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Leadership in innovation projects: an illustration of the reflective practitioner and the relation to organizational learning

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Abstract

The purpose of this conceptual article is to demonstrate that Donald Schön's *Reflective Practitioner* actually outlines an explicit model of the steps that project leaders in practice apply largely unaware. This reflective research model furthermore can be meaningfully combined with Argyris and Schön's model of organizational learning. The combined research and learning model can support project team members and leaders to enhance their reflectiveness and improve their project success. Eighteen project leaders of innovation teams were studied by means of in-depth interviews aimed at assessing how project leaders act when dealing with critical incidents during their projects. Based on a selection of three project leaders, an empirical illustration of Schön's model is provided: they recognized there was a problem, researched the problem, developed alternative solutions, tested different solutions and alternatives on validity, tried out and experimented with solutions, selected and applied a particular solution, and evaluated the process completed. The authors' suggestion for practitioners is applying the combined model of the reflective practitioner and organizational learning, as this can help innovation leadership in practice at both the individual and the team level. The scientific value of this contribution lies in the conversion of Schön's latent (tacit) model into a manifest (explicit) model, and by relating it to the model of organizational learning, a result emerges that is both applicable to future research and practice.

Keywords: Reflective practitioner, Organizational learning, Project management, Innovation leadership

Background

According to Schön (1983), competent professionals are highly unaware that they have a wide range of knowledge when solving issues, which he calls tacit knowing-in-action. They act on skills and experience in an unreflective manner. Some practitioners are able to not only think about what they are doing but can think about it whilst they are doing it. This Schön calls reflecting-in-action. Schön asserts that professionals often act unaware of their expertise. In his theory, he states that it is very difficult to make such competencies explicit, which is a pity because when such competent behaviours could be made explicit, they can be taught and people can learn about them.

This article reports on behaviour of project leaders of innovation projects when these projects encountered critical incidents, i.e. events that could cause a project to

significantly deviate from its planning. In solving issues, such as critical incidents, most project leaders use their expertise in tacit ways, and sometimes they reflect-in-action. Analysing project leaders behaviour, we discovered that some project leaders use rigorous and investigative ways in problem solving and they even proved to follow a logical model without explicitly mentioning this model. We further noticed when we applied the thinking of Schön on how these project leaders were behaving, Schön actually has an implicit model of the reflective practitioner, which could be made explicit. Moreover, this model did fit quite well on some of the project leaders. The purpose of this conceptual article is twofold. First, the implicit model of Schön is made explicit and connected to the theory of organizational learning (Argyris & Schön). In so doing, we present a model of reflective practice and organizational learning that can be used for the professionalization of behaviour of project leaders in innovation projects, and perhaps for other kind of projects as well. Second, we illustrate how some project leaders' behaviours are congruent with the model of Schön. These are meant as empirical illustrations and not as full evidence of the validity of the model. The validation of that model is a future step. In this conceptual article, we formulate a suggestion for follow-up study and how the model can be used for the practice of project leader behaviour in innovation projects. The research question in this study is: how do project leaders act when leading their project and solving or preventing critical incidents in the light of the reflective practitioner model?

This article, which is conceptual from a theoretical perspective and meant as illustrative from an empirical perspective, is organised as follows. We start by conceptualizing the reflective practitioner model and organizational learning. In the next step, we introduce the research and present findings about the behaviour of project leaders. Finally, we draw conclusions and discuss limitations of the study and avenues for future research.

The reflective practitioner and organizational learning

Reflection as research

To Schön (1983), the reflective practitioner is the opposite of a technical, rational problem solver. The concept of technical rationality rests on a model in which professional activity consists of instrumental problem-solving that is based on the application of scientific theory and technique (Schön 1983: 21). However, such a rational model tends to be inadequate when it comes to helping society achieve its objectives and solve its problems; indeed, there is increasing awareness that the actual practice of social problems is complex, uncertain, unstable, and inclined to value-conflict, for which the technical rationality model forms an unsatisfactory standard (Schön 1983: 39). As a result, professionals can suffer from a legitimacy crisis, being swung back and forth between (positivist) rigors on the one hand and (everyday) practical relevance on the other. Schön proposes to discard the technical rationality model, and 'search, instead, for an epistemology of practice that is implicit in the artistic, intuitive processes which some practitioners do bring to situations of uncertainty, instability, uniqueness, and value conflict' (Schön 1983: 49). In Schön's view, competent professionals have a wide range of knowledge, which they apply—being more or less unaware that they do so—when

solving certain issues. With this tacit knowing-in-action, as Schön calls it, professionals are able to achieve desired results, by basing themselves on skills and experience in an unreflective manner, or applying a repertoire of 'automated behaviours'. Tacit knowing-in-action comprises spontaneous actions, of which people are often unaware of ever having learned how to carry these out and which they often cannot describe in terms of the (internalized) knowing which their actions reveal (Schön 1983: 54). In other cases, though, professional practitioners think consciously about what they are doing whilst they are doing it, because they have been stimulated to do so after being taken by surprise (Schön 1983: 50).

Reflecting-in-action means that people not only can think about what they are doing but that they can think about doing this whilst they are doing it (Schön 1983: 50). For example, professional baseball pitchers can have 'a special feel for the ball': they can try to get the ball to repeat exactly the same successful curve, or 'find the groove', every time they play, which means they try to repeat previously winning moves. In such a case, someone does not only reflect on action, but also in action. Much reflection-in-action hinges on the experience of surprise, or unexpected effects or events; indeed, surprise often evokes the response of reflection-in-action. Schön mentions the example of an improvising jazz ensemble, where all players know the basic theme, but individual musicians respond to one another in order to create a coherent performance as an ensemble. 'They are reflecting-in-action on the music they are collectively making and on their individual contribution to it, think what they are doing and, in the process, evolving their way of doing it' (Schön 1983: 56). A practitioner's reflection-in-action is bounded by the 'action-present', or the time zone in which action can still make a difference to the situation. The action-present may last for only seconds for a sportsman, for days for a lawyer, or as long as months for a project manager, depending on the pace of the activity in question and the situational boundaries of the practice concerned (Schön 1983: 62).

