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Hanne Finnestrand, Ola Edvin Vie & George Boak

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RESEARCH ARTICLE



Critical incident technique and action learning to enable organizational learning

Hanne Finnestrand ^a, Ola Edvin Vie ^a and George Boak ^b

^aDepartment of Industrial Economics and Technology Management, Norwegian University of Science and Technology, Trondheim, Norway; ^bYork Business School, York St John University, York, UK

ABSTRACT

This paper focuses on a two-year program with a Norwegian public sector project-based construction company, where action learning groups and critical incident technique were combined to enhance organizational learning. Project-based organizations typically face difficulties of 'project amnesia', as they fail to integrate learning from experience into organizational memory. In drawing lessons from experience, employees often focus on solving short-term problems with individual projects rather than contributing to medium- and longer-term organizational learning. The program that is the focus of this paper engaged newly-appointed engineers in action learning groups and trained them to use critical incident technique to gather and analyze information about recent projects undertaken by the company. The groups reported back their findings to colleagues in the program and to managers and senior executives in the company. Originally designed as an alternative to the traditional induction training for new employees, the program generated useful practical learning across the whole organization about project success factors. This paper explains how action learning and critical incident technique combined in this program to enhance individual, team and organizational learning, and argues that the synergies between these three processes should be explored in other contexts.

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Action learning; critical incident technique; organizational learning; action research; project based organization

Introduction

There is a danger in project-based organizations that learning can disappear between projects (De Groot, Leendertse, and Arts 2022; Hartmann and Dorée 2015; Julian 2008; Wiewiora, Chang, and Smidt 2020). Experiences gathered in projects are rarely systematically integrated into an organizational knowledge base, which can lead to *project amnesia* (Schindler and Eppler 2003). Knowledge loss at a project's end is a serious problem, and the results can be redundant work and repetition of mistakes (Julian 2008). Problems of learning from projects, including between and across projects, indicate the importance of developing capabilities to not only acquire, but also transform, exploit and use new knowledge (Chronéer and Backlund 2015; Mueller 2015).

CONTACT George Boak  g.boak@yorks.ac.uk

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This paper focuses on how evaluation of project design, planning and implementation can be shaped as a process where learning from individual projects can be spread through an organization and directly used to improve the workflow in new projects. In a case study public sector organization, critical incident technique and action learning were used in a two-year program to investigate and analyze different construction projects that had previously been completed. The original purpose of the program was to provide induction training and learning for engineers newly hired by the organization, but as the program progressed it became apparent that it was spreading learning through the wider organization. There was, therefore, a two-fold purpose to the program: first, to facilitate the learning of newly-hired engineers – these engineers were the principal investigators of the construction projects – and secondly to share learning about good practices more widely through the organization. The Human Resources (HR) department of the organization designed and facilitated the program in partnership with a small team of academic researchers: this research team was most closely involved with the first six months of the program, under the terms of the contract between the academics and the organization. During the first six months the researchers discussed the design of the program with HR, and took responsibility for introducing critical incident technique to participants. In the rest of the program, HR involved local managers and project managers to explain various technical aspects of the phases in designing, building and maintain roads, and involved other academics to lead on topics such as conflict management and collective action. The researchers took part in the meetings where all participants gathered together; the researchers also carried out evaluations of the outcomes the program achieved.

Critical incident technique (CIT) is an approach to gathering and analyzing detailed information about specific events, which was first developed in the 1940s, and which has been used by researchers into a variety of aspects of organizational behavior (Butterfield et al. 2005; Flanagan 1954; Watkins et al. 2022). In this program the academic researchers provided briefing and training on CIT, and the process of inquiry was carried out by the engineers.

Action learning is an approach to learning that typically involves the analysis of issues and problems in organizations or communities, such analysis being facilitated by discussion in a small group of peers, and attempts to bring about change in the issue that is being analyzed (Pedler, Burgoyne, and Brook 2005). Action learning is used to bring about change in organizations and communities (e.g. Gilson et al. 2020), to enable individual and team learning (e.g. Kellie, Milsom, and Henderson 2012), to build collective capability (Cleary et al. 2018), and to create organizational learning capacity (Marquardt 2019; Pedler and Abbott 2013).

The research question addressed by this paper is: What are the strengths and limitations of using critical incident technique and action learning to overcome project amnesia and to facilitate organizational learning? This fills two gaps in knowledge: first, whilst a number of mechanisms for improving organizational learning in project-based organizations have been proposed, it is generally accepted that these are only partial solutions for project amnesia (De Groot, Leendertse, and Arts 2022; Mueller 2015; Wiewiora, Chang, and Smidt 2020) and action learning has not previously been researched as a means of achieving organizational learning in this context. Secondly, the use of critical incident technique with action learning has not previously been the subject of empirical research.

