

Back to thinking mode: diaries for the management of information systems development projects

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Abstract. From a practical point of view, systems development methods are important sources of inspiration for the planning and establishment projects, but only to a limited extent do they support the reflections and actions of the participants. We propose the use of diaries as a supplement to conventional methods of reflection on what actually happens and what could happen during the course of a project, i.e., we propose diaries as a medium for the management of information systems development projects. This idea is based on an exploratory study carried out in co-operation with a bank and a research department, and the idea is supported by theoretical arguments from different fields. In conclusion, some practical advice on how to use diaries is given together with some questions for further investigation.

1. Introduction

Conventional methods for the development of information systems are basically procedures to be followed. It is assumed implicitly that by doing as prescribed in the method, one will arrive at acceptable solutions without facing problematic situations or unforeseen obstacles and conflicts. The major managerial problem seems to be how to choose the best method in a given situation.

The basic assumption of this paper is that the reality faced by participants in real projects is somewhat different. Typically a variety of methods are applied, practitioners seem to rely as much on experience and intuition as on methods, and many problematic situations arise.

From this point of view practical management of information systems development is an important issue for all project participants. It is our belief that information systems development cannot be carried out blindly according to given guidelines and procedures without active intervention from the participants. System developers have to reflect continuously on previous and future situations and create and modify actively conditions and patterns of behaviour. Conventional methods address these issues to a limited extent, and we suggest that diaries can be used as a medium to support the reflections involved in project management.

The paper is based on an exploratory study and as such the emphasis is on presenting relevant ideas rather than on providing evidence. An experiment was carried out in co-operation with a bank and a research department (Bengtson *et al.* 1985). Three groups of computer science thesis students underwent the same analysis and design task within the bank. Each group was given realistic conditions for performing the task, but they applied different methods and operated in their own branch of the

bank. The purpose of the experiment was to compare the methods on the basis of practical experiences.

To this end it was decided that each group should use diaries as an empirical research technique (Naur 1972, 1983). The diaries contained notes on what happened and on what should or could have happened during each of the projects. They served as protocols of the participants' experiences and at the same time they had a constructive effect on the way each project was organized and carried out. The reflections entered in the diaries supported the participants' understanding of situations, problems and options in the project. Moreover, they seemed to commit the actors to plans and to bring awareness to mistakes, problems and conflicts which might otherwise have been overlooked.

Our findings have been reported in detail elsewhere (Jepsen and Nielsen 1986). Within the framework of this paper, we start in Section 2 by presenting our own experiences in using diaries for project management. In Section 3 we proceed by relating our own findings to different theoretical observations. Section 4 contains practical suggestions on how to use diaries for project management.

2. Observations

At the basis of our experiment is the following thesis:

'Project groups can use diaries as a medium to support management of information systems development projects'.

This thesis is based on observations made by the groups during the experiment. The most important of these observations are shown in figure 1, and some will be dealt with in more detail later.

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1. Writing diaries encourages the establishment of new working habits.
 2. Writing diaries enhances the participants' understanding of the methods applied.
 3. Diaries are a useful medium for clarifying problem solving situations.
 4. Plans should be in written form and integrated into the diary.
 5. Diaries are useful when evaluating projects and project situations.
 6. Writing diaries encourages interplay between planning and evaluation activities.
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Figure 1. Observations from the experiment.

2.1. Changing working habits

Observation 1 'Writing diaries supports the establishment of new working habits'.

One group analysed the handling of loans in the bank using dataflow diagrams (DeMarco 1978). According to this approach one should start by describing the context of the activity in question, i.e., the handling of loans. However, during the first interview the group realized that it was difficult to get a straight answer to their questions. This situation was recorded in the diary as follows:

- Extract 1*
3. Action.
With help from Sven (the manager) we got hold of Mogens (a clerk) who was working on a specific loan.
 4. Action.
Interview with Mogens. We tried to explain to him what we wanted to know. We made a sketch showing the loan activity as a circle in the middle surrounded by a number of boxes, which we wanted him to denote.
 5. Reaction.
Mogens did not seem to grasp the idea.
 6. Action.
Mogens started explaining in a more unstructured manner (in relation to our notion of context) based on his own perception of the loan activity. Whenever we heard something of relevance we wrote it down.