Reflective practitioners function in a certain practice, the professional situation in which they work. For project leaders, such situations are 'cases', or the projects they execute. A professional practitioner is a specialist who encounters certain types of situation over and over again (Schön 1983: 60). Practicing the practice, the professional develops a repertoire of expectations, images, and techniques. Eventually, the accumulated knowing-in-practice tends to become increasingly tacit, spontaneous, and automatic, which means that the professional can act in a highly effective manner by means of tacit knowing-in-action. However, because of the complexity of practices these days, most professionals tend to experience variations in their work situation and, as a consequence, often have to learn new skills. This means that practitioners will also reflect on their knowing-in-practice.

Schön would perhaps disagree with the view of reflective practitioners following certain steps when performing reflection-in-action, as this seems to imply an instrumental approach that closely resembles the technical rationality which he criticizes. Yet it is clear that there is a certain model underlying his ideas. As has also been noticed by other authors, Schön is perhaps more rational than he claims to be (see in Hébert 2015), and although his model should not be seen as a simplified linear view of how professionals deal with surprises, it is helpful to try and understand which steps exactly

are involved (Schön 1983: 68–69; Schön 1987: 26–29). Professionals think on their feet, improvise, and act both intuitively and creatively (Finlay 2008).

As mentioned, the model to be applied consists of a number of steps.

0. Step 0 is when people act routinely, without being conscious of the fact that they are skilled professionals. In a situation of routine, there is no reflection-in-action because a task or operation runs smoothly.
1. In step 1, the practitioner allows him- or herself to experience surprise, puzzlement, or confusion in a situation which is judged uncertain or unique. This may occur when a situation is 'not normal'.
2. In step 2, the practitioner reflects on the phenomena and on the prior understanding which was implicit in his or her behaviour and experience.
3. The practitioner now proceeds to rephrase the situation.
4. In step 4, the practitioner carries out an experiment which serves to generate both a new understanding of the phenomena and a change in the situation.

When reflecting-in-action, the practitioner becomes a researcher in the practice context. The practitioner acts in a way that is independent of established theories and techniques and constructs a new theory of the unique case. Inquiries are not limited by predefined means and ends, and whilst ratiocinating (reasoning logically) towards a decision, the practitioner does not separate thinking from doing but builds implementation into the inquiry and experiment, thus converting the decision to action. Because this reflection-in-action is not bound by the limitations of technical rationality, it can proceed even in situations of uncertainty or uniqueness (Schön 1983).

As the above shows, the practitioner as researcher implicitly applies a research methodology, which consists of the following steps: (1) acknowledging or recognizing a situation as a problem (or an issue that demands a response); (2) investigating the problem; (3) developing alternative solutions; (4)s testing solutions and alternatives on their validity and experimenting with solutions; (5) selecting and applying a solution; and (6) evaluating the result of the (new) process. At the same time, the research route is a learning process, as reflection and learning are closely related.

Reflection as learning

The reflective practitioner is a professional who learns and acts on it. As will be clear, learning is essential during innovation projects, in order to prevent failure and disinvestment. An insight, as far as we know not explicated elsewhere, is that the model of the reflective practitioner can be linked to the theory of organizational learning, which distinguishes between single-, double- and triple-loop learning (Argyris 1999: 68; Argyris and Schön 1974: 18–19; Tosey et al. 2011). If a professional performs a task based on tacit knowing-in-action, learning is limited to building up experience by executing routine tasks. In such situations, a novice learns more than an expert, seeing that the former has less experience. If carrying out a task has the intended result, no reflection will take place. If, on the contrary, there is a mismatch between the expected and actual result, the professional may try to apply an alternative, available action by way of solution. This will be a single-loop learning activity, which means that it involves learning what is already available as knowledge-in-action, which knowledge can be obtained from, for example, one's colleagues.

If the single-loop action does not render a solution, the mismatch between the actual and expected result remains. In such a case, the professional can try to solve the situation by applying a double-loop learning action. This may lead to varying the norms or even existing governing values. It can involve applying a new solution and therefore undertaking a new action, which broadens the action repertoire.

If the double-loop action (still) does not result in a solution, and the mismatch remains, a professional with enough experience and expertise can try to apply triple-loop learning actions. At this level, a professional 'learns-to-learn' and is capable not only of varying norms and make certain adaptations but also of composing totally new values. This implies that new governing values may emerge, because the existing ones are rejected. The system as a whole changes, as if a paradigm shift took place, resulting in 'a corrective change in the system of sets of alternatives from which choice is made' (Tosey et al. 2011).[1] From time to time, erratic events such as serendipity, charismatic behaviours, reckless risk-taking, and foolishness can occur, which set into motion systemic changes. Such triple-loop learning is rare, though, and is not included in the models of Argyris and Schön or Schön (Visser 2007; Tosey et al. 2011). However, it goes beyond saying that triple-loop learning has 'a dark side, is non-instrumental, exists beyond language and is recursive' (Tosey et al. 2011: 303). Because it is risky as well (its 'dark side'), triple-loop learning is no guarantee for improvement, just like innovation itself is no such guarantee (Sveiby et al. 2012). Indeed, triple-loop learning 'cannot be actively planned and may not necessarily have beneficial outcomes' (Tosey et al. 2011: 304). While triple-loop learning bears conceptual relevance to organizational learning, as yet little empirical data on this is available (Tosey et al. 2011). Schön nor Argyris give examples of such a form of learning.[2] Hypothetically, it is conceivable that professionals set disruptive, systemic change in motion as serendipity-driven agents, charismatic change leaders or as foolish and reckless, sensation-seeking individuals.

