us:

[…] to take workplace activity seriously, studying in analytic focus what people do to get work activities done, how people recognize the prospect of others and craft their contribution to unfolding courses of action, in light of distinctive organisational contingencies and accountabilities. (Yakhlef, 2010).

The focus is on the strategies which the members have devised to negotiate problematic situations and solve them, "building on their intimate understanding not only of how the work gets done but of other organisational situations constraining how it has to be done" (Yanow, 2004).

It is this kind of knowing in practice that keeps an organisation functioning smoothly, notwithstanding occasional incidents, breakdowns or slowdowns.

Managerial efforts aimed at overwriting safety knowledge in practice with codified procedures can be paralleled with the difficult task of enforcing and policing a bureaucratic regime within the work context. Such bureaucratic changes challenge the legitimacy of the workers' knowledge in practice and are thus problematic (Kamoche and Maguire, 2010).

2.2 Safety learning and compliance

Work accidents are traditionally categorized as due to unsafe working conditions and to unsafe work practices. It is common knowledge that workers often engage in behaviors that disregards safety rules; yet, little research has been made to understand the reasons why workers engage in unsafe work practices from their point of view (Choudhry and Fang, 2008).

In a large-scale study dating back in 1997, Simard and Marchand (1997, p. 84) valued the influence of various organisational factors on the propensity of workgroups to comply with safety rules, learning that workers are more likely to follow safety rules when there is a good, cooperative relationship among the shop floor-level supervisor and the workgroup and the supervisory management of safety is carried out with a participative style. They concluded that "[…] the workers' compliance behaviour to safety rules should be interpreted as being fundamentally part of a larger cultural set of safety practices". Upper-level managers play a role as well, as the supervisor's propensity to develop a collaborative relationship or commitment with a participative management of safety is linked with the commitment of the top management to develop the safety program and joint regulation mechanisms:

> […] a 'good' safety culture is one that motivates workers to conform to safety rules by leading them to participate in the safety regulation process, rather than by management imposing safety rules and norms in an authoritarian and punitive manner on the workforce (Simard and Marchand, 1997, p. 185).

From a socially constructivist perspective, hazard conditions appear as rather ambiguous and open to multiple inferences and interpretations of their nature and gravity (Scott and Trethewey, 2008; Gherardi et al., 1998). Risk and reliability are also constructed by the actions of the participants and safety can be considered an "emergent property of a socio-technical system involving people, technologies, and texts assembled into systems of material relations" (Gherardi et al., 1998, p. 203).

Here, safety is seen as a property that emerges from a set of embodied organisational practices (Gherardi et al., 1998; Zohar and Luria, 2005). Conditions that produce safety are embodied in everyday material and communicative practice of the actants a "dynamic phenomenon that must be continually re-accomplished in the everyday discursive practice of safety agents" (Scott and Trethewey, 2008, p. 313).

Gherardi et al. (1998) have suggested that safety can be seen as "a social practice which springs from the interdependence among human, organisational and institutional actors, technological artefacts and situated conversations" (Gherardi et al., 1998, p. 211). Safety as a practice is socially constructed by the various communities of practice that exist in an organisation (Rasmussen et al., 2012).

> It is principally participation in a community of practice as a legitimate member which provides access to the practical knowledge of what is safe and what is not and makes it competent use possible. The participants in a social context of practical collaboration collectively construct a shared understanding of the world, that includes shared meanings, skills and abilities. Learning and knowledge emerge as the result of participation. (Gherardi *et al.*, 2002).

The "competence relative to safety and danger" is learned as a form of practical knowledge and it is inherent to practice, or situated in practices (Gherardi and Nicolini, 2000, 2002). People in organisations do not learn "safety", rather, they learn safe work practices. Safety must not be considered a separate object of knowledge; the knowledge of what is dangerous and what is safe is situated in specific practices and controlled by the community that arises around these practices (Gherardi *et al.*, 1998).

Scott and Trethewey (2008, p. 314) illustrated how occupational identity constrains perception about the practices that are available and acceptable in a given organisational or occupational culture. Occupational identities centered on discourses and systems of meaning that sustain only certain forms of practice risk to compromise the potential effectiveness of organisational risk management efforts.

2.3 Cultural historical activity theory and the investigation of contradictions

The study uses an interventionist and ethnographic methodology to investigate the enactment of safety routines in actual work practices and the ongoing process of negotiation during which practitioners become aware of contradictions and work out practical solutions in interaction.

This approach is close to action research and clinical inquiry (Luscher *et al.*, 2006) in building a collaborative partnership with the research subjects and enabling participatory reflection (Kerosuo, 2011).

The theoretical approach of the study draws on CHAT (Engestrom 1987, 2000). We utilized CHAT conceptual vocabulary and theoretical models to investigate the workers' erratic compliance with safety regulations and the role played by first-level managers' willingness to turn a blind eye to many violations.

In the activity theoretical perspective, the analysis of work practices focuses on the (continuously socially re-negotiated) object of work, the tools, artifacts and material resources that are involved in the accomplishment of practices (Engeström, 1987, Blackler, 1993, 1995; Miettinen, 1999) and the cultural, cognitive and social resources through which they are enacted (Engeström, 1987; Blackler, 1993).

Activity is object-driven, and the object of activity is material as well as ideal, both given and projected (Engestrom, 2001; Kerosuo *et al.*, 2015). It is the problem space at which action is directed; different activities are characterized by their different objects. The relations among subject, object and community are mediated by tools or instruments, the division of labor and cultural and formal rules, which all emerge over time and incorporate knowledge and the negotiated nature of knowledge (Engestrom *et al.*, 1999). Engeström's approach suggests that relations among the elements of the activity system are neither stable nor necessarily coordinated; rather, tensions quite commonly arise. In activity theory, the focus is on activity as the unit of analysis. Human activity is understood as a system which calls attention to the interactions among the system's object, individual (subject) and collective (community) perspective.

CHAT studies consider carefully the contradictions that are inherent in all human activity and that characterize organisational practice. When these contradictions become evident, the analysis of the different perspectives and interests that are at play and of the historically accumulated tensions can lead to new actors' negotiations and learning. Evolving contradictions constitute a central starting point for learning and change. While many aspects of social and material practice in the workplace yield to the object, or final meaning of activity, they also embody different interests and are often internally fragmented, liable to contradictions (Blackler, 1993; Engeström, 1987, 2000). Emerging contradictions can be looked at with the theoretical model of the activity system and conceptualized as contradictions within the object of activity, between the object of activity and other mediating aspects such as the means, rules and division of labor and or between different components of the activity system.

The study of situated practice allows to identify the points of tensions, or incoherencies, that exist in the activity system, and to conceptualize the dynamic evolution of work practices as a collectively accomplished process of developmental transformation through which the workers seek to repair these incoherencies, repair a smooth flow of work and get work done (Blackler, 1995, p. 1,038).

The choice of the activity-theoretical approach seemed particularly useful in this study to address repeated problems, the coexistence of contradictory codes for action, the workers' frequent disregard of with safety regulations and their perception of being put in a double bind between the emphasis on control inherent in safety routine prescriptions and the injunction for optimal productivity which could only be obtained through flexible practice.

The introduction of different safety regulations introduces different rules for work practice and also impacts the division of labor. CHAT highlights that when the object of an activity, the construction of what constitutes the output of an activity and the horizon for practical actions, changes, the rules, means and division of labor also need to be transformed (Miettinen *et al.*, 2009). Activity theorists define such a process "remediation". Another implication would be that when a change in the activity system is initiated externally, impacting the mediational axes of the activity, the entire activity system, must also change and develop, and particularly the object of the activity is likely to undergo some changes.