The rest of the paper is structured as follows. First, relevant literatures on organization learning, action learning and CIT are reviewed. Secondly, more details of the context and purpose of the program in the case study organization are explained. Thirdly, we explain the methodology we used for gathering and analyzing information from the program. Then we give an account and analysis of our findings and present an evaluation that provides answers to the research question. Finally, we propose further research that should be carried out in this area.

The theoretical context

This section expands on the brief introductions, above, to action learning, organizational learning and critical incident technique, drawing on aspects of theory that are particularly relevant to this research.

Organizational learning and action learning

Learning, at individual, team and organizational levels, is necessary to cope with change and with renewal. Individuals need to learn in order to cope with new challenges, including the challenges posed by taking on different roles within an organization – including, but not limited to, assuming the responsibilities of their first role within the organization.

Fisser and Browaeys (2010, 63) define team learning as the process of developing a mental model that is shared by members of a team. Edmondson (1999, 4) characterizes team learning as a process of ‘asking questions, seeking feedback, experimenting, reflecting on results, and discussing errors or unexpected outcomes of actions.’ Team learning was described by Senge (1990, 10) as ‘vital because teams, not individuals, are the fundamental learning unit in modern organizations [...] unless teams can learn, the organization cannot learn’.

Organizational learning has been identified as an important process in enabling organizations to make changes, innovations and improvements (Argyris and Schon 1996; Crossan, Lane, and White 1999; Marsick and Watkins 1999). Organizational learning in the context of this study is the sharing across an organization of learning that originates in sub-units of the organization. In a project-based organization, this means achieving ‘project-to-organization learning’ (Rose, Dee, and Leisyte 2020, 86). From the early days of research into the phenomenon, there has been a range of contrasting conceptions of the nature and characteristics of organizational learning (Easterby-Smith, Snell, and Gherardi 1998; Vera 2009). One influential paper (Crossan, Lane, and White 1999) argued that organizational learning is characterized by learning being ‘institutionalized’, by being embedded into routines, systems, rules and procedures, an approach that has been followed by other researchers (cf. Crossan, Maurer, and White 2011). However, an alternative conceptualization does not perceive this institutionalization to be a core element of organizational learning, viewing the spread of learning to other members of the organization – particularly to senior members – as sufficient (e.g. Campbell and Armstrong 2013; Chronéer and Backlund 2015; Pedler 2002). In the context of action learning, Pedler and Abbott (2013, 98) argue that organizational learning is ‘the sharing of new ideas and insights from individual action learners and their sets with the wider system’. This is the approach we take in this study.

In project-based organizations, however, the temporary nature of project teams is recognized as posing difficulties for transferring learning from an individual project to the wider organization (Hartmann and Dorée 2015; Julian 2008; Mueller 2015; Wiewiora, Chang, and Smidt 2020). De Groot, Leendertse, and Arts (2022) argue that the nature of learning within project teams is influenced by a strong focus on problem-solving to achieve project results, and that this can inhibit sharing learning with other project teams and with the organization as a whole. The strong relationships within a project team support a strong learning capacity, but the looser relationships across project teams and between a project team and the organization as a whole do not provide this level of learning support (De Groot, Leendertse, and Arts 2022).

Management initiatives to encourage organizational learning in a project-based environment include post-project reviews, and project team learning reviews (Wiewiora, Chang, and Smidt 2020), although these authors note that 'the literature consistently reports that these forms of learning do not produce desired outcomes' (Wiewiora, Chang, and Smidt 2020, 202). Other initiatives include rotating employees between projects, embedding codified knowledge into project routines, using project managers as knowledge brokers, creating databases where project reports, codifications, and 'lessons learned' are stored and accessible to other project teams (Mueller 2015, 55), the use of a Project Management Office to span organizational boundaries (Julian 2008) and encouraging the creation and use of networks by project team members (Bartsch, Ebers, and Maurer 2013; Wiewiora, Chang, and Smidt 2020). Projects generate tacit as well as explicit knowledge (Chronéer and Backlund 2015; Rose, Dee, and Leisyte 2020; Wiewiora, Smidt, and Chang 2019) which may be not readily amenable to codifying and standardizing, and is best shared with the wider organization through social learning practices such as meetings, communities of practice and face-to-face conversations (Hartmann and Dorée 2015; Julian 2008; Mueller 2015; Rose, Dee, and Leisyte 2020). However, Mueller (2015) notes that although employees are asked to work to achieve project aims and also to carry out cross-project knowledge sharing, 'In reality, employees mostly focus on project-based activities and neglect cross-boundary knowledge sharing' (Mueller 2015, 53).

