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Diploma Thesis

Subject-oriented Process Survey

An approach and modeling tool for executing subject-oriented process surveys

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Abstract

Process models are a requirement for process analysis and further process management. Through the course of surveys process knowledge is collected and documented as process models. The procedure of performing surveys itself is a process and its results directly influence the following analysis. This requires the surveying process to be as efficient as possible which can only be achieved by analyzing the survey procedure to identify weak spots and optimization potential. In addition common procedures tend to exclude the process end users from the modeling procedure despite the fact that they can provide the most knowledge and information about their particular processes.

By describing subject-oriented approaches for process surveys as process models a basis for future analyses to improve process surveys is created. Additionally with the application of subject-oriented Business Process Management the focus on process activities, as in classic Business Process Management, is shifted towards the elements which execute the processes: the end user.

A newly developed tangible modeling tool will allow the survey participants to directly model their respective parts of the process by themselves. This tool is named S-BPM Buildbook and can be operated intuitively even by modeling novices. The created process models can be documented and digitalized via an optical recognition algorithm which converts the process model into a generic XML file for further process management and administration steps.

The approaches described by the process models are tested during the course of an exemplary case study. A second case study tests the developed modeling tool during a practical application with modeling novices.

Table of Content

1 Introduction

In today's organizations processes are omnipresent and the most important part of an organization's value creation. Practically every organization, be it charitable, commercial or other, executes many different processes on a regular basis. It is crucial to keep these processes as effective and efficient as possible to reduce processing costs, processing times, failure quota, and so on.

This is accomplished through Business Process Management (BPM), even though the term process is not restricted to specific fields or divisions and can represent, among others, a business process, a development process, a production process or the process of process improvement itself. [1] Process Analysis identifies weak spots in the processes and is the basis for further process improvements. It is a necessary phase for more effective and efficient processes. The starting point for such a process analysis is always a process documented as a process model.[2] A process model is a visual description of a single process and describes necessary process steps in a graphical way. Even a rough Process Model raises transparency and can help to understand existing or future processes better. [3,4] In a best case scenario an organization has its processes well documented and modeled. In reality, these process models are often outdated, incomplete or even nonexistent.

The necessity of an up-to-date process model requires a process survey to be executed to describe and document the relevant information for the analysis. A process survey in itself is a process and therefore has to be as effective and efficient as possible too. This makes the surveying process a subject for process analysis and advanced process management to reduce survey times, survey costs and raise quality of the surveyed information. Common literature expresses the need for process models and yet there is no process model for surveying processes in the area of Business Process Management. [5,6,7,8]

Also it is a fact that the actual *"end users are typically not participating in the modeling process*"[9] and if they are participating then the, at least for novices, often overwhelming complexity of most modeling tools has a deterrent effect on the employees.[10] This practically excludes the element which contains the most process

[1] Fischermanns, 2006, p.12
[2] Horváth, 2005, p. 60
[3] Fischermanns, 2006, pp. 115-116
[4] Horváth, 2005, pp. 50-53
[5] cf. Fischermanns, 2006, pp. 116-201
[6] cf. Horváth, 2005, pp. 47-68
[7] cf. Weske, 2007, pp. 73-124, 350-351
[8] cf. Becker, 2012, pp.47-109
[9] Mutschler, 2013, p. 71
[10] Horváth, 2005, pp. 62-66

knowledge from the process survey: the employees who are executing the process or process actor. By actively incorporating the process actors into the survey and modeling phase it is possible to directly survey relevant process knowledge and experience, and validate the gathered knowledge (the process model) at the same time.

For this an approach different from common BPM which mainly focuses on the activities and tasks of a process is taken.[11] Subject-oriented Business Process Management (S-BPM) opens up new possibilities to execute process surveys and actively include the employees in such surveys. The initial point for a process is an active element, the subject, and not the tasks of the process like in classic BPM.[12]

A subject-oriented description and documentation of processes as process models offers a procedure guideline for future surveys and is also an initial point for further analysis and improvement. This will allow the concepts of process analysis and process improvement to be applied to the survey process itself.

1.1 Objectives and Scope

The first objective of this work will be to define practical approaches for process surveys and visualize these approaches as models with the application of the S-BPM method as background. The goal is not to define an absolute procedure and process model but a spectrum of possible approaches. These approaches then serve as standardized process templates for all instances of a subject-oriented process survey and to serve as process standards.[13] The described processes have to be adaptable according to the already existing process knowledge and organizational structures. This will allow the concepts of process analysis and process improvement to be applied to the survey process itself. However, the described process models will only refer to the process of the survey. The following phases like process analysis, process improvement and implementation will not be covered by these models or applied to them. Exemplary one of the described approaches will be tested in a practical application during a case study.

The second objective will be the provision of a tangible modeling tool which allows the process participants to model their respective parts of the process by themselves. The tool has to be intuitive enough to be operable by modeling novices without exhaustive instructions and detached from software or electronic parts to reduce complexity. For modeling experts and the purpose of a proper documentation, advanced process management, and process analysis a standalone interface will be

[11] Fischermanns, 2006, pp. 200-201
[12] cf. Fleischmann, 2012
[13] Schmelzer, 2013, pp. 237-240

provided which allows a conversion of the process model into a digital form. The goal is to involve the process participants directly in the modeling process and to provide a uniform model design that enables modeling novices to model processes and the modeling experts to use the models for advanced process management. The modeling tool will be tested during a practical application in an exemplary second case study.

1.2 Outline

The outline of this work is oriented on the phases of applied research according to Ulrich.[14]

In Chapter 1 the relevant problems are captured from which the objectives for the diploma thesis are derived.

Relevant theories, hypotheses and approaches which are of importance for the derived objectives are described, specified and interpreted in chapter 2. A common survey procedure of BPM is described along with the most common weak points. This is followed by a description of S-BPM and a disambiguation of common and important terms. The application of natural language in process environments through S-BPM and the S-BPM Open Control Cycle will form the structural basis for the approaches of subject-oriented process surveys. The described approaches are placed within the spectrum of the S-BPM method that ranges from Top-Down oriented to Bottom-Up oriented approaches. Modeling by restriction will be the basis for modeling generic process models for process surveys.

In Chapter 3 and 4 structural rules and models for each objective are derived. In addition the defined rules and models are tested in exemplary case studies in accordance to the appropriate practical application and objective.

Chapter 3 describes the different approaches for subject-oriented process surveys and their respective process models. The approaches are placed within the spectrum defined by the SBPM method. At the end of chapter 3 the exemplary test and its result of the approaches is described.

Chapter 4 covers the development of the modeling tool. Existing subject-oriented modeling tools are described followed by choosing an appropriate modeling design and notation and the technical development. The end of chapter covers the second case study in which the developed tool is tested by surveying a real process.

A summary and further research potential are provided in Chapter 5.

[14] cf. Ulrich, 2001, pp 17-51

2 Theoretical Background

2.1 Survey and Analysis

As stated in the objectives the scope of this work only includes the process survey and not the process analysis. This requires a proper distinction of the two terms because people and literature often do not distinguish between an analysis and a survey. Although both terms seem very similar they are fundamentally different.

The Oxford Dictionary defines a survey as "*a general view, examination, or description of someone or something"* [15] and an analysis as a "*detailed examination of the elements or structure of something"* [16]. Considering these two definitions it is clear that there is at least a difference on the respective level of detail. Schnell's description of a survey and an analysis better highlights the differences between the two terms.[17]

A survey collects and organizes data and information regarding the area it addresses. A survey treats the two questions: "What data and information do I need?" and "How do I get the data?".

But information and data by themselves do not make claims or statements about a subject. In order to reach a conclusion it is necessary to examine and analyze the data based on a previously formulated theory or goal. Only if theories and concepts are formulated, theoretically and content-wise, an actual analysis can be done.[18] This boils an analysis down to the question: "What do I want to do with the data?".

In a business process environment such goals could be, for example, to find optimization potential, improve the existing processes or lower process related costs. Those responsible can then analyze the existing data, provided by the survey, and to identify possible ways to accomplish these specific goals. This means that an analysis cannot be done if there is no data. Therefore an analysis expects a survey to provide the necessary data. The formulated goals for the analysis set the scope for a survey and define which data needs to be gathered. A survey, however, may be done without the prerequisite of an analysis. Of course at least a general idea of what to do with the collected data is needed. Without it there would be no way to know which data has to be surveyed.

[15] Oxford Dictionaries, keyword: survey, Retrieved 09 10, 2013
[16] Oxford Dictionaries, keyword: analysis, Retrieved 09 10, 2013
[17] Schnell, 2011, pp. 8-9, 313-410
[18] Schnell, 2011, pp. 9-10, 431-462

In a business process environment this could mean that a company wants to know how and by whom the processes are actually performed, what tasks and activities are executed in the particular processes, and so on. The result of such a survey is a process description or process model. The task of a survey is to deliver the data, not to interpret or examine it. This is the analysis' purpose.

2.2 Business Process Management and Surveying Processes

Surveying a process is a necessary step to obtain process knowledge and to create process models. These models then form the basis for further process analyses.[19]

2.2.1 Survey Procedure in Business Process Management

BPM is not a new concept and so is the procedure for surveying processes and creating process models. Although the nomenclature might differ between authors the procedure remains practically the same throughout the literature.

BPM distinguishes between three roles when creating a process survey: The method expert interviews the team leaders to identify the process, to discuss professional facts and to select the process specialists. The team leaders are responsible for their specific sub-process and the specialists, or actors, provide detailed information about their parts in the process. BPM mostly uses group workshops to survey processes. After the method experts and team leaders have identified the specialists all the involved parties attend a group workshop. The goal is to survey the process and to describe the exact process procedure. The method experts should not be involved in a process as they have to lead the conversation and model the process simultaneously in front of all attendees. If the attendees are not familiar with the modeling technique (method and notation) the method expert has to instruct the attendees first. If a more detailed model is necessary a concrete role is defined for each process activity or sub-process. A role includes a responsible person for the activity or sub-process and all relevant information and resources to carry out the tasks. In addition to the group workshops BPM recommends single interviews with the various specialists (actors). Single interviews allow circumventing group discussions and the specialist is more willing to point out failures or weak

[19] Horváth, 2005, p. 60

points in the process. Although single interviews may require more overall time they still can be more efficient than a (overall) shorter group discussion. [20,21,22,23]

2.2.2 Common Weak Points in the BPM procedure

The BPM procedure to survey processes has several weak points and problems in a practical application.

To be able to create a complete process model it is necessary that all team leaders, method experts and specialists are present at the same time. Method experts have the task to prevent exhaustive discussions between the participants and they need to ensure that the information communicated is failure free and complete. In reality a 100% consensus between the attendees is not achievable, exhaustive discussions cannot always be avoided and the surveyed information is almost always incomplete. [24,25,26]

In addition the method expert cannot validate if the information is error free and complete as they are not involved in the actual process. Furthermore it is not possible that all attendees contribute to the survey at all times, for instance, when a part of the process is discussed in which only two or three of the attendees are involved in. This inevitably leads to the situation when some participants are actually doing nothing, which is a huge waste of resources (time) and lowers the employee's motivation.

Another weak point can be the modeling technique itself. It is important that everyone understands the modeling technique and that the technique is applied in the same way by everyone. Many established methods use a great amount of different symbols, for instance Business Process Model and Notation (BPMN) uses between 70 - 140 symbols to describe a process. This increases instruction times, the modeling method is more difficult to understand and the complexity has a deterrent effect on the employees.[27]

Additionally, all modeling methods have in common that a process overview can only be visualized as a whole and in a strict sequence.[28] Furthermore it is not possible to split a process regarding its actors. The traditional business process management

[20] Fischermanns, 2006, pp. 116-118, 186-187, 200-201
[21] Becker, 2012, pp.165-177
[22] Weske, 2007, pp. 350-351
[23] Schmelzer, 2013, pp. 139-148
[24] Becker, 2012, pp. 177-178
[25] Fischermanns, 2006, p. 187
[26] Weske, 2007, pp. 350-351
[27] Horváth, 2005, pp. 62-66
[28] Fischermanns, 2006, pp. 116-117

methods solely focus on the activities and tasks of processes. Although the experience and knowledge of the actors are taken into account, the individual point of view is often neglected. The actors are, at best, assigned to tasks and that only in the case of a detailed process model.[29]

2.3 Subject-oriented Business Process Management

If a task exceeds the limits of an individual person, people will develop organizations to overcome these individual limits. Organizations are, for instance, communities, companies or academies. However, to succeed, an organization requires all involved parties to work together and combine their individual working forces. The reasons when and why humans form organizations lead to the conclusion that also projects or processes within organizational structures are organizations in themselves: Sub-organizations in an organization. The goal of a project or a process is basically the same: to achieve together where one would fail. [30]

Practical experience has shown that the positive completion of a project is always a direct result of the actors i.e. humans involved in it. Humans are not merely a factor next to a methodical approach. Human beings and their individual approaches are the important factor for an organization to achieve positive business results, not only the processes and systems. Going one step further, they are also a critical driving force behind processes. Processes do not just coexist next to the company's employees. Every employee involved in a process carries out and directly influences the organization's respective processes. Employees and their respective experience, knowledge and features have to explicitly taken into account to ensure processes and projects achieve their defined results. [31]

In this context a process is a sequence of tasks, executed by individuals, to achieve a common goal. Every person stores individual parts of knowledge and experiences required to complete the given tasks. This knowledge is only accessible by that specific person in an implicit form. Thus, knowledge transfer is essential to work towards a common goal.[32] Knowledge transfer in turn requires the knowledge to be expressed in an explicit form, because implicit knowledge is neither share- nor useable. The focus on human interaction, individual experience and knowledge is the basic idea of a method that has been established next to the traditional Business

[29] Fischermanns, 2006, pp. 200-201
[30] Riempp, 2004, pp .65-66
[31] Liappas, 2006, p. 54
[32] Riempp, 2004, pp. 65-66

Process Management: Subject-oriented Business Process Management (S-BPM).[33] As the name already implies, this method especially focuses on the subjects involved in a process. Regarding the understanding of processes, S-BPM is consistent with the common understanding of BPM. S-BPM defines a business process as *"…a set of interrelated activities (tasks), which are handled by active entities (people or systems performing work tasks) in a logical (with respect to business) and chronological sequence, and which use resources (material and information) to work on a business object for the purpose of satisfying a customer need (to thus contribute an added value), and which have a defined start and input, as well as a defined end state and result."*[34]

The basis for process systems in a subject-oriented approach are the subjects of a process. Subjects execute their activities parallel and synchronize their activities via message exchange. Together the local actions encapsulated within these subjects and corresponding interactions between them form business processes.[35]

2.3.1 Disambiguation

For a better understanding a disambiguation of common and important terms will be given here.

Subject:

In the context of S-BPM a subject is an abstract resource which represents an active agent with a specific role in a process and therefore is the initial point for activities. A subject is independent from actual people and can represent humans, systems, computer programs, machines or technical devices.[36,37,38]

"[…] *As actors in defined roles they perform their individual tasks and interact with each other in order to structure and coordinate their joint activities to achieve the desired process result. Normally, they use appropriate tools, as well as information and business objects which they access for reading or writing, and which they exchange. Subjects have an identifier referring to each specific process and a corresponding subject behavior*."[39]

[33] cf. Fleischmann, 2012
[34] Fleischmann, 2012, p. 26
[35] Fleischmann, 2010, p. 89
[36] Fleischmann, 2012, pp. 64, 310
[37] Fleischmann, 2013, p. 3
[38] Fleischmann, 2010, p. 90
[39] Fleischmann, 2012, p. 310

Agent

Agents are entities which embody instances of subjects in a specific context. They perform and respond to activities and changes in their environment. In a subject-oriented environment agents execute the actions and activities defined in a subject description: the Subject Behavior.[40]

Subject Interactions Diagram / Communication View

The Subject Interactions Diagram (SID) (or Communication View) is a structured model which explicitly describes the communication and interactions between all the subjects that are involved in the process. The interactions are represented by so called “Messages” which serve as vessel for information that is sent from one subject to another.[41]

Subject Behavior Diagram

The Subject Behavior Diagram (SBD) consists of states and transitions and describes the possible sequences of a subject’s actions in a process. The Subject Behavior is described from the subject’s point of view. S-BPM defines three elementary tasks to describe the actions a subject performs: *sending* a message, *receiving* a message and immediate accomplishment of a task called *function*. [42]

S-BPM Stakeholder

S-BPM uses a set of so called stakeholders which can be seen as meta-subjects that drive the process design. These stakeholders are responsible for different aspects of a subject-oriented process and are divided into four types: Governors, Actors, Facilitators and Experts.

S-BPM does not provide a hierarchical structure of the stakeholders and therefore no explicit management structures are required. In addition S-BPM does not distinguish between business and IT people. Both can be found in all the relevant roles for S-BPM.[43]

Governor

Governors are caretakers, drivers and managers. They are responsible for the organizational development and create the conditions under which the Actors perform. The Governors are the link between the business management and the operative area. They are responsible to maintain the standards and requirements

[40] Fleischmann, 2013, pp. 1-6
[41] Fleischmann, 2012, pp. 72-73, 311
[42] Fleischmann, 2012, pp. 79-80, 310
[43] Fleischmann, 2012, pp. 26 – 29, 309

regarding the processes given by the corporate management. They are not responsible for the content or technical control of a process.[44]

Actor / Subject Carrier

"*As part of the organization-specific implementation, abstract subjects are assigned to specific people, the so-called carrier subjects*."[45] An actor corresponds to a Subject Carrier, which is the actual work performer in a process. Actors, or Subject Carriers, are active in and responsible for a process at the same time.[46] They take and execute the roles of a subject and are "*primary points of reference in the analysis, modeling, optimization, and implementation of business process models* […]."[47]

Facilitator

Facilitators are companions for organizational development. They support actors at the initiation of organizational development steps, at activities within a group of activities and at the transition from one activity bundle to another one. Facilitators are responsible for the communication between the different stakeholders and the creation of necessary communication networks. They further initiate and support professional and personal development of the involved actors.[48]

Expert

Experts provide functional support for the actors if necessary and they are expected to solve identified or upcoming problems. They are specialists in their specific fields and are requested by either the facilitators, the governors or by the actors themselves. Typical experts are, for instance, internal or external consultants or software developers.[49]

Activity:

"An activity is a set of actions accomplishing tasks performed by a human or automatically by a computer system when managing work."[50] In the context of S-BPM an activity is referred to as predicate or behavior. An activity never occurs by itself, it always requires an actor in the form of a subject.[51] "Hereby, two types of behavior are distinguished: Either the subject communicates with other subjects, or it performs its own tasks, possibly with the help of Business Objects […]."[52]

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[44] Fleischmann, 2012, pp. 26 – 29, 302, 309
[45] Fleischmann, 2012, p. 310
[46] Fleischmann, 2012, pp. 298, 310
[47] Fleischmann, 2012, p. 298
[48] Fleischmann, 2012, pp. 26 – 29, 301, 309
[49] Fleischmann, 2012, pp. 26 – 29, 301, 309
[50] Fleischmann, 2012, p. 297
[51] Fleischmann, 2012, pp. 57, 297
[52] Fleischmann, 2012, p. 57

Activity Bundle

"A bundle of activities is some part (similar to a phase) of the S-BPM procedure model described by activities. They are performed by the various S-BPM stakeholders as part of an entire organizational development step."[53]

Business Object:

Business objects are defined as *"[…] the tools, objects, or also products that are handled by the subject, used, or passed on to others […]. Business objects are all objects or tools a subject needs to execute a process. They can be both: tangible or intangible. They usually refer to actions for communication and the subject's own individual activities*."[54]

2.3.2 Describing and surveying Processes with Natural Language

One of the concepts of S-BPM is to use natural language and it's semantic to describe processes. Practically every human being uses the structure of subject-predicate-object to communicate and therefore it can be taken for granted that everyone understands this elemental semantic. In every language the subject is the initial point of action, the predicate is the action itself and the object is the goal of the action (Figure 1).

Subject view	Predicate view	Object view
Who acts?	What does the subject?	What edits the subject?

Table 1: Elements of natural language[55]

This semantic is applied to describe processes: every process consists of actors who perform actions on various objects. Other methods of process modeling often neglect this aspect of natural language.[56] For example the event-driven process chain (EPC) heavily emphasizes the actions (predicates) in a process.

When natural language is used to describe processes the resulting benefit is that all involved parties are able to describe and analyze the processes without the restrictions of a specialized language, because they can use their natural language. This helps non-involved parties to better understand the processes and process

[53] Fleischmann, 2012, p. 297
[54] Fleischmann, 2012, p. 57
[55] adapted from Fleischmann, 2012, p. 56
[56] Fleischmann, 2012, pp. 15-18

models. In addition this may greatly reduce the time needed for instructions.[57] Overall, the application of natural language can raise employee motivation and acceptance towards performed process surveys and process modeling. This means that the use of S-BPM and natural language to describe processes can solve the problem of overwhelming modeling methods and too specific modeling languages.