In the case situation, workers do not follow prescribed safety rules, but have developed their own appreciation of risks and ways of dealing with safety issues, adapting and interpreting given norms. In the same way, they do not "stay safely inside the given role in the division of labor" (Engeström, 2000), they do not follow role description to the letter nor apply routine procedures.

3. The case

Our study was conducted in a maritime container port during the course of 2011.

The container terminal had recently reached a stage of rapid growth, becoming one of the most important transshipment (movement of containers from long-distance ships onto smaller ships which have the possibility of docking in the smaller ports) hubs in the Mediterranean Sea. It is part of a larger network run by a multinational transshipment company. The recent changes in maritime economics had modified the role of ports which have become fundamental links in the global logistic chain, able to produce innovative transport services in a competitive way. These changes also modified the

institutional and managerial assets of transshipment ports, which have had to become more competitive and to acquire the right amount of flexibility to adapt to market changes, in order to seize the arising opportunities (Brooks *et al.*, 2002). The services offered by a transshipment port are totally standardized and imply the use of a relatively high level of technological resources. The competitive pressure is very high, as the ports operate very near the threshold of profitability. Productivity maximisation of expensive resources, as rail-mounted berth cranes, has to be matched with the clients' (vessel owner companies) requirement of minimizing waiting times with an adequate rate of service completion. The work in a transshipment port experiences rapid variations in operation times. The constant monitoring of the productivity rate of each berth, crane and forklift truck, measured in terms of container units loaded/unloaded per hour, is ensured through constant real-time data feed. All these data are collected and processed by the dispatchers in a central office equipped with monitors that picture the situation of the entire wharf area.

Port operations proceeds around the clock and requires constant coordination. Everyday practical problems concern berth allocation and quay crane scheduling, yard management, vehicle routing problem and maintenance coordination, as well as human resources management problems. The common final aim is to ensure the competitiveness of the container terminal. The container discharge/loading rate, at any given berthing point, is the pulse of all activity. The management of technical equipment and human resources, however, can only be planned in part because it has to be organized on the basis of unpredictable events, emergencies and the relative importance of customers and their cargoes. Customs and anti-drug cargo inspections are recurrent. As they are carried out unannounced, they can delay the unloading of freighters and prolong the occupation of berths for several days.

The port is located in an economically depressed area of Southern Italy, characterized by a marked lack of industrial settlements and industrial culture. Built at the end of the 1970s, it was converted to the transshipment activity during the 1980s. After a massive expansion in the past 15 years, the harbor has become one of the largest in Europe, employing around a thousand people. At the time of our study, a total number of about three million containers are handled per year. It was 16,000 in 1995.

The dockworkers are employed for one-half by the same company who owns the commercial harbor, and for one-half by stevedoring companies who hold contracts to load and unload vessels and transport cargo in the port area.

The harbor workers use sophisticated equipment in working conditions strongly exposed to safety risks and health hazards.

Dockworkers have several different tasks (Figure 1). Checkers inspect the cargo containers and handle shipping and receiving documents. This information is keyed into computer databases, which allows shipments to be tracked efficiently. Winch operators run the crane-like machines that move cargo between the vessels and the dock. The winches have huge pincers that grab loose cargo or the sling (a heavy duty net) used to hold it. Special mechanisms allow the winches to lift containers easily. Other dockworkers secure the slings around cargo so it can be lifted. These more general dockworkers, called riggers (rizzatori), learn to handle dockworkers' hooks, use rope and cable riggings and stack cargo and containers. Maintenance workers and gear repairers keep the equipment in working order. Pier superintendents (shift foreman) are the middle managers of the maritime port. They interface between the operational unit

Figure 1.
The port
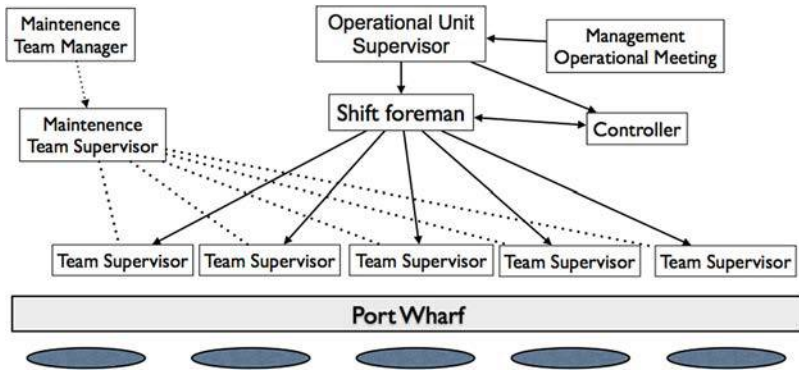
supervisors; the team supervisors, who are in charge of a workgroup of 5-7 dockworkers; the winch and hoist operators; the forklift truck drivers; the dispatchers; and the chief of operations (Figure 1). Most of the workers have been part of the port's workforce for no longer than 10 years. Interestingly enough, the workforce is composed exclusively of men.

The workers' lack of compliance with safety regulations represents an enduring problem that often involves first-level managers, who are willing to turn a blind eye toward divergent practices. First-level managers are often willing to implicitly endorse work practices that breach the prescribed flow of operations as long as good rates of productivity (containers per hour) are reached.

Safety procedures and instructions are codified and imposed by the management in a bureaucratic fashion. The workers are expected to learn safety rules in formal training in classroom settings. The longshoremen all receive an initial basic training related to Health and Safety regulations (use of protective equipment and safety measures), standard work procedures and how to use tools and equipment. Additional Health and Safety courses and training initiatives are organized periodically, whenever a change in technical equipment or port procedures occurs. While the initial training involves a significant portion of on the job coaching, the latter are carried out almost exclusively in classroom situations.

Bureaucratic control is exercised in the form of periodic inspections. External safety inspectors make regular apparitions at the shop floor level to verify and enforce the compliance with safety rules. Such inspections are often pre-announced.

Following the activity theoretical approach, we developed our case study observing several basic methodological principles. First, we posit that our unit of analysis is not the individual enactment of rules and the variability in it, but rather the whole activity system of the dockworkers, giving context and meaning to the issue of misapplication of safety procedures. Second, we endeavor to understand the activity system and its components in their development over time. Third, we consider inner contradictions of the activity system as the source of disruption, innovation, change and development of that system (Engeström, 1993, p. 63). Our focus was especially on the transition from the discussion of individually experienced double binds, which are almost always debilitating for the person, and the different response patterns that the workers were

adopting to the identification of systemic contradictions which can be addressed collectively and lead to system change.

In activity theoretical studies, the focus is often exclusively on the level of collective contradictions; the early phase in which contradictions are experienced as individual crises and articulated in words is not investigated. There are relatively few studies which explore the transition from primary (individually experienced) to secondary (collective) contradictions (Kerosuo, 2011).

We do not mean to convey the idea that the Change Laboratory setting was the first and only situation in which such transition was made possible.

The workers had already acknowledged the existence of contradictions in different organisational codes in speech and action and worked out collective strategies to balance safety regulations with other practical needs. This was a feature of the workers' identity and practical knowledge.

The activity-theoretical-based method of the Change Laboratory was used for analyzing the workers' transformation of existing contradictions collaboratively, and encourage the direction of such process as a process of transformation. The study did not reach the level of working out new organisational solutions, but was limited to the first phase of the Change Laboratory, intended as a setting and the availability of resources that allow the unveiling, analysis and modeling of organisational contradictions in their larger context.

4. Method and data analysis

The study uses an interventionist and ethnographic methodology to investigate the enactment of safety routines in actual work practices and the ongoing process of negotiation during which practitioners become aware of contradictions and work out practical solutions in interaction.

The methodology of the study integrates organisational ethnography, a narrative approach and cultural–historical activity theory. This approach is close to action research and clinical inquiry (Luscher *et al.*, 2006) in building a collaborative partnership with the research subjects and enabling participatory reflection (Kerosuo, 2011).