Integrating the reflective practitioner and organizational learning models

Figure 1 shows a control cycle model, which integrates the reflective practitioner model with the organizational learning model (single-, double- and triple-loop learning). The control cycle model is based on Schön (1983, 1987), Argyris and Schön (1974), and Bateson's learning levels model (in Tosey et al. 2011). The steps distinguished in the reflective practitioner model are indicated in the figure as well: (1) within the boundaries of existing norms and governing values, a tacit 'knowing-in-action' is unconsciously applied to execute a task—[A], after execution of the task, its effect is assessed in terms of match or mismatch, which will only lead to a conscious 'reflection-on-action' in case of a mismatch; (2) simultaneously, the professional will experience surprise because of an unexpected outcome; (3) instantaneously, 'reflection within the action-present' is triggered, resulting in a decision to choose a single-loop action (a known remedy, which is expected to lead to a solution); or resulting in (4) 'reflection-in-action'. Once this process is completed, two options for action remain open. One is the double-loop action and adapts the norms within the boundaries of governing values, so as to design a new solution and experiment and test this on the spot. The other option is to cross boundaries and, apart from changing the norms, also redesign governing values, which means the entire action process changes. Whichever path is followed, the professional will eventually arrive at [B], or the 'ante-action-reflection'. This is a pre-assessment by

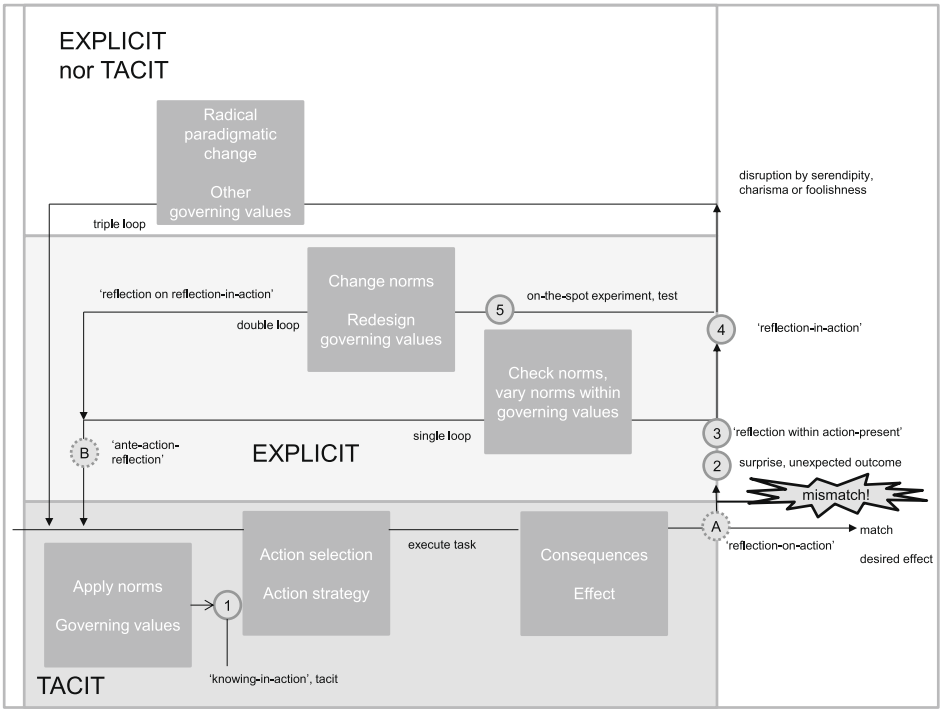

Fig. 1 Reflective practitioner model integrated with organizational learning model. *1* Tacit 'knowing in action' to select an action and execute a task. A 'reflection-on-action' to assess match (not necessarily consciously) or mismatch (consciously). *2* (Immediately) experience surprise due to unexpected outcome. *3* Assess next options as 'reflection within the action-present'; select an available single-loop action as alternative (norms and governing values remain unchanged) or to design a new action. *4* Select as a newly to design action a double-loop or triple-loop action by means of 'reflection-in-action'; in case of triple-loop action (serendipity, reckless risk taking), a paradigmatic change is caused. *5* Test the action and gather data to validate; norms and governing values are adapted. *B* Pre-evaluate the effect of the action by 'ante-action-reflection' (does not happen with triple loop untested or spontaneous actions); execute the task and return to *A*

the professional aimed to judge whether the solution will work. Greenwood (1993) has criticized Schön for omitting reflection-before-action. Such criticism seems valid when it concerns the process of designing a new action (double- and triple-loop) which does not result from knowing-in-action. However, when it comes to routine actions, Greenwood's point does not seem to apply, as such knowing-in-action is actually automated behaviour (single-loop). It could well be that Schön himself would argue that this reflection-before-action is, in fact, part of reflection-on-action, because generally one can reflect on one's own (and others') experiences before one undertakes an action, and reflection is not necessarily limited to the action at hand.

The final option, which is not included in the models of Argyris nor Schön, is to effectuate a triple-loop action, which is disruptive and constitutes a radical, paradigmatic change from existing norms and governing values. This is not a controllable and plannable process, though, and goes beyond what is fully and consciously a reflective act, as the actor does not know what he or she is doing or causing. Triple-loop actions can be spontaneous, impulsive, and untested. Paradoxically enough, conscious reflection can get lost in the action itself, which is why such an action can be described as partly explicit and partly tacit.[3]

In Fig. 1, the numbered circles correspond with Schön's 'reflection-in-action' model and its implicit sequence of steps. The circle with A is a separate activity in Schön's approach; the circle with B seems to be absent in his model (Greenwood 1993).

Reflective practice and innovation leadership

The process of innovation projects depends to a great extent on the skills of project leaders and the quality of their leadership (Burke et al. 2006; Müller and Turner 2010), yet it is often unclear what leadership styles work best in certain circumstances (Clarke 2012). Innovation projects often suffer from setbacks. What project leaders do during such setbacks is assumed to affect the progress of a project and the innovation that is being developed. Dealing with setbacks is a way of problem-solving, which usually implies making a deviation from rule-based and routinized tasks. Deviations have to be made when setbacks are experienced and reflected upon, a process which leads to learning in terms of modifying beliefs, mental models and knowledge, which eventually results in active problem-solving behaviour (Schley and Van Woerkom 2014).

