Communication diagnosis of a financial service process

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Abstract

A diagnostic approach aims at discovering problems and breakdowns as well as their underlying causes. Usually, communication diagnosis is performed on the basis of problem lists and not related to process models. In this paper we propose a more systematic approach towards diagnosis that starts with data collection, followed by representation, interpretation, verification and model comparison. The paper presents preliminary results of applying this method on a financial service process.

1 Introduction

In the '90s, many companies have redesigned their business processes in order to make them more efficient and effective. A large part of business process redesign starts with analyzing critical aspects of organizational processes. Many standardized methods have been developed to support this process of analysis. Although these methods contain elements that can be used in diagnosis, they fail to present a structured method for diagnosis of the actual organizational workings. (Te'eni, 2000) adopts the term "top down analysis" for the use of modeling techniques that aim to understand how the system works. He argues that in order to

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detect problems and inefficiencies, this kind of analysis must be complemented with what he calls 'bottom-up diagnosis' that explicitly looks for what goes wrong and why.

In traditional System Analysis methods, diagnosis is part of the first stage and typically based on the collection of problem lists. In this paper, we introduce a new method for diagnosis based on the normative analysis of communication models. This method can be applied as part of an IS development process, but it can also be performed as a project of its own, as a check-up of the organization.

The diagnosis method presented here is based on the Language/Action Perspective (LAP). The method has been used in a case study that we performed in a Dutch banking organization. In section 2, we discuss the notion of "diagnosis" in more detail and introduce the example case study. In 2.4 we will present the diagnostic framework that we adopted. The use of this framework according to the example business case will be illustrated in section 3. We wrap up with a short conclusion concerning the lessons learned in applying the framework and present some directions for future research.

2. Diagnosis of Information Systems

2.1 Diagnosis in traditional IS development

The word diagnosis can be defined as giving a description of someone's disorder or complaint. This means characterising the symptoms of the disorder and trying to find a treatment to cure it. In a "regulatory cycle", one starts to prepare for action, followed by choosing an action, performing the action, and evaluation. Preparing for action, in turn, starts with formulating the problem by observing a mismatch between the current and a desired situation. Diagnosis is then the next step that aims at finding the causes of this mismatch.

In ISAC (Lundeberg, Goldkuhl, Nilsson, 1981), preparation for action is called "change analysis", and this process starts with *listing problems* and *listing interest groups*. In principle, every problem that pops up in the user meetings is included in the list, but some may be put between brackets, for example, because they are not in the scope of the project. The remaining problems are analysed in order to find underlying causes – this is called *diagnosis* and can be supported by a causal graph. During this phase, an *activity model* is made to improve the understanding of the current situation. Also included is an *analysis of goals*. A *change need* is a difference between a problem and a goal. Note that the activity model is used for understanding only and not essential for the diagnosis process. The diagnosis is based on the problems put forward by the stakeholders.

In ETHICS (Mumford, 1983), diagnosis follows problem formulation. As part of the problem formulation, a description of the existing system is made, particularly to support communication between different stakeholders. Diagnosis is split up in diagnosis of efficiency needs and diagnosis of job satisfaction needs. A difference is made between avoidable (controllable) problems and unavoidable ones. After the diagnoses, and taking into account possible future changes, a definition of change objectives is produced with some priority ranking.

The Information Engineering Method (Martin & Finkelstein, 1981) deviates from both ISAC and ETHICS in the sense that it is much more goal-driven. Diagnosis is part of Information Strategy Planning. It does not make use of problem lists, but starts with the definition of business goals. As the focus of this paper is on diagnosis, we will from now on ignore the impact of (extrinsic) business goals in the change analysis.

An important difference between ISAC and ETHICS is that ISAC puts no restrictions on the kind of problems put forward by the stakeholders (the "complaints"). For that reason, it is very hard to formalize the diagnosis (but the process can be structured), and the decision to consider something a problem or not, is entirely a matter of the stakeholders opinion. ETHICS does not formalize the process either, but it restricts the problems to problems of efficiency and job satisfaction. Apparently, efficiency and job satisfaction are the values that the Information System can and should support.