The research-intervention was carried out in two roughly distinct phases:

(1) a first phase of data collection and collaborative data analysis; and

(2) a second phase of participatory reflection and development built upon the collaboratively produced knowledge (Change Laboratories).

The two phases actually overlap, as the Change Laboratory sessions were also the official moment for the collaborative interpretation of rough data. Data documenting daily work practices were used to enable reflection and expansion.

4.1 Data collection and initial analysis

The study utilized three methods of data collection, participant observation (shadowing), informal conversations and interviews. The triangulation of methods (Denzin and Lincoln, 2008) aimed at providing more in-depth understanding and increasing the breadth and complexity of the investigation.

The setting was the shop floor of a transshipment port.

All the personnel participated in the study. The study was first discussed and accepted in a meeting with the port facility management. Permission was granted by the

Human Resource director. The study was then presented and discussed with each of the work teams that would participate in the study at one of their regular meetings.

Data were collected through participant observation, informal conversations with the workers and interviews. The researchers' contextual knowledge of transshipment ports from previous studies (Ripamonti and Scaratti, 2012) is also used to increase our understanding of practice in this study. Observation was conducted by two researchers seven times in 8-hour sessions during all shifts over a period of two weeks. The researchers dictated their notes in a voice recorder and recorded conversations among the employees when possible, using a little notebook to fill in the gaps when it was not. After each observation or on the subsequent day, the notes were written up into full description in "ethnographic sheets", including descriptions of the setting, verbatim transcription of the exchanges between employees, questions and descriptions/narrations from the participants.

Ethnographic observations, carried out in the form of shadowing (Czarniawska-Joerges, 2007), allowed the study of workplace practice. The researchers immersed themselves in the field, the port deck where the loading and unloading operations are carried out, and followed ordinary activity shadowing workers, team supervisors and pier superintendents. Two trained researchers followed the workers during two periods of one week at a time. In some cases, the ethnographic observation was integrated with audio and video recordings. Video recording of cross-sections of work practices, which was admitted strictly for research purposes in selected work spaces, allowed the researchers to review field notes and increase the understanding of interactions. Approximately 80 work episodes were documented in writing in the form of ethnographic sheets.

The researchers also participated in several meetings, both formal and informal, in which general operational problems, productivity issues and workgroup assignations were discussed.

Emerging understandings were better addressed through semi-structured, in-depth interviews with the participants.

Individual interviews were conducted with 22 dockworkers, 4 team supervisors and 2 pier superintendents (general supervisor) at the end of the observation period. This afforded a common knowledge of the issues under discussion and a basis for more focused descriptions. The interviews were recorded and lasted approximately 1 hour.

An interview guide with three open questions invited participants to recount their experiences in relation to:

(1) Their knowledge of the safety rules and procedures, their representations and opinions about safety regulations and their safety training.

(2) Their representations of occupational hazards and more effective strategies to protect themselves and the other workers.

(3) The problems that they encountered more often in their everyday work practice.

Queries that elicited comments particularly relevant to understanding the workers' compliance with safety rules included questions about good and bad routines, what kind of risks were considered normal and what did they do to prevent other kind of risks.

In total, 28 interviews of the duration of approximately 1 hour were carried over a three-month period. Because the questions were open, the respondents had opportunity

to elaborate, to expand and to add other information. The interviews were recorded and transcribed for analysis. The researchers also asked some questions based on their field notes in informal conversations with the dockworkers and the participants spoke about their everyday practice. The collected textual data were analyzed using a qualitative, pen and pencil approach to structure and categorize data.

We initiated the study to address a general problem: Why do workers neglect safety procedures aimed at their own protection? and Why do team supervisors and pier superintendents often put up with such conducts? To analyze the data, we identified every "story" or description of events and examined each story trying to give a plausible, contextual-rich description of the participants' behavior.

We then attempted to sketch a more comprehensive framework of the participants' practices that breached safety regulations. We built our framework traveling back and forth between the data and the emergent theorizing, going back to the data to check our interpretations (Glaser and Strauss, 1967).

All emerging data were then discussed with the participant during group sessions.

The data, both ethnographic and narrative, were presented to the workers and used as "mirrors" to enhance their critical reflections on their work practice.

4.2 Change Laboratory sessions
The activity-theoretically based method of the Change Laboratory was used in the study.

Contradictions in the system of activity cannot be accessed directly, but rather, as historically emergent phenomena, they become recognisable when they are constructed and articulated by the subjects in words and actions (Engeström and Sannino 2011).

The Change Laboratory method provides resources for uncovering, analyzing and modeling contradictions in a larger context. In the Change Laboratory, pieces of data are used as a mirror to enhance participants' critical reflections on their work practice (Miettinen *et al.*, 2009).

Interventions based on the Change Laboratory are used both to study the conditions of change and to help those working in the organisation to develop their work, addressing the practitioners' conceptions, repeatedly encountered problems and disturbances at work.

Key episodes of interaction, called transitional episodes, are selected to open up new issues for collaborative analysis (Emerson, 2004).

Using the model of the activity system to analyze their practice, community members unveil the activity developmental contradictions and form hypotheses that suggest possible solutions and practice development (Miettinen *et al.*, 2009).

Four participatory Change Laboratory sessions were held. Each session lasted about 1.5 hours and involved a group of 15 people, representing the different professional groups which dealt directly with core operations on port (team workers, team supervisors, shift foreman). The method provides a conceptual vocabulary and a set of learning tools and for discussing, analyzing and modeling contradictions, making the transition from individually experienced double binds to contradictions in the activity system, to possible new models of activity as solution to historically created contradictions.

Through these participatory sessions, contradictions become unveiled and can be addressed.

5. Results

5.1 The recognition of contradictory codes in workers' actions and speech

This study is focused on the individual experience of contradictions, their characterisation as double binds and the "working out of double binds as the psychological and experiential representatives of systemic contradictions" (Kerosuo, 2011, p. 390) which can lead to changing the activity in its larger context (Engestrom, 1987).

The approach used is interested in how this process is carried out in talk and everyday activity.

While workers' responses to contradictory messages are necessarily negotiated and processed over time, and also overlap; in practice, three general patterns of communicative and behavioral response emerged from a grounded analysis of initial data.

The following data illustrate the various ways the in which the workers framed their responses to contradictory codes of conduct.

Through a study conducted with prison guards in two correctional facilities, Tracy (2004) suggested that employees faced with contradictory requests manifest three possible patterns of response. The first type of response is selecting one norm to uphold in favor of another (selection) or choosing which norm to switch to depending on the time, context, situation or person being worked with (vacillation). The second possible type of response is simultaneous attention to different norms intended as different priorities that need to be balanced, or through creative performance that partially respond to various organisational norms at once. The third type of response is withdrawal, which manifests itself as ignoring the rules and withdrawing from all the normative pressure altogether. Withdrawal can also manifest itself as literalness, which corresponds to a pedantic application of the prescribed actions literally, without personal involvement and consideration for the goal that lies beyond (Tracy, 2004).

We organize our exposition of research data on the basis of Tracy's framework, suggesting that the first phase of our research mirrors the existence of relevant tensions between safety regulations and other organisational mandates. These research data represent the tensions emerging in everyday work practice as the workers are torn between the prescriptions of safety rules and the need to "get things done" quickly, responding to the organisational mandate of constant productivity.

The workers framed these tensions mainly as contradictions rather than double-bind situations. Contradictions *per se* do not necessarily paralyze action, while a person in a double bind or dilemmatic situation is likely to experience confusion and paralysis (Watzlawick *et al.*, 1967; Bateson, 1972). Dealing with such contradictions, the workers had developed recurrent responses, alternative codes of conduct and divergent routines that were strictly related to their practical knowledge of work situations. These response patterns helped the workers to avoid paralysis and keep the pace of operations smoothly in most cases.