Innovation leadership, which is a style of leadership aimed at motivating employees to produce creative ideas, products and services (Gliddon 2006; also Deschamps 2008), is usually associated with psychological leadership theories. While psychological approaches of innovation leadership tend to concentrate on the interaction between leaders and followers on the one hand, and the relation between leadership and organizational aspects (such as culture) on the other (Amabile et al. 1996; Basu and Green 1997; Jassawalla and Sashittal 2002; Lee 2008; Sarros et al. 2008), the present study focusses on the behaviour of the project leaders of innovation projects. The interest lies in what project leaders do with regard to the innovation that occupies a central place in the execution of their project. Also, the reflective practice of the project leader is seen as an actionable form of innovation leadership: the project leader leads the project by solving a problem and, more specifically, applies a research-oriented methodology in a tacit, reflective fashion, which stimulates the innovation process of the project. Following Schön, it could be assumed that the project leader performs these actions in a tacit manner, which means that he or she may not be fully aware of applying a stepwise research methodology.

The decision to analyse reflective practices was based on a serendipitous experience we had whilst interviewing project leaders, when we realised that some project leaders apply a research methodology that is analogous to Schön's model of the reflective practitioner. The behaviour of project leaders greatly resembles the implicit or tacit model first proposed by Schön: whilst project leaders consciously solve the problem at hand, they subconsciously or unconsciously seem to apply a variant of Schön's model. In Schön's view, tacit or implicit knowledge is embedded in practice, and actual practice must be reflected upon to make this implicit knowledge explicit, so that improvements can be made (Fook 2013). This implies that, although practitioners already 'know' about their practice, much of this knowledge tends to be implicit rather than explicit.

In the present study, the main interest lies in the model that is applied by project leaders. And how that model studied is closely related to the notion of organizational learning. The central research question in this study is the following: how do project

leaders act when leading their project and solving or preventing critical incidents and do they perform according to the reflective practice model? We intend to make their tacit practices explicit and translate them into a tangible model that is useful in real life. Based on the above, our primary purpose is to illustrate the process of problem solving by using the Schönian model. From that practice, we induce theoretical notions of organizational learning, with the ultimate aim to support future innovation management processes of innovation project teams. After having integrated the model of the reflective practitioner with the model of organizational learning, and discussed innovation leadership, the methodology and data will be presented, followed by a description of the results. Three examples of reflective practices of project leaders stand out to illustrate the real-life application of the Schönian model.

Methods

Data collection and embeddedness in previous study

The analysis carried out forms part of a broader, earlier study into team dynamics of innovation projects (Oeij, P. R. A: A study of teams coping with critical incidents during innovation projects, forthcoming). During this study, the researchers observed that certain project leaders showed particular behaviours that suggested the application of reflective practices. For this reason, it was decided to perform a secondary data analysis of the interview data that were collected earlier. In the broader study, eighteen innovation projects were examined as cases that were carried out by eighteen different project teams. An innovation project can be defined as a temporary task, organized as team work, which is carried out with the goal to develop a new product, service or process to improve an organization's market share or its internal production process of goods and services. Each case study comprised face-to-face interviews with project leaders, team members, and the managers responsible for the innovation project in question. Also, a survey was carried out, with the same respondents and similar project teams in the same organizations. For the analysis of the present study, mainly the face-to-face interview data of project leaders were used.

Method of analysis

During the interviews with project leaders, their project's progress was discussed by identifying critical incidents as milestones: 'Through the use of the critical incident technique one may collect specific and significant behavioral facts, providing (…) a sound basis for making inferences as to requirements for measures of typical performance (criteria), measures of proficiency (standard samples), training, selection and classification, job design and purification, operating procedures, equipment design, motivation and leadership (attitudes), and counseling and psychotherapy' (Flanagan 1954). Critical incidents are events or conditions that interrupt the normal procedure of a project; such incidents can lead to significant deviations from the original plan and result in setbacks, delays or even termination of a project. Critical recovery takes place when the project gets back on track towards the intended or adjusted goal, which can be achieved by 'speeding up' activity, applying a solution, making a decision, or serendipity. Together with the project team leaders, critical incidents that had caused delay and critical recoveries towards speeding-up situations and getting back on track were assessed. By focussing on the critical incident method, we ensured that in the case studies, the problem-solving behaviour of the project leader formed the unit of study.

During the interviews, project leaders were asked how they and their teams had dealt with any critical incidents. As it turned out, several of the people interviewed had applied an implicit research methodology that greatly resembled Schön's model; an operationalization and mapping of this model onto the steps of a general research methodology[4] is shown in Table 1.

This table was used to interpret the interview data. The central topics were the critical incidents and how project leaders dealt with them. Based on the answers to the questions and the storytelling about these incidents, related events and experiences by the interviewee, we used Table 1 as an interpretation grid and recorded whether the steps of the model were absent or present. On the basis of these results, we could reconstruct the narrative of this episode on the innovation project. This approach resembles qualitative exploratory data analysis as we perform phenomenon detection, i.e. observing that project leaders apply a systematic model, which normally precedes theory development (Jebb et al. 2016). The novelty is that we induce this phenomenon not into a completely new theory but in the implicit theory of Schön, and as a consequence, we are able to make this implicit theory explicit. Jebb et al. (2016) point out that inductive research can also be strongly informed by theory, because the exploration of researchers is guided by their substantive knowledge and their tacit ideas about where meaningful patterns will occur.

Table 1 Schön's reflective practitioner model mapped onto a general research methodology[b]

Reflective practice	Innovation leadership by applying a research methodology in a stepwise approach
1 Tacit 'knowing in action': performing a task unreflectingly	0 Unconscious task performance (0 because it precedes reflection)
A Assessing if task execution matches or mismatches the desired effect: in case of a match this is an unconscious/subconscious process; in case of a mismatch: 'reflection-on-action'	1 Sensing an unexpected outcome: what is going on? Reflecting on one's understanding of, feelings about and experience with a particular incident
2 Surprise: a mismatch is assessed in the event when the outcome of task execution is unexpected (positive or negative)	2 Experiencing and acknowledging an unexpected outcome: is there a problem? Structuring the incident and bringing it to the surface (explicating what is implicit)
3 'Reflection within the action-present'[a]	3 Assessing ('scoping') the implication of the outcome (defining boundaries and governing values; critical evaluation of outcomes)
4 Reflection-in-action	4 Assessing outputs and outcomes and developing alternatives (conceptualizing, restructuring)
5 On-the-spot experimenting and testing	5 Experimenting and testing alternatives (general hypothesizing, (re)designing new actions) and striving for validated data (operationalization; putting new actions into a testable framework)
B Ante-action-reflection (not per se in the case of triple-loop learning)	6 Anticipating effects of the newly chosen solution; pre-evaluation (specific hypothesizing)
Performing the task: 'reflection-on-action'	7 Executing the new solution (intervention, implementation of new action)
(Return to) A Reflection-on-action	8 Evaluating the outcome of the new action or solution (feedback, a return to 'reflection-in-action' and 'on-action')