Action learning has been closely associated with organizational learning (Marquardt 2019; Pedler 2002; Pedler and Abbott 2013). Action learning was first developed by Revans through his work in a variety of organizations in the 1940s–1970s, as an approach to tackling difficult organizational problems and to developing management skills (Revans 1980). In its original form, it is characterized by individuals learning by attempting to bring about change in relation to organizational problems, supported by a small group of peers who are similarly engaged, and who help one another learn by asking questions, encouraging reflection, and helping with the development and review of action plans. One of Revans' early formulae was that the pace of learning must equal or exceed the pace of change (Revans 2011). Pedler and Abbott (2013) argue that action learning can bring about organizational learning through the activities of individual action learners taking steps to influence others in order to bring about change, and through exchanges of experiences with others in the organization through networks, conferences and discussion forums.

Action learning is not only associated with tackling organizational problems and achieving organizational learning, but also with individual development – helping

participants to improve their knowledge and skills in leadership and change (Pedler, Burgoyne, and Brook 2005) growing their networks (e.g. Kellie, Milsom, and Henderson 2012) and in the practice of their profession (e.g. Gillett, Reed, and Bryan 2017).

Action learning has evolved into a variety of different forms since Revans first developed it (Pedler, Burgoyne, and Brook 2005). It is related to action research – one form of it has been called ‘action learning research’ (Coughlan and Coughlan 2010) where the principal distinction with traditional action learning is that actionable knowledge is produced that may be of value to parties beyond those immediately involved in the activity of action learning. Another development of action learning has been to encourage participants to investigate positive situations rather than organizational problems, incorporating principles of appreciative inquiry, with the aim of replicating and spreading good practices (Boak et al. 2016; Gold 2014).

Critical incident technique

Critical Incident Technique (CIT) was first developed in the 1940s to research the requirements for successful performance in a variety of jobs (Flanagan 1954). Since then, it has been used as a qualitative research method in a range of different occupational fields, for purposes such as identifying effective and ineffective methods of undertaking a job or a task, identifying factors that are critical to important aspects of an activity, and establishing behavioral or functional descriptions of events (Watkins et al. 2022). Herzberg and colleagues used CIT in research in the 1950s that identified different types of motivational factor in the workplace (Herzberg, Mausner, and Snyderman 1959). In more recent times, CIT has been used in interviews to identify perceptions of skilled managerial behavior in different situations (Hamlin et al. 2022; Hamlin, Sawyer, and Sage 2011; Higgs and Rowland 2010; Hopkins, O’Neil, and Stoller 2015; Ruiz, Hamlin, and Martinez 2014). Although CIT originally included observation of activities by researchers, according to Butterfield et al. (2005), virtually all CIT research since 1987 has used retrospective self-reports, gathered either through interviews or by written accounts.

A variation of CIT, called Behavioral Event Interviewing (BEI), was developed in the 1970s (Motowidlo et al. 1992; Spencer and Spencer 1993), and has been used in a number of research projects to identify capabilities of managers and leaders (e.g. Boyatzis 1982; Boyatzis and Ratti 2009; Dainty, Cheng, and Moore 2005; Vickers 2013).

The rationale of CIT interviewing and BEI is that by concentrating on accounts of particular events, the researcher moves away from examining theories that interviewees hold, or would like the interviewer to think they hold, about how they perform, and moves towards specific examples of activity, which can then be analyzed (Spencer and Spencer 1993). CIT interviews are thought to be particularly appropriate when there is a need to understand what hinders or helps in an activity (Viergever 2019). A more general approach to interviewing may only gather an interviewee’s theories and generalizations. This is similar to the distinction between espoused theory (what people say they believe) and theory-in-use (what an examination of their behavior would lead us to think they believe; Argyris and Schon 1996). According to practitioners of BEI, people are less likely to be able to convincingly misrepresent what they did, what they said, what their reasons were, on specific occasions than they are to provide misleading generalizations (Klemp Jnr and McClelland 1986; Spencer and Spencer 1993). CIT interviews and BEI

concentrate on obtaining accounts of activity that are truthful and accurate, and rich in detail (Boyatzis 1982; Flanagan 1954). They are ideal for capturing the narratives, stories and specific examples (Gubbins and Dooley 2021) that Rose, Dee, and Leisyte (2020) identified as vehicles for the tacit knowledge that arises within projects. Information about behavior can be gathered more completely, quickly and efficiently by this kind of interview than by following and observing someone over a period of time (Klemp Jnr and McClelland 1986).