Notwithstanding this positive organisational outcomes of the workers' way of dealing with contradictory safety rules in practice, it must be considered that it can also lead to serious problems in the form of erratic or haphazard behavior, unpredictability and system failures.

The valence of safety routines and regulations is to relate individual to collective behavior, ensuring systematic control over the conditions of risk. Although careful

planning of safety systems and the existence of well-designed safety regulations is no longer deemed sufficient to guarantee safety, as the literature on HRO suggests, it is clear that the consideration of safety as socially and practically constructed cannot disregard the technical and systemic conditions of safety altogether. The prescription of safety routines aim to introduce an element of order and predictability, interlocking individual actions and systemic effects.

5.1.1 Theme 1 selection and vacillation. Tensions introduced by contradictory codes: example of responses of selection and vacillation.

The following example is taken from the ethnographic observation records. The selection of one norm type of norm in favor of the other or switching between different norms depending on the situation (vacillation) is a way of dealing with organisational contradictions through separation (Tracy, 2004). In this episode, one worker explicitly asks his immediate supervisor to convalidate his choice to select one kind of type of organisational mandate to uphold in favor of another.

Loading operations are underway involving a strategic ship for a potential new client. The Operational Unit Supervisor has directed that close attention is to be paid to the process to avoid any type of problems or delays. It is known, however, that the yard is full of containers, and this could slow the process down considerably. Thus, the supervisor has declared that it is necessary for everyone to cooperate for the shift to perform well.

Shortly after the beginning of the shift, while doing a check of the cranes on the terminal monitor, the Shift Foreman calls the Team Supervisor to check on why certain lift trucks have long work times.

Shift Foreman: 'Hey Giacomo, check on lift truck SC 17. The Dispatcher told me that its times are too long. We're at an average of 4.5, which is a bit too low. What's going on?

Team supervisor: 'OK, I'll check on it now.

Team supervisor (calls the lift operator): 'SC 17, what's going on? your times are too long; is there a problem?

Lift operator: Yeah, I'm picking up from position xxx, which is far away, you know. The problem was known. The yard is full and we have to do pick-ups in the rear sections. I can make a shortcut by passing by the working hoist but I don't want troubles.

Team supervisor: "OK, got it, I'll inform the dispatcher and shift foreman. Stick to the procedure"

Team Supervisor to the Dispatcher: "Hi, how come you didn't inform me of the delay with SC 17? The Shift Foreman called to tell me. Anyway, it's because the route is slow."

The shift foreman again contacts the team supervisor.

Shift Foreman: "can't we speed this up a bit?"

Team supervisor: "we'll check now, we'll try, but you know how the situation is, don't you?"

Shift Foreman: "OK, OK."
>(10 minutes after)

Shift foreman contacts the team supervisor: "can you speed things up with SC17?"
>(40 minutes after)

Shift foreman contacts the team supervisor: "SC17 is still running too slow, give him a move on."

Team supervisor (calls the lift operator): "SC 17, move on or we'll make the worst rate of the day."

Lift operator: "It's full, what the hell! I'll make that shortcut and you stand by me."

Team supervisor: "What the hell, OK."

The Team Supervisor it is aware that the distant position of the containers increases the loading times. But he also fears that this situation has become an excuse for slacking by the forklift operators. Moreover, they are working on the ship of a crucial client.

The interaction also shows that work processes are often subject to shortcuts. In this specific case, it is the Shift Foreman who takes decisions in sake of the strategic priorities of the harbor. He knows if a client is important; he knows if there are particular circumstances which give priority to one task rather than another. The teams, in fact, are assigned their tasks at a daily meeting with the managers to review the priorities. In this case, both the forklift truck driver and the Team supervisor are on the receiving end of a double-bind type of communication (Bateson, 1972). They face "pressing and equally unacceptable alternatives in their activity system" (Engeström and Sannino, 2011). On one hand, they know that the forklift truck must not enter a particular area for safety regulations. On the other hand, the pressure to reduce hauling times is very strong. As the yard is full, there is virtually no other possibility to improve productivity but to pass through the forbidden area.

A double bind is typically a situation which cannot be resolved by an individual alone (Engeström and Sannino, 2011). The resolution of a double bind requires a practical, collective decision. In this case, the forklift truck operator requires that the team supervisor endorse his decision to infringe a rule by implicitly making reference to a shared repertoire of strategies involving selection of one type of norm over the other.

5.1.2 Theme 2 balancing organisational priorities. Responses to contradictory codes: example of responses of simultaneous attention to multiple goals and balancing organisational priorities.

In the following interview excerpt, we are let in on a team supervisors' interpretation and assessment of some rule-breaking workers' behaviors. He considers that sometimes infringing some rules simply makes "practical sense". The workers engage in creative performances that aim at balancing different organisational norms, even if they only consider and follow safety norms perfunctorily:

>There was an accident, a couple of years ago […] a guy, rigger-upper he was, standing on the quayside. They where unloading a big ship. There was an extremely, unusually strong tide and the ship went up and down, and one of the ropes securing the ship in position broke […] we're talking a rope with a diameter this big, an enormous tension. The broken rope hit the guy on the head […] his head was literally smashed. What good is a helmet to protect you from such incidents? If a piece of cargo falls, for example, we're talking a container which often weights

a few tons […] what is a helmet good for? Or if a worker happens to fall from a winch, one of these crane-like machines you see over there, he falls from some 5 to 10 meters, what good what the helmet do?

Truth is, the helmet can't do a thing for us anyway but during the summer it is so hot, and we work under the sun, mind you […] it is so hot that it makes us feel faint […]. Now this is risky, so we keep it secured to our belt, and when the COs make their tour, we put it on our head, quick, and then back down again when the tour is over.

In the following example, taken from our ethnographic observation records, we report a typical work situation that involved more than one workgroup, one team supervisor and one of the port dispatchers (person who is in charge of controlling the proceeding of logistic operations remotely through data feed). All these workers put into practice a creative, coordinated action that infringes multiple rules, but responds effectively to the fundamental mandate of not missing out on time.

We are at the end of a shift in the late afternoon. We are observing loading/unloading operations performed by our team. A dull thud is heard. A crane has jammed. The container wobbles. The crane is positioned in front of a ship which must set sail shortly. We watch the team supervisor opening the crane's control panel. He tells us that he knows this crane like an old friend. He works with it every day and he knows that power downs – frequent at the harbour – cause blackouts which reveal more serious operational problems.

He calls the dispatcher, who is watching the operations from around 10 m away. They talk and exchange opinions about the problem.

The team supervisor pulls out a special power key he has and uses it to re-start the crane. This non-canonical operation enables him to move the crane back around 100 m. Space is thus created to position another crane under the ship and resume operations.

The episode is communicated only to the Dispatcher, who is following the operations online. It is not communicated to the shift foreman, who is told about it only when the operations have been completed.

After some minutes, the team finishes its shift, and it is immediately replaced by the team on the next shift, which continues with the loading/unloading operations.

Conversation as reported in the researchers' notes:

Team Supervisor to the Dispatcher: "Hi, look, the crane has stopped. According to me, it's the usual problem. The power has dropped off and caused a blackout. What do you think?"

Dispatcher: "I reckon so as well. It's crane number 13, which always has this problem."

Team Supervisor: I'll try to start the crane engine with my special key. If it starts, we'll shift it. OK, so the assistance can work on the quay. We'll move another crane below the ship. I'll move crane number four below the ship, so the next shift won't be held up. Do you agree?