If diagnosis is the process of identifying a mismatch between the current and the desired situation, and then analyzing the causes, one would expect that systematic diagnosis would pay more attention to a careful modelling of the current situation and be more explicit about what is desired. In the case of ISAC, one would expect that the problems in the problem list are traced back to problems in the activity models. If not, there would be no reason to change the activities. But if there are problems in the activity models, then it should be possible to detect them independently of any "complaints". Or, to be more precise, the complaint may draw the attention to a problem, but its status as a problem should be assessable independently. And this leads us to the second shortcoming in the approaches considered above, that they are not explicit about what is desired. If that would be explicit, for example, in the form of norms or quality objectives, then it would be possible to assess the quality of the activity model independently from the complaint. ETHICS is more explicit about what is desirable, but apart from the question whether efficiency and job satisfaction are the only important values in Information Systems, it does not attempt to make these values so explicit that one can assess the current situation independently from the complaints.

2.2 Diagnosis in the Language/Action Perspective

(Winograd & Flores, 1986) not only introduced a perspective on communication modelling based on Speech Act Theory, but also a "new foundation for design" based on Heidegger's existential philosophy. In this philosophy, our actions in the world are always preceded by our being in the world. Winograd and Flores argue in favour of a design philosophy that takes its starting-point in the breakdowns of real-life rather than in some abstract concept that is imposed on the world as it is. In our opinion, such a design philosophy leads to an approach in which diagnosis is central. The question is then: how can diagnosis be performed in a systematic way?

(Reijswoud, 1996) discusses the structure of business communication and devotes one chapter to optimization in which he argues that the Transaction Process Model (TPM) can be used as a means to detect and optimize malfunctioning communication. Van Reijswoud notices that the DEMO method (see below) allows for different levels of business reengineering. He concentrates on business system reengineering at the level of the realization of the core business processes. Diagnosis is an important step in this process, which should be followed by Improvement (at the level of models), Reconstruction (Implementation of the new models) and Evaluation (following Kettinger et al, 1995). He proposes to use TPMs as a diagnostic tool. A pathological situation can be detected by looking at the amount of communication/discussion in a transaction. If the amount is high (a lot of questions, discussions etc – in general, a lot of "looping"), then this must be caused by lack of agreement on the rules underlying the transaction. The remedy consists in a discourse about these rules.

We agree with Van Reijswoud in insisting on a careful diagnosis step, and his suggestion to look for discussion loops is useful indeed (we also found such loops in our case study). However, we think that TPM's alone are not sufficient. A TPM is a kind of State Transition Diagram and does not model the communicating actors. As long as there are only two involved, this is not a big problem, but this is not always the case. Related to that, TPM focuses on one transaction only, and therefore can only find pathologies below the transaction level. Moreover, the TPM attaches a rather special meaning to the different states (noted by means of the numbers 1 to 12), which makes it not easy to understand.

The DEMO method such as presented in the DEMO Handbook (Van Reijswoud, Dietz 1999) is based on the LAP perspective. Understanding the organization and its communication structure is central in DEMO. For that reason, DEMO uses several communication models. These models will help the analyst to abstract from irrelevant details and understand the essentials. However, knowing how the system works is not the same as knowing what goes wrong and why. Although the DEMO models can be of use in a diagnosis process, DEMO itself does not include a diagnosis method.

Action Workflow (Denning & Medina-Mora, 1995; Medina-Mora et al, 1993) is also based on the LAP perspective. In this method, the description of the current situation (in terms of communicative acts) is very important. Although diagnosis is not mentioned as such, the model of the current situation in the form of Action Workflow diagrams is analyzed for shortcomings such as the occurrence of complaint loops in the organization. If a lot of attention must be given to complaints, one can conclude that something is wrong in either the preparation or the evaluation of the work. Although this is a useful heuristic, the Action Workflow method does not offer a systematic diagnosis method to detect non-closed loops. Since everything is modeled in the form of loops, any existing violations have been filtered out as soon as the diagrams have been drawn.