"The reluctance of stakeholders to model processes can be eliminated by teaching them to reflect their assertions within the framework of communication processes by using complete natural language sentences. […]"[58]

Further S-BPM specifies relevant information to survey and describe processes originating from the three major elements of natural language: [59]

- The Subjects
- The Activities
- The (Business) Objects

By identifying these three elements relevant process information is defined and the process can be described in natural language. The subject is the initial point for a subject oriented survey and the following questions offer a guideline to identify relevant subjects: [60]

- *Who (or actually, what role) is active in the process?*
- *Who is passively involved in the process (e.g., as a source of information)?*
- *Who has to communicate, and with whom?*
- *Which organizational units are involved?*

The identified subjects form the basis for the identification of the relevant activities the subjects perform. The activities are defined as a behavior and can never occur by themselves. No action without an actor who performs it. When a subject performs an activity it either communicates with other subjects or executes various tasks on its own.[61] Essential questions to identify activities and the type of activity are:

- *With whom does the subject communicate?*
  - *From whom does the subject receive information?*
  - *To whom does the subject send information?*
- *Which activities does the subject perform by himself?*
  - *What tasks does the job description of the subject contain?*
  - *In which sequence are these tasks being accomplished?*
  - *Do these tasks depend on other events?*

[57] Fleischmann, 2012, p. 44
[58] Fleischmann, 2012, p. 57
[59] Fleischmann, 2012, pp. 56-58
[60] Fleischmann, 2012, p. 57
[61] Fleischmann, 2012, p. 57-58

- *Are there specific waiting periods?*
- *What other prerequisites for running the activities must be met?*

The last element that has to be identified is the relevant business objects. Business objects are tools, products or any other kind of object that is used or passed to others during the execution of the process. They can be tangible or intangible and in the context of S-BPM *"refer to actions for communication and the subject's own individual activities."*[62]

- *Are physical or electronic documents or forms created, processed, or forwarded in the process?*
- *How are they structured?*
- *Which elements do they contain, and what is their structure and format?*
- *Are there physical or electronic documents being used for completing the process?*
- *What IT support, such as through a content management system or transactions of an ERP system, is provided?*
- *What input masks are used in the process?*
- *What data is used hereby, in terms of reading or writing information?*
- *What role does information from the Internet play for handling the process?*

The use of natural language allows describing processes in a form that is accessible for novices as well as for experts. The questions serve as guideline for a subject-oriented survey to identify relevant process information.

2.3.3 Disassembling processes with Subjects

S-BPM describes processes through subjects, the individual subject behavior and the corresponding interactions between the subjects and thus allows disassembling the process regarding its subjects. The subjects and their respective subject behaviors define the actual process. This allows an actor to describe his particular subject behavior as a whole and independent from other actors. The actor's tasks and activities are encapsulated within the respective subject.[63] This means that the various agents can model their behaviors simultaneously and parallel to each other. These individual subject behaviors are then brought together and form a complete process.

A process then can be surveyed by describing one subject after another or simultaneously (parallel). The tasks and activities of every subject are described in the respective subject behavior diagram which represents a concluded sub-process.

[62] Fleischmann, 2012, p. 58
[63] Fleischmann, 2012, pp. 63 - 127

It is not necessary to describe the whole process at once or in a strict sequence as it is necessary in classic BPM.

Here is an example for a better understanding:

The employee has to do a business trip for which he has to fill out a request and send it to the manager. Depending on the answer from the manager the employee either goes on a business trip (Approval) or not (Rejection). (Figure 3)

The activities and tasks of the employee are encapsulated within the subject “employee” (Figure 4).

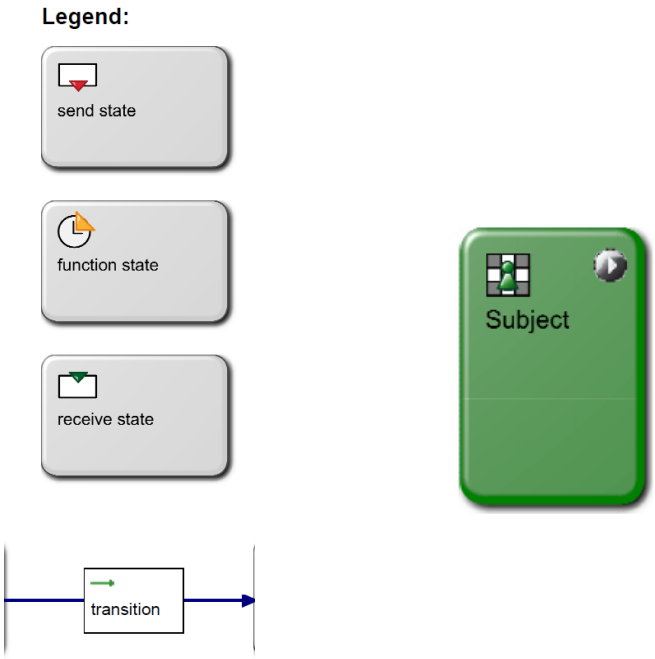


Figure 1: Legend for the S-BPM notation

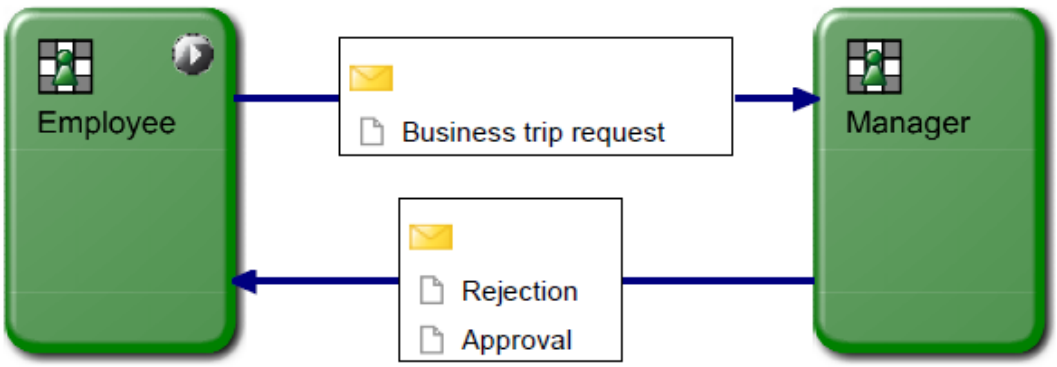


Figure 2: Interaction between the employee and the manager

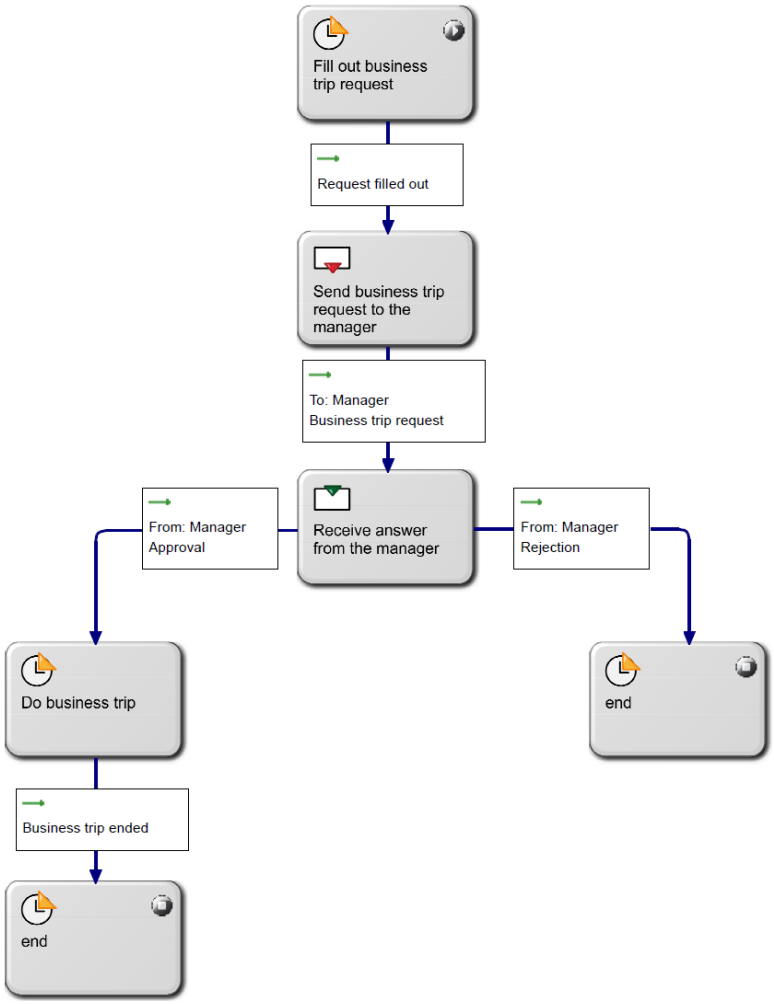


Figure 3: Subject Behavior of the employee

The subject behavior of the employee is a concluded sub-process which does not require any input from the manager to be described. The employee is able to describe his behavior independent from other involved subjects. The various subject behaviors can be surveyed independently from and parallel to each other.

2.4 The S-BPM Open Control Cycle

S-BPM organizes management activities in so called activity bundles along a feedback control cycle. These bundles are analysis, modeling, validation, optimization, organization-specific implementation, IT implementation, operation and monitoring. The S-BPM activity bundles correlate with the management objects of classic management processes. However, they differ from most of the traditional

approaches as they are not strictly performed in a specific preset sequence, hence the name *Open Control Cycle*. [64]

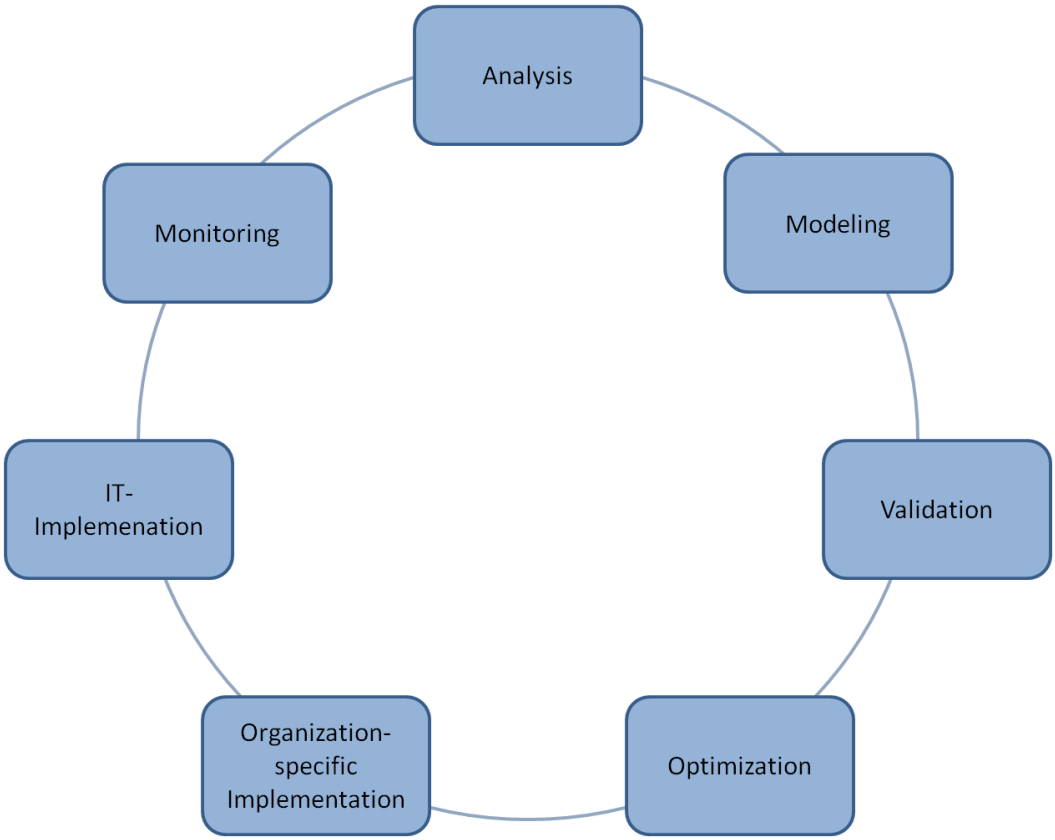


Figure 4: Open Control Cycle of Activity Bundles[65]

Depending on what the actual process requires activity bundles can be skipped, forwarded or may pass a complete iteration. By passing through the various activities the Control Cycle accumulates information about business processes and the process design. The S-BPM stakeholders are the driving force and control the Open Control Cycle and they can cycle through the various phases as the process requires them.[66]

The Open Control Cycle will provide the conceptual structure for the procedure of a subject-oriented process survey and the resulting process models. Like other methods the S-BPM method does not clearly distinguish between an analysis and a survey, it incorporates the survey in the activity bundles “Analysis”, “Modeling” and “Validation”.

These three activity bundles are defined as following (a complete description of all activity bundles will be foregone):

[64] Fleischmann, 2012, pp. 30-33
[65] Adapted from Fleischmann, 2012, p. 31
[66] Fleischmann, 2012, pp. 30-33

Analysis

"The first step in S-BPM is usually the analysis. In this phase, a process is examined while being decomposed into parts. In addition, its operational context and rationale is made transparent. The object of concern is on the one hand derived from the organization's strategy to structure work and its S-BPM strategy. On the other hand, analysis activities can also be triggered by feedback stemming from another bundle of activity, especially monitoring, for instance to identify causes of deviations from desired process performance."[67]

Modeling

"Modeling in Business Administration means reducing the complexity of the reality through mapping observations to a specific medium (Meyer 1990,p. 16). Before doing so, a self-contained set of characteristic items and relationships needs to be identified and abstracted from the observed reality. Modeling of business processes is essentially a matter of representing which subjects (humans and machines as actors) perform which activities (tasks and functions) on which objects (as a rule, information which is bound to specific carriers) using which tools (e.g., IT systems), and how they interact to achieve the desired process goals and outcomes. Initially, an abstract process model is created. This model is still independent of the specific actors. These are then added in the course of the organizational and IT implementation of business process models."[68]

Validation

"Validation in the context of S-BPM means checking whether a process is effective, i.e., whether it yields the expected output in the form of a product or service. The subject of validation is the observed business process itself or its model. Through validation, a process model can be evaluated to see whether it corresponds to the intended representation."[69]

Each of these activity bundles incorporates different aspects of a process survey or aspects that are important for a survey.

The procedure described by the activity bundle "Analysis" actually refers to a survey and the following analysis although it does not distinguish between these terms. The decomposition and examination of a process and the resulting greater transparency

[67] Fleischmann, 2012, p. 29
[68] Fleischmann, 2012, pp. 29-30
[69] Fleischmann, 2012, p. 30

actually are aspects of a survey. The identification of performance deviations is an analysis, an analysis that could not be done without the preceding process survey as there would be no process data to analyze. In the case of missing, incomplete, or insignificant data the survey has to be repeated for refinement.

The activity bundle “Modeling” contains both a part of a survey and a direct result of the same: the Process Model. The activity of process modeling itself is a part of the survey and the documentation of the survey in the form of a process model is a result. A subject-oriented process model describes how to accomplish specific tasks and how to manage the necessary transactions between subjects. This specifically includes a description of all activities that yield a result of value and, most important, who is performing these activities.[70]

A process model results from a survey and documents the gathered process information. This information has to be examined and validated to determine if the model and the information it contains is correct. This is done through the activity bundle “Validation”. If the acquired information is proven wrong or inconsistent the survey or parts of it have to pass iterations for further refinement of the gathered knowledge.

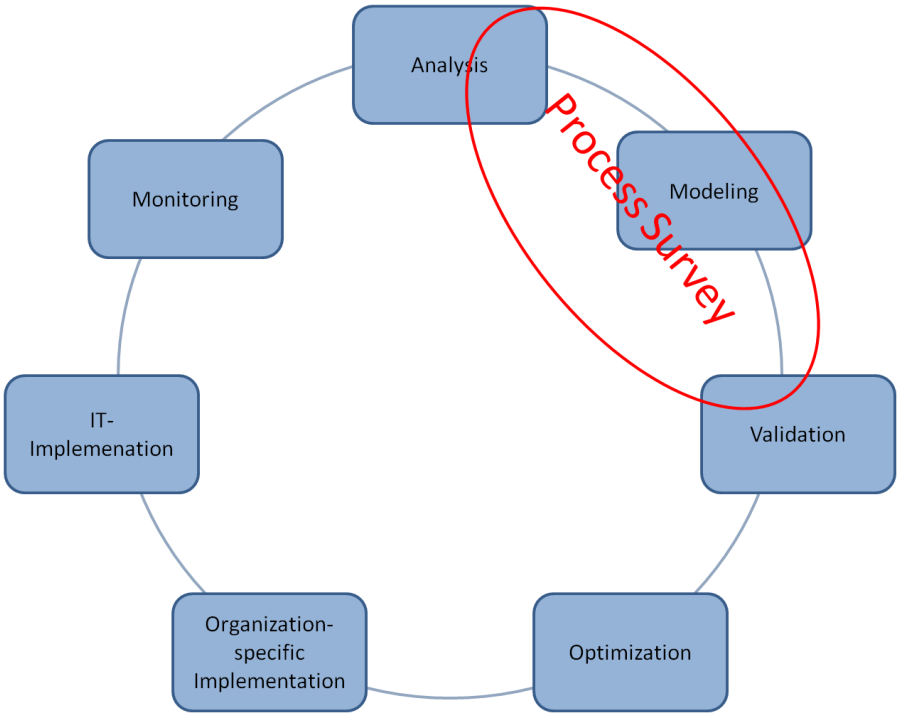


Figure 5: Process Survey contained within the Open Control Cycle

By detaching the parts of an actual survey from the activity bundle “Analysis” the new activity bundle “Acquisition” is created. Together with the bundles “Modeling” and

[70] Fleischmann, 2012, pp. 29-30

“Validation” a new Survey Control Cycle is defined that describes the non-sequential structure for a subject-oriented process survey:

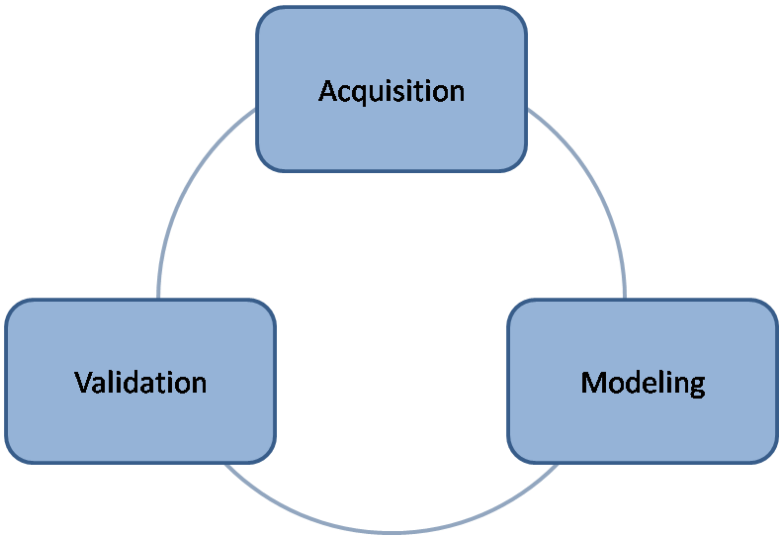


Figure 6: Process Survey as an Open Control Cycle

These activities are not executed in a strict sequence, depending on the circumstances the bundles can be skipped or iterated. However, certain prerequisites apply. To be able to model or validate data they have to be acquired, represented by the activity bundle Acquisition. After the data acquisition the further sequence is not strictly defined. The gathered process knowledge can first be described and documented as a process model followed by the validation. Or the information is first validated and then, if proven correct, modeled. Validation can result in an iteration of the modeling phase because the information is correct but was modeled wrong. Also an iteration of the survey bundle is possible because the collected data is wrong or not enough. Or the data is surveyed and neither modeled nor validated. This applies the open nature of the control cycle directly to the surveying process.

An example: An expert interviews an actor regarding his tasks in a specific process and the expert simultaneously models a process model during the interview. This not only helps the expert to better understand the process, but the actor can see how the process actually looks like and how the expert understands it. The actor can instantaneously verify the process model and edit it accordingly. All three Activity Bundles are performed in a non-sequential order.

The new open control cycle will provide the conceptual structure for subject-oriented process surveys.

2.5 Approaches to perform process surveys

An analysis requires a preceding survey to provide data and information.[71] In S-BPM an analysis is the first step of the Open Control Cycle and a central part of it, which so becomes true for a survey as the analysis in S-BPM includes the survey.[72] Surveying information is a directed accumulation and non judgmental evaluation of all relevant process information. The acquired information can then be used to plan and prepare future steps of a process model. Such process information includes, but is not limited to, existing process descriptions, process specifications, measurements, and analyses of key performance indicators.[73]

The direct focus on a process' driving force, the agents or actors, is what makes the subject-oriented method so unique. S-BPM differs from traditional BPM as it uses the acquired process information to identify and define subjects within a process and the communication between these subjects that is necessary to accomplish a task. This can be achieved by answering the following question: "*Who does what with what and when?"*[74]*.* The subjects and their interaction then act as reference points for further specifications.[75] In traditional BPM the points of reference are the tasks.

The goal of the process survey is either to accumulate any relevant process information and to define what the agents are actually doing, or to document how the overall process looks like. This means that the survey requires a lot of implicit knowledge, knowledge which is not documented and is only available in the actors' heads. This knowledge has to be gathered and transformed into explicit knowledge to make it use- and shareable.