Dispatcher: "OK, go ahead."
On conclusion of the operation:

Shift Foreman to the Operational Unit Supervisor: "Look, I've shifted crane thirteen with crane four, so I've created fewer problems for the next shift. All right?"

Unit supervisor: "OK, OK, I understand. Next time consult me first."

In a follow-up meeting, we reconstruct the safety procedures pertinent to similar cases (Figures 2 and 3).

The Team Supervisor must notify the Shift Foreman. The Shift Foreman must notify the technical assistance switchboard operator. Because a crane has halted, the switchboard operator must call the head of technical support so that he can decide how to deal with the problem.

The head of technical assigns a code number to the call according to the seriousness of the situation.

On the basis of this code number, the technical support team organizes its shift relative to the other interventions scheduled. When ready, the technical support team makes an inspection and decides whether it should act immediately or schedule more substantial work for later that day.

On average, this process takes up at least 2 hours between the call and the team's arrival at the crane.

The researchers then re-interpreted the situation on the basis of their better knowledge of the activity system:

The workers talk to the team supervisor, who consults the controller. They know that similar problems happen constantly. On the basis of their embedded knowledge, they decide that the situation is not serious, and that it is not worth wasting 2 hours for because they already know that the technician will try to start the crane using a special power feed key. Only if the crane still does not start will it be clear that the problem is not due to a power drop, and that specific technical support is needed. They, therefore, decide on a non-standard procedure which disobeys the instructions in the company safety manual. Yet, on the basis of their joint appreciation, they have classified the situation as not dangerous.

According to the nature of problems, the Shift Foreman, on consultation with the Operational Unit Supervisor, decides how to deploy the maintenance teams among the ships. The efficiency of the unloading processes depends on how work situations on the dockside are interpreted. But such interpretation requires decisions to be taken by at least three or four people:
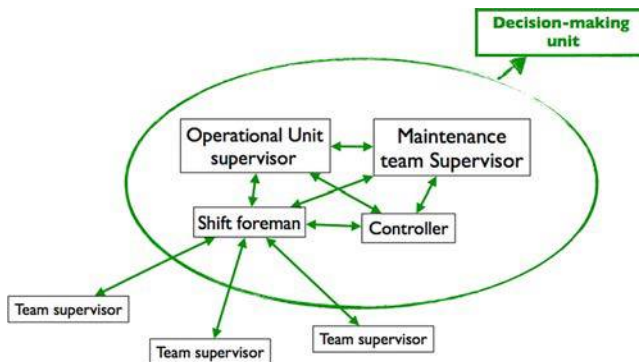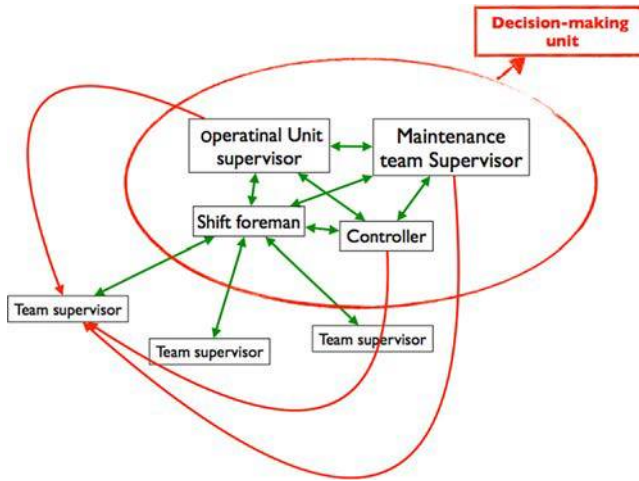

Figure 2.
Prescribed procedure

Figure 3.
Followed procedure

- the monitor operator who notices data at odds with anticipated flow;
- the team supervisor, who furnishes further situational data to interpret the number displayed on the screen; and
- the operational unit supervisor, who decides how to deal with emergencies.

When the problem is due to a technical breakdown, the decision on what to do is complicated. Now involved in interpretation of the situation is also the Maintenance Team Supervisor and, in very serious cases, the Head of Port Maintenance as well.

The workers had gone as far as to develop an alternative and unwritten division of labor, proved by different sequences of communication and action as compared to those prescribed by existing operative instructions and work role descriptions.

In Figures 4 and 5, the prescribed flow of communications and actions is confronted with what happened in practice.

5.1.3 Theme 3 literalism. This striking example of response to contradiction was expressed by one team supervisor in a casual conversation with the researcher when the ethnographic observation was taking place. He related that on several occasions the dockworkers, who felt that they were put under excessive pressure to conform to safety regulations and the whole body of regulatory instructions and procedures that contains them, attempted a demonstrative action. This was defined a "white strike": the workers ceased to take responsibility and engage themselves in the active, creative collective effort to find quick solutions for problem situations. They ceased to use their practical knowledge and invest their creative effort to find quick fixes and practical shortcuts. Instead, they conformed to regulatory instructions and performed standard procedures literally, causing a terrible slow down of all port operations which resulted in a disastrous situation of overload. The workers thus staged collectively a common type of response to code contradictions framed as double binds. When faced with a dilemmatic situation, the workers may choose to withdraw from work tension by blatantly ignoring the rules or following each and every rule literally, one after the other.

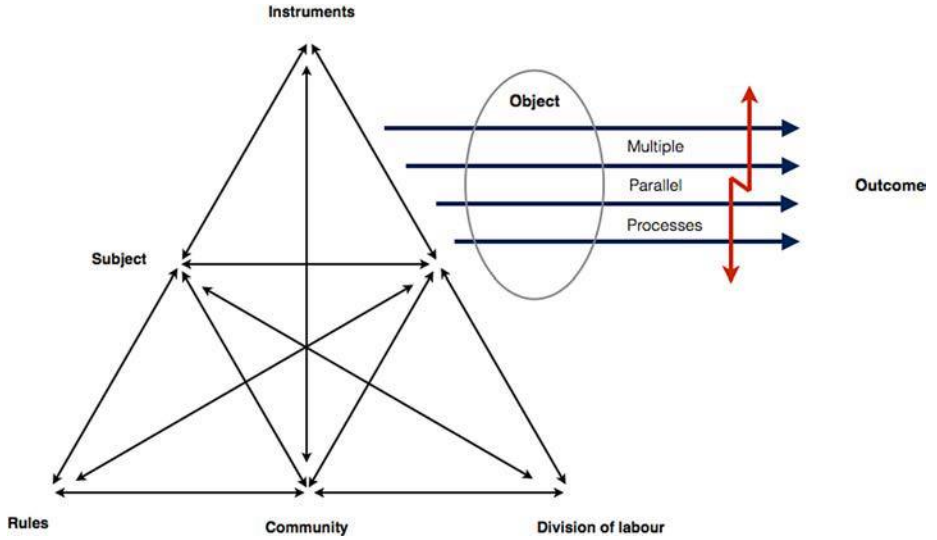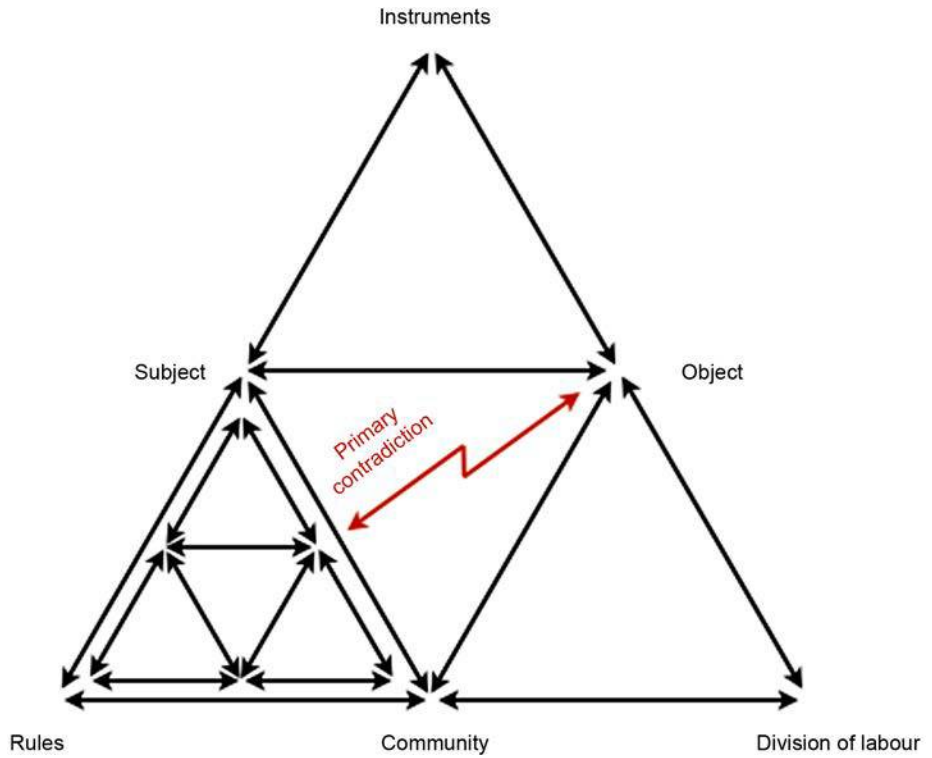**Figure 4.**
The activity system