During the interview the analysts realized that situations developed unexpectedly. In fact, the interview stopped, as the clerk did not understand the analysts' questions. Then the clerk took the initiative. Apparently, the analysts accepted this new approach, listening and selecting the relevant information.

The important point here is, that the diary entries made the analysts reflect on this incident. They did not state explicitly that the first approach proved useless while the second seemed more practical. They did, however, establish the second approach as a practical way of applying the method in question, and this approach was applied later in the project when analysing other activities in the bank. Writing the diary supported the analysts' reflections on what happened – instead of their merely being satisfied by the fact that they succeeded in producing the context diagram prescribed by the method. In this way they learnt from and took advantage of their early experiences and established new working habits.

In another situation the analysts interviewed a clerk on the basis of the context diagram produced earlier on. The purpose was to produce detailed dataflow diagrams of the loan activity. The following extract shows how the early part of the interview was recorded in the diary:

- Extract 2*
11. Action.
We started interviewing Jens (a clerk).
 12. Reaction.
The situation soon became chaotic.
 13. Comment.
This happened because:
 - we had to hurry because it was 2.30 p.m. and the bank closed at 4.00 p.m.,
 - we felt that everyone in the bank was very busy,
 - we hadn't prepared our approach carefully. Our questions didn't follow the same line of thought.
 14. Action.
The interview became more and more unstructured. Written, formal banking procedures were suddenly confused with what actually happens in the bank.

15. Decision.

Everyone agreed that the analysts should leave and study the written, formal banking procedures.

At this stage the analysts did not know how to develop dataflow diagrams in co-operation with a user. After analysing the situation they admitted that they had not made sufficiently careful preparations, whilst also blaming external conditions (cf. 13. above).

At the next interview with the clerk, it was agreed that analysts would ask the questions and draw the diagrams individually. (During the previous interview one would draw the diagrams whilst another would ask the questions.) The second interview brought further insight:

Extract 3 28. Comment.

It is a bad idea to let one analyst ask questions and the other draw diagrams, as the dialogue concentrates on what is actually drawn.

29. Decision.

The analyst asking questions should also draw the diagrams. The other can write down further questions for later clarification.

30. Comment.

Dataflow diagrams supported the dialogue between analyst and user when used in this way.

31. Comment.

We each have our own style of interviewing users. This is another important reason why the first interview became chaotic.

32. Question.

Should one structure the interview according to different levels of diagrams or should one let the interview develop more freely?

In this case the diary served as a medium for reflecting on a sequence of related interviews. As the interviews continued, the analysts developed a more profound and practical understanding of how to use the chosen method. Writing the diary provided the analysts with an opportunity to evaluate and develop their working practices in a systematic and coherent way:

- The discipline of writing a diary invited the analysts to reflect on problematic interview situations immediately after the incident while impressions and ideas were still present.
- The diary served as a shared memory presenting different situations as parts of the same totality.
- While writing the diary the analysts continued to search for explanations of the first chaotic interview and from this it emerged that each analyst had his/her own interview style. In this way the diary served to trigger the observation of important, latent aspects of working practices.

2.2. *Evaluating and planning activities*

In the context of this paper, it is not possible to deal with all the observations in figure 1 and we therefore turn to:

Observation 4 Plans should be in written form and integrated into the diary.

Observation 5 Diaries are useful when evaluating project situations.

Observation 6 Writing diaries supports the interplay between planning and evaluating activities.

The following diary extract deals with detailed project planning and evaluation:

Extract 4 Plan for next visit to bank

1. Start by going through financing of buildings with Lars (a clerk). Use the notes produced last Tuesday.
2. Kurt and Winnie (clerks) must check our first model of car financing. Remember to explain the principles behind the model.
3. Make Kurt and Winnie refine the model into tasks.
4. Open conversation with Karen (a clerk) on student financing.
5. Estimates of the four tasks
1: 1.5 h; 2: 1 h; 3: 0.5 h; 4: 1 h.

Visit to bank

1. We went through financing of buildings. We asked questions, Lars explained and elaborated. The notes were of great help.
2. We made new notes directly onto the old diagrams and descriptions.
3. It was difficult to have descriptions checked by two people at the same time when there was only one copy.
4. We explained the principles of the model to Kurt and Winnie. No problems.

In this case we see how the diary was used for planning and evaluating purposes. The detailed plan of the next meeting was written down in the diary, and in the subsequent records of the meeting we found several evaluations of elements from the plan.