[a]Finding a solution at this level is single-loop in nature; going beyond this stage is double-loop. Single-loop is instrumental means-end reflection on actions (technical rationality), whereas double-loop learning results from of reflection on the norms and values and social relationships (Greenwood 1998: 1052)

[b]Column 2 are in fact actions undertaken by project leaders of innovation projects as an interpretation of the model of Schön

Data and cases

Three cases of leadership behaviour were selected from the total number of eighteen teams. These eighteen teams perform innovation projects. Those projects and teams are selected from profit and non-profit organizations in The Netherlands. The purpose of the overall study was to investigate team dynamics during innovation projects in order to determine aspects that can support teams to improve their performance, such as leadership behaviour, resilient team behaviour called innovation resilience behaviour (Team IRB) and achieving project success (Oeij, P. R. A: A study of teams coping with critical incidents during innovation projects, forthcoming). The eighteen team leaders encountered a variety of issues they had to solve, such as technical issues, issues with decision-making or combinations of smaller issues that clustered into bigger ones (Oeij et al. 2016). But not all teams were reporting encountering critical incidents (some had none) or project success (some reported lower than average project success). When inspecting the survey data, six of the 18 teams showed that they did not do very well on innovation resilience behaviour; they had a lower than average score on being resilient in dealing with setbacks. In the end, nine project leaders of teams with higher than average innovation resilience behaviour and higher than average project success reports remained. All these project leaders performed parts of the reflective practitioner model, but only three of them applied all parts.

Criteria for inclusion cases of team leaders in this conceptual analysis were the following. First, a critical incident or an anticipated critical incident in the innovation project had been identified as a situation that demanded problem-solving behaviour. The problem-solving behaviour had resulted, or failed to result, in success or critical recovery. As will be clear, the success of problem-solving behaviour does not depend solely on a project leader's behaviour: external factors, such as the behaviour of clients, partners, and higher management, could potentially negatively affect the results of the action undertaken by the project leader. For the purpose of the present study, therefore, the act of problem-solving behaviour of the project leader was more important than the effect it had in terms of success. The second criterion was that it had to be possible to reconstruct all the steps in research methodology that had been implicitly undertaken by the project leader. Apart from the three cases, the other 15 cases turned out to be less or unsuitable as illustrations of reflective practitioners. Two cases had not encountered any critical incidents, and five other cases no critical recovery, which means that there was no resilient activity or measures that satisfactorily curbed a critical incident. The eight remaining cases had performed critical recoveries, but these were not exclusively related to the behaviour of the project leader. These cases showed, for instance, a combination of measures, the application of project management tools or the intervention of higher management to get the project back on track (Oeij et al. 2016). Summarizing, three cases had critical incidents or a serious threat of such an incident, did perform resilient activities to prevent or recover from critical incidents, and showed that the project leader played a decisive role in that process. Moreover, these cases could provide easy-to-reconstruct evidence of reflection by the project leader according to the reflective practitioner model, in the sense that the full Schönian model could be reconstructed. Of the 18 project leaders in the database, those three examples stood out: these project leaders had clearly reflected on the situation at hand and on their own behaviour. The three cases selected are presented in Table 2.

Table 2 Cases

Main target of the project leader's reflective practice	Organization and innovation project
1. Project leader Team01 project: get stakeholders on board	Team01 is an R&D team in the dairy industry; the project is a co-innovation with another company aimed to develop a specific substance as an ingredient for food products.
2. Project leader Team06: continuous impact management	Team06 is an R&D team of a food and care products producer. The project was set up to use (deploy) a new product much faster than normal. In this project, there were no critical incidents, only limited incidents, but there were several high risks of critical incidents.
3. Project leader Team17: redesign the product	Team17 is an R&D team of a company producing automated material handling systems. This team's project was to develop an automatic detection system of human beings by measuring body form and the body heath.

The 18 teams are anonymized for privacy reasons

Results

Project leader Team01: get stakeholders on board

William is a highly experienced project manager of innovation projects; he is circa 50 years of age. The innovation project he led was aimed at developing a certain substance as an ingredient for food products; the project was carried out in cooperation with a co-innovation partner (another company). William's role was to bring the right people from the management side of both companies together and to recruit people from his own R&D team and the R&D team of the partner. Over the years, William had developed his own set of project management tools, which enabled him to steer projects in terms of the '5 Ps': pace (tempo, timing, meeting); points (issues); persons (internal and external stakeholders); presentation (framing and communication); and place (where things happen). Based on his experience, he could anticipate certain issues in different project phases. This 'reflection-on-action', or reflection on past experiences, structured his actions. As William explained, it had taken 2 years before the actual start of the project in question to 'find the right people': approaching the right managers at the right moment to build a business case for the project had been a delicate task. Once the project had been launched, critical incidents arose during the collaboration with the co-innovation partner. The main two incidents were disputes about IP (intellectual property) rights and the fact that the co-innovation partner had trouble convincing their business side that the innovation objective was good for their own business. The first incident, William said, was only to be expected, because IP disputes are more or less normal in such situations. Such disputes are often complex and absorb much time. In this case, an external expert had to be brought in to mediate in the matter; however, William had anticipated this and could quickly apply the required scenario. 'It was critical, we almost walked out of the project.' The second incident was a 'hidden' incident, because their partner failed to inform them that their business had not given the green light to go along with the project and finance the necessary research activities. In fact, their partner kept redefining the objective of the project, which, in retrospect, was done to convince their internal business partner by adjusting specs and scopes. Meanwhile, William had to act on the recurring unexpected delays. Right after the project had been launched, the partner already wanted to redefine the specs. Not only did this threaten progress, but it also endangered the acquisition of internal

resources from their own business side, because people grew nervous. To ensure enough progress, William called a meeting during which the project teams of both partners were set the assignment to make a system description. Ten to 12 routes were developed to realize the requirements of these so-called conceptual approaches, after which a limited number of most likely routes were selected. This resulted in five prototypes, with enough cogency to keep the internal business department on board, and let the team continue their research work. A striking feature of this project leader's organizational skills—professional artistry in Schön's words—was his conviction that it was important to hold regular team meetings, even when no new results had been realized. 'Projects need rhythm. Regular meetings provide rhythm but also create a sense of urgency and cohesion. I firmly belief in doing things together, making plans together, and listening to what people have to say. Even when you do not have a clear reason for meeting up, it is always valuable.' According to William, the results of such regular meetings are new ideas, hunches and unexpected yields.