Figure 5.
Primary
contradiction

5.2 Change Laboratory sessions
During the Change Laboratory sessions, the participants worked out the existence of contradictions discussing the emotionally charged experiences of being torn between opposing mandates. The recognition of the existence of contradictory organisational codes lead to an animated interaction during which the participants discussed the different ways of acting and talking as framing responses to such contradiction. During the course of this intensive exchange they discovered tensions and framing practices related to contradictions in the activity system.

Contradictions in the activity system emerged at different levels:

- as individually experienced double binds;
- as repeated problems that have to be solved with a collective practical effort to maintain a reasonably smooth flow of the operations; and
- as different interests or objects ascribable to different organisational groups.

We consider contradictions as the principal trigger for evolution and change in a system of activity. An activity system is constantly undergoing transformations due to the internal contradictions between its elements and between the entire activity system and its environment (Engestrom, 2001).

5.2.1 The activity system. First, we introduce the description of the system of activity, as it was sketched during the Change Laboratory sessions by the participants together with the two researchers, in a joint effort to make use of the activity theoretical concepts *in situ.* (Figure 4)

Object: The central activity of the container port, the problem space at which action is directed. The core activity is transshipment: the unloading of incoming cargo vessels, the storage of cargo on the port yard, the handling, sorting and loading of cargo on trucks or smaller vessels that then set out for other smaller ports in Italy and the Mediterranean. Additional activities are the handling of refrigerated containers, the handling of non containerized or non standard-size cargo, the maintenance and refueling of incoming vessels.

The main activity is the unloading of cargo vessels. The workers conceive it practically in terms of number of container units handled. Because not all containers demand equal effort to handle, and there is a quota of ship cargo which is not containerized, in the workers' conceptions, the object is often thought in terms of space management: the unloading of ships, the occupation of berthing points which are then vacated; the transfer and temporary storage of cargo at the yard; the loading of cargo onto smaller vessels and trucks, which frees up yard space.

In the management's conceptions, however, the actual object of all activity is the productivity/competitiveness of the port is, symbolized by the number of container units handled per unit of time. The productivity rate is measured per hour, shift, month, year and also for each berthing point, crane, forklift truck. To achieve competitiveness, it is also important to obtain constant flows of work, by ensuring that the clients, the freighter companies, receive adequate service. The clients all demand to minimize waiting times for the loading and unloading operations and, as usual, important clients have the priority. On a fairly regular basis, the pier superintendents and chiefs of operations must make quick decisions that deviate from the optimal employment of

resources to privilege certain vessels. Custom and police regulations also intersect with work operations.

Subject: The dockworkers and the management refer to partially different objects of activity: we can sketch two distinct, intersecting activity systems with a partially shared object. In defining who the subjects of our study are, there is a risk of summing up a network of different, intersected activity systems in one complex system whose central activity and object is defined in a quite vague, opaque manner.

The subjects of the activity system of reference are the dockworkers that participate in the joint effort to unload a vessel and move the cargo to a point of the yard. In our view, these two activities cannot be separated but in a somehow artificial fashion, as they are executed simultaneously. This is also well reflected in the division of labor practically operating at the port wharf, where an operational unit supervisor coordinates the work of 5-7 riggers, one or more winch operators, and several forklift truck drivers.

Outcome: The outcome of the activity is twofold, the handling of container units (measured with precise figures) and client retention. These two factors combined generate the financial flows from clients that ensure the survival of the port and, finally, the dockworkers' jobs (as there are very few job opportunities in the region).

Community: The community of the dockworkers is divided into operational units; each operational unit has its supervisor and directly or indirectly interacts with many different figures: the port managers, the dispatchers, the personnel of the incoming and outgoing vessels, the truck drivers, the maintenance workers, electricians, cleaners, the forwarding agents, customs officers, customs inspectors, seafront policemen, safety inspectors and the trade unions delegates, among which the nominated trade unions delegate for safety.

Instruments: The actors accomplish this object practically with the help of certain tools, and within certain systems of rules (Engeström, 2000, p. 303). A number of instruments were identified. First, the technological artifacts without which the transshipment work would not be conceivable in its current form and importance: the freight vessels, the containers, the winches, hoists, cranes, hooks, slings, cable riggings, ropes, forklift trucks, shuttle trucks and the plethora of more minute gear that the dockworkers' utilize for everyday work. The ships that are used to transport winches and cranes from one berthing to another (the port wharf is about 2.5 km long). The electrical net, switches and sockets frequently caused problems during the observation. The fueling stations, fueling ships, which can be noticed everywhere near the quayside but we will not consider, as they are not directly linked to the object of the activity. The communication tools are transmitters, cellular phones. While observing work practice, we also noted the ubiquitous presence of the artifacts that mediate continuous operations control. The data-feed devices are the checkers' optical reader, the wireless devices for data gathering mounted on each winch, crane and forklift truck and held by the checker, the dispatcher, the yard controller. The artifacts for data control are: the monitors in the dispatchers' office, central mainframe, terminals, model simulation programs installed. Finally, the apparatus that is directly related to safety issues: helmets, safety harnesses, safety shoes, glasses, gloves, fluorescent work garments.

Rules: This refers to the explicit and implicit regulations, norms, conventions and standards that constrain actions within the activity system (Engeström, 1987). Rules which apply to this system of activity stem from multiple sources: work contracts, which dictate work shifts and the dockworkers' duties and responsibilities, the Port

authority rules, the operations manual, edited by the quality certification agency and endorsed by the company, which contains the safety regulations. One important source constraint for work actions are the technical standards of productivity.

As an additional safety requirement, the port wharf is divided into areas which become accessible or non accessible for safety reasons, depending on the placement and working situation of technical equipment.

Division of labor: The division of labor is quite definite; general dockworkers secure cargo with hooks, slings and rigs; the winch operators lift cargo from the vessels and depose it on the quayside where truck drivers immediately take it and move it to an assigned place in the yard (or to whatever free space of the yard they are able to find, which occasionally leads to "lost cargo" problems when operations are not recorded correctly). A supervisor coordinates these operations and maintains contacts with the dispatcher and chief of operations. There are very few examples of job rotation for riggers and forklift truck drivers.