The relation between project activities, reflections on evaluation, and diary notes, is illustrated in figure 2. In the experiment the diary was always written in close

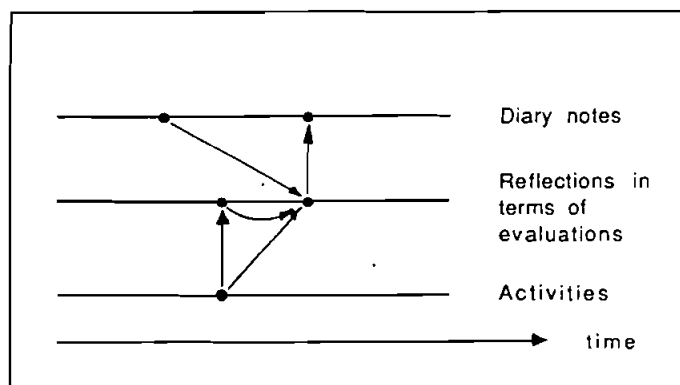


Figure 2. Using diaries as a medium for evaluating project activities. Evaluations are based on activities, previous reflections and diary notes and result in new diary notes.

connection with the activities. In this way evaluations were based on a full picture of the situation in question. At the same time earlier notes in the diary – e.g., plans – would also be at hand so that intentions and earlier evaluations could be taken into account.

Figure 3 illustrates the relation between activities, reflections on planning terms, and diary notes. During the experiment the groups established a certain discipline in writing in the diary, which had a positive effect on planning activity. Plans were carefully worked out, and the participants seemed committed to them because they produced them themselves. Moreover, the plans were realistic: first, the detailed plans were always made in close connection with the activity. Second, the participants would always be confronted with the plans in the diary during the subsequent evaluation of the activity. And third, each group developed and recorded specific knowledge on how many resources were needed for various types of activity.

Analysing the experiment in general, the use of diaries seemed to introduce both discipline and care into each group's working practice. Each group managed to establish and maintain the discipline of writing in their diary in close connection with all major activities throughout the project. At the same time each group continued to consider diary writing as a meaningful task, so that, at the end of the project, the diaries consisted of careful descriptions and evaluation of what happened and what should or could have happened. In our context this practice was, to a large extent, a result of the agreements and social commitments that were established as part of the experiment. The interesting point is, however, that we did not experience discipline and care as mere prerequisites for the production of useful diaries. Throughout the projects, discipline and care were maintained and developed in the diary practice. These virtues even seemed to affect the working practices themselves.

On the basis of our observations we believe that the use of diaries can have a positive effect on the discipline and care of a project group's working practice in general. Partly because diary writing requires and maintains such a practice, but more importantly because the diaries serve as an effective medium for reflecting on working practice.

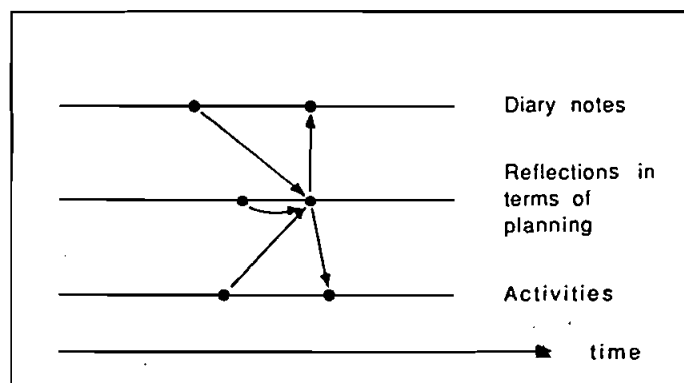


Figure 3. Using diaries as a medium for planning project activities. Planning is based on activities, previous reflections and diary notes and resulting in new diary notes and, hopefully, in new activities and new working habits.

3. Theoretical considerations

To support our thesis we proceed by looking at some theoretical considerations related to professional practice, information systems development and the use of diaries in general.

3.1. *Reflection-in-action*

We can apply two different perspectives to professional practice: technical rationality and reflection-in-action (Schön 1983).