The goal of this paper is to introduce a method for diagnosis in line with the LAP perspective that is more systematic than what has been described in traditional methods. Before outlining our framework, we describe a business case in which the method has been applied and that will be used in this paper for illustration.

2.3 The case of settlement of mortgage finance

The business case considers the settlement of mortgage finance within a Dutch banking organization. A diagnosis of the communication in this process was performed within several local offices. An elaborate description of this diagnosis can be found in (van der Poll, 2002).

Our case starts with a customer initiating a request for a mortgage contract. The interviews revealed that several scenarios are possible, of which we will present one as an example. For a good understanding of the example, the reader should know that the mortgage selling process is handled by local offices, but some of the administrative tasks have been delegated to a central service center geographically located at another place. The internal communication process at the service center falls outside the scope of this example.

A customer initiates a request for a mortgage contract by delivering a signed tender to a bank employee. In this case the delivery occurs by sending the signed tender per post to the local office. When a tender comes in, it is registered by a commercial assistant into a workflow management system (WFM). The purpose of this registration is to report reception of a request for a mortgage contract. Furthermore this serves as a means of control for the office manager. Before a promise is made to the customer to deliver a mortgage contract, the commercial assistant has to check for any missing items that are necessary for further processing. If items like an employer's certificate or health certificate are missing in the customer file, the commercial assistant will draw up a letter of thanks, saying that a mortgage contract will be drawn up as soon as the local office receives the missing items, thereby stating a conditional promise.

When all missing items have been delivered, the commercial assistant will request the service center to process the tender data and draw up a mortgage contract for the customer. This request is done through an automated mortgage system (M-System). The tender data will then be visible for a service center employee. According to the agreements between local office and service center, the commercial assistant talks with one service center employee and vice versa. So the data needs to be made visible to that specific service center employee. At the same time the commercial assistant will deliver the physical customer file to the administrative support department of his local office. The administrative support department is responsible for the settlement of the mortgage finance within the rest of the mortgage finance process at the local office.

Before the contract is drawn up the service center employee will report the date of signing obtained form the notary, to the commercial assistant at the local office. Two days before the actual signing of the contract the service center employee sends an letter to the commercial assistant, stating the amount of money that needs be transferred to the specified mortgage account.

In this particular scenario, somewhere in this time period the administrative assistant of the local office needs to know when the signing of the mortgage contract occurs and which amount of money needs to be transferred, because he/she is responsible for settling this matter within the banks local administration. In this case the only thing the administrative assistant can use as a trigger for action is the notification of the signing date send by the service center. In this case we assume that the commercial assistant is 'smart enough' to forward this notification to the administration department, so that the administrative assistant knows when the signing takes place. One day before signing occurs a request for information is made to the service center about the amount that has to be transferred, after a decline a request is made to the commercial assistant who delivered the customer file. The letter stating the transfer amount is then handed over or sent per post to the administrative assistant.

2.4. A framework for diagnosis

Figure 1 shows our framework for diagnosis. The diagnosis starts with *data collection*, using interviews or other techniques, such as direct observation. A coding scheme needs to be in place like the one used in (Te'eni, 2000) that can be of guidance to the data collection. During this step, problems ("complaints") are collected as well, but the main focus is on getting an accurate picture of the process in question.

The next step is schematic *representation* of the data. The purpose of this step is not understanding, but faithful recording of the process as it goes, and as there are usually many ways it can go, it is necessary to set up several schema's

representing different actual scenarios and points of view. It is important that the schema technique does not introduce too much abstraction, since it must be an accurate picture of the 'as-is' situation. This means that techniques like Action Workflow or DEMO will not be suitable for use at this stage, because the structure and level of abstraction they impose on the collected data are too high.

