



Opportunities for learning from crises in projects

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Abstract

Purpose – The purpose of this paper is to investigate how individuals in projects learn from crises.

Design/methodology/approach – The multiple-case protocol described by Yin and his six sources of evidence were utilized. Observations were contemporaneous and somewhere between direct and participative. Bias was avoided by having the observer on site, but not part of the project team. A diary recorded events; company notes and records substantiated observations.

Findings – The study contributes to the understanding of the need that project managers have to adapt to changes from plan and the coincidental learning that occurs in the workplace. Both cumulative and abrupt crises treated by project/site teams and corporate staff are described. A necessary and sufficiency approach was used to rationalize the organizational learning. The necessary condition was that the episodes could be described in terms used by Gherardi in her treatment of routine learning. As a sufficiency condition, the authors discussed the systemic approach in which these episodes are handled.

Research limitations/implications – Because research was built on case studies, one has the reservations commonly associated with this approach. Extension from and agreement with previous studies, however, lend to acceptance of the study.

Practical implications – Results suggest that crises can be managed in accordance with four general responses associated with learning within the organization. The responses themselves are associated with five organizational practices that aid management in general.

Originality/value – The value of the work is that it extends basic concepts of organizational learning to treating crises in projects, which are both by definition unique.

Keywords Project management, Learning organizations

Paper type Research paper

Introduction

“A crisis is a terrible thing to waste”, a quote attributed to Vinod Khosia to Larry Page, founders of Google (Vaitheeswaran, 2007). In this case, the quote was associated with carmakers’ addiction to oil and the consequential warming of the planet. We, however, tend to agree with the general premise. Implicit in this approach to crises is that each of them carries with them an opportunity, specifically the opportunity to learn from them.

In a study of deviations from plans in projects (Hällgren, 2004, 2007, 2009), we have noted that some of these deviations rise to the level of crises (Hällgren and Wilson, 2007, 2008a, b). In this case, the special case of projects, crises are defined as those deviations that interrupt progress along the critical path of the project so as to interfere with contractual obligations in timing and/or costs. Deviations along sub-critical paths that make those paths critical of course also become crises. Clearly, this topic is important for two reasons. First, there appears to be a growing importance of projects in industrial activity (Lundin, 2000; Lundin and Midler, 1998; Ruigrok *et al.*, 1999; Whittington *et al.*, 1999; Whitley, 2006) which means as a practical matter, contributions to their management are important. Second, crises as concepts and phenomena are *per se* under-studied areas within project research. In contemporary writings, the management of crises is either understood



as a matter of applying “tools and techniques” (Reid, 2000) or as a behavioural process (Loosemore, 1998). This understanding contributes to the development of techniques for handling crises and for understanding patterns and the general phenomenon of crises. The present theorizing, however, lacks understanding of often fine-grained, mundane details of crises management practice and therefore how project teams learn from crises. Typically, “practice” is assumed to be synonymous with “routine”. Projects and crisis by definition, however, have an element of uniqueness and thus pose a challenge to the organization that has to manage them. Learning under this unique versus routine situation poses a challenge of continued interest. This paper thus investigates the research question of how individuals in projects learn from crises.

The purpose of this paper, therefore, is to extend concepts of learning to the non-routine case where individuals must deal with crises in projects. The point of departure from previous work is associated with unforeseen operational triggers in a general sense. In this regard, accidents involving people represent a special case. There, learning may be directed toward avoidance. If general triggers are considered, management must be oriented toward efficiently and effectively dealing with the unforeseen. In fact, Weick and Sutcliffe (2001, p. 1) suggest that “one of the greatest challenges any business organization faces is dealing with the unexpected”. Consequently, we hope to extend the consequential elements that are seen to shape how people acquire knowledgeability and sustain the competent reproduction of practices.

The paper first develops the background of project management in construction firms and then how crises are handled in that particular environment from a conceptual point of view. This section is followed by the methodology going into the details of the case study, based on interviews and observation data, detailed in the data section. An analysis is then made based on four specific episodes, which can be related to conceptual elements of learning from practice. The discussion section connects the conceptual base with observations and our interpretation of them. A short conclusions section summarizes our contributions to theory in terms of four general responses and practice in the form of five organizational developments.

Background

Project management and organization of construction firms

An essential feature of project management is the idea that it is possible to accomplish developments within time and cost constraints with a reasonable assurance. In other words, project management tends to approach operations by planning (Christensen and Kreiner, 1991, p. 39), which has influenced much of the current literature and practice on projects (Söderlund, 2004). Of course, it has been recognised that there are a variety of project types (Nicholas, 2001, p. 6; Turner, 1999, pp. 25-7; Ekstedt *et al.*, 1999). That is, there is a natural uncertainty in projects depending upon how well work methods and goals can be identified. Nevertheless, classical project management approaches suggest that it should be possible to bring a project to completion within time and cost constraints. Consequently, virtually every project has a plan that specifies the completion time and cost. Construction projects tend to be among the “most certain” and so these specifications are accepted by both customer and provider in contracts – frequently fixed by competitive bids.

The construction industry has been described as loosely coupled (Dubois and Gadde, 2002), and construction firms themselves tend to be organized around their projects.

That is, their reason for being is the project work that they do. As a consequence, their structures can be described by some form of Mintzberg's (1983) maps, or diagrams. Put another way, the operating core of the organization reflects the project organization. Number of projects determines the form. Ones with few or single projects take on an *ad hoc* structure, larger ones a form of a professional service firm. Despite being loosely coupled in structure, projects tend to be tightly coupled to plans, which can cause considerable problems in learning (Dubois and Gadde, 2002; Scarbrough *et al.*, 2004) and even crises in operations (Hällgren and Wilson, 2008b).