From the technical rationality point of view, professional practice is seen as instrumental problem solving. The practitioner starts with given objectives and chooses optimal means to realize them. In doing so, the professional practitioner uses scientific knowledge to perform specific tasks and to select methods and techniques that apply to different types of situations within his practice. According to this view, professional practice situations can be categorized scientifically, the knowledge applied is a result of scientific work, and professional practice is seen as different from related scientific work: professional practice applies scientifically-based theories and techniques whereas scientific work develops these theories and techniques.

In contrast, the reflection-in-action perspective assumes that the different situations of professional practice are unique, complex, uncertain and even discordant. Here the practitioner must be aware of the uniqueness of the situation and behave accordingly. In addition, it is often possible to see or comprehend only small fragments of the situation because situations are typically dynamic, consisting of complex networks of problems and conflicts. According to this view knowledge and action are intrinsically related. The practitioner's knowledge is in his actions and cannot be fully described. Professional practitioners do research in the situations they find themselves in, reflecting while they act, and developing new insight as part of their daily practice.

What is needed from the technical rationality point of view, is a suitable set of general methods and techniques for the development of information systems, combined with methods for the analysis of situations and the selection of appropriate methods and techniques (Davis 1982). From the reflection-in-action point of view this is far from sufficient. The system developer must master a repertoire of general methods and techniques and he/she must know how to choose from this repertoire in different situations—at the same time having the competence, resources and the means to cope with the uniqueness of situations. It is our claim that project groups can use diaries as a medium for reflecting on the situations they face and for combining knowledge about methods, techniques and other situations with insight into the specific situation in which they find themselves.

In other words, we argue that our basic thesis is supported by the reflection-in-action view of information systems development. The diaries contain descriptions, evaluations and reflections on the actions contained in the systems development project. Furthermore, in our experience there is a close interplay between diary writing and action: the diary is written in close connection with the actual activity, and descriptions and reflections in the diary address and affect future situations and actions. It is fair to say that the diaries in our experiment served as a link between the actual course of the project and our reflections on former and future situations.

3.2. *Information systems development*

Still, some would argue that technical rationalism is a more realistic or useful view of information systems development than the reflection-in-action view. Most of the

literature on information systems development relies on this assumption. There are, however, several authors who strongly disagree.

Naur (1985) argues that intuition plays a dominant role in systems development and he concludes that programmers' experience and integrity are more important than their use of methods.

Lanzara (1983) argues that technical rationalism does not always apply to practical systems development. In many cases the practitioner will have to abandon the idea of optimal solutions and apply Simonian bounded rationality to reach a satisfactory solution. Sometimes the practitioner will even face situations where no objectives are stated and where the task is to set the problem, i.e. the practitioner has to go from an open, unstructured situation to a structured perception of the situation formulated in terms of a problem to be solved.

Mathiassen and Munk-Madsen (1986) discuss the limits to applying formalizations in systems development. They argue that formalizations are valuable in some situations but insufficient in others. They suggest that as an alternative to using formalizations system developers reflect on the situations in which they find themselves, and from there adapt a combination of a formal and informal approach.

Finally, Parnas and Clements (1985) examine several characteristics of systems development. They argue that the image of the system developer deriving his/her design in a rational, error-free way from a statement of requirements is unrealistic. They conclude that no system has ever been developed in a rational way, and probably none ever will. 'Even the small program developments shown in the textbooks and papers are unreal. They have been revised and polished until the author has shown us what he wishes he had done, not what actually did happen.'

In summary, we claim that practical information systems development cannot follow the technical rationality ideal. Information systems developers do, in fact, reflect in action – they do operate more in 'thinking mode' than in 'performing method mode', and that is why the conventional methods ought to be supplemented by other approaches.

3.3. *Diaries*

Diaries are a well-known media for private, personal reflection (Rainer 1983). Rainer describes the general intention of keeping a diary as the personal development of the author. The idea is to understand oneself better, to obtain greater self-confidence, to feel more integrated and balanced, to discover one's own patterns of behaviour etc. Diaries deal with what people think and feel as part of their daily lives.

Our thesis is, on the one hand, supported by these general experiences. Diaries are considered a useful means for personal reflection and development. There are, on the other hand, some important differences between the way diaries are generally used and our idea of using them as a medium for effective management of information systems development:

- our aim is not personal development as such but professional development,
- our notion of 'diary' is a collective means for reflection and development, not a private one.

Being aware of these differences, we still claim that the general experiences in using diaries can be transferred to specific areas of professional life as a supplement to more conventional methods and as a means to support reflection-in-action.