The case – the Norwegian Public Roads Administration

The Norwegian Public Roads Administration is a typical project organization. The expertise in the organization is highly interdisciplinary. This includes everything from planners, control engineers, construction managers, geologists, and landscape gardeners. Everyone has high expectations of their own and others' professional contributions. Like many other project-based organizations, the Road Administration finds that it can be difficult to transfer learning from one project to another, as well as to establish an understanding of the necessity of having developed common goals. The organization too often experiences decisions being made on the basis of too narrow an understanding of the situation, and they use the term 'silo thinking' about the way they operate. It has therefore been particularly important that the organization seeks to give employees a solid understanding of the whole work system and the connection between their own work and the Public Roads Administration's contribution to society.

Thus, in 2014, one of the regional offices within the Norwegian Public Roads Administration, established an action learning program that became known as The Learning Curve (Læringsløpet). The program focused on relatively newly-hired engineers, with the goals of making them aware of their own role and responsibilities, getting them to know the internal organization and to understand how their role was intertwined with the rest of the organization.

The learning curve program

The case study organization, like most organizations, had previously provided traditional, classroom-based induction training for newly-hired engineers, to help them learn about their job role and the work of the organization. Many of these training programs were courses provided by universities, at quite some expense to the organization. With the Learning Curve program, the HR department decided to take a different approach to facilitate individual learning.

The two-year program was designed by the HR department who were interested in testing new work forms, together with a team of academic action researchers who introduced them to theoretical perspectives on action learning and the use of CIT. The program was overseen at a strategic level by a Steering Group, and managed by a Program Management Group (PMG) of HR professionals, and line and project managers. Two of the three authors of this article were part of the group of five action researchers who participated throughout the entire project period. The researchers interviewed managers and employees both before the program started, during the program and after the program had ended. This information was then presented to the PMG, who thus had the

opportunity to make changes to the program on an ongoing basis. The presentation of this information led to reflection between the action researchers and the PMG, where the action researchers contributed with theoretical perspectives and the PMG with local knowledge. This way of working as an action researcher has previously been referred to as 'trailing research' (Finne, Levin, and Nilssen 1995). The result was an action learning program that consisted of three parts; (1) workshops, (2) group exercises using CIT, and (3) reflection. Initially, 33 participants took part in the program.

Workshops

There were 14 workshops throughout the program with concurrent parts. In the workshops, lectures and presentations were given both by internal and external experts and leaders. These presentations covered topics such as communication and interaction in projects. Between the workshops, the participants were given 'home exercises' to be discussed or reflected upon both in groups and individually. The goal of the exercises was for the participants to immerse themselves in the topics discussed in the workshops. In this way, the workshops became an arena for the participants to develop shared mental models (Senge 1990) on work practices. In the workshops, participants were also taught how to use CIT, and they were briefed on how to use CIT to investigate projects. The workshops were also the venues for groups to present the findings from their investigations. The final workshop was an arena for reflection on learning points throughout the program and the group exercises, and it was attended by the top management team of the organization.

Group exercise on critical incident technique

An important goal of The Learning Curve was to develop a method that would meet the organization's needs for learning from completed projects. This meant, among other things, that the program was based on real projects. The PMG put out a call through the organization for projects to investigate, and selected a number of construction projects that they believed represented the breadth of the project portfolio. The projects were usually relatively small-scale projects building short new roads, including pedestrian and cycle paths, new or upgrading of pedestrian and cycle paths or bus stops, or new public transport fields. Only one project was a larger 5 km 4-lane highway-project, however all projects had substantial complexities and many public and private stakeholders. These projects had ended, but the experiences were still sufficiently fresh that it was easy to find people in the organization who had actually worked on them. The program participants were divided into groups of 3–5 people from different parts of the organization, who were each given a specific project to analyze. Some of the projects were described as successful projects, which usually meant that they had delivered on time and to the right quality. Other projects were selected because they had suffered from major delays or exceeded cost limits.

Regardless of project implementation, through CIT, it was important to find the critical events that had led to good or less than good results. In this program, critical incidents were described as crossroads where the actors in the project consciously or unconsciously made choices that had a major impact on the end result. The participants

were given a short description of the selected project, and were then told which key persons they could contact for more information about the project. These were often those who had worked as project managers or others who had a central position in the project. In addition, the groups were given a process supervisor from the HR department who was to help them in the practical implementation. Researchers acted as academic supervisors who could answer more general questions related to CIT that might arise along the way.