Learning in project-intensive organizations

Project-intensive organizations are comprised of a "permanent" organization that utilizes "temporary" groups to implement its project work (Anell and Wilson, 2002; Ekstedt *et al.*, 1999; Lundin and Söderholm, 1995). In this regard, the ability of the permanent organization to learn from projects has been questioned (Ekstedt *et al.*, 1999, pp. 124-54). Essentially, it is suggested that the knowledge processes that take place in projects are difficult to feed back to the permanent organizations. The argument is that projects are temporary endeavours in specific contexts where routines necessary for learning cannot be developed as in a permanent setting. To the contrary, March *et al.* (1991) have suggested that not only do organizations learn from projects, their competitors may as well. More recently, Sense (2004) has surveyed the literature on organizational learning and suggested that it is possible to group different authors' observations under specific perspectives on organisational learning. These perspectives included cognitive, which is an informational processing view; behavioural, which has an outcome focus and sociological, where meaning is a result of social relations and practice. Project learning was viewed as a product of the community rather than of the individuals within it. Five interdependent elements (learning relationships, cognitive style, knowledge management, learning support and a pyramid of authority) were identified that constituted a learning architecture for intra-project learning. Gherardi (2006) in an extensive study of safety development in construction projects suggested that not only did individuals learn as a socialization process in the organizations, but also organizations learned as a consequence of accidents. Somewhat similarly, Hällgren and Wilson (2007) in their study of deviations posited that two levels of learning occurred. Initially, participants recognized consequences of the interruption in a Simon sense (Simon, 1996, p. 100). Simon argued that there are regularities which make planning possible. Then again, with planning follow that interruptions against the regularities a re-occurring reality. The organization itself developed an approach that permitted to handle these problems, which could be considered a form of secondary learning.

Methodological contributions to studies on organizational knowledge and workplace learning with an emphasis on projects

The practice turn in social sciences (Schatzki *et al.*, 2001) understands organizations through studying what is done and said in often mundane settings. The idea that the approach brings forward is that micro-activities influence the outcome and therefore are worth studying in their own right. The approach aims to understand phenomena as diverse as strategy (Jarzabkowski, 2005; Whittington, 2006), technology (Orlikowski, 2000, 2002), learning (Brown and Duguid, 1991; Wenger, 1998), ethics (Clegg *et al.*, 2007), management accounting (Ahrens and Chapman, 2007; Lukka, 2007), problem solving

(Orr, 1996) and institutional change (Seo and Creed, 2002; Hallett and Ventresca, 2006). Recently, practice studies have emerged within the field of project management where three concepts are recognized as fundamental to the practice approach – practitioners (e.g. the project manager), Praxis (the situated actions that the project manager does) and the practices (the norms, values, rules, traditions that the project manager utilizes when doing projects; Blomquist *et al.*, 2010). This recognition implies that learning takes place in the interplay among the practitioner, praxis, practices and the social-situated settings, i.e. projects-as-practice studies. In this area, Scarbrough *et al.* (2004) reflected on the processes of project-based learning, Hällgren and Wilson (2007) focused on learning from deviations and Söderholm (2008) on unexpected events.

In a general sense, knowledge within a project resides in the people conducting the project and in the development of the plan. Deviations from the plan occur and these deviations are commonly faced by the people within the project. Examining the micro-activities executed when managing deviations in a dual-structure global engineering organization, Hällgren and Wilson (2007) found that some deviations were managed on a local site level, others were pushed up to the corporate project team and still others involved the line management. In addition, they found that a number of the solutions were attributed to “outside of the box” approaches, thus requiring improvisational skills among participants. These findings concur with Lindkvist (2005) who argues that projects cause non-conventional solutions to sometimes conventional deviations, contacts outside of the project team and a focus on personal experience and network. The common denominator among the studies has been an “emphasis on the detailed processes and practices, which constitute the day-to-day activities of organizational life *and* which relate to (project organizing) outcomes” (Johnson *et al.*, 2003, p. 3).

Gherardi (2006) undoubtedly comes closest to anticipating this study and in establishing results that usefully serve in reflections upon it. In essence, that research represented a comprehensive investigation of the development of workplace safety among firms in the construction industry. Numerous cases and examinations of activities were used to develop concepts of learning at the individual, group, organizational and institutional levels. It is impossible to cover the total contribution that work has made to the topics of organizational knowledge and workplace learning in the space allotted here. Nevertheless, there are four elements of that study that are useful in appreciating the results cited here. First, observations frequently were determined and enriched by reflecting upon episodes (Gherardi, 2006, p. 180). That is, it was not generalities, but specific activities that anchored the work. Frequently, specific critical events could be identified that were instrumental, even essential, in establishing understanding. Second, it was the interpretation of developments subsequent to these critical events that were used to characterize the learning that occurred in the organization. Put another way, organizational reactions captured the manner and degree of learning – be it “darning, patching or quilting”. “Darning” refers to the practice of the invisible repairing of the social order, “patching” to a visible form of repair work of the social order and finally, “quilting” to making do with what is hand based on previous experiences and the situation at hand (Gherardi, 2006, pp. 181-3). Third, the concept of texture was developed (Gherardi, 2006, p. 64). In a way, texture represents the culture in which practice in a firm occurs[1]. To a certain extent, there is circularity in the development of texture. That is, texture is determined by reactions to critical events, but at the same time, determines the reactions that might occur within an episode. Finally, extensive background is established that can

be cited in describing the development of learning in an organization. This contribution goes beyond background. For instance, in this study, the material on the education of the individual (Gherardi, 2006, pp. 66-100) ranging from culture of practice to situated learning proved useful in characterizing the organization under study.

It follows that this framework might be used to describe and discuss some of the field observations in handling construction project crises.

Deviations and crises in projects

There is a natural uncertainty in projects depending upon how well work methods and goals can be identified (Turner, 1999, pp. 25-7). Put another way, a research project may carry uncertainty because it is not evident how long a specific step may take. In addition to uncertainty, however, projects also have unforeseen interruptions that disrupt progress. A construction project, which should proceed with relative certainty, can be disrupted by unforeseen circumstances such as a delay in material delivery. These are the snags, difficulties and tensions referred by Hirschman and Lindblom (1962) and are called deviations in this paper – primarily deviations from project plans but also from expectations surrounding the project and its activities. Studies on projects that are followed closely show that deviations from a general, planned endeavour do indeed happen (Hällgren, 2007).