In the field of process management the two approaches for a process survey (often in direct connection with an analysis) are the Top-Down- and the Bottom-Up-Approach. In common literature and in praxis there is no consistent opinion which approach should be used to survey and model a process. This requires a closer look at the two approaches to determine when each approach is suitable for a process survey as they use different initial points. To prevent confusion it should be noted that in some literature the Top-Down-Approach is also referred to as To-Be-Analysis and the Bottom-Up-Approach as As-Is-Analysis.[76]

[71] Schnell, 2011, pp. 8-9, 313-416
[72] Fleischmann, 2012, p. 44
[73] Fischermanns, 2006, p. 220
[74] Fleischmann, 2010, p. 89
[75] Fleischmann, 2012, p. 44
[76] Fischermanns, 2006, pp. 102-103

2.5.1 Top-Down or Bottom-Up

The Top-Down Approach

The Top-Down approach derives the processes from the company's visions and strategies. Based on future product or market goals and the involved customer needs all necessary execution processes are defined. Afterwards those management and support processes are determined which ensure a proper execution process performance.

One of the advantages of the Top-Down approach is the possibility to plan and define new processes independent from existing processes or organizational structures. One can practically plan and design a new process landscape without any restrictions based on strategies and visions. Also the processes are more easily integrated into the company's goals, because the goals and strategies are the initial point for the process survey.

This approach has an essential disadvantage. Processes which are identified with the Top-Down approach are often not consistent with the reality. Practical actions and the thought patterns of the people in charge of the processes often greatly differ from the expectations. Also strategies are based on future behavior and so it can happen that the process model contains new and unknown processes. Or other processes which are still executed on a daily basis are not included in the new process model. The Top-Down approach in traditional BPM surveys To-Be processes. [77,78,79]

The Bottom-Up Approach

The Bottom-Up approach surveys existing processes, sub-processes and tasks. The collected individual processes and tasks are then categorized and together induce an overlaying process. This approach is As-Is-oriented and the initial point often is a concrete problem. One of the advantages of a Bottom-Up approach is the focus on the As-Is-Situation. The process model reflects the actual reality of the process landscape. This helps to identify potential improvements or possible weak spots during the analysis as the process model is based on detailed facts. Additionally a detailed As-Is description helps new employees or uninvolved third parties to better understand the processes.

[77] cf. Fischermanns, 2006, p. 102
[78] cf. Fleischmann, 2012, pp. 50-51
[79] cf. Becker, 2012, pp. 195-220

A disadvantage is that it supports a status-quo thinking pattern and the tendency to only look at sub-processes within one area because a generalized overview is missing. The basis of this approach is from detailed to overview and this can lead to a focus on very small and, for the present, unnecessary process details. It is, for instance, not necessary to document every hand movement, but it can happen and that in turn leads to an over detailed documentation of the process model. The combination of single process steps and the deletion of unnecessary steps are not possible till the optimization phase. Additionally one has to pay attention to the information used for such an approach. If existing data is used it might not only be over detailed, it can also be old. These aspects can lead to unrealistic and confusing process models which again lead to a status-quo thinking pattern. Such a thinking pattern is a hindrance on the way to find innovative solutions. The result is a high input of time and money with only little or no gain. [80,81,82]

Conclusion

Both approaches have different areas of application, depending on the overall goal of the organization and the survey. Although in theory these two approaches are strictly separated from each other even though such a separation is not achievable, or reasonable, in a real practical application. A process survey may begin with a Top-Down approach to acquire an overview and create a To-Be model of n organization's visions and future goals for its processes. After the Top-Down survey it is reasonable to execute a Bottom-Up survey to document the As-Is situation and test the previously defined To-Be model regarding the actual reality and integrity.[83] Also it is a fact that in reality there cannot be an absolute pure To-Be survey. No human being can completely forget or disregard all personal experiences when a survey is done. This means that a survey done with the Top-Down approach always includes elements of a Bottom-Up approach. [84]

The same applies if the initial point for a survey is the Bottom-Up approach. An As-Is model provides information regarding the actual executed processes, possible weak points and potential improvements. For further development it is necessary to define a future To-Be situation from the top. Extensive changes to an As-Is situation are not possible without the proper definition of a To-Be model.[85]

[80] cf. Fischermanns, 2006, pp. 103-104, 115-116
[81] cf. Becker, 2012, pp. 165-178
[82] cf. Fleischmann, 2012, pp. 50-51
[83] Fischermanns, 2006, pp. 102-105
[84] Fischermanns, 2006, p. 105
[85] Becker, 2012, pp. 165-228

This leads to the conclusion that a procedure for process surveys not only has to consider these two approaches but should actively incorporate and combine them. The S-BPM method actively applies and uses both methods in combination.[86]

2.5.2 The S-BPM Approach

The S-BPM approach is not a single approach but a range of approaches with the Top-Down- and Bottom-Up approaches as extreme points. By merging these two approaches the advantages of both can be used and applied. The initial point of a subject-oriented survey is the subject and the actual approach then depends on the goal of the survey. [87]

- If the actual process execution is important the logical approach is a Bottom-Up approach. The individual agents and their specific activities regarding the specific process are surveyed and described through various subject drafts (the subject behaviors).
- If the goal is to describe possible future developments or to define a process scope a Top-Down approach is the logical first step. The process is then described through the communication view. The communication view describes the communication (through messages) between all involved subjects within a company or organization regarding the surveyed process.

Process requirements are provided from the top while the actual execution happens at the bottom. The following figure stylizes a subject-oriented process within an organization. The pyramid and its layers represent the organization and its hierarchical structures. The higher management at the top of the pyramid defines the organizational goals and process requirements. The actual process execution begins at the bottom of the pyramid and is handled by the various actors. The subjects and the subject communication are represented by the blue boxes and arrows.

[86] Fleischmann, 2012, p. 51
[87] Fleischmann, 2012, p. 51

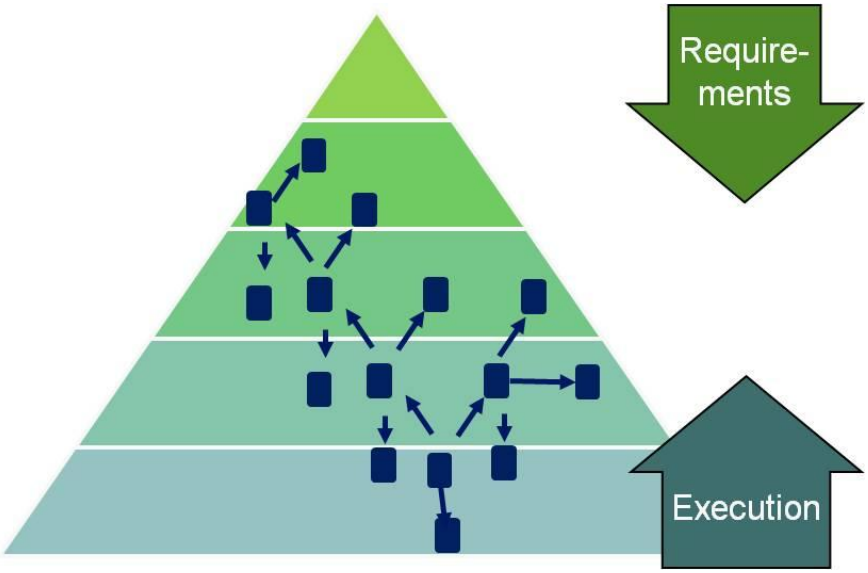


Figure 7: Process Requirements and Execution

The S-BPM method provides an approach for executing process survey with all the advantages of a Bottom-Up and a Top-Down approach. The actual performed approach can be chosen and adapted in accordance to the defined goals, the existing process knowledge and the organizational structures if necessary.

2.6 S-BPM stakeholders involved in a Process Survey

S-BPM defines four kinds of stakeholders: *the actors, the facilitators, the governors and the experts* (cf. Chapter “Disambiguation”). Each role provides a different point of perspective and is responsible for different parts of a process which, in this case, means for the process of surveying processes. The S-BPM stakeholders for a process survey are derived from roles involved in a process analysis.[88]

The *actor* or actors are the active parts in a process and usually know best how the process looks like and the according activities and tasks are carried out. The actors provide practical knowledge and experience for their particular processes.

The *facilitator* supports the actors during a survey in finding relevant contacts and handling the interpersonal communication between the involved parties. This also includes the provision of the necessary infrastructures.

The *governor*’s responsibility is to ensure that the defined goals and objectives meet the organization’s standards, that they are within the organization’s constrains (time, budget, etc.) and in accordance to the overall goals of the organization.

[88] cf. Fleischmann, 2012, p. 44-46

The *expert* provides background information about his specific field and he is either directly or indirectly involved in the process. They may also provide a neutral point of view if they are external experts not directly involved in the process.

In a process a concrete agent executes the tasks of a particular subject described in the subject behavior. The agent also incorporates one or more of these roles depending on the process and the subject. These roles define the tasks and responsibilities of each involved agent during a process survey. For the explicit case when an agent incorporates two or more roles additional stakeholders are introduced: the *Process Owner* and the *Subject Owner*. These two stakeholders represent partial roles as well as role combinations.

"*The process owner denotes a role, position, or person that is responsible for a process within the organization. Process ownership is valid across functional borders or lines in organizational structures."*[89] A process owner is responsible for a process within an organization and combines the tasks of the governor, the facilitator, and in certain circumstances even the tasks of the expert. In the context of a process survey process owners are responsible for the survey execution itself, not the surveyed process. They have all required rights to organize, control and execute the process survey along with the access to all data and information which are required for this task. The role of the process owner as defined by the S-BPM method is comparable to the role of the process manager as described in BPM methods.[90]

A subject owner incorporates the role of an actor that is responsible for the description of specific subjects and subject behaviors of the surveyed process. This means that the subject owner also incorporates the role of a governor; within the limits of the respective subject. As an actor the subject owner is directly involved in executing the process and may provide specific knowledge in a certain field. This means that a subject owner can additionally represent the role of an expert regarding his specific processes. The subject owner has all required rights to gather information and data necessary to describe the respective subject behaviors.

2.7 Modeling subject-oriented Processes

After defining the method and the roles of the stakeholders for a subject-oriented process survey it is necessary to determine how to provide process models for process surveys. These process models have to provide a procedure for performing subject-oriented surveys while still being adaptable to each specific use case. This

[89] Fleischmann, 2012, p. 308
[90] cf. Becker, 2012, pp. 322-324

means that the described process model has to be general enough to be applicable for all kinds of processes and organizations.

Subject-oriented Business Process Management offers two different ways to model processes: modeling by construction and modeling by restriction.[91]

2.7.1 Modeling by Construction

The more traditional method is modeling by construction. This method starts with a blank sheet of paper and then constructs the initially undefined process. Approaches for modeling by construction are, for instance, the Unified Modeling Language (UML), Business Process Model & Notation (BPMN) or event-driven process chains (EPCs).[92]

The stakeholders use the information acquired by the survey and begin to create the process model on a blank sheet of paper. Step-by-step all the involved subjects, their respective activities, and the required business objects are introduced. [93] The subjects and their behavior are prone to change and the process model expands continuously, for example by adding or removing messages. These steps need to be carried out in a strict sequence and modeling by construction is the only possible method to build process models for most common modeling techniques.[94]

The steps for modeling by construction and their sequence are defined as following:[95]

- *Description of the processes and their relationships (process network)*
- *Identification of the process to be described*
- *Identification of subjects involved in the process*
- *Determination of messages exchanged between the subjects*
- *Description of the behavior of the individual subjects*
- *Definition of business objects and their use*

2.7.2 Modeling by Restriction

S-BPM additionally supports modeling by restriction. The difference is the starting point: Modeling by construction begins with an empty world; modeling by restriction begins with a universal process and a world of subjects.

[91] Fleischmann, 2012, p. 64
[92] Fleischmann, 2012, pp. 130-133
[93] Fleischmann, 2012, pp. 131, 305
[94] Fleischmann, 2012, p. 131
[95] cf. Fleischmann, 2012, p. 131

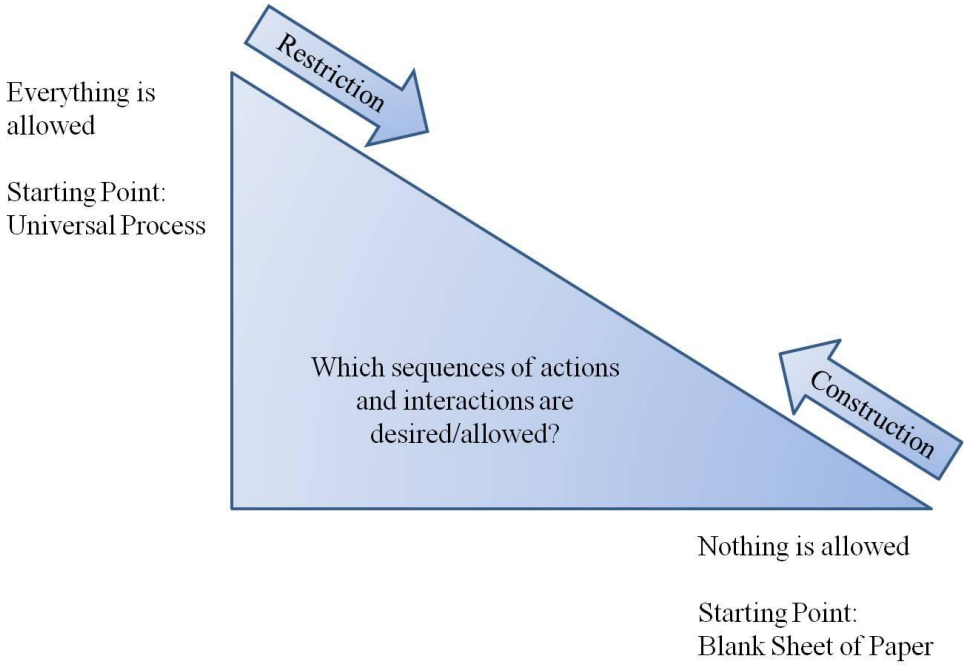


Figure 8 Modeling by Restriction and Construction[96]

The idea is that every Subject can do everything and is able to communicate or interact with any other Subject, at anytime and anyplace. For instance, everybody in a company can exchange information and messages with everybody else via e-mail or phone.

Modeling by restriction uses the idea of a universal process model. This is represented in the model as every subject can send and receive messages from any other subject at any time. "*This process is then restricted step by step until only the desired communication relations remain. This is done by successively removing those elements, which are not required to accomplish tasks.*"[97] Figure 10 shows an exemplary subject interaction diagram for a universal process with three subjects. The names Subject1, Subject2 and Subject3 are abstract and do not have a designated agent or roles.

[96] adapted from Fleischmann, 2012, p. 131
[97] Fleischmann, 2012, p. 130

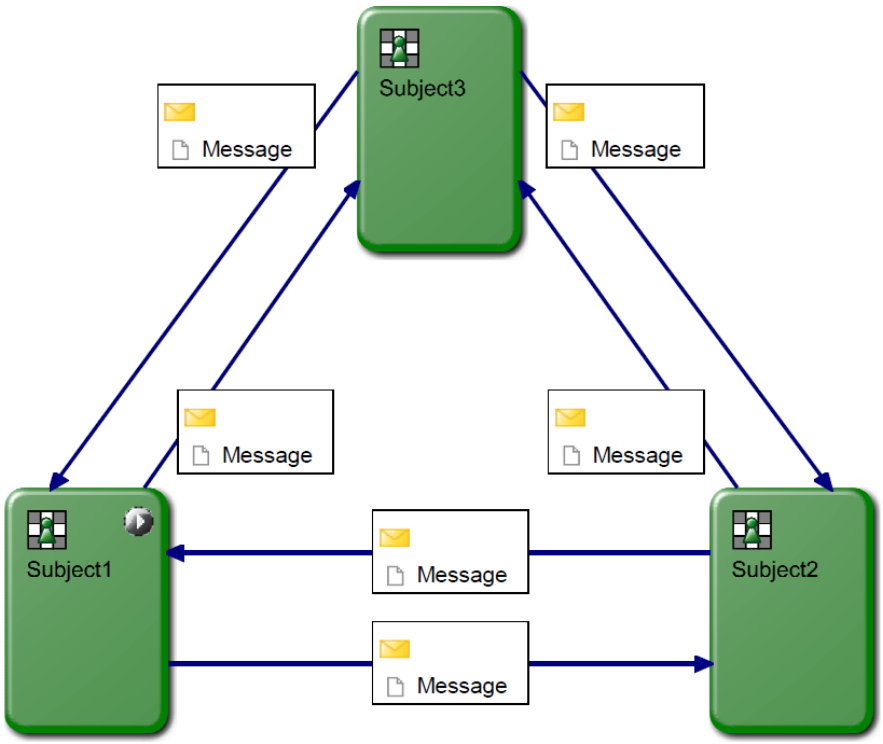


Figure 9: Example of a universal process with three subjects[98]

The subjects involved characterize the universal process. As every subject can send messages to any subject, the number of involved subjects defines the individual subject behaviors. The universal process model uses a universal subject behavior to describe this accordingly. Figure 11 shows the universal subject behavior for Subject1 from Figure 10.

[98] adapted from Fleischmann, 2012, p. 132

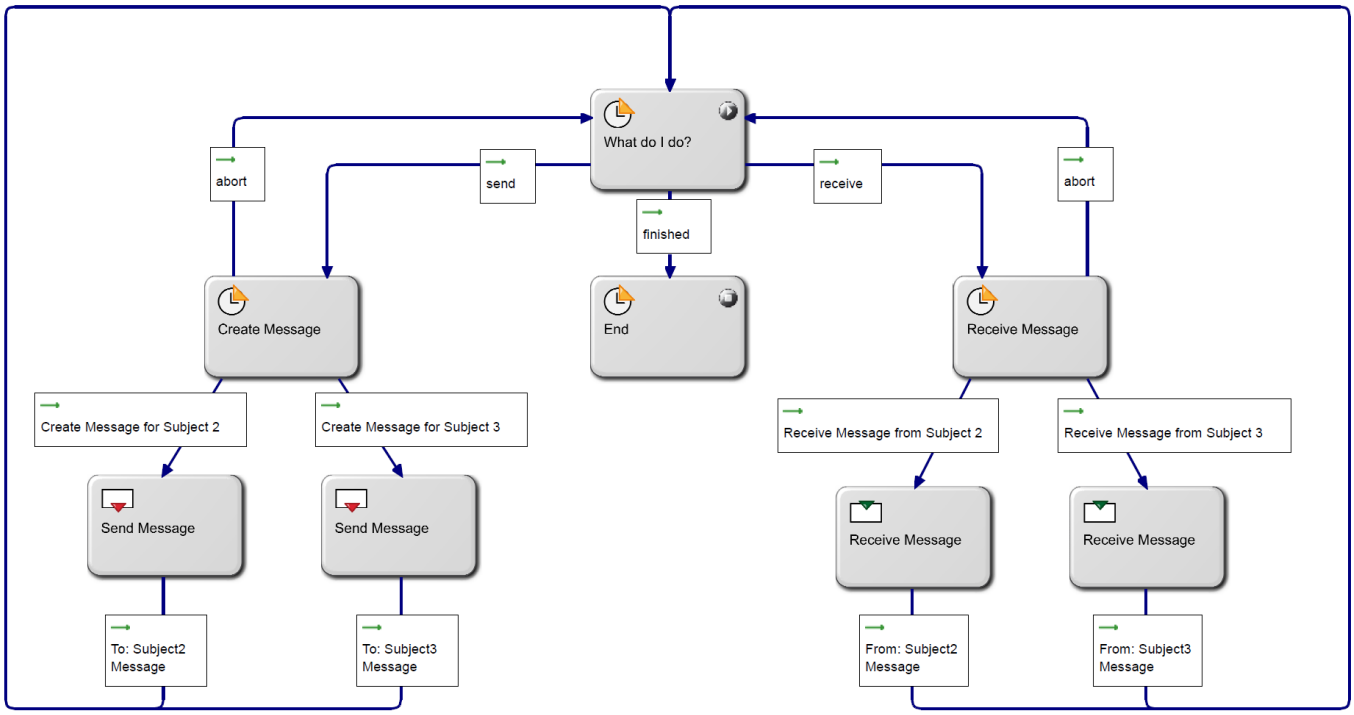


Figure 10: Universal Behavior of Subject 1[99]

The subject begins the process by deciding what to do, represented by the state “What do I do?”. Depending on the decision the subject then either sends a message to one of the other subjects or waits to receive a message from one of them.

The Subject Behaviors of all other involved subjects are analogous. The universal process with three subjects is just an example. There is no limit to the actual number of involved subjects. The Subject Interaction and subject behaviors change in accordance to the number of involved subjects and their tasks.

The universal process of modeling by restriction and the abstract nature of the subjects allow modeling and describing generic processes for theoretically any kind of organization or company. This means modeling by restriction can be used to describe a universal process to survey processes. The universal process can then be adapted for each specific use by determining the number of subjects, their communication and by introducing concrete identifiers. This way it is possible to create process models for different approaches of a process survey by adding or removing restrictions to/from an already existing process model.