The first step for each learning group was to familiarize themselves with the documents associated with their project. Interviews, applying CIT, were arranged with key people in the project. Some groups were also given guided tours of the final outcome of the project they studied. The information from the project documents and the interviews with key people provided further guidance for what the learning group defined as decisive events in the project. These were events that had a significant impact on the project design, planning and implementation. This phase provided the basis for an initial understanding of what was important to be able to design, plan and implement effective projects.

Through the work with the projects, the groups were asked to identify systematic connections and challenges in project management, from planning to implementation. In practice, this means first-hand knowledge of where the projects have come from, the cost flows, project management processes, and examples of the kind of challenges that can arise along the way. This insight is an important prerequisite for being able to understand the complexity that a large project represents. As described earlier, critical incidents were described as crossroads where the actors in the project consciously or unconsciously made choices that had a major impact on the end result. The groups were asked to consider the consequences of these choices. Based on this, the groups wrote a learning story for their project which became a reflection object.

Reflection

Though it would be impossible for all the participants to experience the relevant situations in real life, the goal was to move the learning from the team assignment on critical incidents happening in an internal project to a shared experience for a larger number of people in the organization. The groups were organized in an interdisciplinary way, with the goal of every participant achieving a broader view than their own on the cases discussed. The result was nine different project stories. About three months into the program, these were presented by the groups and discussed in a plenary of all the groups and managers from various parts of the organization, including the top regional managers. The learning from CIT built on systematic reflection on one's own practice in interaction with other employees. The plenary was primarily designed for the new employees to learn through reflection, and the managers were invited in order to comment on the findings. However, the managers reported that the reflection itself had created learning and new understanding of the organization.

After the groups had presented their first CIT-based learning story, they decided on aspects of the projects they wanted to explore in more detail, and carried out a further round of investigation on them. Learning points from these exercises were presented in two later workshops, 10 and 18 months into the program.

Methodology

The empirical material in this paper has been gathered while interviewing and interacting with the different actors before, during and after the end of this program. The main research methods used to gather data were observation with field notes, and interviews with individuals and groups; information was also gathered from the participants' notes, their reports on documents they had analyzed and their response to surveys (Buvik et al. 2017). Data gathered from observations, interviews, notes and reports were analyzed inductively (Bryman 2015). Informed consent was obtained from the organization and from all participants, and ethical approval was obtained from the university with which the academic researchers were associated.

Through attending the workshops, the researchers were able to observe how the participants applied their understanding of the critical incident technique through their work, discussions, questions, comments, and presentations. A researcher was present at 13 of the 14 workshops in the program, and at some workshops there could be up to four researchers. While the participants were working with the learning story of their project, researchers engaged actively as discussants and facilitators, and were included as equal-discussing participants when participants presented their findings.

Collecting empirical material in real time, and not in retrospect, gave the researchers and the PMG the opportunity to make changes to the program as it progressed (Greenwood and Levin 2007). The material derived from the observations in workshops was also used to guide the development of the interview guides.

The interviews were conducted by four researchers, using a common interview guide for each group of actors. At approximately the half-way point of the program, in 2016, twenty participants, nine managers, and two project managers were interviewed in groups. At the end of the program in June 2017, the researchers carried out group interviews of twelve participants and two process guides in addition to individual interviews of four participants, six managers, two project managers, and one HR-manager (Table 1).

The participants were asked how they had experienced the program, and if they perceived that they had learned anything new or relevant. This was followed by asking if they had changed anything in their daily work based on their learning, and if they had thoughts on how the organization could benefit more from the learning in the program. They were also asked about the level of support from others in the organization – their manager, HR, and project managers. These groups were asked similar questions about their involvement in, and experience of, the program, to what degree they perceived that their participant had learned, and learning implications for themselves and the organization. Everyone was also asked to suggest changes in a potential new version of the program.

The group interviews brought a new dimension to the data gathering. By bringing together several informants focusing on a common theme, the questions posed led to discussion among the informants and further reflection. In the context of action learning, this could be an important step for informants to take further action afterwards. The group interviews contributed both towards the evaluation, but also as an arena where the internal actors could discuss their experience with a 'friendly outsider' (Greenwood and Levin 2007). There were between two and four informants in each group interview.

Table 1. Schedule of interviews.