Not all deviations, however, are crises. Deviations along the non-critical path for instance can be handled by using some of the slack available that makes the task non-critical. It is only when the deviation occurs along the critical path, or when it extends the timing of a non-critical task to make it critical, does a crisis occur. Our research suggests that a relatively high incidence of these crises is possible in the construction industry. Although firms in the industry have been described as loosely coupled systems (Dubois and Gadde, 2002), which would suggest resistance to the cascades of failures associated with tightly coupled systems, crises still occur as a consequence of the tight coupling of activities in planning.

Because they occur across industries, much of the information on crises and their responses tend to be general (Mallak and Kurstedt, 1997; Hwang and Lichtenthal, 2000; Lagadec, 1997; Perrow, 1999). Regardless of the approach, however, there are certain things that appear common to industrial crises conceptualisation. They include an assumption of primarily singular events that have the propensity to impart significant injury to the company. Fundamentally, the observation is made that complex organizations somewhere along the line will experience unimaginable events that destabilise the organization (Lagadec, 1997). For instance, Hensgen *et al.* (2006) use the operational definition of a crisis “those internal and/or external events that cause stress on organisational resources and pose the greatest threats on any organization’s security and vitality”.

It should be noted from this definition that crises are associated with consequences. Nothing is said about magnitude as a criterion. That is, it does not take a tsunami, an earthquake, a fire, or a death on site to precipitate a crisis. In other words, crises may be associated with disasters, but not necessarily so. They are any event or incident that poses a threat to an organisation’s security or has an adverse effect on financial conditions, relationships or reputation in the marketplace. Further, Hwang and Lichtenthal (2000) have indicated crises do not necessarily have to be associated with a specific event. They identify two types of crises – abrupt crises that strike suddenly

and catch management off-guard versus cumulative crises (their words) that accumulate stressors and eventually erupt. Likewise, Roux-Dufort (2007) allows for a type of crisis that is a process of accumulation of deficiencies and weaknesses rather than as a sudden and extraordinary interruption.

The management of crises is, however, somewhat similar to the practice approach, about the effective control of social and behavioural instability. Crises stimulate temporary communications divided into phases that influence the efficiency of the management process. Crises also contribute to conflicts among the participants who are less prone to take a collective responsibility of the events and communicate efficiently (Loosemore, 1999).

Methodology

The purpose of this paper is to contribute to the understanding of the need that project managers have to adapt to changes from plan and the incidental learning that may occur in the workplace as a consequence of this adaptation. Basically, the multiple-case protocol described by Yin (1989, pp. 52-60) and his suggested six sources of evidence (pp. 85-103) were utilized in the study. In many ways, the methodology parallels the approach used by Gherardi (2006, pp. 52-6). Although a spiral approach was not used, comparable detail in cases was developed as a consequence of on-site observations. In this study, cases were followed in the experiences of distributed power plant projects developed by an integrated provider of projects of this type. These observations were in line with the classic ethnographic studies of Mintzberg (1973) and Carlson (1951) and the stream of ethnographic studies associated with contemporary practice research (Jarzabkowski, 2005; Johnson *et al.*, 2003; Schatzki *et al.*, 2001) and communities of practice (Lave and Wenger, 1991; Brown and Duguid, 1991; Gherardi and Nicolini, 2000), which have gained appreciation for producing knowledge based on actual practice in everyday operations.

The larger portion of the study was on the practice of managing deviations, i.e. when something unexpected occurred and how such situations were remedied (Hällgren, 2009). That is, unforeseen interruptions affected progress[2]. Crises were of particular interest. The “call” on whether a deviation was a crisis or not thus depended upon its location in the project plan, i.e. was it on the critical path or not? That call invariably was made by the project manager who worked at the corporate office, and it represented the first level of coding required to permit systematic analysis of qualitative data (Miles, 1979).

Although one may expect that deviations and crises will occur within a project, one does not know at which point they might happen. In fact, it was found that they occur at any point within a project. Consequently, identification and follow-up virtually mandated an on-site presence. One suggestion by Van Maanen (1988) of keeping a field diary was helpful in the association of events prior to and after these incidents occurred, as well as what was considered deviations by the project team. The observations themselves were somewhere between the direct and participative observations described by Yin (1989, pp. 91-4). In other words, the observations were made contemporaneously, but the observer was not really part of the project team thus avoiding the bias that might be associated with such involvement (Yin, 1989, p. 94). In the majority of instances (13/15)[3], crises in projects were observed during a total of ten weeks of on-site visits for each project. A range of ancillary methods supported observations. Informal conversations with project principals were noted and recorded in a diary of observations. In this way, the diary provided notes on team conversations as well as

those conducted with onlookers. There was full access to the database of plans, e-mails and reports. Previous agreement gave access to phone calls and other records for the specific periods in which the deviations occurred. Subsequently, 60, formal, semi-structured interviews among participants ranging between 30 minutes to 2 hours were conducted and tape-recorded (Hällgren, 2004, 2008). From this information, the crises could be coded abrupt or cumulative (Hwang and Lichtenthal, 2000) and then who was instrumental in handling them – project overseers plus site team, or corporate staff. Team characteristics were determined by whether the team was formally recognized as a group and set up to handle a situation as an extraordinary task over a period of time, which defined the formal groups. Informal groups, on the other hand, handled the crises within the work-a-day responsibilities and were not recognised as formal groups, but collections of individuals contributing their resources to end solutions. The results of this coding approach are reflected in Figure 1.