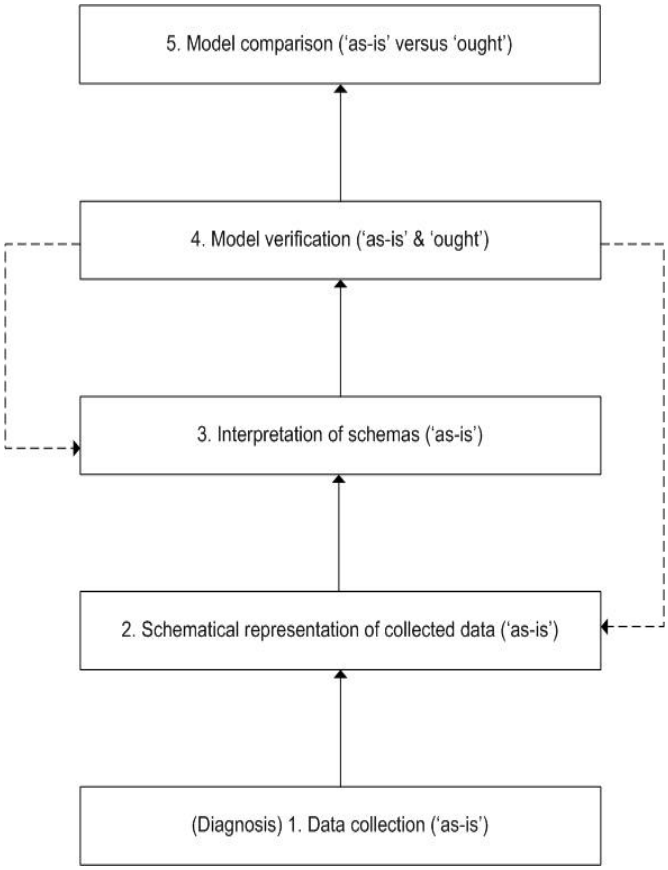

Figure 1: A framework for merging diagnosis with analysis

The third step is *interpretation*. For example, a certain message from A to B is interpreted as a request. For Te'eni, interpretation has to do with taking the actors into account as intentional beings. In terms of LAP, interpretation means moving from a data level to a communication level. Although it is possible to detect certain pathologies without interpretation, many communication problems can only be identified after interpretation. Action Workflow and DEMO provide useful modeling techniques for the interpretation step. Note that most of the existing approaches do not distinguish between representation and interpretation. As a result, many interpretation decisions are made implicitly. Another drawback is that

almost inevitably information is lost during the interpretation process that cannot be recaptured anymore later.

The next step is model *verification*. This step is missing in all the other approaches discussed above. In this step, the quality of the current process is assessed using the communication norms listed in (Weigand & De Moor, 2001). At this stage, also the "ought" process models are introduced. These are authorative process descriptions within the organization, typically in some schematic format. In practice, the actual way of working ("as-is" models) usually deviates to some degree from the "ought" process models. The quality of the "ought" process models is assessed in the same way as the "as-is" models. The dotted arrows indicate that the model verification makes use of both the schema's and their interpretation, and may also urge the analyst to redo these steps, since the model verification may raise new questions. An example of such a question is the question who is the principal of a certain agent, and how is the reporting done.

The fifth and final step is the *comparison* of the 'as-is' description with existing "ought" models. This comparison is useful and may reveal that these models can be improved, or that they are ok but should be communicated or implemented better. Of particular interest is the question why the "as is" deviates from the "ought"; this has usually to do with some tension in the organization that may be due to internal evolutions or changes in the environment. For that reason, simply restoring the "as is" situation to comply with the "ought" is not always the best reaction. Note that this comparison step is also missing in the approaches discussed above. Most of them naively assume that the actual way of working coincides with the formal organization. Or perhaps they do not see the relevance of looking at the authorative models. However, if we may draw a comparison with medical diagnosis, a medical doctor would never recommend a certain therapy or medicine without having asked what cures the patient has been following or is currently following.

After the verification (norm checking) and the comparison, recommendations for improvement should be formulated that can be discussed and implemented within the organization. This is the point where the diagnosis as such stops.