[99] Fleischmann, 2012, p. 133

3 Practical Approaches for subject-oriented Process Surveys

Modeling by Restriction will be used to model the process models of the various approaches. This does not mean that modeling by restriction is necessarily used during the actual survey. The Process Owner of the survey process has to decide by himself which of the two modeling method is suitable to survey and model the surveyed process. The main principle for a subject-oriented process survey is to gather process knowledge and information from the point of view of each involved agent.

The Process Owner responsible for the process survey identifies subjects and their respective subject owners according to the surveyed process. To identify the subjects and the subject owners the process owner can evaluate existing process information, observe the process itself, and apply the help of various superiors or agents involved in the process. The Subject Owners define their tasks, messages and interactions with other agents according to the specific roles they inhabit in the regarding process. Naturally the process definitions given by the various agents may differ from each other. In this case the agents communicate with each other to solve the issues and discrepancies. The Process Owner monitors, evaluates and controls the process survey and the results provided by the subject owners and plans further steps accordingly.

A Subject as represented in S-BPM is not necessarily a person. If an abstract subject represents a database, a technical device, or other, the required information has to be provided by a representative subject owner

Applying the structure of the Open Control Cycle for a survey, the spectrum of S-BPM approaches and modeling by restriction three core approaches for a subject-oriented process survey are defined:

- The Neural Approach
- The Communication Approach
- The Workshop Approach

All three approaches are subject-oriented methods to survey and model processes. They are not strictly defined step-by-step procedures instead they form a spectrum to survey a process and to acquire process knowledge. These approaches may vary and change depending on the available process knowledge, its level of detail and organizational structures. This means for example that the initial approach might be a Neural Approach which then shifts towards the Communication Approach during the survey as more process knowledge becomes available.

3.1 The Neural Approach described as subject-oriented Model

The Neural Approach is a bending point at one end of the spectrum that is defined by the S-BPM approach and represents a Bottom-Up approach.

The Neural Approach begins with the process owner and at least one subject owner. The Process Owner has to identify at least one subject owner to begin the survey with, in conjunction with the process that has to be surveyed. The Process Owner and the subject owner then define and describe the respective subject behavior accordingly. The Subject Behavior consists of all the subject's actions and the subject's communication with its neighbors. The result of this first survey is the subject draft, which describes the first subject behavior, and newly identified subjects (the neighbors).

All interactions between subjects are handled through messages and these messages define the subject's direct neighbors (the other subject owners). After completing the first subject draft the survey moves on to include the newly identified subject owners and the procedure is repeated. Figure 12 visualizes the concept of the Neural Approach.

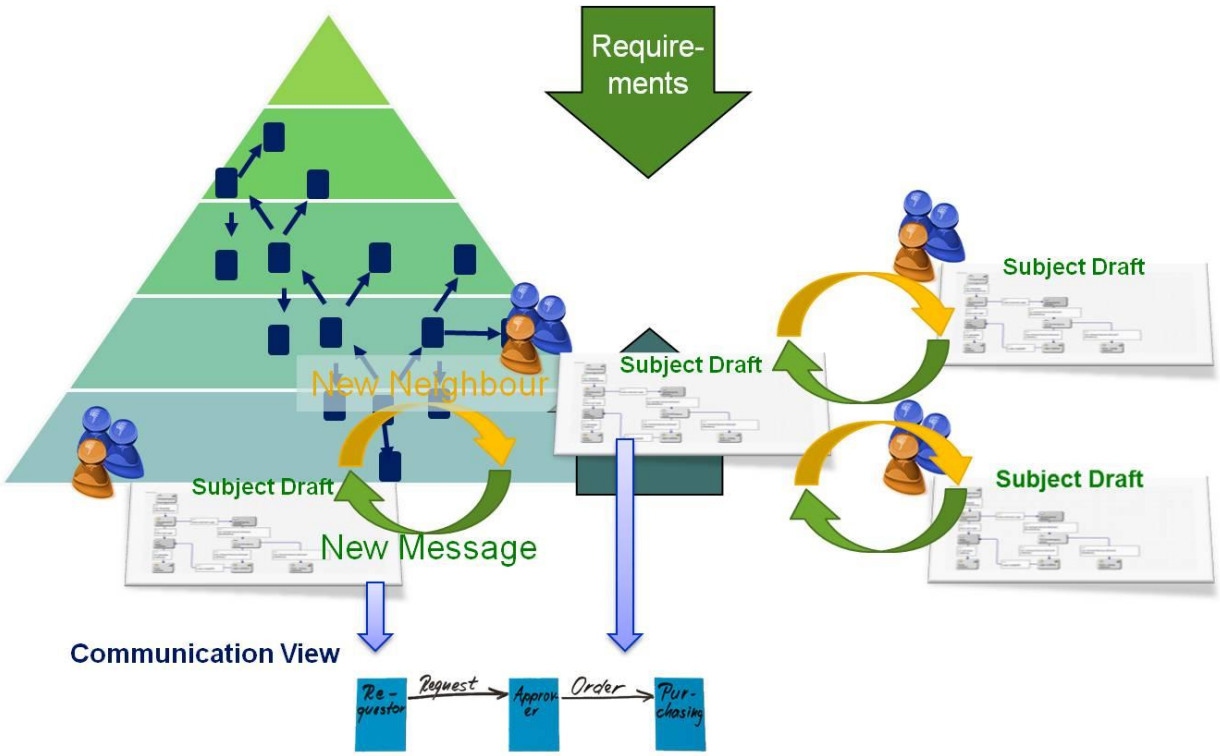


Figure 11: Concept of the Neural Approach

This way the survey jumps from subject to subject and information is transferred between them via messages, similar to a Neural Network: hence the name Neural Approach. The Neural Approach creates the subject interaction diagram automatically through the description of the subject behaviors and the subjects' interactions. The Process Owner has to decide if identified subjects are actually relevant for the survey goal, if acquired information is relevant and when to end the survey.

3.1.1 Subject-oriented Process Model of the Neural Approach

The depicted process model is an example of the Neural Approach with three subject owners. The number of involved subject owners is theoretically infinite but in our example it is assumed that there are a maximum of three subject owners. It is easy to extend the model to any number of subject owners. This does not mean that all three subject owners are necessarily part of the process and will be interviewed during the survey.

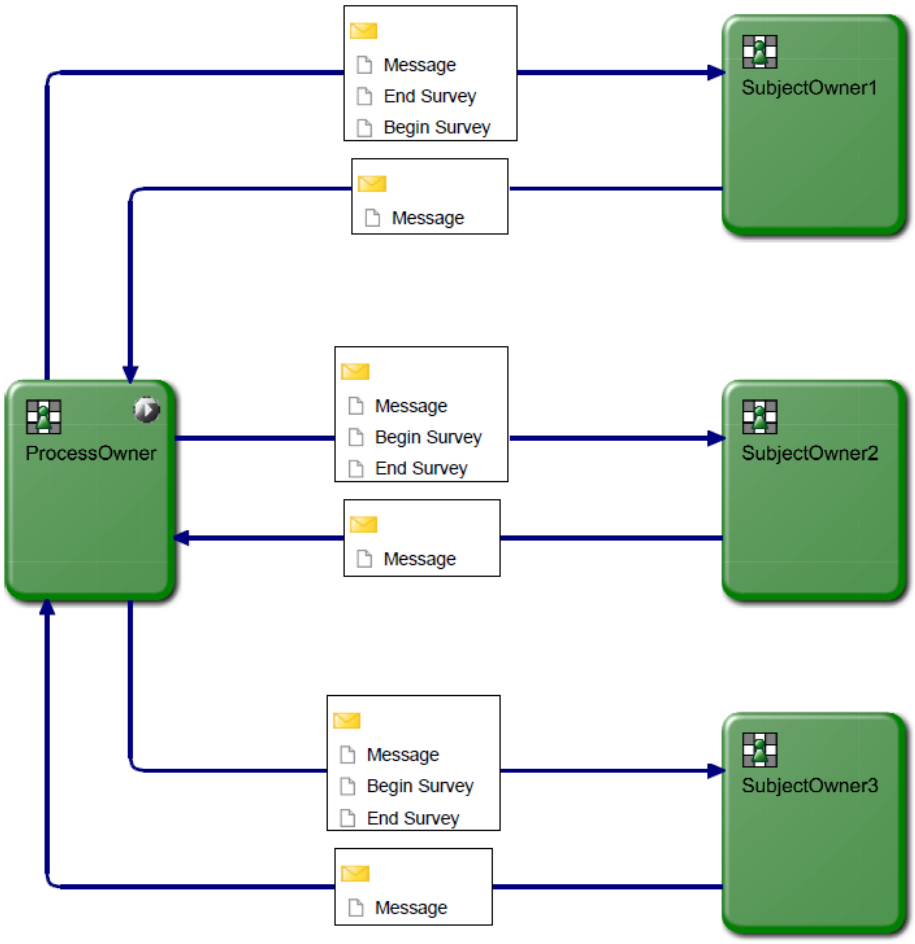


Figure 12: Subject Interaction Diagram of the Neural Approach with three identified Subject Owners

Figure 13 visualizes the process owner's behavior. The Process Owner identifies the first subject owner (SubjectOwner1) and begins the survey by notifying the representative subject owner. The survey and collection of information is carried out by communicating via messages. By defining the subject behavior of the first subject the process owner can identify additional subjects that are involved in the process. During the survey the process owner evaluates the gathered information and may choose further actions based on the result:

- Additional information is required to describe the subject behavior. The Process Owner continues the process survey with the subject owner to complete the subject draft. ("Further information is necessary" in Figure 13)
- The description of the subject behavior is complete but an additional subject owner has to be introduced to the survey. The Process Owner moves on to the next identified Subject, repeating the procedure. (" Introduce new Subject Owner" in Figure 13)
- Enough information is surveyed to define the process. The Process Owner ends the process survey. ("End Survey" in Figure 13)

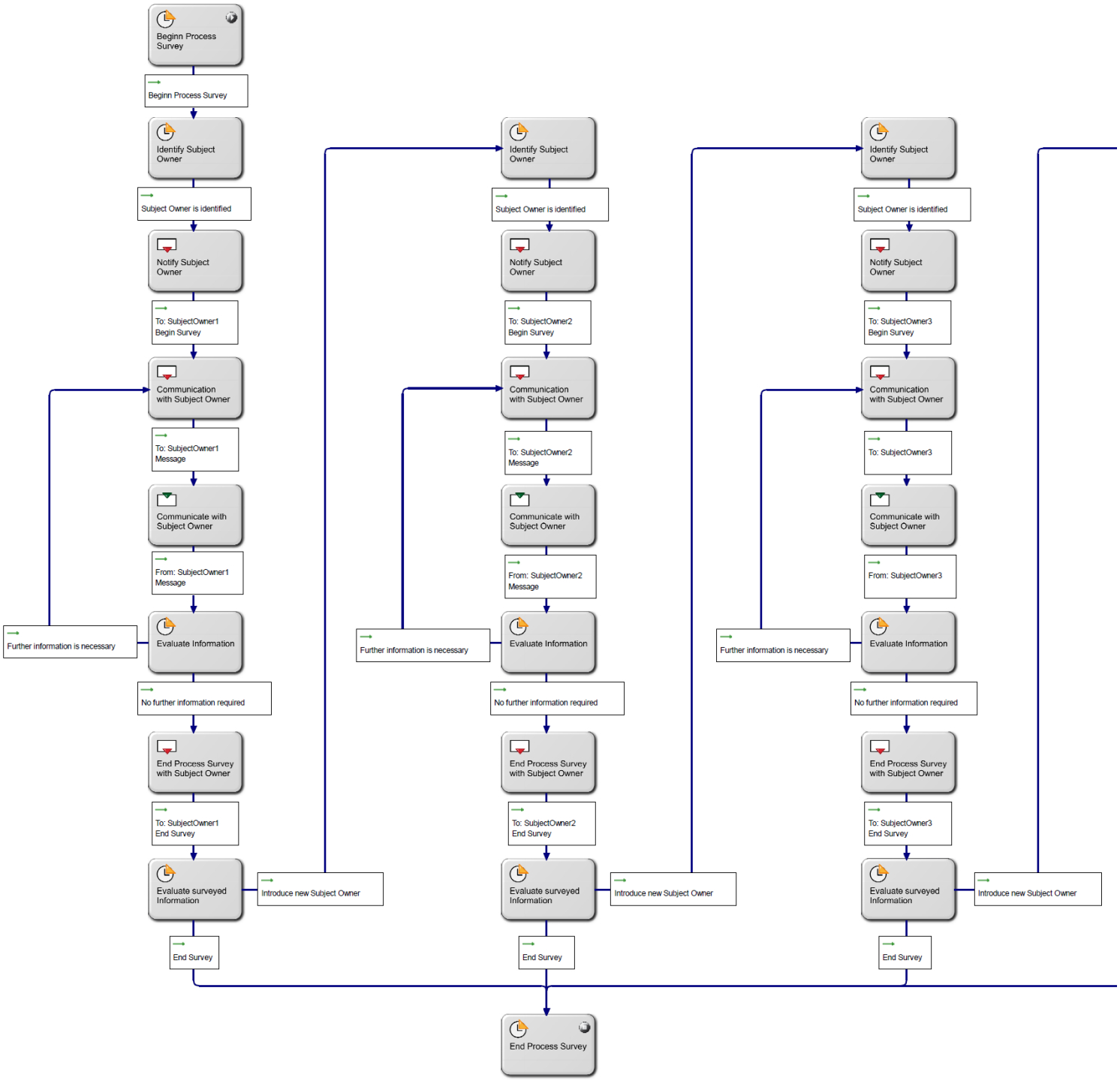


Figure 13: Subject Behavior of the Process Owner in the Neural Approach

Figure 14 shows the subject behavior of any subject owner in the Neural Approach. The Subject Owner begins the survey process as soon as a respective notification is received, represented by the state “Wait for Message from Process Owner”. The Subject Owner then communicates with the process owner via message exchange and prepares required information. This may include a spoken or written answer,

gathering additional information about activities or a consultation with other subject owners. When the subject owner receives a message that no further information is required for the moment the process ends.

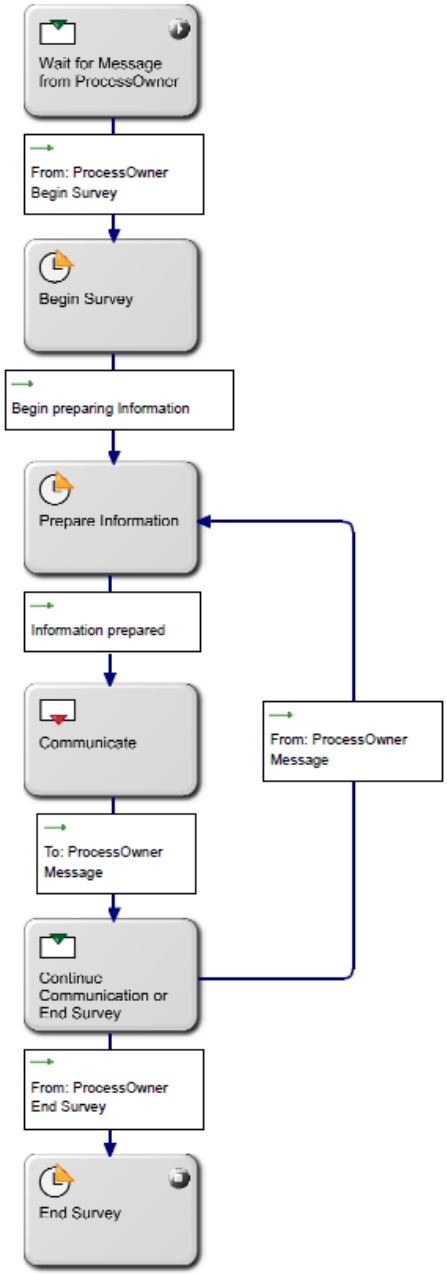


Figure 14: Subject Behavior of a Subject Owner in the Neural Approach

3.1.2 Advantages of the Neural Approach

An advantage of the Neural Approach is that the resulting process model mirrors reality as it is. The involved agents (or subject owners respectively) directly define the process model through their actions and interactions. The agents describe the As-Is-situation and so can directly influence a possible To-Be-Situation. This raises

employee motivation and the acceptance of upcoming changes. Another advantage is that the actors control and correct each other through their individual subject behaviors. For example if a subject behavior makes it evident that an agent requires data from another subject, but this data is never sent, then the subject behaviors are not consistent. This means iterations of the subject drafts are necessary to correct the process model. These iterations ensure that the defined subject behaviors practically complement each other and mirror reality as close as possible.

A company's communication is often very complex and difficult to understand even for long term employees. Figure 16 shows a possible communication structure of subjects in an organization. Each subject can communicate with other subjects either face-to-face or by using other means like software applications, E-Mail, phone, or social medias.

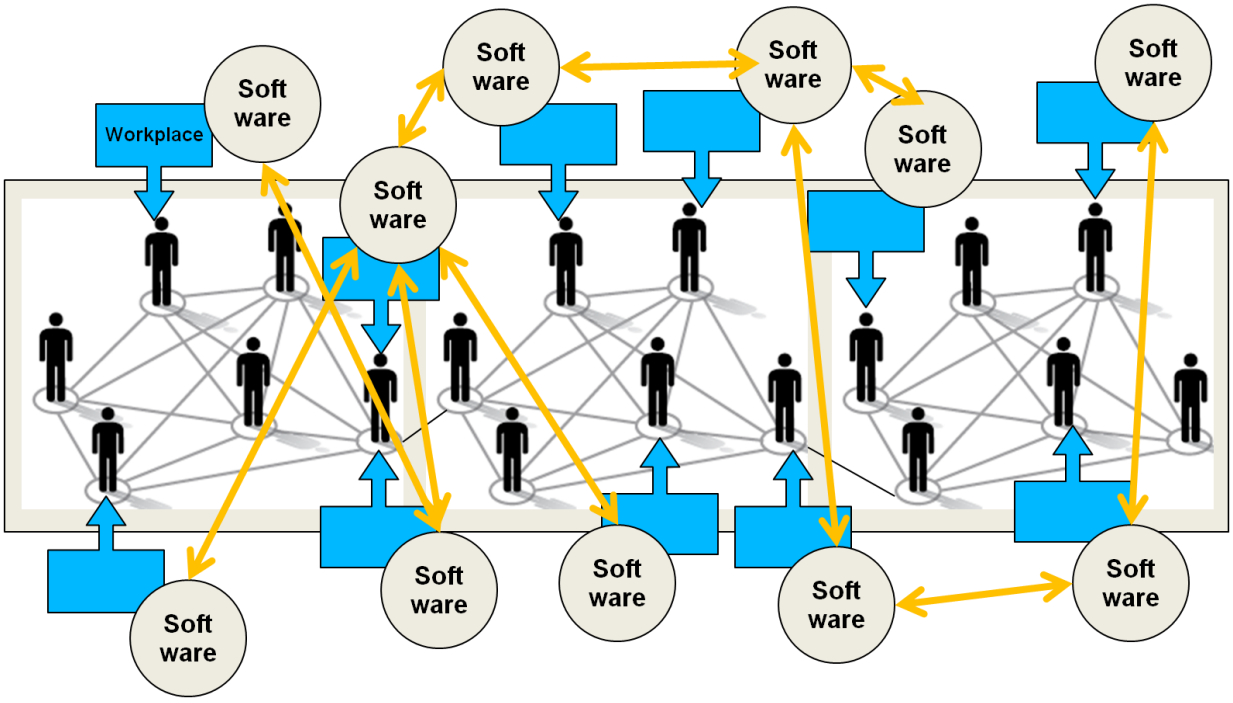


Figure 15: Exemplary Communication of Subjects in an Organization

This makes it very time consuming to get an overview of the actual communication and interactions between the involved agents in a process. The Neural Approach generates the Communication View automatically and simultaneously through the description of the Subject Owners and their messages.

3.1.1 Disadvantages of the Neural Approach

The number of single surveys, surveying information with one subject owner at a time, tends to be higher in the Neural Approach than in other approaches in the

spectrum. A time reduction might be possible by parallelizing the performed surveys by grouping identified subject owners and gather information from them simultaneously. The problem is that, especially at the beginning of the Neural Approach, only a small number of subject owners is known at a time and therefore only few subjects (if not only one) can be included in the survey. As only few agents are known at a time it can be difficult to schedule the survey and plan accordingly. This can make it very difficult to estimate the overall survey time and required resources.

An additional problem is the lack of a process scope. The process scope is defined through the process survey itself. Without a previously defined scope the process owner has to decide when to stop the survey, maybe without knowing if the accumulated information is really enough (or not enough). Without a previously defined process scope the Neural Approach risks surveying unnecessary or over detailed information.

An example: The goal of a survey is to model the sales process. The next logical step is to begin the interview with one of the sales manager, followed by all his neighboring subject owners and so on. Now one subject owner from the financial area describes what happens if the customer is not paying his order and that another division then handles admonitions. The process now drifts from the original sales process towards the admonition process. The survey of the admonition process was not intended and is useless for the actual survey goal. This can only be avoided with a previously defined process scope.

3.2 The Workshop Approach described as subject-oriented Model

The Workshop Approach represents the Top-Down end of the survey spectrum. This approach circumvents the problem of a missing process scope by beginning the process survey from the top, with the definition of a specific communication view and process scope. The communication view and process scope are defined in accordance to the organization’s communication structure and the survey goals.