5.3 Contradiction within and between activity systems (Figures 5-7)
5.3.1 Primary contradiction. A primary contradiction emerges when basic understandings and assumptions that sustain existing practice within a community are challenged by new problems or interventions (Figure 5).

Primary contradictions correspond to the individually experienced tensions between use value and exchange value emerging in the socio-economic relations of a society (Engestrom, 2001).

They emerge as emotionally charged experiences of contradictions in dilemmatic situations.

In our case study, a primary contradiction was characterized as a general situation in which the well-being and the preservation of the workers' health is limited due to the constant pressure to maximize productivity and competitiveness.

The workers recognize and accept some risks, both for incidents or long-term health outcomes, as a normal feature of the activity, but they also claim a right to be the ones who make decisions about work pace and risk-avoiding strategies.

The open discussion of this type of primary contradiction was a talkative background that accompanied the progressive uncovering of secondary contradictions between the elements of the activity system (between the object of the activity and the rules, the rules and the division of labor).

5.3.2 Secondary contradictions. Secondary contradictions (Figure 6) were found within the rule-set. The explicit, espoused rules such as port authority and safety regulations are in contrast with the normative pressure to continuously conform to technical standards. Another contradiction became manifest between espoused rules and deeply rooted cultural rules for social interaction that favor personal relationship over work description and manual-like regulations. In fact, it is consider socially unacceptable to enforce the respect of rules such as wearing safety helmets and protective glasses. This is intended as a threat to the men's role identity.

Second, contradictions emerged between the rules and the division of labor. The transshipment port is both a highly dynamic context of work where the workers must make quick decisions and handle unexpected situations on a real-time basis and a highly regulated, highly controlled situation. For example, a possible scenario is a vessel which declares upon entering port that it is carrying hazardous cargoes (containers containing
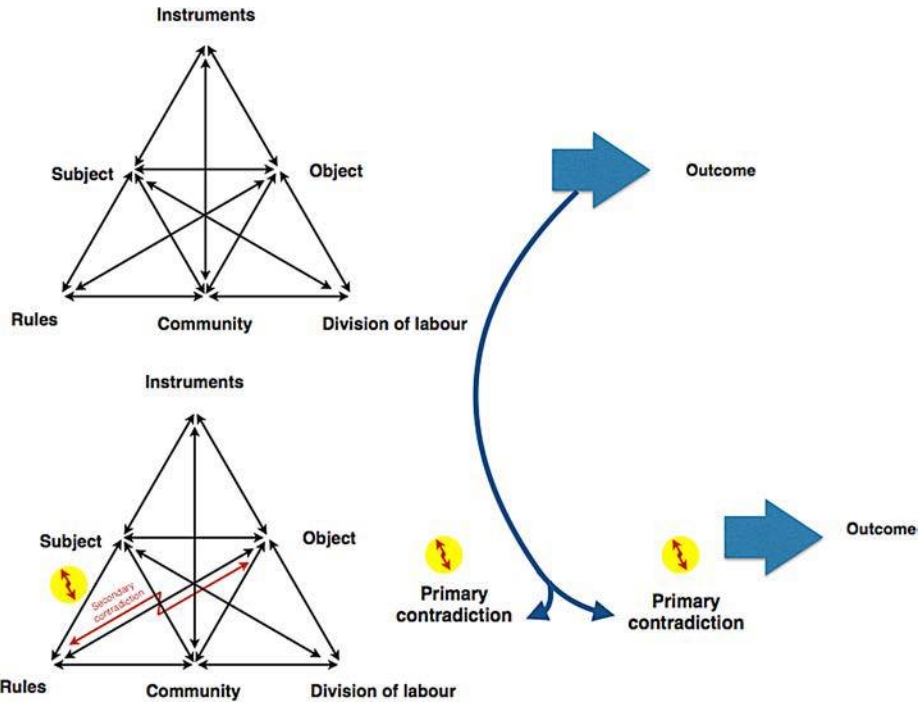
Figure 6.
Secondary
contradiction

dangerous goods, such as chemicals or explosives) which had not been previously declared. The unloading procedure has to be adapted on the spot. Another scenario is the overbooking of the wharf facilities which causes considerable slow-downs and productivity problems. A third, very frequent scenario is equipment failure or power downs. Everyone in every position of the chain of operations has to take responsibility and to make quick decisions. Everyone is under pressure to reach productivity standards. Yet there are procedures to follow for each of these cases, a prescribed flow of communications and actions that is not normally followed in practice.

5.3.3 Tertiary contradictions. Tertiary contradictions refer to the coexistence of different interconnected activity systems with a partially shared object.

A tertiary contradiction became unveiled as inconsistency between the activity system of the dockworkers and its neighboring activity systems, those of the port managers and Health and safety managers (Figure 7). We elaborate this finding in the following Discussion section.

6. Discussion
The goal of our study was to explore the enactment of safety routines in a transshipment port. We aimed to contribute to the understanding of a persistent problem: the workers' erratic application or misapplication of safety routines. The workers indicated a number of reasons for their ways of doing. Lack of awareness of safety measures, the desire to be considered tough guys and social pressure to conform to a masculine culture of carelessness were cited, but considered less significant. The principal reason given was

that safety norms were impossible to follow if the workers had to their job properly. We can indicate this situation as a paradox of performing (Luscher *et al.*, 2006, p. 494). Paradoxes of performing originated in contrasting messages: simultaneous demands that are perceived as conflictual (for example, nurses are called to provide care while reducing costs).

Contradictory work tasks and procedures are experienced as pragmatic paradoxes that the workers have to deal with in everyday practice. When workers' responses to such organisational tensions are not simply treated as individual patterns of behavior but considered from the workers' point of view, we can help processes of organisational change that contribute to ensure better conditions of safety in the workplace.

The organisational paradox introduced by the simultaneous presence of contradictory codes, safety regulations and practical accomplishment, manifested itself in enduring tensions, and erratic, unpredictable application of safety rules.

Safety regulations and training attempt to construct uniform practice in an effort to ensure workplace safety. The workers frequently violated safety prescriptions or juggled different priorities through creative practical strategies. It was also clear that, in many cases, supervisors accepted this type of conduct, or at least did actively try to enforce safety regulations.

Middle managers (team supervisors and pier superintendents) acted in ways that reinforced the perceived contradiction between safety procedures and pressures to speed up work operations in surges.

Our data set provided an interesting context for understanding these contradictions, given the potential implications for an employee group marked by significant productivity pressures.

When workers have to respond to multiple role priorities and contradictory requirements, they experience difficulties (Katz and Kahn, 1966; Putnam, 1986; Hatch, 1997). But contradictions and paradoxes are a normal feature of organisational life. Hatch suggests that organisations are capable of maintaining mutually exclusive structures, such as stability and instability and still function properly, by allowing the existence of a number of organisational paradoxes (Hatch, 1997). Conflicting pressures are a normal part of many workers' experience, a reality that is now largely recognized by organisational scholars that eschew traditional discourses of rationality and order which have for long characterized the prevalent logics of organisation theory and practice (Ashcraft and Trethewey, 2004).
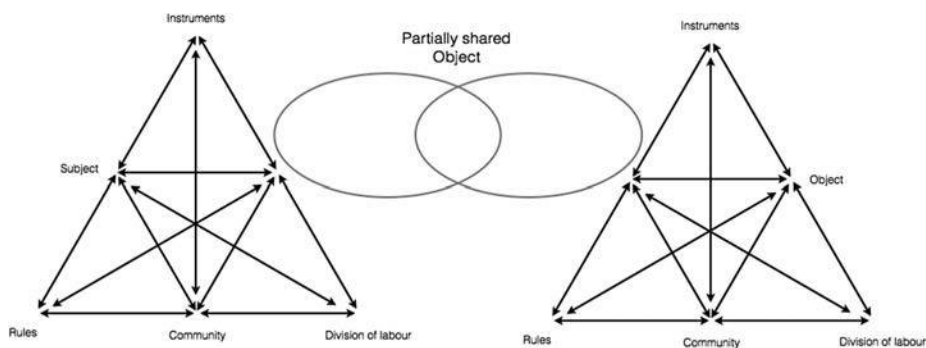

Figure 7.
The challenge of constructing a shared object

Paradoxes of performing (Luscher *et al.*, 2006) are originated in contrasting messages: simultaneous demands that are perceived as conflictual. Paradoxes of performing are also associated with role conflicts. Putnam (1986) proposes that role conflicts arise through mixed messages given at different levels of communication, especially between superiors and subordinates. The managers may not be aware of the mixed messages they are conveying, and if subordinates do not address the contradiction, such a pattern of communication is confirmed and thereby established as a part of the ongoing relationship.