3. Diagnosing communication in a financial service process

3.1 Data collection

To collect relevant data on the communication within the process of the settlement of mortgage finance we used semi-structured interviews and observations. We kept an open mind and focused on all sorts of communication

that lead to actions. The coding scheme, (partially based on Te'eni, 2000), that guided the interviews and observations had to reveal information about the: communicating actors, purpose of the communication, specific messages that are exchanged, medium used, structure of the messages, goal of the message (request, promise, etc.), formulation, coordination and control of communication, breakdowns as a result of miscommunication. Section 2.3 above describes an example scenario that resulted from the interviews and observations.

We will now move to the next steps of representation and interpretation.

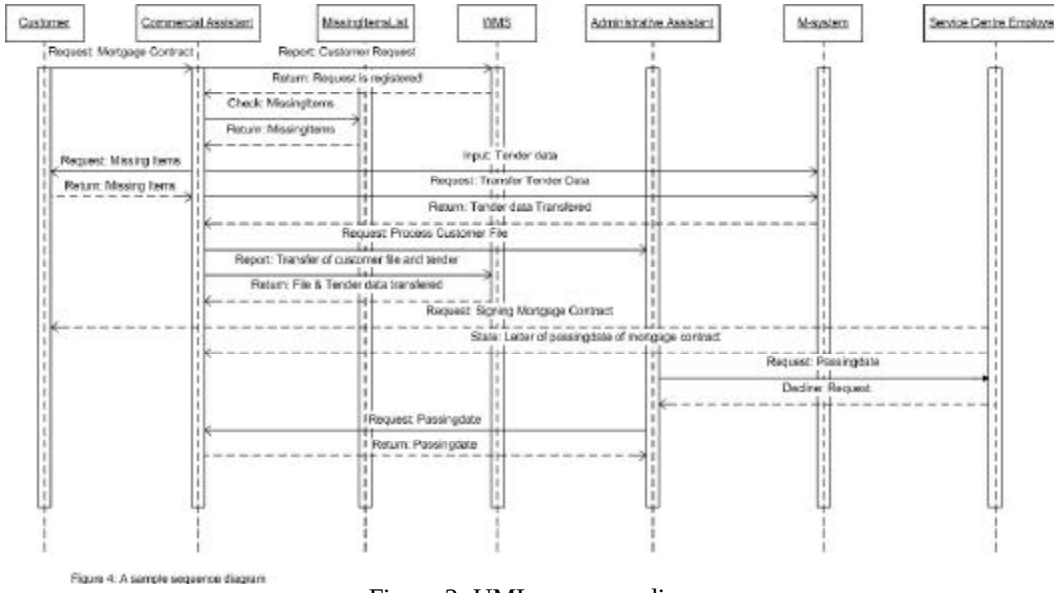

Figure 4: A sample sequence diagram

Figure 2: UML sequence diagram

3.2 Representing and interpreting the collected data

We compared a number of modeling techniques for finding suitable elements which we could use to represent collected data. The techniques we studied are UML (Booch et al., 1999), ARIS (Scheer, 1998,1999), Petri Nets, DEMO (Reijswoud, Dietz, 1999) and Action Workflow (Medina-Mora, 1993; Kethers, Schoop, 2000). The selection criteria we used are, that the technique for representing the data needs to be communication oriented, should be able to represent as much scenario's as necessary on the basis of the data found, furthermore the technique must not cause any loss of relevant information and finally it must be able to represent breakdowns found during the interviews in a structured way. This last criterion is important to make further interpretation easier. Therefore we chose to *represent* the collected data with a UML sequence

diagram. During the interpretation stage we used modelling techniques that are slightly more abstract and take a communicative perspective. In short, we used the following 3 elements to model message interchanges and their interpretations:

?? A sequence diagram (taken from UML)
?? An action workflow diagram
?? An interaction diagram (taken form DEMO)

A sequence diagram shows the time order in which messages are sent and received among actors and between actors and other objects or systems (Booch, 1999). Its possible to model as many scenario's as are needed to represent the collected data. An action workflow diagram relates messages to speech-acts. The focus is on representing acts, conversations and time (Medina-Mora, 1993), (Kethers, Schoop, 2000). This diagram takes a communicative perspective, but its elements correspond almost 1-1 with the sequence diagram and will therefore be used to for the first interpretation of the schematised data.