Project leader Team06: continuous impact management

Marcus is an energetic and experienced project manager in his early forties. The innovation project he led was aimed at bringing a new product on the market, called deployment, which implied preparing the production process, including packaging and transport, and getting the product 'on time in full on the shelf' of targeted retail businesses. The normal time for such a deployment process needed to be cut in half, which was deemed nearly impossible. Although not a critical incident yet, a risky situation arose that could easily become an incident. The purpose was to launch the new product line quicker than competitors in the same market segment. Marcus accepted the challenge, built a project team and scrutinized and anticipated possible caveats, after which he and his team closely monitored the process of preparing, testing and executing production, whilst keeping an eye on the entire line from factory to consumer. His reflection-in-action was based on his reflection-on-action in former deployment projects. Despite the presence of a high risk of critical incidents, due to extremely tight planning, the project went well. As the preparation, testing, production and transportation of the product were tightly interrelated, one serious mishap could have meant a delay in the product launch of 6 months. Unplanned issues that emerged were sudden changes in the production lines, a cap of a mismatching colour, a new tube that burst during production and spare parts that were delivered too late to another production site. The project leader and his team anticipated any possible problems at every stage of the project: they kept 'going up and down the project' in order to assess and monitor possible risks, the possible consequences of these risks and developed back-up plans. 'We had an extremely high number of back-up plans, like I've never seen before.' Throughout the project, they communicated intensively with their partners at local test and production sites. For any unplanned issues that occurred, solutions were quickly developed. Meanwhile, the project leader communicated any progress and setbacks in detail to the business side, the actual marketing department that had commissioned the project. As this shows, the project leader kept going through the research methodology, as if it were a cycle. Whilst the organization used tools for continuous impact

management and consequence management, and trained its staff to employ these tools, the project leader's professional artistry lay in how he managed the expectations of stakeholders and suppliers. 'You must know how the game is played here.' Marcus knew what marketing and business need. He discussed every relevant detail with the different departments, keeping them feel fully informed and getting their immediate feedback on how to proceed. He was familiar with how higher management judges and evaluates progress. For example, information about the mismatching colour cap could have been fateful if it had been given too early in the process, but by timing this news cleverly at the point of no return, accepting it as a fact was traded off against meeting the deadline. 'You know, when a deadline approaches fast, details become less important, like the colour of the cap. They decided to leave it as it is, which we had anticipated.' Marcus knew how to put the right (contractual) pressure on suppliers, so as to get them to solve the issues they were responsible for in a timely manner and prevent his own project from getting delayed. One mitigation measure he took was to split up production lines in order to minimize risks; another was to plan production first and the tubes later. In all these activities, the golden rule was to provide the solution before a problem was brought to the table.

Project leader Team17: redesign the product

Alexander, an entrepreneurial person in his mid-thirties, has worked as a project manager for a few years. The purpose of his team's innovation project was to develop an automatic detection system of people by measuring body form and body heat (3D and infrared) on a conveyer belt system. He and his team members joined the project at a late stage, inheriting the task from their predecessors. The predecessors had already performed the feasibility study and defined the scope of the project, and the new team continued from the point where the old team had left off. Along the way, several critical incidents occurred, in the form of technical setbacks to do with camera hardware, image processing and the software from an external supplier. At a certain point, the project reached an impasse. The accountable manager wanted the team to continue according to plan, because so much had already been invested and the business case still seemed valid. However, Alexander sensed that the original plan would not work and wanted to find alternative ways, exploring other avenues that might be more fruitful. He started meetings with other R&D people, organized a work session with his team, and soon some new ideas emerged, which he wanted to test. 'A conversation of one hour with a software developer resulted in a new concept, which we explored further with the team.' Yet the accountable manager wanted the team to continue with the original plan, which the team duly did, until a few months later, when they reached a dead end. This opened the way to present the new ideas to the management team, who soon grew convinced of the possibilities. Alexanders' reflection-in-action was to try and change tack when he sensed the old idea would not work and a new idea seemed more promising. He consulted others on the validity of his hunches and gradually developed new ideas. He let the team prepare presentations supported by the evidence needed for the management team to be convinced of the worth of changing course. The evidence-based

presentations were important to persuade both the project manager and the management team.

Overall view

Table 3 summarizes the findings in terms of the research methodology (as set out in Table 2). In all three cases, reflection could be perceived, and more occurred than just tacit 'knowing in action' or performing a task without giving it any thought. In all cases, the project leader assessed whether the execution of the task matched or mismatched the desired effect, and they sensed the likely risk of a mismatch: 'reflection-on-action' was triggered by looking at what was actually happening (Alexander; William in the case of B) or what might or might not happen (William in the case of A; Marcus). In William's case B (the partner redefines the scope) and Alexander's case (the design does not work as planned), what Schön would call a surprise occurred, as the mismatch was assessed as an unexpected outcome of task execution. In all three situations, the project leader's reflection remained within the 'action-present', and their solutions were partly single-loop actions. This means that the solutions they applied were to a degree instrumental means-end reflection on actions (technical rationality), as they fell mainly within existing values and norms. Yet at the same time, the solutions applied could also be described as double-loop learning actions, resulting from reflection on norms and governing values. Marcus' solutions to keep the deployment project on track remained within the boundaries of deadlines and quality norms and were therefore single-loop; however, he crossed the boundaries of existing values in the way he dealt with suppliers—note that he showed risk-taking and not reckless behaviour in the entrepreneurial sense of the word. Moreover, when he accepted the assignment, he negotiated with his managers to loosen the rules of the stage-gate model which is usually applied in deployment projects. Alexander and his team developed a new design that was partly based on former feasibility studies, but they added new technical insights that lifted the solution to a double-loop form of action. William's solution for the IP rights issue—calling in the help of an external expert—was a single-loop solution or a foreseeable intervention. His solution to deal with the partner's continuous redefinition of the objectives and scope of the innovation required solutions beyond the standard model of his own project management tools. Although it is true that he was equipped to cope with unexpected situations, William's design of the system description session included elements of improvization in order to reach consensus with external and internal partners. Stretching the rules to keep partners on board and keep the business case clear for his own commercial department makes this a double-loop solution.