Interview	Number and time
Group interviews participants	3 in June 2016 and 6 in June 2017
Individual interviews	4 in June 2017
Group interviews managers	3 in February 2016
Individual interviews managers	6 in May/June 2017
Group interview project leaders	1 in April 2016
Individual interviews project leaders	2 in June 2017
Individual interview HR director	1 in July 2017
Group interviews process leaders	1 in June 2017
In total	27 interviews, 58 interviewees

Some informants were interviewed twice, at the half-way stage and at the end of the program, while others were only interviewed on one occasion.

All interviews were transcribed and coded. The initial phase of the study was very much informed by Grounded Theory (Bryant and Charmaz 2007; Charmaz 2003) in the sense that data collection and analysis proceeded simultaneously and each informed and streamlined the other. All members of the academic research group read through the transcribed interviews and discussed and reached agreement on the development of codes and further categorization of the codes. As the study developed and the researchers saw what interesting aspects the data material offered, the foci of the research were narrowed, and a much more deductive research process was followed.

Findings

The program generated a large amount of information. In this section there are some examples of the many stories participants gleaned from their investigation into the various projects. These are followed by five main themes derived from the evaluation of the program.

The learning stories demonstrated the variety of the challenges with regard to learning in and from projects. The findings in the nine learning stories are quite detailed and technical, as each group discussed between two and seven critical incidents in their assigned project. This is not the major focus of this paper, but it may be useful to share a general overview of the findings in the learning stories as well as two more detailed examples, which will indicate the range of issues that the program brought to light. There were some common findings about project management in the organization: first, all groups found evidence of the importance of spending enough resources in the early design and planning phase. Faulty design or surprises in the soil condition led to trouble with cost and time overruns. Detailed planning led to more flexibility in the building phase, even mitigating other critical incidents. Poor cost estimates were not uncommon and led to problems, while precise estimates made room for more flexibility. Second, maintaining key people with the right competences throughout the project led to better continuity, while departures had an impact on knowledge transfer, cost and time. Third, solid project documentation and evaluation were lacking in almost all projects.

In one example, a group highlighted the choice of a foreign consultancy firm as a decisive event in their learning history. The consulting firm met all the requirements that were outlined in the tender, on paper, but it turned out that the consulting firm was in reality not familiar with the quality system and requirements for approval, even though the desired standard

was described in the process description. Another group that had studied the rerouting of the route for a road, focused on an unplanned change of construction manager. The change of construction manager was carried out surprisingly painlessly because the project management had placed sufficient emphasis on the risk such a change entail. Among other things, the project had made it possible for the transformation to take place over a longer period of time and for those involved to work in the same location.

At the end of the program, an evaluation was carried out where the participants were asked to assess their experience with CIT as a learning methodology, and the use of the action learning groups. The analysis identified five main themes.

First, all the participants felt that they had gained a far greater insight into how the Norwegian Public Roads Administration was structured, both with regard to how it is organized and how the projects work. Many pointed out that they had gained a better understanding of the entire workflow, based on the fact that the various parts of the organization are connected and that the projects depend on the teamwork of these various parts for a successful project implementation. As one participant said:

I have gained a greater insight into other people's everyday working life and what different challenges exist within the various areas.

Secondly, almost all participants said that they had gained a larger network of contacts in the organization through their work in the groups and in investigating the projects. This network consisted both of colleagues who took part in the Learning Curve and experienced people whom the groups interviewed. Although power was not an explicit theme in the project, the analysis shows that this type of network empowers young and relatively inexperienced employees, and equips them with a competence that is sought after by the organization. The understanding of how power plays out in learning systems is still under-researched (Flood and Finnestrand 2019). One participant said:

[The] network is another very positive thing about the Learning curve, which also helps in everyday work. Just knowing where to turn, and having a relationship [to others at work]. I think that's a very important point about the Learning curve.

Another said:

Now, people from other parts of the organisation are coming to me and asking for help, because they knew I participated in the program. I have also reached out to others.

A line manager said:

I do not think they [the participants] realise how they have grown their network until they meet them again in the settings. ... and the value of knowing the organization, knowing who to get in touch with if you face a problem.

Thirdly, more than half of the participants emphasized that CIT and reflection as a working methodology in the Learning Curve had led to them transferring this way of thinking about project implementation to the daily work situation. They were not as concerned with looking at the problem that arose, but rather **why** this problem arose. As one participant described it:

Critical incidents, interaction and reflection keep appearing in my everyday work. What the outcome might be and possible consequences are thought of in a slightly different way now than before.