The DEMO interaction diagram (Reijswoud & Dietz, 2000) is more abstract and displays the timeless transaction structure of an organisation or business process. The main focus is on specification of all sorts of business transactions taking place within an organization and between the organization and its environment. It is used to define system borders and to interpret the interchange modelled in the sequence diagram and the action workflow diagram.

On the basis of the interviews, we constructed a UML sequence diagram, which reveals the message interchanges between the actors, objects and systems they interact with. Figure 2 shows this diagram. Figure 3 shows the action workflow diagram we constructed for this example. The link property information is not included.

Notice that the level of abstraction is still rather low and corresponds reasonably well with the sequence diagram, although here we don't see the time order anymore in which the exchanges take place. Attention is given to who the customer is and who the performer and what the conditions of satisfaction are. Note that the objects and systems that the actors are communicating with are not present in this diagram. For the rest, there is a one-to-one correspondence between the messages in the sequence diagram and the messages (arcs) in the action-workflow diagram.

Finally, a DEMO interaction model was produced (not pictured here). This model clearly shows the essential elements of the process, and where a factagenic or actagenic conversation can be found.

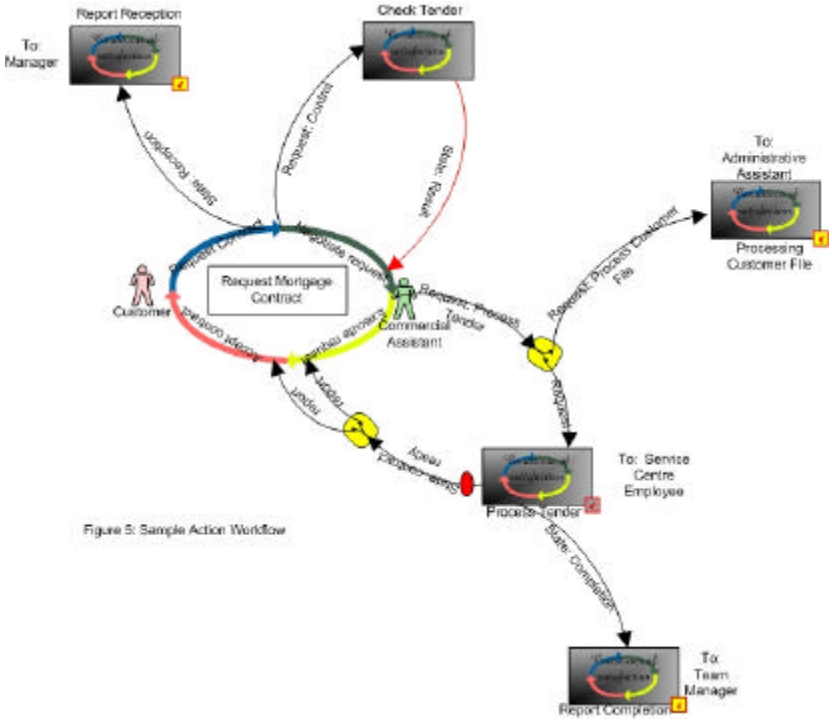

Figure 5: Sample Action Workflow

Figure 3: Action Workflow diagram

3.3. Model verification

We used the framework for normative analysis of workflow loops to check the created models ('as-is' and 'ought') of our example on violation of the underlying norms. For the list of norms we refer to the article of (Weigand and de Moor, 2001). Our purpose is to check to what extent the norms apply to our models and which norms are violated. Norm violation may form a cause of breakdowns found in the interviews. Other causes or underlying problems may be revealed in the comparison of both models.