Data collected by this process were used to build cases as in a manner described by Yin (1989), Eisenhardt (1989) and Eisenhardt and Graebner (2007) who in combination suggested first that cases include several types of data in order to triangulate evidence. Data hence included interviews, reports, minutes-of-meetings, observations and e-mail correspondence to characterize the cases. In addition to the 26 formal interviews conducted on these cases, there were 26 informal conversations monitored among participants, ten meetings attended, 138 e-mails monitored and two formal reports made available. Second, it is recognised that good practice provides breaks for analysis in order to get some distancing from observations so that modifications might be made in the methodology. Two weeks long breaks between the cases were therefore used for post-analysis. This time was utilized to summarize the individual cases as suggested by Yin (1989). Third, it has been recommended that cases should be spread in order to extend the findings. In this regard, projects were available with different geographic locations and type, which produced deviations along the projects' time lines. Finally, cross-case observations have been discussed in internal seminars with the project group at the authors' university and at external conferences of peers, which provided a sense of credibility for observations and inferences made from them (Lincoln and Guba, 1985, pp. 281-308).

Observations

The organization

In order to understand the specific episodes that are captured in the cases, it is necessary to understand the nature of the business being conducted. The organization that

		Crises	
		Cumulative	Abrupt
Organizational treatment	Project overseers plus site team	Q2	Q4
	Corporation staff	Q1	Q3

Figure 1.
Hwang and Lichtenthal (2000) crises anatomy adapted to a project management situation

cooperated in this study was an international project organization, which specialized in power plant and power conversion construction. The company operated with a quasi-independent sales force, which responded to opportunities and was responsible for bid preparation, together with an appointed project team when appropriate. Projects officially started when a bid was accepted and a first down payment was made. Typically, these projects would either be turnkey projects, i.e. the full responsibility for the construction of a plant, or engineering and equipment projects, i.e. the design, procurement and transportation of materials for plant construction. Ostensibly, the size of the project (13-80 MW) and duration (eight to 16 months) reflected the complexity and cost of these projects. The nature of work at the time of this research produced the opportunity to visit projects at various stages of completion ranging from start-up to transfer. At the time of this study, all the projects were of concurrent engineering nature. The firm employed the approach because it proved to be a competitive advantage. That is, it allowed customers to respond to sudden market windows (Wikström, 2000, p. 140).

Under common circumstances, the organization would have two teams working on each project. One team would be a project team that would be located at the corporate office. This team had the overall responsibility for the project, i.e. it would plan, organize, monitor and control the project. During this study, two corporate project teams were operating and they had responsibility for multiple projects. The site team had responsibility for operations at the physical project location, which could be anywhere in the world. Site teams were devoted to the project upon which they were working and in general did not share responsibilities with other projects. Every team in the organization had its own project manager or shared one if they were for the same customer in proximate locations. Senior engineers staffed the teams – project teams used electrical and mechanical engineers and in case of turnkey project a civil engineer; site teams were staffed with an electrical, mechanical and civil engineer as well as a contract engineer and other experts where they were needed. In terms of usual terminology, the site team would be a temporary team (Lundin and Söderholm, 1995; Turner and Müller, 2003) devoted to the project for the customer. The project team, on the other hand, would be part of the permanent organization, albeit temporarily assigned to specific projects, thus representing a temporary organization within the permanent setting.

Cases

The observations presented here are built around Figure 1, which associates the types of crises observed with the general manner in which they were handled, and Gherardi's (2006) approach in depicting episodes as occurring in three acts – normalcy, breakdown and mending, which are similar to the distinct phases identified by Loosemore (1999, pp. 13-14). See Table I for further specification of the figures content.

Q1 – cumulative crisis handled by corporation staff: client unwilling to accept hand over.

Normalcy. Normally, when a project is coming to its end a “hand over” phase occurs. This term means that all major activities by the company are finished, and the client is prepared to put the power plant into operation. Typically, handing over does not mean that all activities by the company are finished. Minor tasks are put on a “punch list” that involves tasks such as painting and final touches on buildings. In some situations, major tasks are also put on the punch list, but only if they can be covered without interference with the handing over process.

Episode	Explanation	Utilised resources	Security and viability threat
Q1 Client unwilling to accept transfer	Several days of discussions with the client and local sales office to reach an agreement on the transfer	In-house services (sales and legal) and project team	Penalty for late transfer and less corporate revenue from plant operations
Q2 Client delay in essential component implementation (delay in major installation component 1)	A several month cumulative crisis ended in demobilization of the entire project site. Owing to political considerations no costs were claimed even though this was discussed in initial meetings	Site team and project team	Project schedule delay. Cost associated with re-mobilisation and guarding the plant
Q3 Engine variance (essential component non-compliance)	Explanation required. Plants usually run at base or peak load. Because of delay in modification, variance appeared. To be adjusted later	Project team and sub-contractor design team	Delay of entire design, overall delay and customer frustration
Q4 Transport damages	Several days taken with stakeholders to determine responsibility. It took two days to ascertain damage and order new components. Certain components could be repaired, but others had to be re-ordered	Project and site team, in-house services (logistics) and sub-contractors (manufacturer, logistics)	Project schedule delay and period payment associated with delivery

Table I.
Summary of case studies

Breakdown. In this case, which is not uncommon, a diesel power plant company was responsible for subsequent operations after project services were completed. The client, however, was unwilling to accept hand over because they were not finished with the tasks for which they were responsible. Accepting the hand over would have two major consequences; first, they would lose face and second, they would have to carry the cost of the operations. In this part of the world, losing face is a big thing so on a cultural level that would be a stigma for them. On a more general level, the cost of the operations was severe. Because of these two reasons, the client was unwilling to accept transfer at the time it normally would have been handed over. The reason for not accepting transfer was officially that the engine did not perform the way it should.

Mending – mobilization. Responding to the client’s unwillingness to proceed further, the project manager (together with his team and supported by in-house technical services) prepared a document that detailed the engines performance and support. Then the project manager and the local sales office approached the client and explained why the performance was not an issue. In addition, the project team had an ace up their sleeve as they were able to claim a “force majeure”, which had occurred earlier in the project. They discussed the issue with the client as this would save face and allow for some other

tasks to be finished within the time frame. In the end, both parties agreed on the handing over with the final ceremonies and final payment was made.