While this reflection-in-action shown by the project leaders took place within the action-present, the experimenting and testing they did were also carried out within the action-present. Broadly speaking, one could call this 'on-the-spot experimenting and testing'. Before implementing their solution, the project leaders reflected on the possible effects of the actions they were about to undertake, which could be seen as ante-action-reflection. The clearest example of this is the presentations given by Alexander and his team, which formed a pre-evaluation of what might be expected from the new design. This return to reflection-on-action by the project leaders closes the circle of the Schönian model.

Table 3 The research methodology applied by project leaders of innovation projects

Innovation leadership by applying a research methodology as a stepwise approach	Team01 project leader (A and B here refer to 2 critical incidents)	Team06 project leader	Team17 project leader
1 Sensing an unexpected outcome: what is going on? Reflect on one's understanding, feelings and experience of an incident	A Pre-sensing possible risks with IP rights B Experiencing delay and redefinition of objectives	Anticipating issues that are expected to emerge	Sensing that present design is not going towork
2 Experiencing and acknowledging an unexpected outcome: is there a problem? Structuring the incident and bringing it to the surface (explicating what is implicit)	A IP distribution needs to be settled B Objective must be made clear in system description	No unexpected outcomes due to anticipation and being alert; risks are explicit	Acknowledging that a new design is needed
3 Assessing ('scoping') the implication of the outcome (defining boundaries and governing values; critical evaluation of outcomes)	A Action is a single-loop solution: intervention by expert B Action is a double-loop solution: arranging a special session	Action is single-loop: keeping risks within manageable boundaries and double-loop: creating workarounds when needed	Action is single-loop: finding new ideas partly based on former feasibility studies and double-loop: developing additional solutions based on new technical insights
4 Assessing the outputs and outcomes and developing alternatives (conceptualizing, restructuring)	A Agreement on IP rights will continue the project with the partner B Developing routes will continue cooperation and team work	Back-up plans are made for likely deviations	Developing a new design by consultation of others and team
5 Experimenting and testing alternatives (general hypothesizing, (re)designing new actions) and striving for validated data (operationalization; incorporating new actions into a testable framework)	A Consensus is drive for sharing business with partner B Trust is a drive for collaboration with the partner team but not always achieved	Solutions for emerging issues are designed on the spot	Gathering evidence-based information, preparing and giving presentations
6 Anticipating effects of the newly chosen solution; pre-evaluation (specific hypothesizing)	A IP-right distribution is a condition for sharing B A good business case will convince business side of partner	Solutions for issues are provided to stakeholders in advance to gauge their responses	Building a business case for the new design
7 Executing the new solution (intervention, implementation of new action)	A Effectuated B Effectuated	Effectuated	Effectuating new plan
8 Evaluating the outcome of the new action or solution (feedback, a return to 'reflection-in-action' and 'on-action')	A Cooperation continued B Five prototypes were developed in the end	Project debriefed to gather lessons learned	Execution is underway; expectations are favourable

Some limitations of the study

From a research point of view, there are some limitations to this study. First of all, our selection of examples is very small, which does not allow for generalization to a higher level, but only serves to confirm our theoretical conceptualizations. Second, the original sample of 18 projects was not targeted at analysing the reflective practice of project leaders but aimed to arrive at a broader understanding of team dynamics in innovation projects. The present study followed an unexpected serendipitous hunch the researchers had after having completed the basic fieldwork. Third, deducing reflective behaviour of professionals from face-to-face interviews suggests that the researcher can retrospectively objectify what a practitioner has been doing whilst being unaware of doing it. This 'thinking for others' can be invalid if not tested properly. The validity could have been approved if the findings had been discussed with the respondents.

Discussion

A note of self-criticism is that we may have given the impression that making Schön's tacit model explicit is to give it a rational-technical turn. To a certain extent, this is no doubt true, yet doing so seems unavoidable if one wishes to gain an understanding of what goes on in organizations. Such tensions between wanting to know and realizing that rationality has its limits are hard to avoid. Our integration of reflective practice and organizational learning could be described as a 'too neat' exercise, reminiscent of the 'paradox of coerced freedom' (Dalton 1959: 243) identified long ago, which describes how leaders and managers have a certain amount of freedom to act on their own (informal organization) as long as it does not harm superiors (formal organization). Double- and triple-loop actions may require the freedom necessary for innovation, yet they constitute a conflict with the organizational standard model, which, in its turns, touches upon the question of which values promote the best way to move forward.

In order to meet the mentioned limitations of the study, a follow-up research is needed that at least takes two steps into account to support the validity of results. The first step is to use an instrument that enables the valid measurement of each of the steps of Schön's model, and the second step is a way to analyse the data resulting in highly reliable interpretations. In this study, we did not have such instruments. In fact, we followed a hunch to understand what we experienced as it emerged. Future studies could for example develop a validated instrument before data are being gathered and apply inter-rater reliability by having the data analysed by more researchers. Other than our exploratory analysis which performs phenomenon detection that precedes theory development, hypotheses could be formulated to be tested on new data sets. In order to validate the conceptual theoretical notions of the reflective practitioner and the application of a rigorous research methodology as a behavioural tool in leading innovation projects, future research is needed to test the hypothesis that effective problem-solving project leaders apply such models when critical incidents occur. Taking into account the risk of social desirability in answering questions, a combination of observation of project leader behaviour and measuring the presence of the steps of reflective practitioner model (see Table 1) via interviews or surveys could be a fruitful avenue.