During the survey any involved agent can communicate (exchanging messages) with any other agent at any time, for example via phone, E-Mail or any kind of social media. Together the subject owners define a communication view of the process including a concrete description of all subjects and their messages. When the subject owners have defined a complete communication view they continue with their individual subject behaviors, based on the communication view (see Figure 17).

The procedure of the Workshop Approach somewhat resembles the procedure of a process survey in BPM. The Process Owner identifies and gathers all involved agents of a process. However, the difference to classic BPM is that not all involved agents have to be physically present in the same room at the same time; they just begin with the survey process at the same time. By disassembling the process into subjects each subject owner describes his subject and subject behavior independently from others. As soon as a subject owner finishes a subject behavior he presents it to the process owner and so contributes to the overall survey.

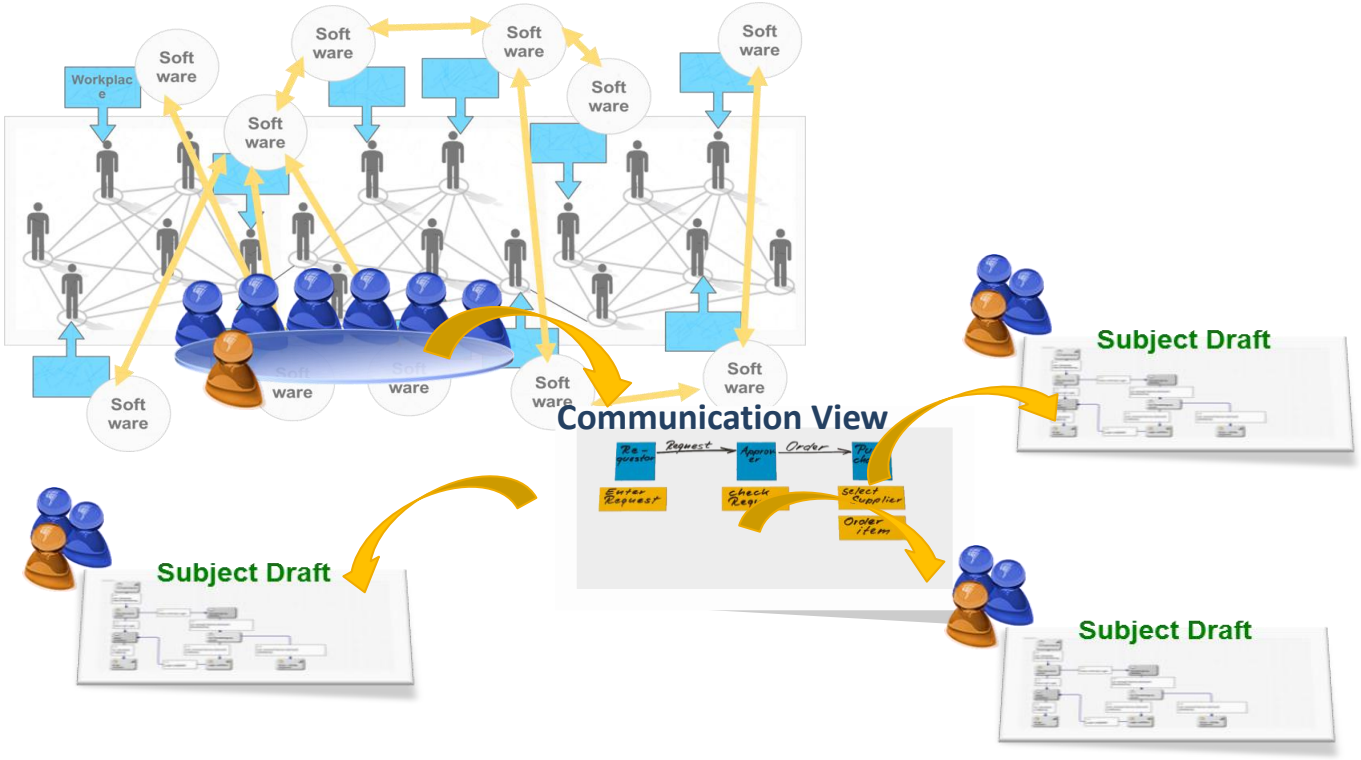


Figure 16: the Workshop Approach

The results of this approach are various subject drafts that describe the respective subjects' behavior in respect to the surveyed process. A subject draft includes all activities and messages the respective subject requires to execute the process. The communication between the various subjects is defined by the communication view. The Process Owner evaluates the survey results and ends the survey if the communication view and subject drafts sufficiently describe the surveyed process in accordance to the defined goals. The approach resembles the workshop procedure used in classic Business Process Management; hence the name Workshop Approach.

3.2.1 Subject-oriented Process Model of the Workshop Approach

Figure 17 visualizes a process survey with three identified subject owners: SubjectOwner1, SubjectOwner2 and SubjectOwner3. The Process Model is based on the universal process model (see Modeling by Restriction). Each identified subject owner receives a message from the process owner to begin the survey. All involved Subject Owners can communicate with each other through messages at any time.

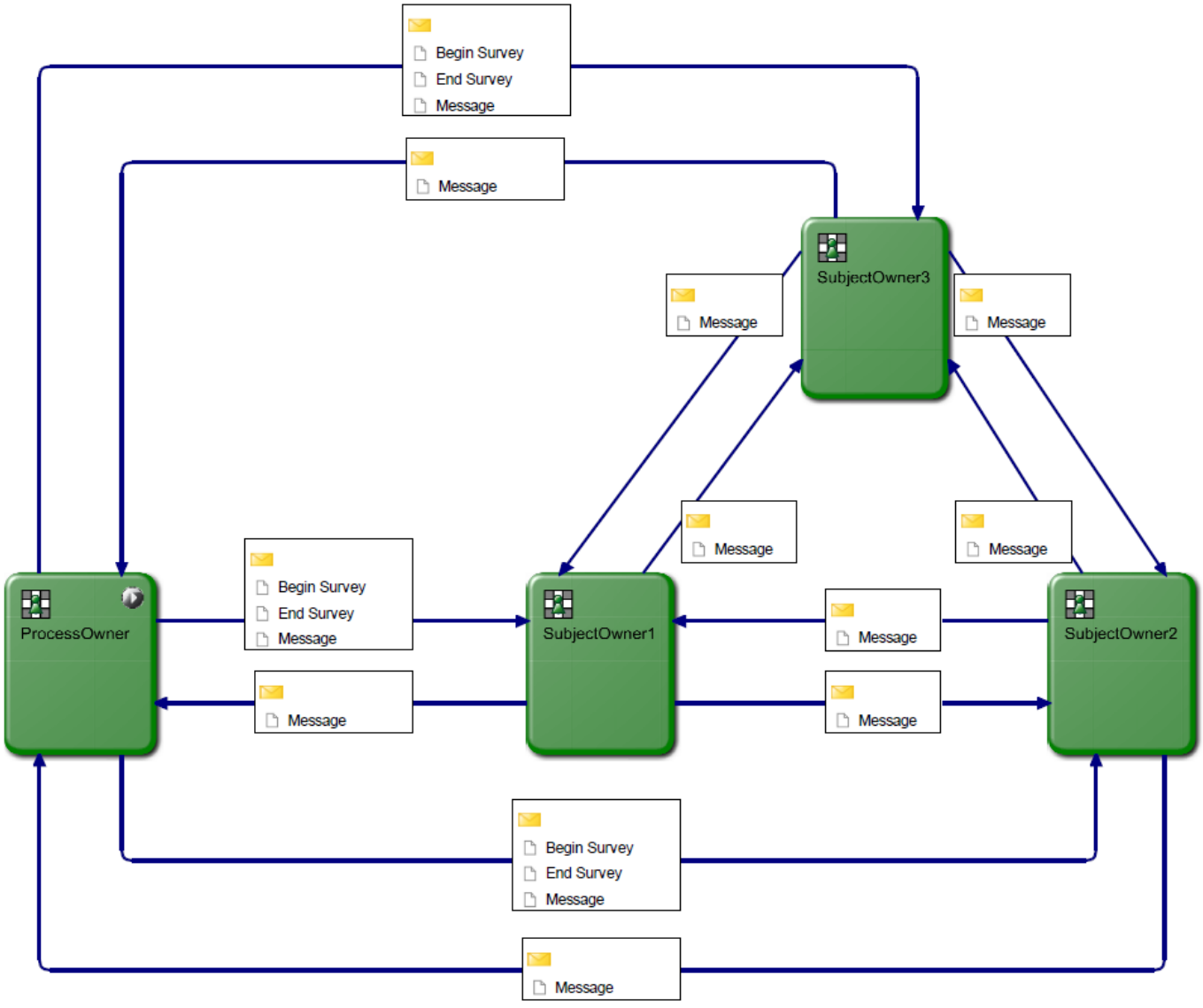


Figure 17: Subject Interaction for the Workshop Approach with three identified Subject Owners

Figure 18 shows the subject behavior of the process owner in a Workshop Approach. The Process Owner informs the various subject owners to begin with the process survey. The Process Owner then communicates with the subject owners via messages and evaluates the results to determine further actions:

- Remove a Subject Owner from the survey because all relevant information has been acquired.
- Continue the survey because relevant information is still missing.
- End the process survey because all relevant information for the surveyed process has been collected.

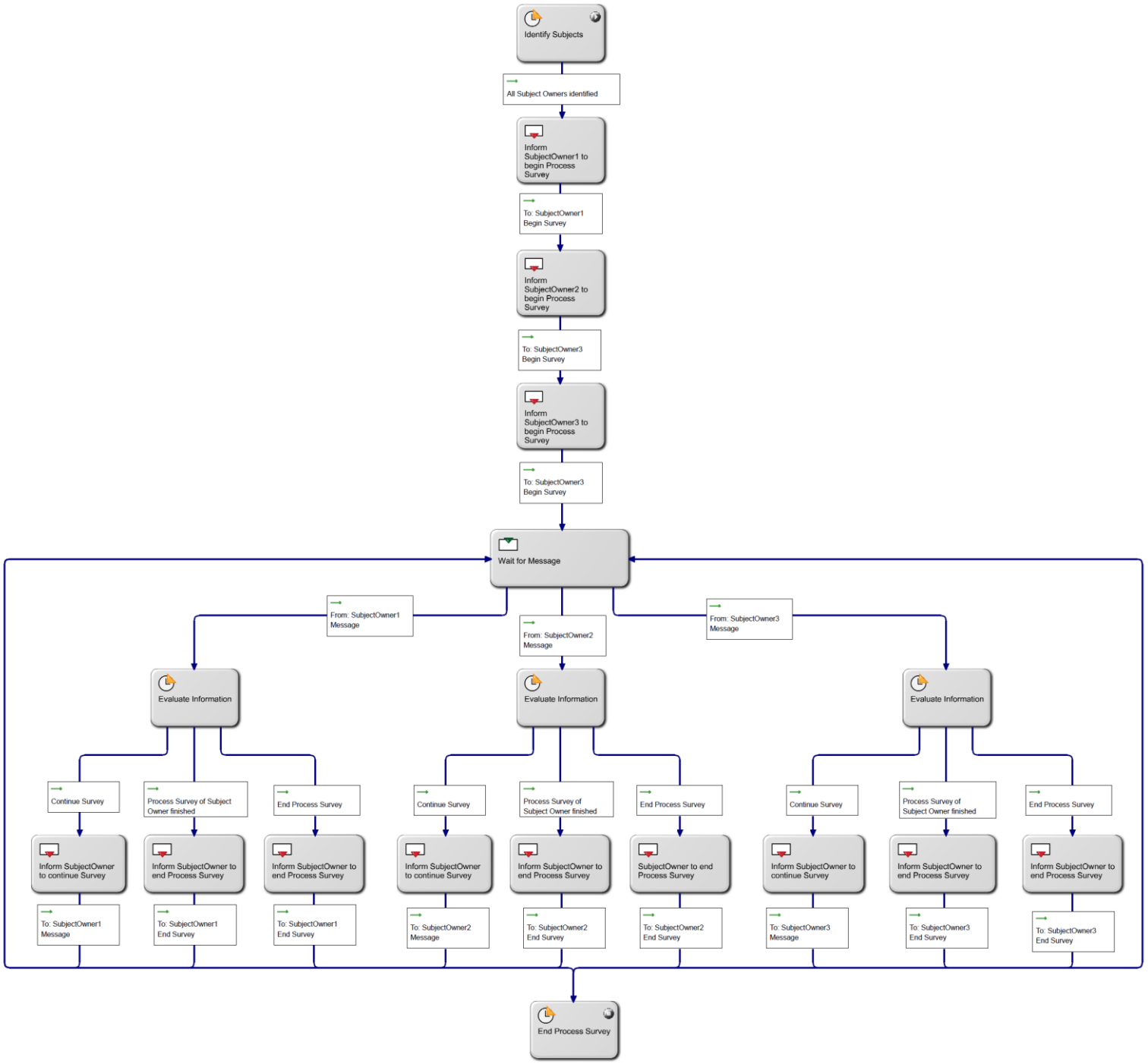


Figure 18: Subject Behavior of the Process Owner in the Workshop Approach

Figure 19 visualizes the subject behavior of a subject owner in the Workshop Approach. The Subject Owner begins the process survey after being informed by the process owner (Message “Begin Survey”). The Subject Owner then executes the process survey which includes several tasks and activities like collecting or creating process documentation, being in a group workshop or being interviewed. The Subject Owner may decide to communicate with other subject owners at any time, represented by the “Create Message” and “Send Message” paths in the diagram. When the subject owner finishes the survey he sends the survey results to the process owner and then waits for further instructions. Depending on the evaluation of the survey results the subject owner either gets the order to continue the survey or to end the survey (Message “End Survey”).

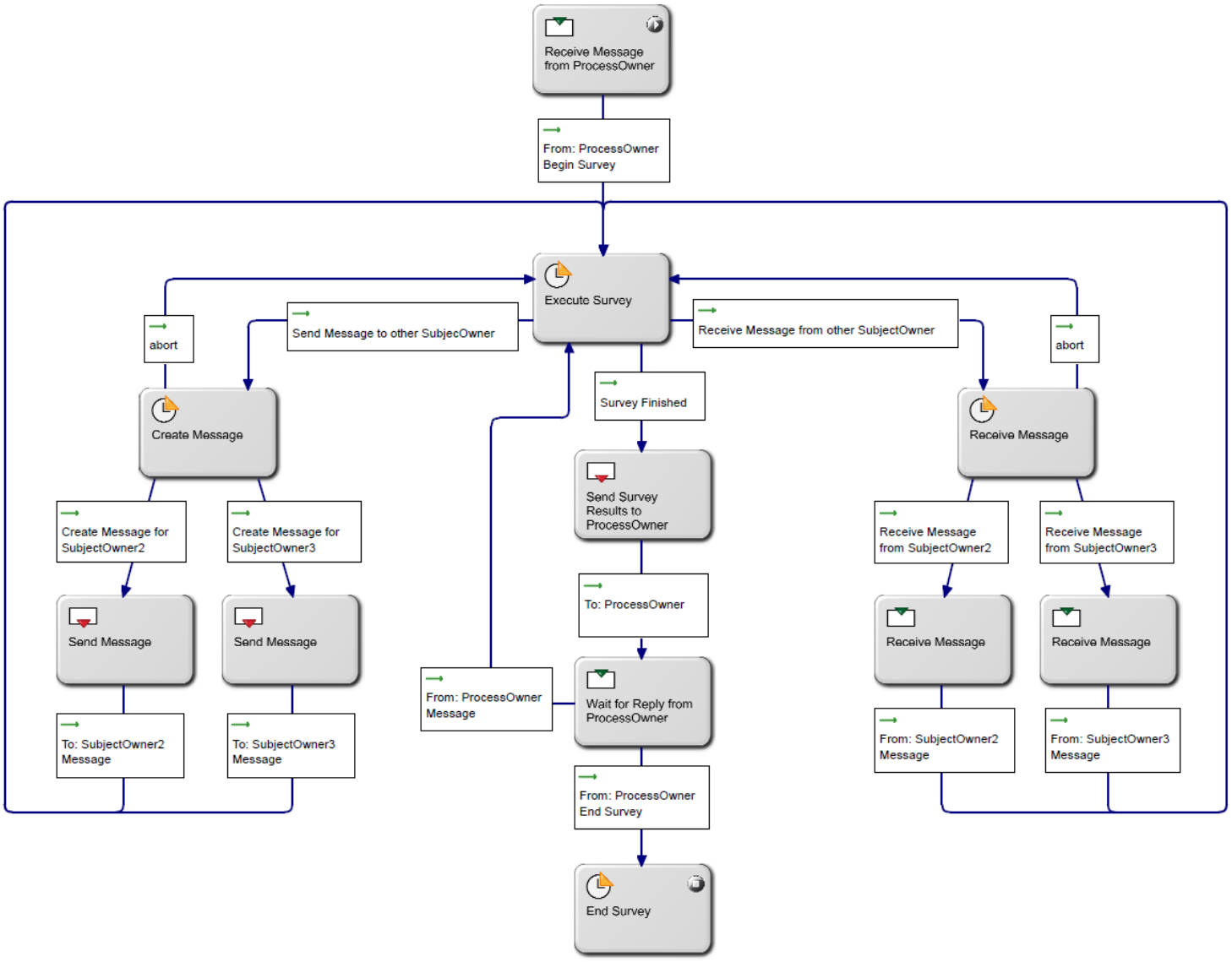


Figure 19: Subject Behavior for a Subject Owner in the Workshop Approach

3.2.2 Advantages of the Workshop Approach

The Workshop Approach, in contrary to the Neural Approach, has a defined process scope and so the process owner can more easily determine which information is relevant for the process survey and when to end the survey. All Subject Owners are identified at the beginning of the process and begin to work on the survey at the same time. As in the Neural Approach this does not mean that all involved subject owners are gathered in the same room at the same time, because of the encapsulation of the subject behaviors each subject owner can define his sub-process independently from others. The Process Owner can inform the specific agents beforehand which facilitates the planning of a time schedule for the survey. By applying additional experts it is possible to accelerate the survey as the experts may work independently from each other during the survey. This enables the process owner to parallelize the survey to some degree, for example by assigning two or three experts to interview different subject owners simultaneously.

3.2.3 Disadvantages of the Workshop Approach

The Subject Owners have to define a detailed communication view and therefore need to have a good overview and also a very detailed knowledge of the process. Additionally the “everyone communicates with everyone” situation resembles a group interview or discussion like in classic BPM approaches; with all the resulting problems: The participants may get lost in exhaustive discussions or in an overly detailed survey. Practical expertise has shown that it is not possible to achieve a 100% agreement between all participants of a workshop or group interview.[100] Another disadvantage is that the Workshop Approach in this form does not allow adding or removing subject owners to or from the process survey. A possible solution is to begin the process anew, including previous survey results as far as possible.

3.3 The Communication Approach described as subject-oriented Model

The Communication Approach keeps the balance between the Neural Approach and the Workshop Approach. The difference is that the process owner does not need to identify all subject owners for the process survey beforehand and the goal is not do define a detailed communication view, but a communication draft. Unlike the communication view, the communication draft is subject to change and it is expected that subject owners might be removed or added to the process survey. The identified

[100] Becker, 2008, p.177

subject owners can communicate with each other at any time and together they further develop the communication draft. While defining a subject behavior, a subject owner may conclude that an additional subject is necessary to completely describe the surveyed process. Also it is possible that a previously identified subject is not required for the process. In this case the process owner adds or removes the relevant subject owner to/from the process survey. This identification of new subjects happens automatically when subject owners define their communication for the surveyed process. If a subject owner needs to interact with another subject that is not yet included it is added to the process survey. If there is no communication between an involved subject and others (no messages going to or from the subject) it is implied that it is not part of the process and therefore removed. The identification of necessary or unnecessary subjects heavily depends on the communication between the involved subjects, therefore the name Communication Approach.

3.3.1 Subject-oriented Process Model of the Communication Approach

The Process Owner identifies as many relevant subject owners as possible and begins the survey by notifying the involved subject owners. If a survey result leads to the conclusion that another subject owner is necessary the process owner adds the relevant subject owner(s) to the survey. Figure 20 shows a process model with three identified subject owners and a placeholder-subject that represents any additional subject owners that may be added to the process survey. Any subject owner can exchange messages with any other subject owner at any time. Of course this includes subject owners that are added during the survey; naturally communication within the scope of the survey is only possible after the respective subject has been added.