Q2 – cumulative crisis handled by project overseers plus site team: client delay in essential component implementation.

Normalcy. Normally, a power plant is constructed for:

- the client to sell power to the existing power system; and/or
- to provide their own installations with a stable flow of power in an otherwise fluctuating environment.

In this case, the client had ordered a power plant to provide their paper mill with power and steam, while the remaining power would be sold on the power marketplace.

Breakdown. Hooking up the power plant to an existing structure involves considering the interfaces between often complex structures. In this instance, interfacing involved the construction of a pipe and cable rack from the power plant to the paper mill. This construction was critical because without it, performance testing and hand over could not be accomplished. Any delay would not only interrupt the critical path, but also delay the project immensely with associated costs. The client was responsible for this specific task.

This crisis was a truly cumulative one. It started well before Christmas with the project manager recognizing that the client had not yet started their task that had a mid-June completion date. Consequently, the project manager contacted the client repeatedly. Each time, the project manager received word that the client was on top of their task and that they would be finished in time. Naturally, the project manager had his doubts but there was not much more to do but wait. Well into the project and one day after the official deadline for completion of the pipe and rack, the project manager sent a final e-mail letting the client know that this delay threatened the entire project. The response was still that this would be done in time to not delay project completion.

Mending – prioritization. Since the official deadline was passed the project manager had a legitimate position to making arrangements for subsequent activities. First, he contacted the line management about what had happened. Second, he discussed the situation at hand with the site team. This discussion was focused on the impact of the event and which path they would choose for the future developments. The site and project team were in agreement that the client would not be able to make it in time and this situation would have a major impact on the project.

To sort things out, the project manager booked a trip to the foreign location with his project team. The specific purpose of the trip was to discuss the situation with the client and advance the demands and the solutions that they thought fitted. During the subsequent meeting the client was not thrilled because what was proposed involved severe costs for them. That is, the client would be held responsible for any costs involved with the massive demobilization of the site, personnel costs and costs involved with not being able to make performance tests as planned. In the end, the client did not have to assume the costs (although they were quite huge compared to the rest of the costs of the project). In discussions with the line management and the sales support service, it was decided that they would accept the cost in exchange for the hope of future projects.

Q3 – abrupt crisis handled by corporation staff: engine variance.

Normalcy. Construction of a diesel power plant is under normal conditions a complex undertaking. One added complexity is that the client in some cases wants to do some

tasks themselves in order to save money and have control of certain tasks. Within the framework of this specific project, the client was responsible of building load-absorbing furnaces. The function of these furnaces would allow the power plant to run at full capacity and was thus essential for both the performance tests and the subsequent hand over process.

Breakdown. Once the implementation of the power plant had reached the point where the performance test could be initiated, it was discovered that the engines had an unexplained variance that caused a crises for both the site team and the client. The situation jeopardized the entire operations. If the operations would have to be shut down, severe penalties would result for the company; each delay day carried huge costs according to the contract on top of the costs of keeping personnel on site longer than necessary.

Mending – normalization. In this instance, an explanation was developed by the project team that involved other project engineers and the technical support function of the company. Plants usually operate under full power. Because that state had not been accomplished, the variance appeared. Said the project manager:

The project has its tricky parts, which need to be thought over. We have to fix this particular problem with a document containing the explanation and then send it to the customer.

Nevertheless, it took approximately 15 days from the time that the deviation was observed until the customer was convinced. Adjustments would be made later, as would the punch-list when the customer developed their end of the installation.

Q4 – abrupt crisis handled by project overseers plus site team: transport damages.

Normalcy. Building a power plant in remote areas also has its tricky parts. Among other things, logistics can be problematic. Equipment must be taken first by sea from one point to the other, which takes several months. On top of that, the heavy equipment usually needs to be transported several hundred kilometres to reach its final destination. Delays in this kind of process may carry permanent consequences to the project and organization.

Breakdown. The transport damages emerged late in the project after a majority of the on-site activities were done that depended on equipment delivery. When the site team opened up one of the crates, they discovered that some vital equipment (control panels and switch gear cubicles) was severely damaged and apparently beyond repair. Even before the damages were discovered, delivery had already been delayed, which caused an initial stress to the organizations resources and timetable.

The site team immediately responded to the situation by sending an e-mail to the project manager. He, however, could not do much more than wait for additional information and forward that information to his project team. During the first and second day, while the information was gathered, the project manager was observed talking on his phone most of the day. Penalties existed for delays in turnover, and transportation itself added several months to any replacement process. The phone calls went to the parties involved. During one call the project manager rather angrily said that he:

[...] must be able to order disregarding the responsibility of the situation.

Mending – responsibility. Consequently, the temporary, expeditious solution was to place orders without having a perfect estimation of the damages on the basis of the project manager's intuitive assessment of the situation. In the end, about two months later, the logistics company agreed to pay about a third of the money that the project manager thought suitable despite the fact that they were not contractually obligated to do so.