From a theoretical point of view, we have limited reflective practice to situations of problem-solving by project leaders of innovation projects. We could easily be criticized

for ignoring team contexts and the interaction with others and making a quick connection between an individual's intrapsychic and extra-psychic behaviours. We do acknowledge that these are important issues, which can perhaps be explored by others (for criticism on Schön, see also Finlay 2008). However, we would like to stress the relevance of individual reflection for innovations brought about by teams. Reflection is essentially an individual's intrapsychic activity. 'What presents a large challenge for individuals is all the more so for teams and especially teams that are working together in projects as they are faced with problems that can seldom rely on routines as project work is highly problem based' (Schley and Van Woerkom 2014: 116). This means that reflection in teams or team reflexivity (the extent to which teams collectively reflect upon and adapt their working methods and functioning) is crucial for team learning and innovation (Schippers et al. 2007, 2008, 2015) and arrives at effective and efficient team work (Schley and Van Woerkom 2014). Other researchers have found that, for teams working on innovative projects, team reflexivity shows a positive association with team effectiveness, but not with team efficiency (Hoegl and Parboteeah 2006). Research on favourable conditions for team reflexivity points to transformative leadership (Ollila 2000), the team leader as initiator and the importance of psychological safety (Schley and Van Woerkom 2014). In order to promote innovativeness at the project level, project leaders need to consider how their leadership influences the behaviour of the different project members (Ollila 2000; Clarke 2012).

An important prerequisite to benefit from reflective practice for innovation seems that professional artistry or skill and its value are made explicit. Ultimately, it should be accepted that there will always remain a paradoxical tension between technical rationality and the 'arts' of professionals; however, organizational members have to become aware of the choice they make about their espoused and applied theory-in-use. A practical means to align one's espoused values with the theory-in-use is to apply the steps of the reflective practitioner and organizational learning model (see Table 1 and Fig. 1) when mismatches are experienced. To make innovation leadership a team attribute, it is recommended that this model be applied at the level of the (project) teams when critical incidents are met.

Theoretical and practical implications

This article has made a contribution to the theory in two ways. In the first place, the behaviour of project leaders was made explicit with the reflective practitioner model and by doing so that model itself was made explicit as a rigorous research methodology that some project leaders apply in practice. In the second place, a relation was made between the reflective practitioner model and the model of organizational learning which resulted in a model to on the one hand enable to explain what project leaders are doing, and on the other hand to provide a framework for learning and improving effective leadership behaviour through making explicit what often remains implicit.

Our findings have certain implications for innovation projects, both from the perspective of organizational learning and that of innovation leadership. First, the organizational learning model makes a distinction between single-, double- and triple-loop learning. In our small sample, the three project leaders applied single-loop learning actions for solutions which were already part and parcel of their repertoire of available actions. Double-loop learning actions were designed to implement solutions that

went beyond the present norms (standards) but fell predominantly within governing values (corporate rules of the game). The double-loop learning actions showed more of the project leaders' professional artistry or skill. Triple-loop learning did not take place in any of the cases studied. Second, innovation leadership means that one influences others in order to achieve innovation success. Reflective practice is not always or easily observable; however, just as professional skill, it can be observed in its effects. Such effects can form a subject for reflection and imitation by team members and thus offer an opportunity for learning and obtaining new knowledge-on-action. Making this tacit research methodology of project leaders explicit (see the organizational learning model in Fig. 1) would be beneficial to other project leaders and for project teams doing innovation projects.

For practitioners, the take-home message rests on the notion that critical reflection can form a weapon against organizational inertia and the cover-up of undesired situations that require a change, as can sometimes happen during innovation projects. Technical rationality closely resembles the dominant theories-in-use in organizations. Theories-in-use often represent the single-loop norms and governing values on which everybody unconsciously agrees. Even if theories-in-use do not work, people will hesitate to refute them, for fear of appearing incompetent or disloyal (Argyris and Schön 1974, 1996; Schön 1983). However, as our discussion of reflective practices and professional artistry shows, a new theory-in-use can emerge that specifies double-loop norms and governing values on which most people agree when they are made explicit; examples are valid information, free and informed choice and internal commitment to the choices made (Argyris and Schön 1974: 87).

Conclusions

In all three cases studied, the project leaders of innovation projects acted as problem solvers and applied a Schönian model of reflective practice that closely resembles a research methodology. This research methodology goes beyond rational-technical instrumentalism, as it combines with the project leaders' professional artistry or skill, which efficiently and effectively supported them whilst sensing, designing, testing and implementing solutions. Professional artistry is a personalized capability to design solutions according to one's reflective appraisal of events, situations and relations, which cannot always be expressed in words, according to Schön. Mostly unaware of the Schönian model, the project leaders studied each had their own problem-solving methods and ways of dealing with critical incidents. However, despite the fact that their problem solving was not merely instrumental, they all took more or less the same steps. They all sensed or foresaw an undesired outcome, which triggered the need to find out what was going on and led to a search for alternative solutions. These alternatives were tested on their likely consequences, and subsequently implemented and monitored. When project leaders reflect-in-action, they are likely to reflect on both past actions and future outcomes; when they design solutions consciously and deliberately, they seem to apply ante-action-reflection. As the cases of William and Marcus show, if project leaders anticipate critical incidents, they can undertake single-loop actions; however, at the same time, they can flexibly add double-loop actions when needed, as could be seen when William and Marcus created workarounds to stretch their 'action present'.

Endnotes

[1]Tosey et al. (2011) refer to Bateson's III-rd level of learning, which they regard as exemplary for triple-loop learning.

[2]Argyris and Schön (1974) do mention deutero learning, which is not equivalent to triple-loop learning but points at reflexivity in processes of learning at either single-loop or double-loop learning levels (Visser 2007; Tosey et al 2011), which Visser (2007) dubs meta-learning.

[3]As in Bateson's level III of learning (Tosey et al 2011).

[4]The steps (circles with figures and letters) of Fig. 1 are shown in the left-hand column of Table 1.

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Authors' contributions
PRAO and JBRG are the main conceptual architects of the article. TvV and SD strengthened the analytical structure. All authors read and approved the final manuscript.

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Competing interests
The authors declare that they have no competing interests.

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