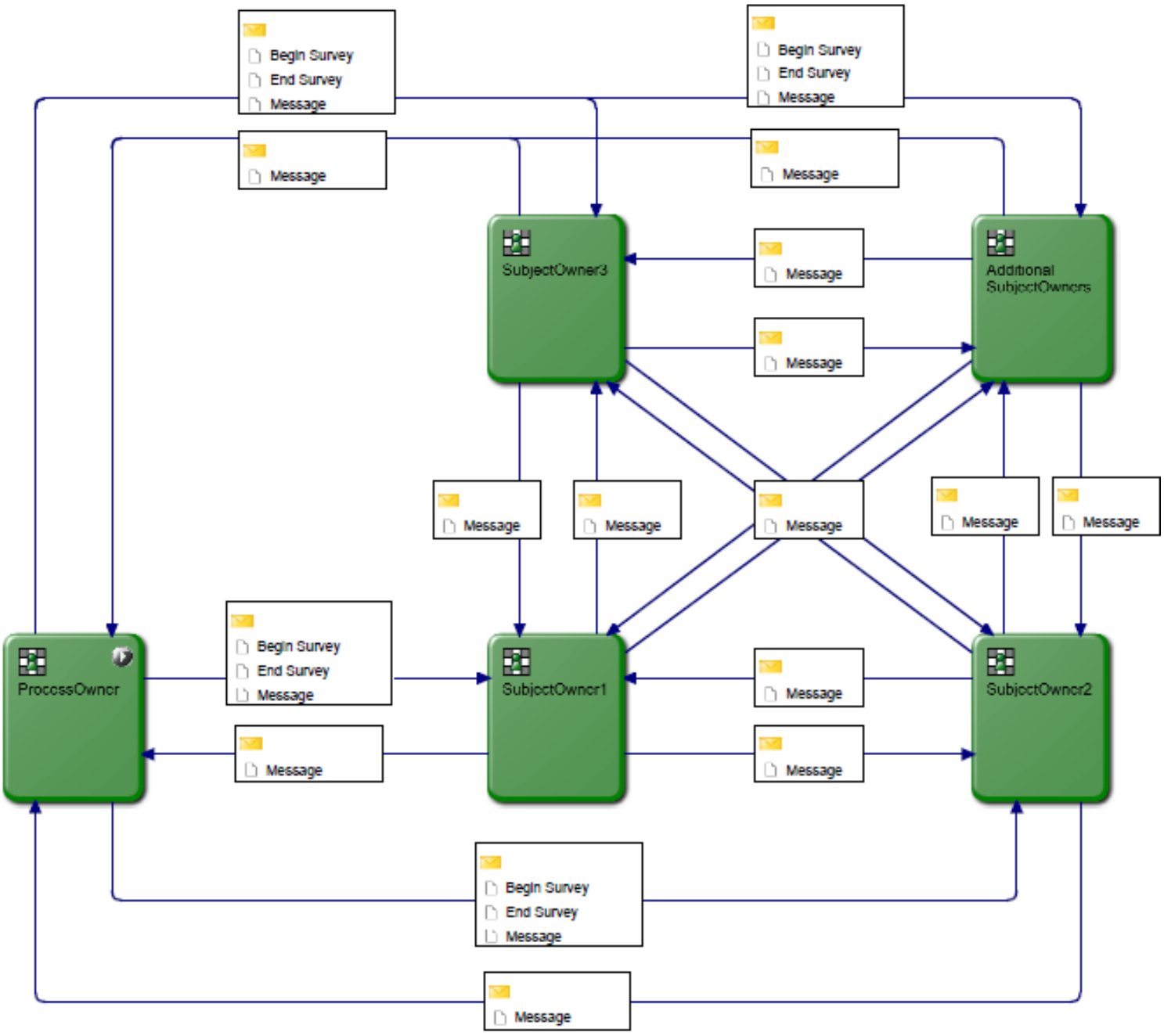


Figure 20: Subject Interaction of the Communication Approach

Figure 21 describes the subject behavior of the process owner. After identifying the subject owners the survey begins. As soon as the process owner receives survey results, he evaluates these results to determine further actions:

- Remove a subject owner from the survey because all relevant information has been acquired or because the subject is not relevant for the process anymore.
- Continue the survey because relevant information is still missing. This is done by sending a “message” with the relevant content.
- Add a new subject to the process survey by identifying and notifying the additional subject owner.

- End the process survey because all relevant information for the surveyed process has been collected.

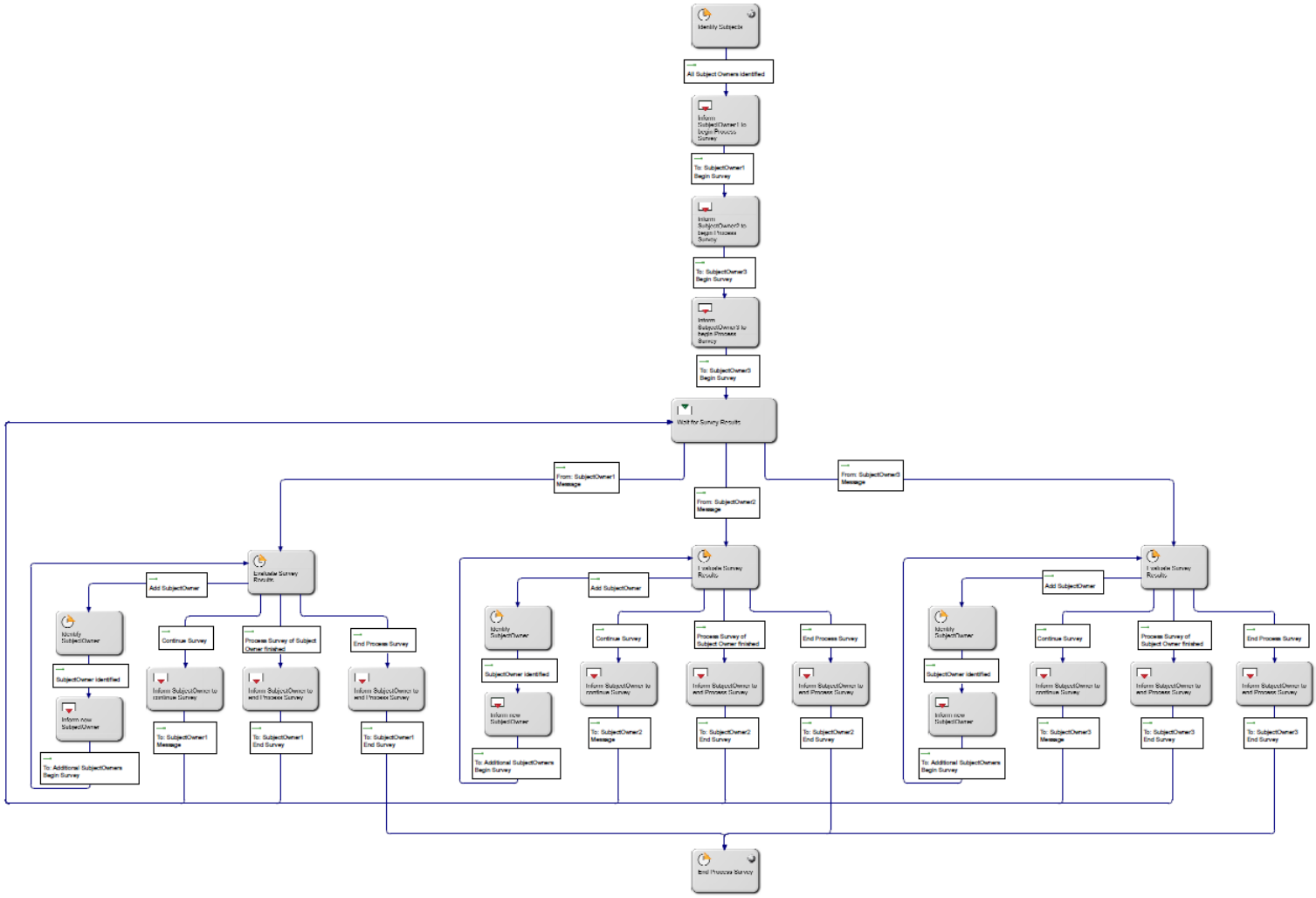


Figure 21: Subject Behavior of the Process Owner in the Communication Approach

Figure 22 shows the subject behavior for a subject owner in the Communication Approach. The subject behavior is practically identical to the behaviors in the Workshop Approach. The only difference is that the behavior is enhanced to include possible new subject owners to communicate with.

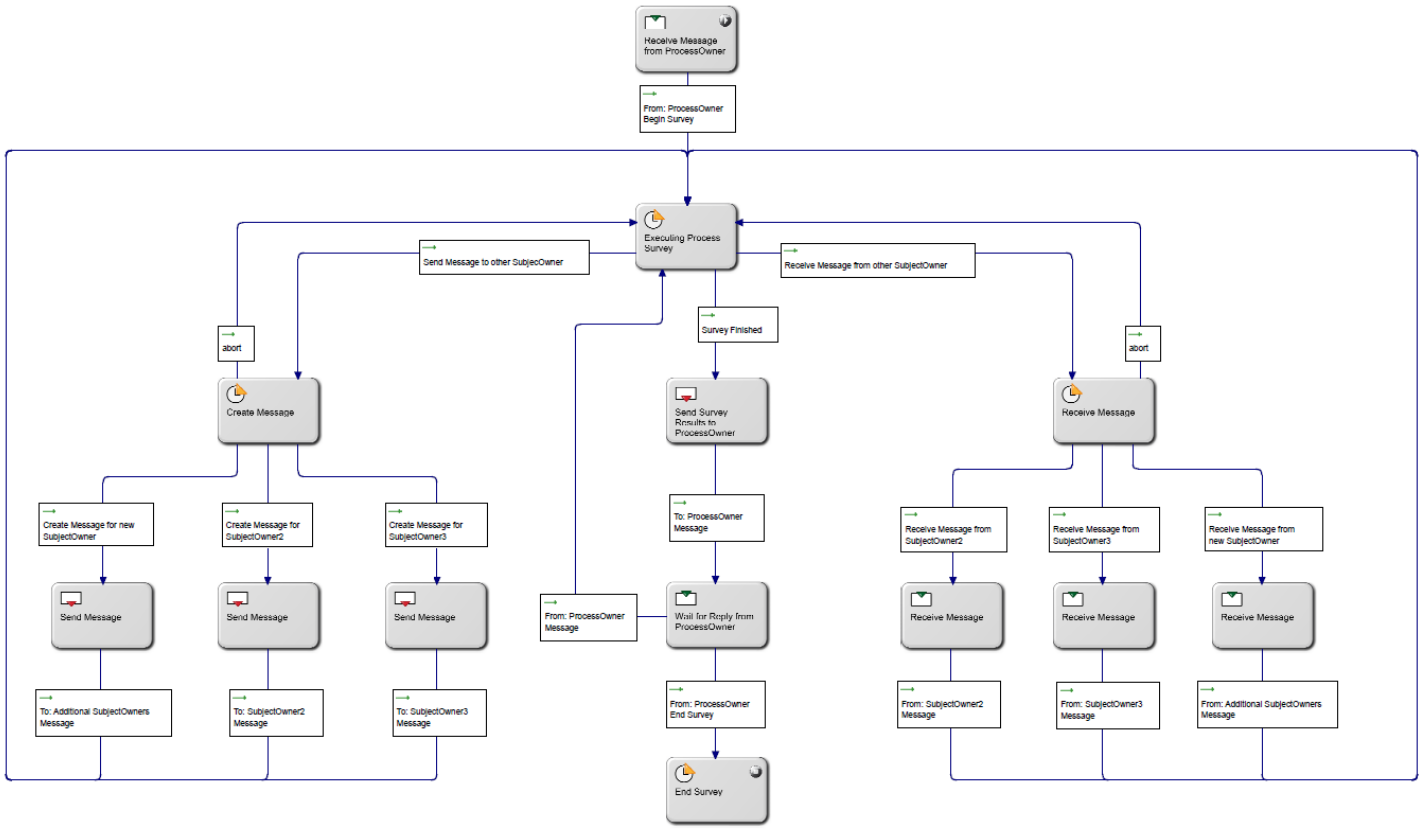


Figure 22: Subject Behavior of a Subject Owner in the Communication Approach

3.3.2 Advantages of the Communication Approach

The Communication Approach defines a process scope before the survey of the subject behaviors begins which helps to better differentiate between necessary and unnecessary information, countering one of the disadvantages of the Neural Approach. This also supports the process owner to determine if all relevant data has been surveyed. The subjects define their behaviors on their own and the communication draft together, this enables the subject owners to control and monitor each other's behaviors to some degree. The Communication Draft is corrected simultaneously, by adding and removing subjects and their representative subject owners. Step by step the communication draft is modeled into a detailed communication view.

3.3.3 Disadvantages of the Communication Approach

Although the subject owners identify other subjects it is still the process owner who has to decide if the new subject is really relevant for the surveyed process. If a

subject owner lacks the general process overview he may deem a new subject necessary for the surveyed process, even if it is not. Even with a defined process scope supporting the process owner, the risk of exhaustive discussion remains. The Communication Approach emphasizes the subjects' communication during the survey to define the surveyed process and to serve as a control mechanism. This, however, can again lead to exhaustive group discussions also not in the extent as it is possible in the Neural Approach.

3.4 Overview of the three Survey Approaches

The Neural Approach, the Communication Approach and the Workshop Approach are subject-oriented approaches to survey processes. The three approaches are not strictly defined procedures, they form a spectrum of process models and approaches to survey processes and acquire process knowledge. All approaches are subject to change and an organization may need to adapt the process models by introducing or removing restrictions according to the specific survey requirements. Such restrictions can influence, for instance, the direct subject interaction, the type of messages and content the subject owners may exchange or the time when communication may happen. The subject interactions, visualized through the messages in the process models, do not necessarily mean that the subject owners interact face-to-face. The Subject Owners can communicate in an indirect way through the process owner or through any other means of communication.

The Neural Approach generates the communication view automatically and simultaneously to the subject drafts. The Neural Approach is not a suitable solution to do a very detailed and exact survey of a specific process. However, if little process knowledge is available the Neural Approach can be a possible approach to gather process knowledge and gain a process overview. A parallelized way to execute the survey is be difficult to implement because only very few subjects are known at a time. Because of the S-BPM method it is not necessary to know all involved subjects from the beginning. Each known subject owner can describe a concluded subject behavior within the subject.

The Workshop Approach is closest to traditional BPM and so naturally inherits some of its problems, most noticeably the group discussions. A subject-oriented approach of such a process survey can soften some of the weaknesses because it enables the subject owners to define and model their respective subject behavior in a modular way, independent of other subject owners. The definition of the communication view only requires the subject owners to concentrate on the description of their respective tasks and activities in accordance to the defined view. This reduces the problem of exhaustive group discussions and the amount of unproductive time; as soon as the

communication view is completed the subject owners can work on their own. Still every subject owner can interact with any other subject owner at any time. This may lead to a kind of chaotic communication within the scope of the survey. However, defining an exact communication view requires a lot of detailed and exact process knowledge and information. This means the Workshop Approach is a suitable way to survey a process and create a process model if there is already a high amount of detailed process knowledge available.

The Communication Approach is in the middle of the spectrum and offers a more balanced way. The Communication Draft provides a process scope for the survey and a process overview for the involved subjects. The Communication Approach avoids exhaustive group discussions about detailed procedures by only defining a communication draft as guideline. Using the communication draft as orientation the subject owners define their exact subject behavior, adapt the communication draft accordingly, and create an exact process description step-by-step. The Communication Approach is a survey method that applies existing process knowledge to gather more detailed knowledge and to create a refined process model.

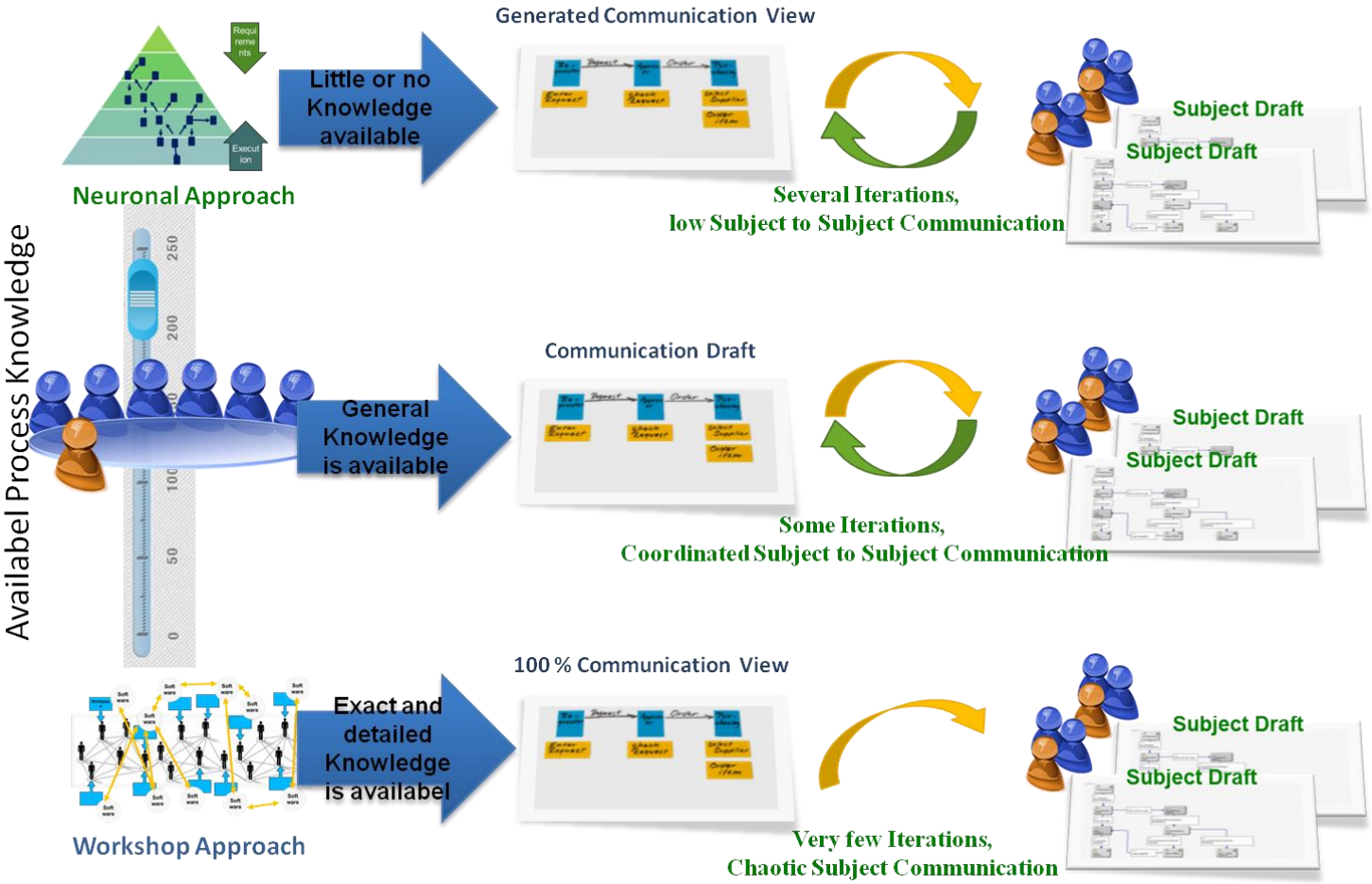


Figure 23 Overview of all three approaches

All approaches use the process owner and one or more subject owner as initial point for a survey. The basic structure for each approach is nearly the same over the whole

spectrum, most notably the subject behaviors change according to the respective approach.

Knowledge validation remains a problem for all approaches. The only possibility for the process owner to validate the gathered knowledge is to ask the participants if the surveyed process model is correct. The problem that the model and the contained process knowledge may be described incorrect, out of fear of negative repercussions or out of convenience, remains.

3.5 Use Case: Applying the Communication Approach in a Broadcasting Company

Exemplary one of the approaches is tested in a company. In respect to the company's goals for the process survey and the initial situation, a suitable survey approach is chosen. The goal is to proof that the approach can be used in a practical application to gather process knowledge and create a subject-oriented process model of the As-Is situation. The definition of a To-Be situation for the surveyed process is not part of the use case.

3.5.1 Initial Situation for the Survey

The company uses a very complex software and database system for data maintenance and to execute a management process. The software in use to operate and control the management process is very old and the company wants to replace and update it and in the same step optimize and improve the process itself. This requires not only a clear overview of the process but also detailed knowledge about the involved parties, their tasks and software requirements, in short: a process model. Although general process knowledge is available the company lacks the detailed knowledge to accomplish this goal. Previous approaches to survey the management process encountered two problems:

1) The software in use is very complex and supports many other processes. The development time of a new software system, to replace the old one at once, is an estimated period of 6-8 years. The only possible solution is to disassemble the process into sub-processes and replace the various modules of the software step by step. The BPM methodologies in use so far did not properly supported such an approach.
2) The management process consists of many different aspects and from an organizational point of view it is not possible to survey the whole process with

all involved parties. The actors involved in the process are scattered across different branch offices and across different cities. Due to time and geographic issues it is not possible to gather all employees at the same time to define a process model as described by classic BPM methods.

The company came to the conclusion that a new approach was required and was willing to try S-BPM as a new method to survey the process. The goal is to use the process survey as means to acquire relevant process knowledge and document the knowledge in a process model. The so gathered knowledge will then be used later to improve and optimize the process itself and to develop a new software tool for data maintenance.

The company's situation is used to test one of the three process survey approaches. Given that general process knowledge about the process goals, used software and some involved parties is available, the Communication Approach is chosen as initial point for the survey.

3.5.2 Procedure and resulting Process Models

By applying the S-BPM method, the management process can be divided into several sub-process and modules which then are further disassembled regarding the involved Subjects. The sub-process that was chosen first for a survey is the "Produktions- und Sendenachweis"-Modul (PSN-Modul; production and broadcasting confirmation). The "PSN-Modul"-sub-process is responsible for managing and maintaining the air dates of the various programs including data for planned programs or programs currently in production, generating invoices based on air times of the programs, and the verification of licenses regarding the used visual or audio footage.