Fourthly, more than half of the participants believed that the many learning stories together had helped them to see which challenges and issues that often reoccur in the organization. This gave them the ability to see the larger picture of the organization's modus operandi. However, this also led to some frustration and disappointment for many of the participants.

I was thinking that the managers were reasonably good at relating our findings with their own experience, but it was a piece missing: 'Fair enough, we know about the issue. What should we do about it'.

Finally, the small group work was highly appreciated by almost all participants. Through working together to gather and analyze information they had achieved much more than they could have achieved alone, and gained more learning. Some participants said the group work was fun, although some reported issues when other group members were in very different professional areas from them. The researchers had expected participants to have a greater appreciation of cross-disciplinarity by the end of the program, but this did not emerge as a strong theme.

I can not remember that the diversity of the group contributed to a better solution at all!

The line-managers remarked that the engineers learned more quickly about the organization than previous intakes who had experienced the traditional induction training. This is illustrated in the following quote:

She [one of the participants] has become more familiar with others who work in the other professional areas and she makes use of this in the job. I think that has probably come a little quicker through the Learning Curve.

The participants also called for more learning arenas to share knowledge and experience and to solve recurrent critical incidents, as they perceived that this was lacking in the organization for the present.

Overall, the Learning Curve program was judged to be successful in enabling participants to gain a holistic view of the large, complex organization, and in spreading learning about good practices in project management across the organization. It was a resource-intensive program, but in another regional office of the organization work began on designing a similar program, inspired by what had been achieved by the Learning Curve. However, a national re-organization of roads administration took place shortly after the program finished, and it was not repeated.

Discussion

This section discusses three main conclusions concerning the processes that were used in this study, in relation to relevant theory: the spread of individual to organizational learning, the use of critical incident technique with action learning, and the role of action learning in the program.

From individual to organizational learning

The original aim of the Learning Curve was to enable newly hired engineers to learn about their roles in the organization, but as the program developed a central issue became how

the learning could be shared between the participants, and how the learning could be spread beyond the participants in the program to the wider organization. Applying the method of critical incidents could reveal system deficiencies, which in turn should be addressed and corrected, as well as system strengths which should be applied elsewhere when appropriate. The formation of experiences and increased expertise obtained from learning about a project is high for the individual, and for the group, but the transfer to the organizational level is more challenging (Mueller 2015; Wiewiora, Chang, and Smidt 2020). In an ideal situation individual learning transforms into organizational learning, and ultimately to changes in behavior or routines in the organization.

After the first presentations by the groups about what they had learned, to fellow participants and to line managers, the managers expressed surprise at how much impact the learning stories had on them. The program gave them the opportunity to stop and reflect on practices in the organization. There was no room for such reflection previously – not because there was reluctance in the organization, but because the need to take time to reflect on the learning points had not previously been considered. Arrangements were then made for line managers to participate in later presentations and discussions of the learning stories. When the managers were invited to these gatherings, it was because they were considered to be knowledge resources for the participants, but the meetings led to just as much learning for the line-managers and the organization as for the participants. If organizational learning is the spread of learning from a sub-unit to the wider organization, (as argued by Campbell and Armstrong 2013; Pedler 2002; Pedler and Abbott 2013) then the program certainly achieved organizational learning.

In one example, actions by a participant in the program led to an initiative to change and implement a new routine. The participant was working in a project where there was a tragic and fatal accident in connection to unexploded explosive material. The accident was routinely investigated by the authority and the police. However, the participant used his understanding of critical incidents and asked questions about prior incidents that led up to the fatal accident. This analysis was shared with the authorities, which approved the findings. Based on this work there was an internal initiative to change the routines to prevent a similar accident happening again. The new routine was promptly implemented throughout the Norwegian construction sector. The learning gained through the program led to sector-wide change.

Critical incident technique

The benefit claimed for CIT is that it facilitates factual analysis of actual events and the causal factors that result in certain outcomes (Butterfield et al. 2005; Hamlin, Sawyer, and Sage 2011).

In this program, the detail of actual projects provided a richer picture of project management activities than could have been gathered by classroom analysis of theories. Some studies of projects have argued that they generate significant tacit knowledge, which is not amenable to codifying or standardizing (e.g. Chronéer and Backlund 2015; Hartmann and Dorée 2015; Rose, Dee, and Leisyte 2020). The narratives and stories (Gubbins and Dooley 2021) gathered by CIT in the program were vehicles for collecting and communicating this tacit knowledge.