The texture of the organization

To conclude the observations, it is necessary to understand the internal environment in which they occurred in order to understand developments. A useful formalism exists to rationalize situations observed in the field. In her treatment of the development of practitioners, Gherardi (2006, pp. 66-100) identified six inputs into the construction of personal knowledge in situated working practices. These included absorbing the culture of practice, knowledge pointers, knowing as aesthetic understanding, conversation in and on practice, knowledge mediation and situated learning (Table II). The situation

Item	Definition and example	Comment	Outcome
Culture of practice	Stories that illustrate a point. Team that was attacked by guerrillas	One of the two illustrations that “everyone” knew about. Theory remains abstract. Practice is practice	Crises will occur. The company employs heroes
Knowledge pointers	Seeing and listening are important in knowing. Sub-contractor that was consistently late	Initial call is essential in resolving crisis, especially in cumulative crises	Contractors will provide problems, better be prepared
Aesthetic understanding	Use of senses to understand a situation, i.e. to have an ear or nose for the situation. Form of organisational knowledge that is personal, e.g. underpricing of contract	Something just did not “smell right”, which lead to initial inquiry	Always be cautious
Conversations in and on practice	Decisive factor in the circulation of knowledge, e.g. debriefing on situations, which results in monthly reports	Essentially, group extends information to “good”, if not “best” practice. Group learns from individual occurrences	Provide an arena for discussions and mutual development
Knowledge mediation	Mentorship, exceptional situation suggestions, word of mouth and norms important in transferring knowledge, e.g. the project manager having a junior counterpart doing project management-related activities such as planning and follow up	Especially, crises need attention. One of the functions of the group is to get diverse input	By being close to the scene professionals are raised
Situated learning	Learning tricks of the trade, i.e. the shortcuts that make an experienced individual more efficient, e.g. the resolution of tax issues which the project manager never been involved in before	Linking problem situations to solutions	Constant adaptation to the situation

Source: After Gherardi (2006, pp. 66-100)

Table II.
On the development
of texture

studied by her, i.e. the education of a novice in the subject of safety, was different than the study here of handling of deviations in construction projects. That is, safety in operations is almost a process variable; these episodes here tended to be unique, albeit possibly reoccurring at some future date. Nevertheless, the learning required to expediently handle situations threatening to disrupt a project apparently has much in common with the learning required of Gherardi's novice. In a general concurrence with Gherardi what is done (praxis) and what is drawn upon (practices) mutually develop and influence each other (Whittington, 2006). Thus, it is suggested that what is done is a reflection of what was previously learned, and *vice versa*; what is done also influences future behaviour. In terms of general observations, learning and action thus cannot be separated.

In essence, the six items in Table II help understand the texture existing within which learning occurs. For instance, the culture of practice is conveyed in part by stories that have a point. When it was learned that we were interested in crises, we were told stories that "everyone" knew about. One had to do with a site team that was attacked by guerrillas. This conveyance was meant to imply that although we might be interested in theories and abstractions, individuals in the company knew about reality. More importantly, for employees these stories carried a message of the dire consequences that may result in crises, but that the company will be there to protect and support you.

An insidious form of crises faced by organizations is the cumulative or creeping crisis (Hwang and Lichtenthal, 2000; Roux-Dufort, 2007). These situations are not associated with spontaneous or even specific events, but instead develop over time. Two elements of texture thus become important in dealing with these situations – aesthetic understanding and knowledge pointers. Aesthetic understanding deals with the use of one's senses to understand a situation, i.e. to have an ear or nose for a situation. In some situations, e.g. a client unwilling to accept transfer or ongoing delays by a client, something just does not seem to "smell right". Likewise, there are knowledge pointers that suggest seeing and listening is important in knowing. With regard to crises, there is general agreement among both practitioners and academics that timing of the first call is important in rectifying situations. Delay can result if egos get in the way. Emphasis was placed upon this importance within the organization under study.

One specific way in which the organization prepared for crises was through its conversations in and on practice. Specifically, use of *ad hoc* groups (Engwall and Svensson, 2001, 2004; Pavlak, 2004) to handle the specific episode was the general practice. Utilization of these groups tended to spread recognition of the situation throughout the organization. Further, there was a monthly debriefing on each project that tended to spread knowledge horizontally through the organization. The use of groups had additional effects on the environment. For one thing, by using individuals with past experience in handling similar episodes, a form of knowledge mediation developed. That is, a form of mentorship and certainly exceptional situational suggestions were obtained. Finally, the whole idea of having senior people responsible for projects at the corporate level was an example of situated learning. These were the individuals who had learned the shortcuts that tended to made them both efficient and effective.

Discussion

The purpose of this paper was to extend concepts of learning to the special case of where individuals must deal with crises in projects, and four cases have been developed

for analyses. The cases, reflecting internal and external events, caused strains on the organizational resources, which posed threats to the company's security or vitality (Hensgen *et al.*, 2006). Further, because the observed cases affected the critical path, they potentially affected profits and profitability – considerations of no small impact in a journal concerned with project management in business. Nevertheless, because crises are unique, it is not an easy task to demonstrate that organizational learning has occurred. We approach this task by considering necessary and sufficiency conditions. The necessary condition is that the episodes can be described in terms used by Gherardi (2006) in her treatment of routine learning. In that study, learning could be associated with a metric – efficiency or reduction in accidents over time. Crises, however, are unique and thus learning from them is not easily measured in quantitative terms. As a sufficiency condition then, we discuss the systemic approach, the template as it were in which these episodes are handled.

The crises did not as in Gherardi's (2006) accidents have a high-emotional content associated with death or near death. Rather, they dealt more with company and project health. Nevertheless, the crises were associated with the same feature of unexpectedness in a general sense. As a first step then, there was the learning that had to occur as each of the crises was handled. Gherardi (2006, pp. 177-85) might call this darning, patching and quilting. The specific skills in darning is the art of invisible repair work of the social order; patching the visible repair work of the social order and quilting is using what is at hand to invent something new and/or to make imaginative reuse of what is old. In the engine variance case (Q3), for instance, an explanation was developed for the variance, which involved other project engineers and the technical support functions of the company. In a Simon (1996, p. 100) context, this situation would be associated with his acquiring information end of a cognitive spectrum. This step is common to any decision-making situation and although outcomes cannot be certain, they persist in a step toward normalized behaviour. These steps have been associated with a Lindblom's (1959) scientific muddling approach (Hällgren and Wilson, 2007) because the decisions themselves could change on the basis of feedback. In fact, an essential element of scientific muddling is that improvements are sought through iterations on the basis of learning that occurs as a consequence of the decision.

We suggest these episodes reflect cue-response situations where the cues are of a general nature. One of the contributions of this paper is thus the identification of four responses and thus learning opportunities associated with the cases: mobilization, prioritization, normalization and responsibility[4].