To gather the individual process knowledge of the involved actors the questions provided by S-BPM to identify core elements in a process were used to perform guided interviews.[101] For the process survey the role of the process owner was distributed among five agents. These agents were:

- A technical expert who also incorporated the role of the governor and the facilitator. He was responsible for the Requirements Engineering of the software development and the technical implementation of the to-be developed software tool.
- Three method experts who performed the various interviews and were responsible for collecting all relevant process information.

[101] cf. Schnell, 2011, pp. 315-319; 378-381

- One modeling expert who operated the modeling tool during the interviews and the whole survey.

The information acquired during the interviews was documented in three forms. Each interview was recorded via microphone, allowing the experts to listen to the interview again for later evaluation. Each expert also took individual handwritten notes during the interviews; these notes were used to further complement the recorded information. Additionally, a process model was created simultaneously to each spoken interview. The experts used guided interviews to survey relevant process information.

In accordance to the Communication Approach an internal instructor for the software tool was interviewed to specify a first communication draft. The instructor incorporated the roles of an actor, a facilitator and a governor in the surveyed process. The resulting model of the draft was validated and further refined by the instructor at the end of the interview.

Figure 24 shows one of the main components of the communication draft that was modeled during the interview. Red subjects represent links in the modeling tool and only serve the purpose of increasing the overview over the process model. A bigger version of figure 24 can be found in the appendix.

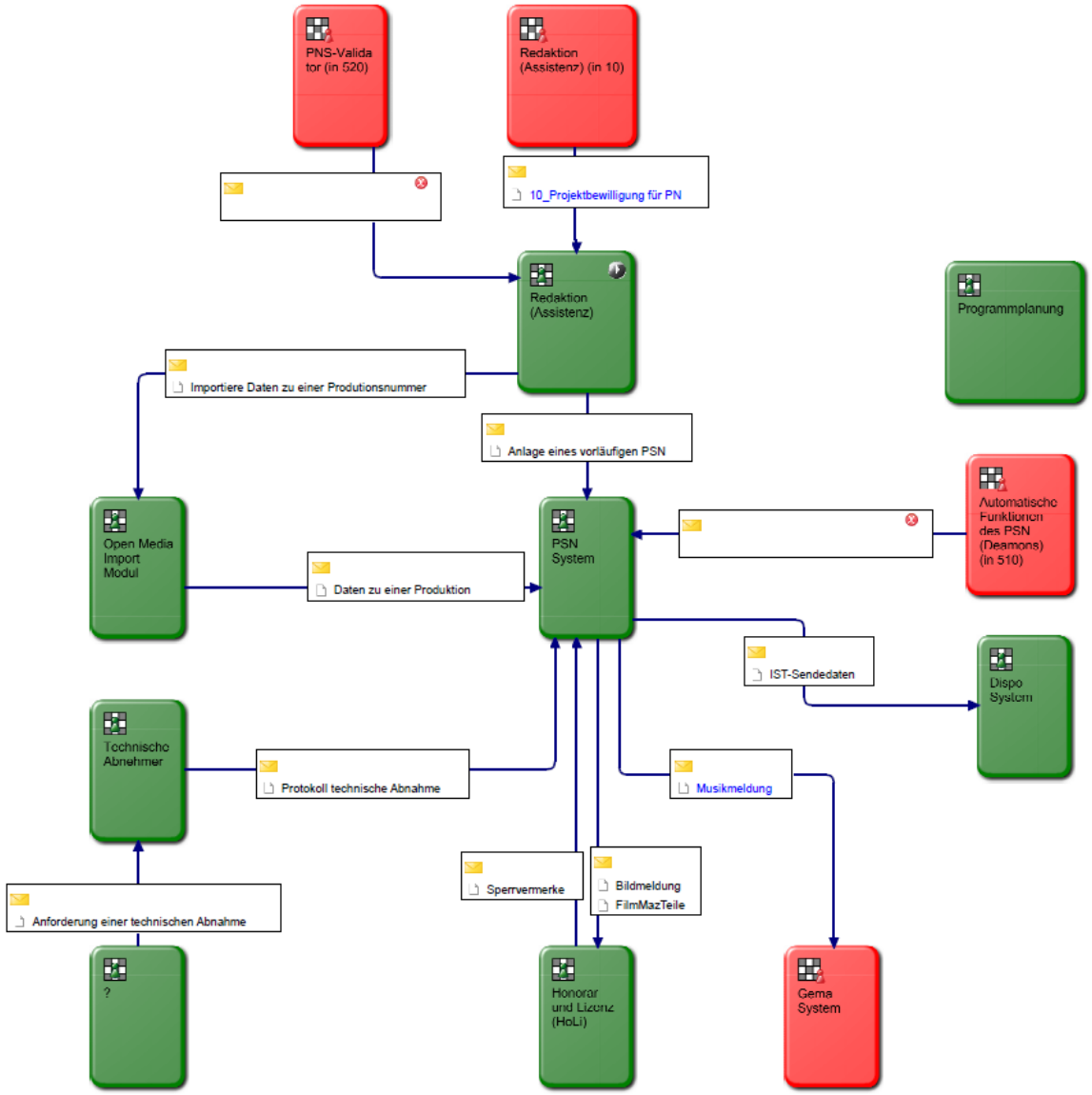


Figure 24: The first Communication Draft

Empty messages between subjects mean that it was known that communication happens between the subjects, but not what actually is communicated. Subjects with a question mark show that it is know that a certain subject exists within the process, but not the exact subject. This is the case with the subject “Technische Abnahme” (Technical Acceptance). The instructor could provide information that the subject “Technische Abnahme” exists and that it performs a technical verification but not who or what actually triggers the subject to begin with the verification. This is represented by the “?” subject.

Using the communication draft as initial point, the experts were able to identify involved subjects and the representative subject owners and plan further steps. The next step was to inform the various subject owners of the survey and plan a schedule for the interviews. To accelerate the survey the experts split up into two teams and so were able to parallelize the survey to some degree. Each team interviewed a part of

the subject owners and modeled a particular process model independent from the other team. To coordinate the results and the process models both teams were in permanent contact and met on a regular basis to share and compare results. If additional questions or discrepancies arose outside of the interviews the respective subject owners were send additional questions via E-Mail. These questions could normally be processed in written form. The Experts then refined and adapted the first communication draft in accordance to the gathered knowledge and the surveyed subject behaviors. Through these iterations the first rough version of the communication draft was refined into a more defined and exact model. Figure 25 shows the main part of the finalized communication draft. A bigger version of figure 25, the remaining parts of the communication draft and all modeled subject behaviors can be found in the appendix.

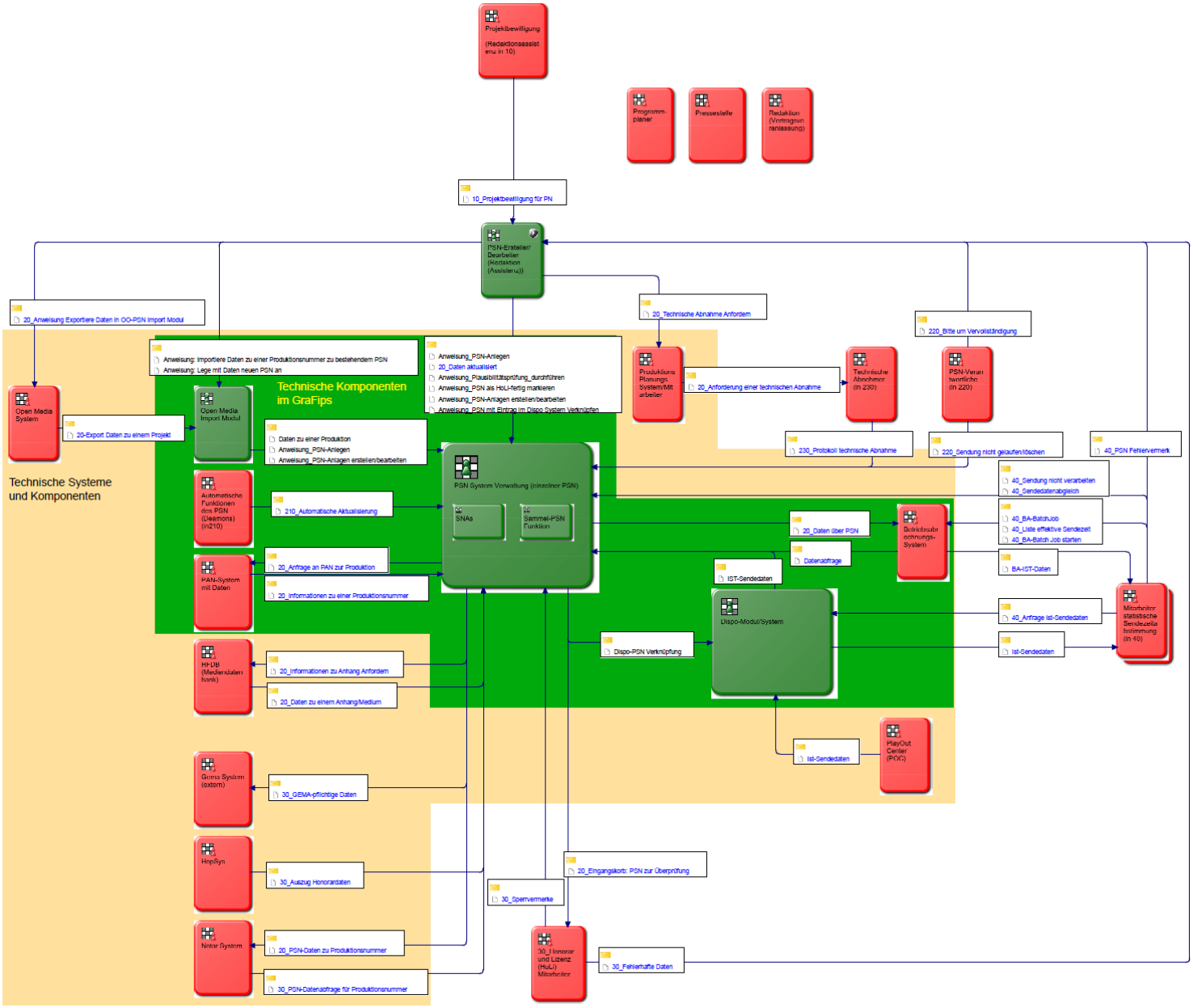


Figure 25: Finalized main part of the Communication Draft

Noticeably many new subjects were added to the first communication draft. To increase clarity complex functions were, if possible, further disassembled into extra subjects. Also several new subjects were identified by the subject owners during the survey, although this does not necessarily mean that the newly identified subjects are of importance for the survey goal. In the scope of the use case it was not possible to further validate and refine the shown communication draft.

3.5.3 Conclusion of the First Case Study

The overall effort for the survey was 30 (thirty) man-days for five (5) Experts. The overall duration for the survey was approximately three (3) months. The people representing the company were surprised and thrilled by the short duration of the survey and the detailed process model as a result, compared to their previous experiences with other BPM methods.[102]

The Case Study shows that the approaches are not clearly defined procedures. The initial approach for the survey is the Communication Approach, with a tendency towards the Neural Approach. The actors involved in the process are from different departments, scattered over different buildings or cities, and most of them have actually never even seen each other. This is the reason why a direct communication between the various subject owners was practically nonexistent during the survey. The experts (process owner) coordinated the indirect communication between the agents, like depicted in the Neural Approach.

Even though process models were created simultaneously during several interviews, due to time issues it was not possible to verify the process models with the interviewee on the spot (the only exception was the interview with the instructor). This resulted in one of the main problems the experts encountered during the survey: the interpretation of the information acquired during the interviews. The information gathered through the course of the interviews was sometimes not specific enough to describe all relevant aspects of the subject behaviors or subject communication. This led to time consuming discussions between the experts and made additional iterations with the respective subject owners necessary in order to verify and correct the process models. These verifications and iterations were processed in a written form via E-Mail because due to time issues within the company, it was not possible to do additional interviews.

The Case Study at the broadcasting company reveals that many problems result from the different interpretations of gathered information. A possible approach to

[102] Statement of the Project Leaders of the company at the final presentation

solve this problem is to interview the subject owner and simultaneously model the process, as partly executed during the case study. This way the subject owner can directly see how the experts understand the process, thus enabling the subject owner to immediately verify the process model. This has been proven difficult to implement in the course of the case study. The first reason, as already mentioned, were time constrains for the interviews which left the experts with practically no time to do individual verifications. The second reason was that to verify a process model the respective agent needs at least a basic understanding of the modeling notation in use which requires additional instructions. And the third reason was that not every interviewer is simultaneously a modeling expert capable of creating a process model parallel to the performed interview.

An approach to solve this problem can be to let the subject owners directly model their particular processes. This would involve the employees even more in the survey process and directly in the modeling process. But this also requires time for instructions for the modeling tool and additional resources for software licenses and hardware. The more time the subject owner requires learning and understanding the modeling tool the less efficient the survey becomes because instruction time is non productive time. Also deterrent effects of overwhelming modeling tools remain. The time needed for instructions can be reduced if the subject owner is allowed to choose his own modeling technique and modeling design that he is already familiar with. However, such an approach may lead to the application of many different model designs and does not prevent unclear or incomprehensible process models which again require the experts to interpret the information.

A uniform modeling design, supported by a proper modeling tool, which both experts and novices can intuitively understand and interpret, is a possible way to solve this problem.

4 Providing a Modeling Tool

As already mentioned software tools are often very complex and require additional resources for licenses, equipment, and instruction time. A normal process actor is seldom a modeling expert and neither has the time nor the desire to learn a complex modeling tool.[103] Time consuming instructions, issues with the compatibility of software versions and a complex modeling notation decrease the employees' motivation and require time and money. Another common problem with modeling tools is that companies focus on the technical application of the tool, instead of fulfilling the requirements for an efficient application of the modeling procedure and the resulting process models.[104]

An intuitive, uniform modeling design and appropriate modeling tool can result in a more direct involvement of process actors in the modeling process. This can reduce the overall survey time, reduce deterrent effects of complex modeling techniques, and can raise the overall quality of the documentation of process knowledge. Such a tool has to be intuitive to operate for modeling novices but also has to support phases of advanced process management and subject-oriented process surveys.

4.1 Existing S-BPM Modeling Tools

Existing modeling tools for subject-oriented process modeling are the Metasonic Business Process Management Suite (Metasonic Suite) and the Tabletop Concept Mapping (MetasonicTouch).[105,106,107]

The Metasonic Suite is a software modeling tool that was specifically developed for the S-BPM method and the creation of subject-oriented process models. Although the suite only uses the five symbols of the S-BPM modeling notation the high amount of possible setups and functions can overwhelm novices. Because of the previously explained disadvantages the to-be-developed tool will be detached from the direct employment of software interfaces to model process to eliminate the deterrent effects as far as possible.

[103] Turetken, 2013, pp. 38-39
[104] Schmelzer, 2013, p. 161
[105] Metasonic – business. in tune., keyword: Metasonic Suite, retrieved: 12.09.2013, http://www.metasonic.de/metasonic-suite-im-ueberblick
[106] Oppl, 2009, pp. 275-282
[107] Metasonic – business. in tune., keyword: Metasonic Touch, retrieved: 19.10.2013, http://www.metasonic.de/touch

The Tabletop Concept Mapping is an interactive platform to survey process knowledge.[108,109] The tool uses tangible blocks to model processes on a digitally augmented tabletop system (see Figure 26).

Figure 26: the Tabletop Modeling Surface[110]

The process modeled by arranging the blocks on the table is captured via a camera and simultaneously converted into a digital version, automatically documenting the process model and transferring it into the Metasonic Suite. This enables the process actor to operate a software based modeling tool via the application of tangible blocks. The Tabletop Concept Mapping increases the intuitiveness of operating modeling software by introducing a tangible modeling interface. However additional input via keyboard and mouse is still required to enter concrete subject names, message names or other additional process information. This means the Modeling Table does not allow a complete detachment from the software suite and still requires at least one expert who can operate the software during the modeling process.

The technical facts of the modeling table with a size of 1100x1080x970mm, a weight of 50kg and a price of approximately 17.000€ are an additional hindrances for the goal to let the process actors directly model their processes. [111] Taking the case study at the broadcasting interview as an example it would require multiple tables to work with more than one interviewing team. It also would require either additional effort to transport the tall and heavy table or the process actors to travel to the location of the modeling tool. The high cost of the table and the additional resources

[108] cf. Oppl, 2009, pp. 275-282
[109] cf. Oppl, 2011, pp. 16-33
[110] Oppl, 2011, p. 19
[111] Metasonic AG, business. in tune., keyword: Metasonic Touch, retrieved: 19.10.2013, http://www.metasonic.de/en/touch-technical-facts

required for transportation and/or travel can decrease the overall efficiency of a survey.

4.2 The Modeling Tool: the S-BPM Buildbook

Derived from the former described problems and by using the concept of tangible interfaces from the Tabletop Concept Mapping the specifics for a new modeling tool were defined:

- The tool has to be intuitive to operate by modeling novices by using an intuitive modeling design and notation. The predefined design and notation serve as guideline to prevent inconsistencies between different users and ensures the highest possible quality of the resulting process models. In this case quality refers to the relevant process information contained in the process model.
- The provides a framework to modelers to create non-redundant and syntactically correct process models while being detached from software based input to model processes.
- The tool can be provided to several modelers at once and supports the describe approaches for subject-oriented process surveys.

The need of proper model documentation and the use of software tools for a more complex survey, analysis and administration of the process models cannot be neglected. The tool supports further steps for advanced process management and documentation. These functions are still completely detached from the actual modeling process.

For the base structure for the modeling tool the size and weight of an average laptop were used as orientation point. The goal of using a tangible interface without any kind of software resulted in the application of a letter case as basic structure with the name “S-BPM Buildbook”. The concept of a letter case is very intuitive to understand and operate. The idea is to model the process with different kind of plugs within the provided case. To ensure a proper quality of the so create process models a suitable modeling design and notation has to be employed.

4.2.1 Modeling Design and Notation

To determine a proper modeling design for the new modeling tool the results from two experimental studies were factored in. The goal of the studies was to understand which design forms novices use to describe a process with basic tools (pen and paper) and which process design is best suited to transport relevant process

information. [112,113] These studies identify five different process design archetypes which range from a pure textual design to a pure graphical design (cf. Figure 28).

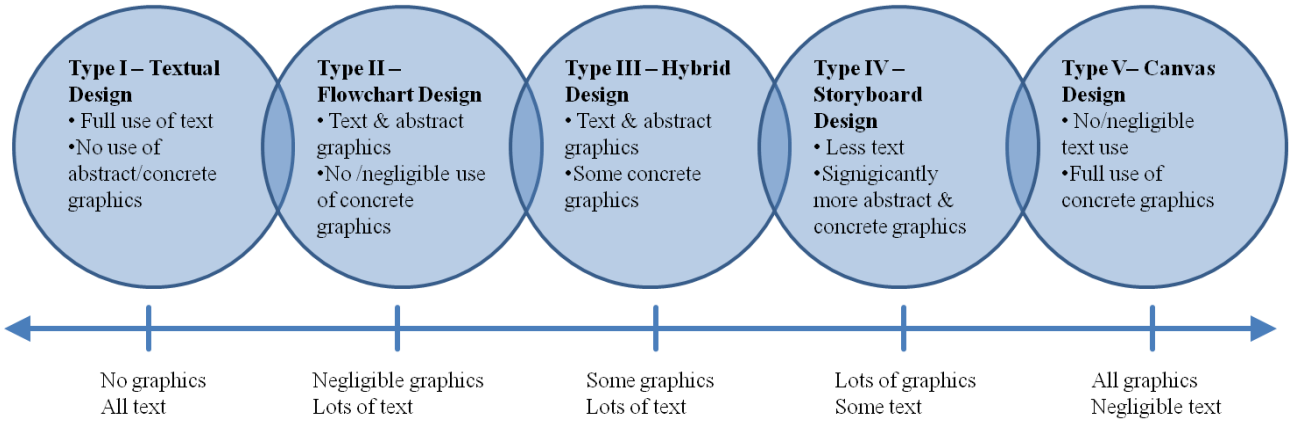


Figure 27: Identified Process Design Archetypes[114]

The results of both studies come to the to the conclusion that designs that use text and abstract graphics, like the flowchart design or the hybrid design, result in process models with the highest quality and are the most effective designs in displaying process elements. Additionally the flowchart design was the most favored type of design which implied an intuitiveness in using and understanding abstract graphics and text.[115,116] Based on these results a notation which implements the flowchart design is used for the modeling tool.

The S-BPM notation consists of five symbols to describe processes: three symbols for the different states, one symbol for the subject, and an arrow to visualize state transitions and messages (cf. Figure 2 on page 16). Based on the concept of blocks for process modeling (as also used by the Tabletop Concept Mapping) abstract symbols were designed to apply the S-BPM notation and the flowchart design to the S-BPM Buildbook.