However, in the course of hearing the engineers' accounts of what they had learned, some of the limitations of CIT were evident, few of which are discussed by researchers who have used CIT interviews or BEI. These limitations may mean that some behaviors are over-represented and some under-represented. In brief, these are:

The approach appears more suitable for some types of event: it is particularly good for capturing the detail of the single, perhaps dramatic, episode, such as a confrontation or a presentation, and less suitable for gathering detail of the more mundane activities that may build up over a period of time and contribute significantly to a successful project.

In addition, whilst CIT seeks accounts of events and behaviors from interviewees, these accounts are interpretations of events, based on memory. There is also the possibility of the stories having been told and re-told before, and perhaps acquiring or losing certain details.

Action learning

In this project, action learning processes were used to enable small groups of engineers to work together in teams to investigate and analyze projects. At the heart of action learning is the small group of peers who support each other in mutual learning (Revans 1980). The situations they investigate may be problematic (Revans 1980) or positive (Gold 2014) as they were here, with some projects deemed successful and other less so. The action learning groups on this program were designed to provide individual participants with the social and cognitive support they required to gather relevant information and make sense of it, and also to enable team learning as well as individual learning (Fisser and Browaeys 2010) with the development of shared understandings of the projects they were investigating.

Action learning always involves the learners gathering and analyzing information about the problems (or opportunities) they are seeking to address. Critical Incident Technique provides a valuable structure and discipline for these processes of investigation, guiding the learners to focus on particular types of incident, and seek detail of specific occurrences.

The work in groups undoubtedly strengthened the analysis of past projects and contributed to the ability of the program to spread learning more widely through the organization, through presentations to colleagues, to line managers, and to the top management team, and went some way to overcoming the 'project amnesia' (Schindler and Eppler 2003) that is a common characteristic of project-based organizations (De Groot, Leendertse, and Arts 2022; Mueller 2015; Wiewiora, Chang, and Smidt 2020).

Similar to the findings of published research (Gillett, Reed, and Bryan 2017; Kellie, Milsom, and Henderson 2012; Pedler, Burgoyne, and Brook 2005) participants in the program also reported achieving individual benefits, including organizational knowledge, developing their networks, a greater understanding of why certain problems arise and which problems occur most frequently. The strengthening of networks is seen as an effective way of spreading learning through project-based organizations (Bartsch, Ebers, and Maurer 2013; Wiewiora, Chang, and Smidt 2020).

Conclusions

This research demonstrated that a learning program incorporating action learning and critical incident technique enabled individual, team and organizational learning in a

project-based organization, where cross-project learning is traditionally considered to be problematic. The research also demonstrated a synergy between action learning and CIT, where CIT provides a powerful structure for gathering and analyzing information about problems and opportunities. An implication for practice is that CIT could be combined with action learning in other situations.

One limitation of this research is that it took place in a case study organization. Further research should explore whether a program of this nature would be equally effective in other settings, including private sector settings. The research generated a large amount of data, with many examples of critical incidents within learning stories, and it was not possible for the researchers to capture all the data that was generated. Some activities were also not directly accessible to the researchers, who were not able to be present during the CIT interviews led by the participants, or during the discussions in the action learning groups. Further research could explore the processes by which the action learning groups assimilated and made sense of the critical incident information.

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Notes on contributors

Hanne Finnestrand worked for many years as research scientist at the independent research organization, SINTEF, doing Action Research in the fields of Organization Development, Industrial Relations, and Sociotechnical Systems Design. She is now Associate Professor of Organization development at the Norwegian University of Science and Technology (NTNU), Norway. She holds a PhD in Action Research and Enterprise development from the same university. She is also the Editor-in-Chief of the Springer journal, Systemic Practice and Action Research.

Ola Edvin Vie is Associate Professor in Leadership at the Norwegian University of Science and Technology (NTNU), Norway. He holds a PhD in Managerial Work from the same university, focusing on the emotional sides of everyday relations between managers and employees. Vie's research area is within project management, learning and action research. He is currently teaching and studying leadership in volunteer student organisations.

George Boak has worked on aspects of individual and organizational development for over 30 years, with managers and professionals from a wide range of private sector companies and public sector organizations. He is particularly interested in how change can be brought about in complex organisations. He is an associate professor in leadership and innovation at York St John University, where he is a core member of York Business School's suite of executive MBA programmes.

ORCID

Hanne Finnestrand  <http://orcid.org/0000-0003-4146-8032>

Ola Edvin Vie  <http://orcid.org/0000-0003-3829-5636>

George Boak  <http://orcid.org/0000-0002-4489-3096>

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