Q1 – mobilization

Mobilization refers to the practice of summoning the necessary forces within the organization in order to develop a joint appreciation of the crises. That is, in order to resolve the crises the situation needs to be understood in a common way with the part that finally is to convince. In this case, this would be the client. This practice is similar to "patching". Patching is the practice of visually repairing the social order (Gherardi, 2006, p. 181). In this case, suggesting to the client that the parties cannot be in disagreement and that they have to agree on a solution. The repair work as such was visible in terms of official e-mails, contract references and visits with minute of meetings.

The mobilization response addresses the issue of learning within the framework developed by Gherardi (2006). It comes most closely to what is called knowledge

mediation. Knowledge mediation includes mentorship, exceptional situation suggestions, word of mouth and norms important in transferring knowledge. Although mentorship was not apparent in this specific episode, suggestions on how to resolve the situation finally produced a remedy. This type of learning utilizes knowledge and powers of other within the organization, which would imply that a network and structure is essential in the available support system. The nature of the crises, however, suggests that it was how the situation “smelled” that determined how it was subsequently managed. This smell is visible in how the project manager continuously referred to the processes behind the scene and what he thought was going on. Thereby referring to previous experiences in doing business in the area (aesthetic understanding) but also paying attention to what is not said (knowledge pointers).

Q2 – prioritization

The features of the prioritization response refer to making one task more important than another. The practice associated with this mechanism is the reorganization of activities and the allocation of resources. Typically, this call is made by the project team with some input by the site team. The specific episode involved a make or break situation for the project as it became clear that it might delay the entire project and force demobilization. It, therefore, was seen essential to the project team to shift tasks that were immediately dependent on the procedures that could be done before the work had to end. This practice is the art of darning. Darning is represented by an invisible practice and is in the empirical case illustrated by the sensitivity to which the client was approached. As the situation escalated the project manager had to become more aggressive and in that involve the corporate staff in the negotiations. The darning thus developed into a patching practice with a more visible approach, reflected in official e-mails and meetings (Gherardi, 2006, pp. 181-3).

The prioritization response required the parties to have a face-to-face discussion on how things should or could be solved, which thus required mutual adaptation. The prioritization thus had to first be set internally and then communicated to the client and the sub-contractors who at end had to comply in order to allow the project process to continue.

Learning is addressed in prioritization in terms of situated learning among the parties involved in the process. The feature of situated learning is knowing the shortcuts involved in allowing the project to continue uninterrupted. The knowledge of the project manager and his team was obvious. The situated learning requires the project manager and his team to be aware of similar situations and the logic of the project setup, thus above all based on previous experiences and knowledge pointers. Situated learning may occur on the individual level but may be more importantly is to reflect over how the situated learning is distributed among several parties that as long as they work in similar projects at the same organization most likely will have to face similar situations, or at least be asked to help someone out in a similar situation.

Q3 – normalization

Recall crises in projects are associated with critical path interruptions. If the timing constraint can be re-negotiated, the critical portion the crises goes away. Likewise, if performance and cost goals are also negotiable, then these elements of crises are minimized. Consequently, negotiations on response goals carry practices associated with normalization; re-defining tasks and generally bringing things back to earth.

Although each practice was observed in this case the normalization practice was relied upon most heavily. Normalization is basically the act of making the crisis into something normal, controllable and in less need of attention and thus practically defining away the situation. It necessitates, however, re-negotiating the project goals. Goal negotiations permit the project manager to put crises in perspective. A goal definition response is thus a way for the project manager to rationalize a crisis rather than actively manage it. This mutual negotiation is thus an invisible repair work of “darning” nature. The purpose of the darning practice is to get the client to agree that the crises is none existent there is no case for further dispute.

The learning associated with this response is associated with teaching parties on what and how they should think about a situation. It is thus about presenting enough evidence to make others trust one’s judgement without contemplating alternatives. This episode was handled by the project team presenting enough trustworthy material to the client that he could no longer see the crisis as a crisis. It was thus very much a conversation about practice (Gherardi, 2006). Specifically, all the performance tests could not be done according to procedure at the time, but as long as the client complied this was not regarded as a problem.

Q4 – responsibility

Transfer of responsibility refers to the practice of shifting internal or external organizational accountability. In projects, these shifts occur when tasks and consequences are assigned to sub-contractors or clients. When the project organization carries overall responsibility, these responsibilities are shared. Sharing responsibility carries at least two implications; there needs to be a division of labor and a common agreement on each party’s responsibilities.

Commonly, the features of the responsibility mechanism are formally documented in the contractual agreement among organizations, i.e. instructions for contract disputes (as in Q4 the transport damages). In situations such as this episode, instructions were not followed which made the transfer of responsibility a semi-informal one. “Semi-informal” in the sense that there was a joint interest in dividing the responsibility and that meeting notes were taken and later on incorporated in a claim request. In this sense, the practice had a patching aura to it, however, examining site-level activities the practice had more of a quilting nature. The quilting refers to making do with what is at hand. In practice, this is seen in how the activities were rearranged to fit a future available product which would replace the damaged equipment and be readily installed.

Transfer of responsibility carries consequences for learning also. Once again, according to a Gherardi’s (2006) framework, it resembles situated learning and adaptation to situation. Although the costs were severe, it was better to be proactive in ordering equipment facing project delay with the subsequent contractually stipulated fines. Thus, a risk that was taken was balanced against possible additional costs. This decision could not have been made without considering the project in general and the crisis in particular in combination with past experiences of both.

To make such a decision, the project manager, however, had to have enough information about the situation to be reasonably certain that the cost would at least not entirely fall into his lap. From a more general perspective, the situation and the project set up (concurrent engineering) governed the way the crises were managed.