When applying the norms we run into the problem that the elements used so far to describe the example process do not take delegation (communication between agents and managers) into account. That is why we had to use the framework for normative analysis (Weigand and de Moor, 2001) for constructing an additional model of our collected interview data and of the 'ought' situation provided to us by the specific organization we studied. We only have space here to show one example of the model constructed for the 'as-is' diagnosis (Figure 4). An interesting observation is that there is no single unit of control; two managers are involved, with a contract loop between them.

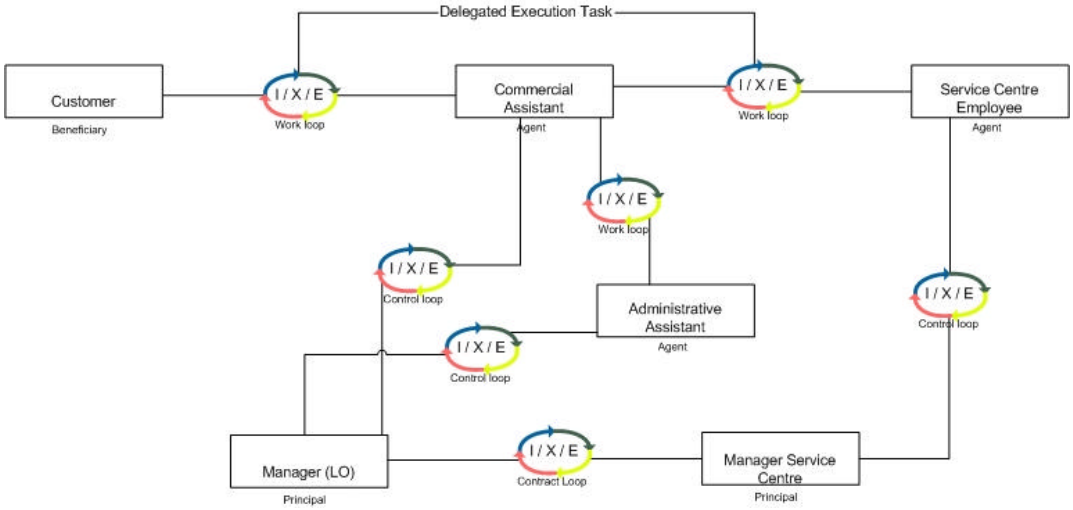

Figure 4: An example of the normative analysis model

An example norm violation that was already manifest in the example scenario is that the administrative assistant at the local office is not directly involved in the communication with the service center. However, he seems to be a beneficiary of the work performed by the service center, as he needs to know *at least* the date of the signing. This information is sent to the local office, but does not always reach the administrative assistant. If he is a beneficiary, he should be an evaluator, in other words, he should receive the information and if it corresponds to his own data (the physical file that he possesses), he can give a positive confirmation. Note that in fact there are two related norm violations: one being that the task performed by the service center (on behalf of the local office) is not evaluated and confirmed, the other being that the beneficiary (or one of the beneficiaries) is not involved in the evaluation.[1] Alternatively, it may be said that the administrative assistant is the executor for the service center. But also in that case, there should be a conversation between the two.

3.4 Model comparison

The final step in the diagnosis process is a comparison between the diagnostic model and the existing "ought" prescription of the example process. This may give directions for solutions. Sometimes the problem has to be sought within the

[1] The norms in question are: (1) If a work task exists, its corresponding *evaluation* conversation should exist as well and should always follow the task. (2) The beneficiary should be involved in the initiating conversation and the evaluation conversation.

acceptance, adoption and integration of the process descriptions within the organization. However, it may also be the case that the process description is incomplete or that it can be improved (process reengineering). Then the diagnosis of the norm violations may give directions for reengineering.

One important difference we found is the fact that in the process description the administrative assistant is assumed to be responsible for sending the tender data to the service center! This means that the process description assumes that the service center employee communicates with the administrative assistant, and this assistant communicates with the service center, and that all the information coming back from the service center has to go directly to the administrative assistant. This is in contrast to what we found in our diagnosis. We note that when the existing process prescription would have been followed, the norms would not have been violated.