4. Practical advice

We conclude our discussion by giving some practical advice on how to introduce and use diaries in a project group. Some of our own experiences from the experiment on how to use diaries are summarized in figure 4. The advice given is based on these experiences combined with Rainer (1983) and Naur (1972, 1983).

We have deliberately chosen to give advice instead of guidelines to be followed. Each project group should develop its own mode of operation that suits the conditions of the project and the working habits of the participants. Our advice can serve as a starting point and a source of inspiration.

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1. Inexperienced diary writers should experiment with different forms.
 2. Collective diaries provide better opportunities to gain insight than individual ones.
 3. Using checklists can help produce a fuller image of the project.
 4. A review of diary notes can improve the quality of the diary.
 5. It is cumbersome to write a rough draft before the actual diary note.
 6. It is often considered an onerous task to write a diary.
 7. Many descriptions in the diary are useless because they are too superficial.
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Figure 4. Observations on diary writing.

Advice 1 'Make the intention clear'.

The project group should make clear why they start writing a diary, and what types of effects or changes they intend to obtain. If the intentions are clear these will serve as criteria for the participants when selecting and evaluating what is relevant information.

Advice 2 'Be disciplined and careful'.

There is considerable difference in deciding to write a diary in a project group to actually doing it in a useful way. The project group must establish and develop a certain discipline and care in writing and using the diary. Discussing the intention and form of the diary can help commit the participants to the idea. Later on, reviews of diary notes can serve the same purpose, and at the same time support the development of a useful form that suits the participants.

Advice 3 'Make a checklist of issues'.

It is important to have a clear notion of the diary's relevance. Clarifying the intention makes one step in this direction, but a more refined checklist of issues is also of practical help. It is impossible to let the diary address the project as such. At the same time it is important to establish a reasonable balance between the resources needed to write the diary and its practical use as experienced by the participants, cf. figure 4, observation 6. There are several general areas of concern, e.g.:

- the working practice,
- methods and techniques applied,
- project plans,
- conditions of the project,
- the task and the user organization,
- ideas on improved or changed working practices,
- written documents.

Advice 4 'Be selective and thorough'.

Give priority to problematic situations. Be critical of what happened and try to go beyond immediate observations and explanations. Superficial descriptions with no arguments are of little help later when one returns to the situation to compare it with others and learn from it.

Advice 5 'Decide on when'.

There are several different possibilities, but it is important that the project group decides on when to write the diary as part of establishing the necessary discipline. The diary can be written:

- integrated with the activities in addresses,
- as a separate activity based on notes produced during the activity it addresses,
- as a separate activity without notes.

Advice 6 'Reflect on how'.

The individual entries in the diary can be of different characters. Some of the options are:

- descriptive vs. reflective,
- chronological vs. according to issue,
- selected by using checklists vs. selected from personal preference,
- quantitative vs. qualitative.

There is no best way of writing a diary. Each project group should reflect on the possibilities and develop its own style and discipline.

Advice 7 'Consider using other related techniques'.

We have already mentioned a couple of supplementary techniques. More generally, the project group should consider using other techniques in relation to the diary, e.g.:

- notes to support diary writing,
- checklist to support selection and development of focus,
- reviews to develop useful diary practice and to maintain discipline,
- baselines to describe plans in the diary that can easily be used in later evaluations (cf. Andersen *et al.* 1986),
- mapping as a way of relating reflections to actions (cf. Lanzara and Mathiassen 1985).

5. Conclusion

We have claimed that diaries can be used by project groups as a medium to support management of information systems development. We propose that such an approach supports the participants by reflecting on their actions and by establishing and modifying working habits. Both the nature of information systems development and the general experiences in using diaries support our thesis. Our own experiences are limited to an experiment, and further practical insight is therefore needed. Among the questions to be investigated further are:

- Is the approach mainly suited to smaller projects?
- Will experienced systems developers find the approach useful?
- What are the practicalities related to learning the approach within a systems development organization?
- Is the approach worthwhile from a strict cost/benefit point of view?

Hoping that others will apply our idea in practice and develop it further, we conclude by summarizing the practical pieces of advice we have given on the basis of our learning:

1. Make the intention clear.
2. Be disciplined and careful.
3. Make a checklist of issues.
4. Be selective and thorough.
5. Decide on when.
6. Reflect on how.
7. Consider using other related techniques.

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