The second aspect of learning observed or sufficiency condition in these cases involved the patterns in which they tended to be handled. Each crisis presents a company with the opportunity to review organizational practices. Per Khosia and Page (Vaitheeswaran, 2007), these crises were not wasted. The review of the organizational texture suggests that the company had developed systemic practices that enabled it to handle these critical episodes. Ekstedt *et al.* (1999, pp. 140-2) would call this development system embedded knowledge and would be effective in what they call the generation phase of learning. That is, the system adapts so that crises of the type documented here can be handled in an expeditious manner. From our projects-as-practice study, five practices in the process have been identified that can be associated with a knowledgeable approach to handling crises.

The initial call. The importance of the initial call should not be underestimated (Hensgen *et al.*, 2006; Perrow, 1999). It essentially starts the clock in the time taken to get recovery. Further, it initiates the deviation-crises call. These calls are especially important in the case of cumulative crisis whose consequences could be greater the longer they go unnoticed. Loosemore (1998) noted that the behaviour associated with the initial call, or rather the cumulative/abrupt features of the situation, differed depending upon the situation. Cumulative situations created a sense of backward momentum and a negative feeling within the project team. Thus, it seems as early initial call may allow cumulative crises to be regarded with a more positive turn.

An immediate initial call also allows the project team to reflect longer over the situation. As noted by Hällgren (2007), the project is past the point of no return as soon as the project is initiated, which implies that there is commonly not much time to allow a crisis to muddle along. Hence, an early call is essential both in terms of time to manage but also in what kind of learning that could be utilized and developed.

Maintenance of relative calmness. Crises are associated with both an element of surprise and an outlet of associated emotion at the personal level. The company, however, at any given time had over a 100 projects ongoing. Observations suggested that other activities in the project and other projects in the organization went on as planned while the crisis in the affected project was being handled. Likewise, activities associated with recovery proceeded with a relative calmness. There was an atmosphere of urgency, but individuals went about their business in a professional manner.

Assessment of situation and assignment of responsibility. The initial call invariably went to the project manager at the corporate office. It was his responsibility to use company resources in assessing the situation and making the call on the approach. In this sense, the project manager's function is, as a project manager expressed it: "to be the initiating force behind anything that happens in the project". The role of the project manager is thus to initiate interest following the situation and secure the necessary resources. According to Loosemore (1999, pp. 14-15), this responsibility is prone to be divided rather than shared among the (external) actors.

Temporary permanency and crises response teams. In addressing these crises, the organization was observed using two group setups that aided operations and learning. One team would be the semi-permanent project team, which would be stable over several projects, and the *ad hoc* crisis response teams. The semi-permanency of the project team was observed as being useful in the way the project team worked and the knowledge they developed as a group. Over time they developed the features of learning that Gherardi (2006) observed; a culture of practice, knowledge pointers,

aesthetic understanding, conversations in and on practice, knowledge mediation and situated learning. Thus, one appreciation from this is that the semi-permanency allowed for the development of a praxis which would not have been present in an all together temporary setting (Lindkvist, 2005).

The crisis response team, on the other hand, is one of the most temporary organizational forms observed (Engwall and Svensson, 2001, 2004; Pavlak, 2004). These teams are organized around one specific issue that needs remedied, and they dissolve once the solution is in place. The learning associated in these team developments tends to be both horizontal and vertical. Horizontal in the way the response team involved other engineers or project teams in the solution (e.g. the engine variance in Quadrant 3) and vertical in the way it involved support functions and line management (e.g. the transport damages in Quadrant 4). Through these situations and individuals, organizational practices are developed that equip the organization to handle similar situations more efficiently and effectively in the future. Next time the individual (e.g. the sales support function) faced a similar situation, he or she would be better equipped to manage that situation, a learning that benefits future projects conducted by other project teams.

Debriefings. One important way of communicating learning across the organization was present in the organizational practices of the monthly meetings. Debriefings allowed the project manager to reflect over the situation and put the most pressing situations in a monthly report. In one-day meetings, all the project managers gathered to discuss pressing deviations and crisis in their projects. In the discussion, some resources would be distributed by the line management, but also there would be knowledge pointers directed in the project teams direction in regard to the management of the situation.

As in the case of the crisis response team debriefings served a dual function. It allowed both line management and other project teams to learn about operations, i.e. knowledge for future utilization.

Conclusions

Based on a “projects-as-practice” approach this paper has suggested that crises need not be wasted. Indeed, concepts of learning have been extended to the non-routine case where individuals must deal with crises in projects. A necessary and sufficiency approach was used to rationalize the organizational learning that was observed. The necessary condition was that the episodes could be described in terms used by Gherardi (2006) in her treatment of routine learning. As a sufficiency condition, we discussed the systemic approach, the template as it were in which these episodes are handled. Results suggest that crises can be managed in accordance with at least four general responses (mobilization, prioritization, normalization and responsibility) associated with learning within the organization through culture of practice, knowledge pointers, aesthetic understanding, conversations in and on practice, knowledge mediation and situated learning. The responses themselves are associated with five organizational practices (the initial call, maintenance of relative calmness, assessment of situation and assignment of responsibility, temporary permanency and crises response teams and debriefings) that aid the management of the crises in general and learning from them in particular. The practices provide opportunities for horizontal and vertical learning in and between projects and the permanent organization. One particular contribution is thus that learning opportunities initiated by the crisis exist in both the temporary and permanent organizations.

Notes

1. Actually, Gherardi (2006, p. 64) leaves the concept of texture undefined, perhaps because it changes over time. Rather, it is left as adequate to appreciate that it can be shown and demonstrated. In Chapter 6 of that text, for instance, three firms reacting to accidents in three different ways would suggest that texture has comparison, but perhaps not absolute characteristics.
2. All in all 118 deviations were observed.
3. Two of the crises were common knowledge in the corporation and these details were determined by separate interviews. They are included here because their elements appeared to coincide with observations in the other 13 crises.
4. *Note:* This quadrant contains the accidents covered by Gherardi.
5. This is not a claim that responses to other crises are limited to these four types. The response nature is an illustration of the practice used in relation to the nature of these specific crises.

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