Apparently, something is wrong in the "contract" between local office and service center, in which the existing process prescriptions are not followed. The problems that we had in finding out who is the beneficiary are a reflection of a certain ambiguity in this contract (who is serving whom?).

3.5 Recommendations

In the end, the diagnosis should lead to recommendations for improvement of which we can give here only one example. Roughly speaking, the modeling and interpretation steps of diagnosis give indications of the *occurrence* of problems (such as inefficient or incomplete loops). The verification using norm checking gives indications of the *causes* of these problems. The comparison with the "ought" models gives indications about possible *solution*s. In the abbreviated example of this article, a problem occurrence was noticed in one of the scenarios: although the administrative assistant, in this scenario, needs certain information, he does not get it or only after several attempts. The norm analysis revealed some violations: in particular, the fact that there should be a conversation between administrative assistant and service center. The comparison with the existing models reveals that in this case, practice deviates from the process description.

Although in practice, the problem is usually dealt with quite well by additional communication within the local office (the informal organization), the recommendation must be to reconsider the "contract" between local office and service center. It must be made clear who does what for whom.

Of course, there are two possible directions. One is to reestablish the existing model, that is, to agree that the commercial assistant hands over his work to the administrative assistant, and that the *latter* informs the service center – and also gets the results back. In this approach, the administrative assistant is the customer of the service center. The other approach is to reconsider the process description. There must be a reason why the prescribed procedure is not followed. In the current practice, the communication chain to the service center is shorter: the

commercial assistant circumvents the administrative assistant. This may be more efficient, but as our diagnosis reveals, it may lead to failures and repair communication afterwards. If this alternative is chosen, at least the communication between commercial assistant and administrative assistant must be improved. Even more important, it must be made clear to all parties that the commercial assistant in this case is the leading customer, and the other parties are supposed to serve him.

To make a good choice, the two approaches must be compared on the basis of criteria such as operational costs, time constraints, the costs of changing the organization, but also the risks involved and the present failure costs. This needs to be considered before a decision can be made to change anything.

4. Conclusion

Traditionally, analysis has always been aimed at producing models that can form the basis for the design of some automated system, and diagnosis has been a rather informal step. In business reengineering projects, diagnosis could also get more attention. Often, these processes are driven by the wish for a more efficient or alternatively structured process, and the problem becomes how to transform the existing situation (the 'as-is' system) into this desired ('to-be) situation. In contrast, diagnosis carefully looks at how the processes (automated or not) actually go, and where problems exist, and from there, suggests changes. This is in line with the philosophy of Winograd and Flores who argue extensively that design should be rooted in being and connected to actual breakdowns (Winograd & Flores, 1986).

This paper has introduced a framework for communication diagnosis that has been used successfully on a financial service process. The method is based on a seperation between representation, interpretation and verification of the current situation. It also distinguishes between the current way of working and the authorative process models.

We have seen that this method leads to a precise understanding and a very complete view of the process under study. The method allowed us to trace back problems in the problem list to norm violations in the as-is models. We also showed that the framework for normative analysis of workflow loops can be used within a practical business case and that it produces meaningful results. However, it must be kept in mind that this article only focuses on communication. For other aspects of the system, other diagnosis methods (schema's, interpretations, norms) should be used, although the general framework can remain. For example, for a diagnosis of the efficiency, the interpretation should take quantitative data about the number of messages, the response time, processing costs, etc.

Interesting research questions that have to be addressed later are, for example: are the (communication) problems identified in the interviews always caused by some norm violation? If not, should the list of norms be extended? Are the current

norms not too strong? (for example, is an explicit commitment or "uptake" always necessary, or can it be left implicit if the communication medium is reliable enough). On the level of IS development, an interesting question is on the relationship between diagnosis and goal-driven design.

We hope that this paper will inspire analysts to complement their analytic approaches with diagnostic approaches, either during the change analysis phase of system design or during operations. Diagnosis is a necessary tool for organizations that wish to improve the quality of their business processes on a continuous basis.

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