Employees can respond to contradictions in different ways. Our study contributes to advance the understanding of how people actually respond to the imposition of safety regulations that are perceived as opposed to other organisational mandates.

Contradictions are experienced individually as double binds when a person receives contradictory instructions that are structures as a paradox (so that to obey is to disobey) and cannot step outside the frame set of this message by meta-communicating or avoiding the situation altogether (Watzlawick *et al.*, 1967). This is primary contradiction in the activity-theoretical framework.

In the course of this study, it also became apparent that different groups in the organisation oriented their actions at different problem spaces, or objects.

People constantly create and change their object of concern through their activities (Engestrom, 1987). The challenge of constructing a shared object within two or more activity systems in a work organisation can be considered one fundamental source of tensions and contradictions that are normal conditions of organisational life. The managers of the port had productivity figures and profitability on their mind all of the times. They tended to exercise a loose, bureaucratic-type control on all other port-life issues which did not contribute directly to productivity. The Health and Safety managers were focused on incident rates, risk evaluation, inspections and due periodic reporting on the fulfillment of the safety manual. They operated from a position detached from the everyday port life. The workers were pressured to "keep things moving on" and thought about their activity in term of cargo repositioning and space occupation, their work world inextricably fused with the wharf tarmac and machines. They even spoke about a "gut feeling of the dock", explained as a collective feeling of the state and prospect of operations at any given time. In activity theoretical terms, we refer to this situation as contradictions that exist between multiple activity systems with a partially shared object.

The port management underrated and discounted the knowledge in practice of the workers and its role in determining the efficiency in functioning of the port. They missed plausible explanations for a hectic functioning of the facility, with days when it worked seamlessly and efficiently and others when it experienced marked productivity falls.

The workers do not perform repetitive routines, but have developed local practices that are highly contextualized, require sophisticated skills and diversified knowledge, concerning both technical details of the functioning of the port and the flows of communication that permit its functioning. It is the skilled accomplishment of creative practical solutions that permits the seamless working of the port and the respect of productivity targets.

Workers made periodical attempts to leverage their knowledge in practice as a source of contractual power by conforming their following standard procedures literally.

Prescribed safety routines are played up as the principal source of operative obstruction when followed narrowly.

The workers then go on what they called a white strike, restraining from engaging in the application of creative solutions and practical shortcuts for performing their work tasks. In this way, they wish to make evident that the strict compliance with safety procedures leads on alarming productivity losses.

Infringing safety also represented contestation of the given activity of working in the tightly constrained, stressful environment of the transshipment port, were constant data feed provided the management with almost ubiquitous control. Acting beyond the limits set by contradictory safety rules was an affirmation of the workers' agency and of their mastery of the work situation.

In everyday work activities, organisational safety arises not only from designed processes or procedures, but from the ways in which individual relate to and evaluate contingent situations.

The contradictions in the system of activity, which are a normal feature of work situations, often undermined the reliability of safety procedures as prescribed routines for carrying out work tasks. This is especially true in a work situation presenting a high degree of variability.

The disconnect between safety procedures and technical standards of functioning is the most important factor determining the erratic compliance with prescribed procedures.

Micro-social processes of interaction that reflect largely cultural norms also interfere with the workers' choices of conduct.

While safety regulations and training were aimed at preventing all possible situations of interdependence that could lead up to safety risks, participants were more concerned about temporary halts and slow-downs of the activity that could reverberate from one part of the system of activity to another.

They had devised creative, situated ways to deal with this type of contradictions: for example they chose which part of safety routines to follow and which ones to ignore depending on the situation.

Team supervisors and pier superintendents, sharing the same concerns and the same view of the activity, often implicitly endorsed these practices, even when they were considered responsible for the monitoring of the application of safety procedures.

It was precisely the workers' engagement with the competitiveness issue that had conduced them to developed practices divergent from existing safety procedures over time. Selective application of safety norms and practical strategies to balance different organisational priorities were collectively shared and culturally regulated.

It was part of the workers' identity. As more than one participant elaborated, they had the conviction that they could "get things done and deal with things" when they referred to their own, practically accomplished set of routines, and that they could "block up the port" by following the espoused rules.

If we acknowledge that safety routines in practice represent an enactment of collective, local knowledge (Gherardi and Nicolini, 2000, 2002), and part of work practices and identities that are learned working with others, the design of training, inspections and safety manuals could be conceived in a way to ensure maximum collaboration between safety managers and workers.

If the workers' safety can be considered a practical accomplishment of individuals and work teams, which requires knowledge in practice, we must also consider that the coexistence of divergent practices can pose a serious threat to organisational safety since it endangers the coherent application of principles of coordination among multiple interdependent activities in a highly complex setting.

Safety learning need not be a one-way process, the transfer of codified knowledge and enforcement of bureaucratic procedures in a classroom setting.

When workers engage in everyday practice, more than merely executing a process or a task, they are continuously changing their understandings and capacities. Participation in work and learning are inseparable (Lave, 1993; Billett, 2004). If safety training takes place in a separate context, such as a classroom setting, different goals, norms and practices will frame the activities the workers participate in, who is selected to participate in these activities, the composition of groups and how their participation will be appraised. But then when engaging in workplace activities, they will be engaged in different kinds of social practice, with different goals, constraints, affordances and appraisals. These particular requirements for work practice cannot be appraised other than in the situation where tasks are undertaken, and the conditions for and judgments about those performances are exercised (Billett, 2004).

First-line managers and safety supervisors (inspectors) should be included in the process. Safety learning could then entail the participation of learner workers and safety instructors in situated work activities. This can be a moment for translation of safety regulations in practice, when specific attention is paid to elements such as the interplay between formalized rules and other explicit and implicit constraints that compel work activity. The compatibility between safety procedures and the existing division of labor could also be tested. The workplace can become a learning environment, in which the affordances and constraints of the activity, on the one hand, and the agency and identity of the workers, on the other, can be understood as a complex negotiation of formal and codified knowledge, knowledge situated in practice, roles and processes.

Safety learning can be understood as a form of development, the creation of new patterns of activity. The formation of new patterns of activity requires the formation of a new object at the intersection of three partially overlapping activity systems: that of the dockworkers, of the port management, and of Health and Safety officers. Such development occurs over time in practice and through the opening up and blending of existing categories in discursive actions.

7. Limitations
This contribution falls short of an extremely important aspect of the activity theoretical approach: its developmental orientation. The initial research and intervention project was meant to lead to a longitudinal process of expansive learning and development in the activity system. The authors had planned to pursue the cycle of expansive learning with more Change Laboratory sessions involving representatives of the dockworkers, the port management and the safety certification agency. This had to be postponed to an undefined time due to the significant changes occurred in the international maritime cargo industry and the decision of the multinational company who owns the transshipment port to cut down its cargo traffic and privilege other ports in the Mediterranean area. A part of the workforce has been put on redundancy pay and this has considerably altered the organisational climate.

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