The application of the flowchart design and the S-BPM notation resulted in the following notation for the S-BPM Buildbook:

S-BPM Buildbook Notation	S-BPM Notation
Green plug	Receive message state
Red plug	Receive message state
Yellow plug	Function state

[112] cf. Recker, 2010, pp. 29-44
[113] cf. Weitlaner, 2013, pp. 52-71
[114] Adapted from Recker, 2010, p. 36
[115] Recker, 2010, pp. 40-41
[116] Weitlaner, 2013, pp. 61-62, 67-69

Grey plug	Message/Transition
The letter case	The subject

Table 2: S-BPM Buildbook Notation and S-BPM Notation

The modeler can then write relevant process information, like name of the states or messages, on top of the plugs by using an overhead marker.

The next step was the technical development of the letter case and the plugs.

4.2.2 Technical Development and Construction of the S-BPM Buildbook

Various technical aspects for the development and construction of the S-BPM Buildbook had to be considered. The material had to support the planned size of 450x250x40 mm (closed) while simultaneously keeping the case light enough for transportation. Steel balls inside the case and magnets within the plugs were used to keep the plugs in place around a defined grid. Figure 28 and Figure 29 show the technical drawing and 3D renderings of the first prototype.

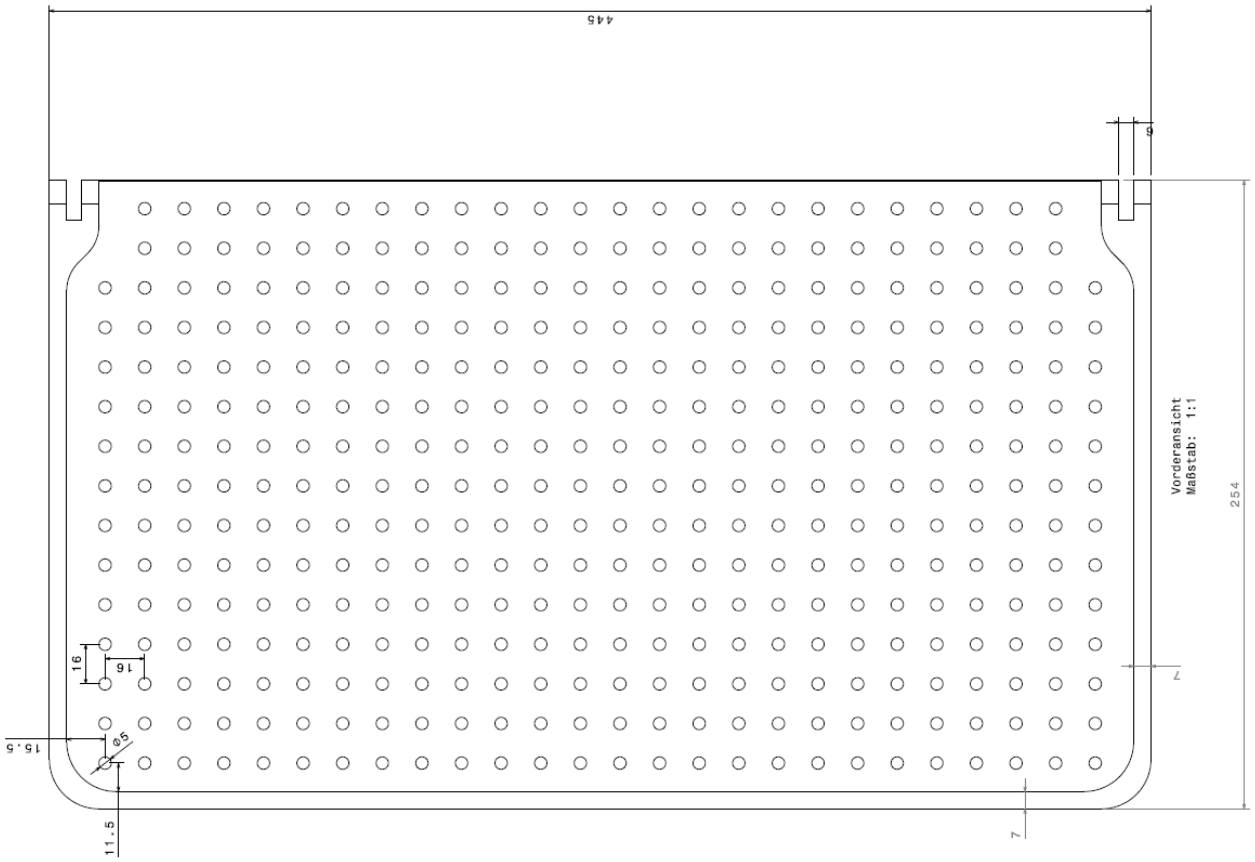


Figure 28: Technical Drawing of the first Prototype

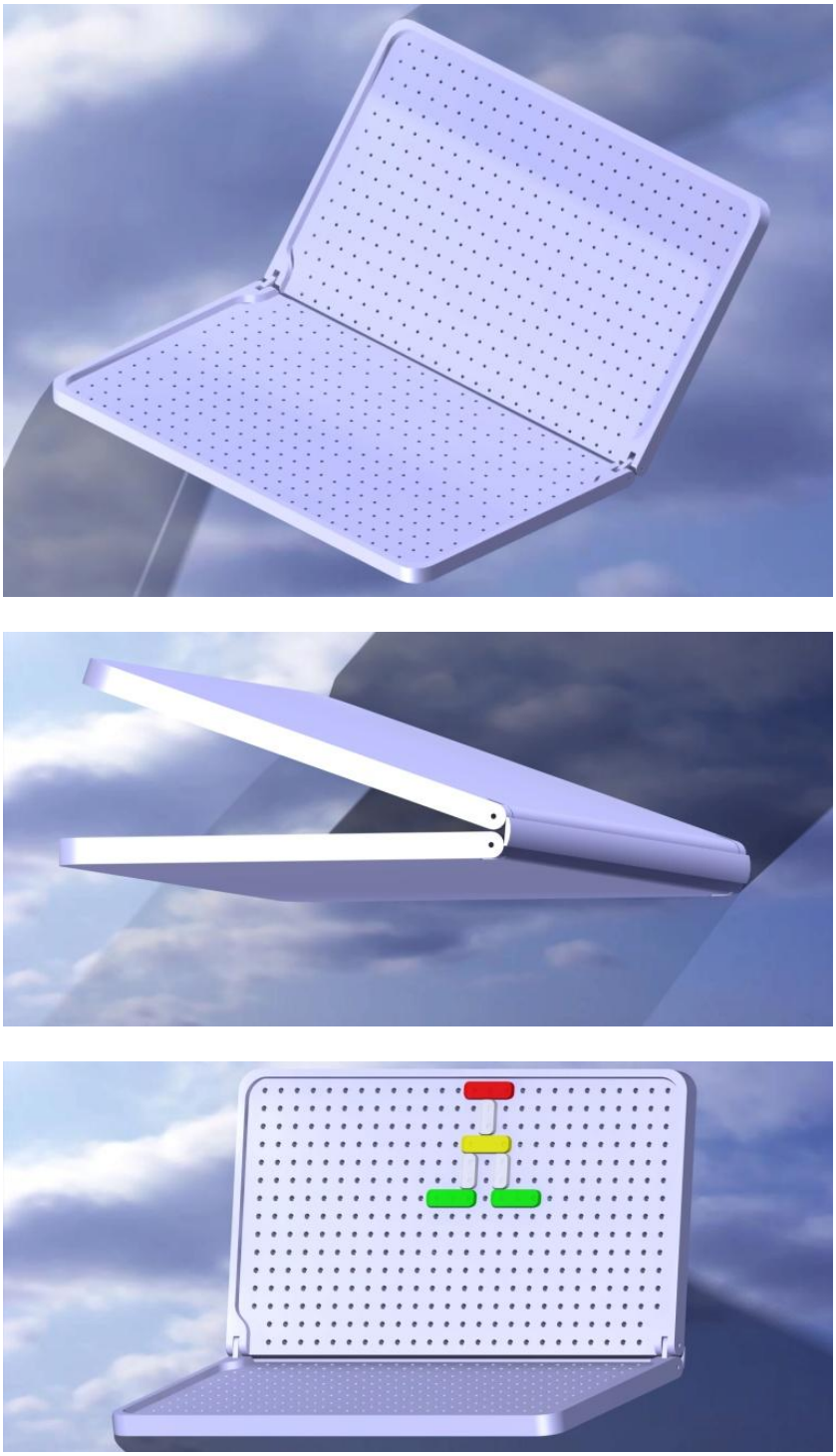


Figure 29: 3D-Model of the first S-BPM Buildbook prototype (from the top: open, half closed, open with plugs)

With a weight of 6,5 kg of the first prototype was considered too heavy to be accepted as a mobile modeling tool, especially if two or more pieces have to be transported. In addition the measurements of the plugs were proven as too space consuming for the limited space of the S-BPM Buildbook. The relatively big state

plugs were to restricting for complex processes and the plugs for the transitions/messages were too small to write on. (Figure 30)

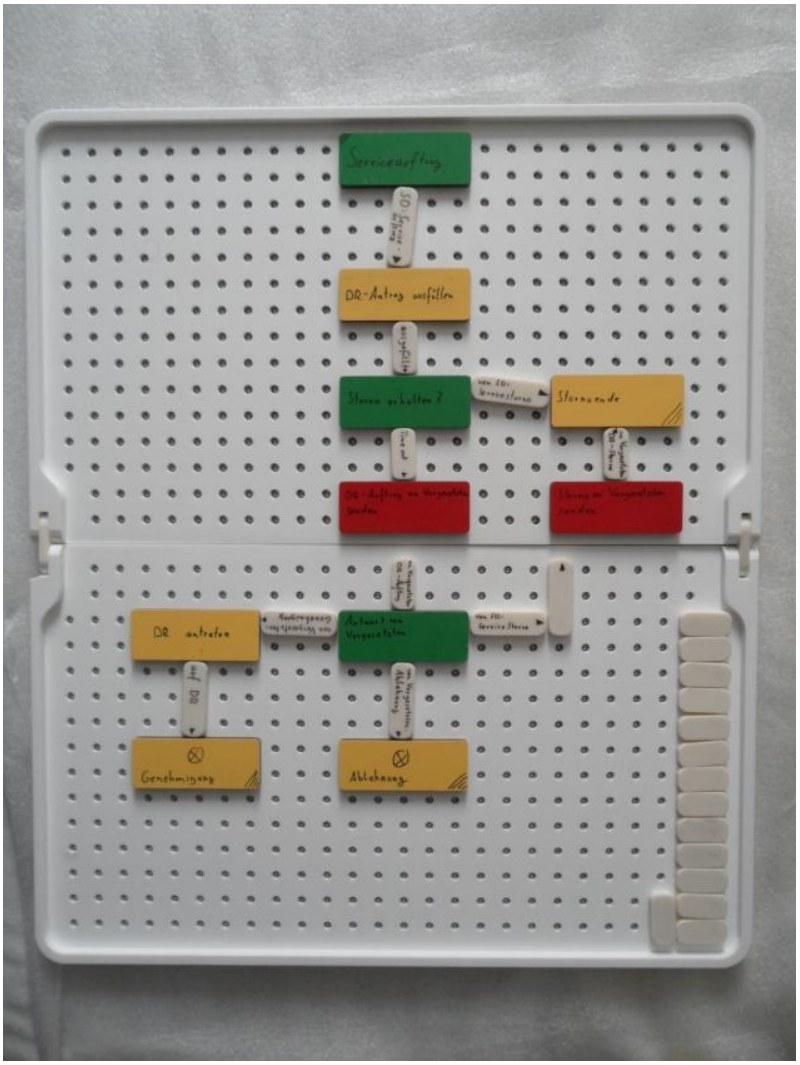


Figure 30: Subject Behavior modeled with the first Prototype

These issues could be solved through constructive changes for the second version of the S-BPM Buildbook. These changes were:

- Uniform size for all plugs, resulting in smaller state plugs and bigger transition/message plugs.
- By using multiple layers the 5mm steel balls could be exchanged for a 0,6mm sheet metal.

The implemented changes resulted in an overall increase in space for process modeling, an even more uniform modeling notation, a weight reduction down to

approximately 3,6 kg and a height reduction from 40mm down to 19 mm when closed.

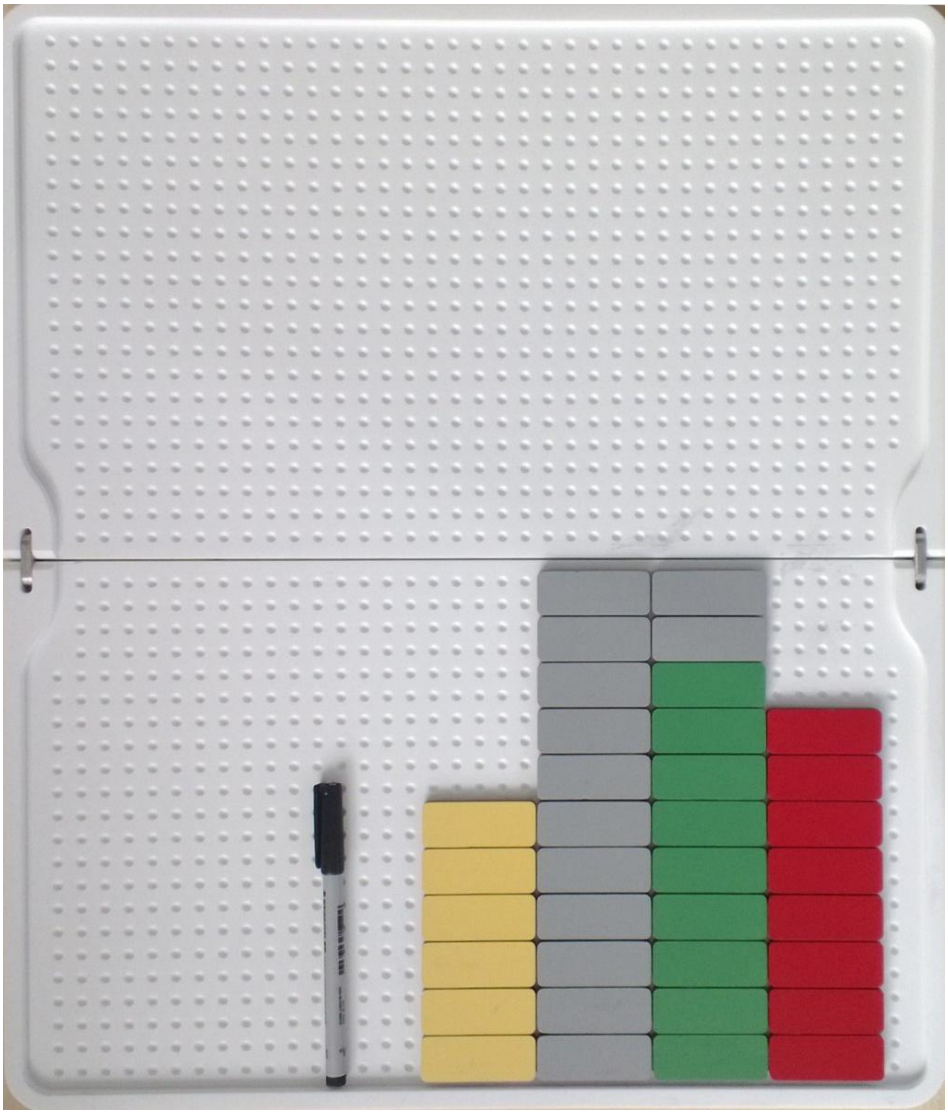


Figure 31 Second Version of the S-BPM Buildbook

4.2.3 Digital Conversion and Documentation

One of the specified requirements is the support of digitalized process documentation and software tools for more advanced process management phases. By utilizing the concrete orientation of the plugs through the grid, the small number of simple symbols and the clear differentiation of states by color an algorithm and appropriate interface for a digital conversion could be developed. By taking a picture via camera or mobile phone it is possible to convert and document the process model from the

S-BPM Buildbook an XML file. Figure 32 shows a modeled subject behavior that is converted into an XML file.

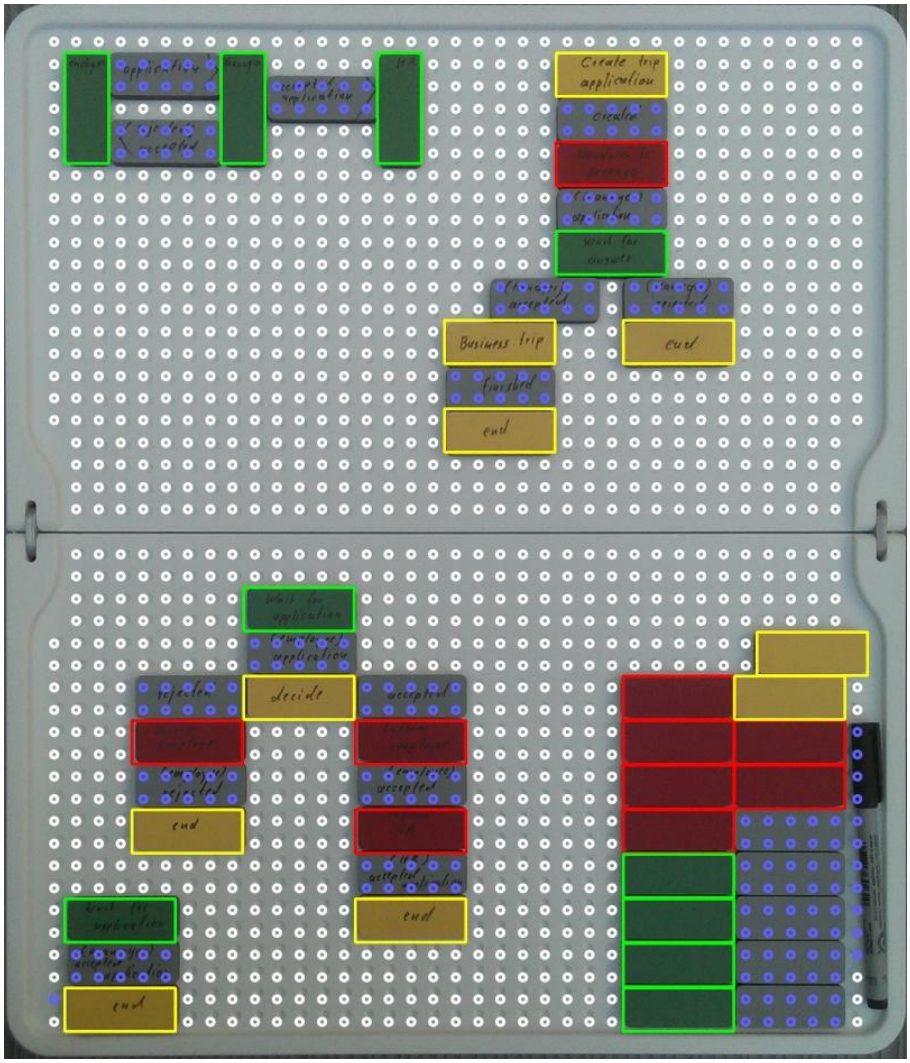


Figure 32: Optical Recognition of a Subject Behavior

The created XML file can then be used in modeling tools for further business process management steps like process optimization. The recognition software is a first approach and further development is necessary; in particular to enable transitions of the generic XML files for specific modeling tools. Additional refinements of the various filters are necessary to eliminate recognition problems due to shadows and reflections.

The recognition algorithm was developed by Alexander Bachinger. A detailed technical description of the optical recognition algorithm and potential improvements can be found in the appendix.

4.3 Use Case: Practical Application of the S-BPM Buildbook for a Process Survey

The goal of the case study is to test the S-BPM Buildbook during a practical application regarding its usability and intuitiveness. The interviewed actors are modeling novices and have little or no knowledge regarding process management and process modeling. Criteria for measurement are the time needed for instructions, the time needed for the whole survey, the evaluation of the S-BPM Buildbook through the participants regarding intuitiveness.

4.3.1 Evaluating Intuitiveness and Modeling Knowledge

To determine the usability and intuitiveness of the S-BPM Buildbook, as well as the modelers' knowledge in the areas of process management and process modeling a questionnaire was created. The questionnaire is based on traditional methods for empirical social research through written questioning. The question types used for the questionnaire are questions of conviction. Questions of conviction evaluate perception and assessment of past, present and future reality. This evaluation is restricted to cognitive experienced facts. [117] The questions are structured into open questions and hybrid questions in order to enable the participants to freely describe their experience and opinion of the survey and the S-BPM Buildbook. The use of closed questions with previously defined answers (Multiple Choice) was rejected because fixed answers can (unintentionally) influence the result of such questionings.[118]

The following provides an explanation of each question used in the questionnaire:

Question 1: Did you have previous experiences with process management?
Answer: yes/ no; If yes, which ones

Question 2: Did you have previous experiences with process modeling (modeling tools, software, notation, etc)?
Answer: yes/ no; If yes, which ones

Questions 1 and 2 determine the existing knowledge and experience of the respondent regarding process management, process modeling and process modeling tools. The evaluation of the respondent's state of knowledge is important to determine the intuitiveness of the Buildbook. To be intuitive the Buildbook has to be operable by novices who have no or little previous knowledge in the area of process modeling.

[117] Schnell, 2011, pp. 319-333
[118] Schnell, 2011, pp. 324-327

Question 3: During the survey I could present my process knowledge sufficiently:
Answer: Not correct/a little correct/moderately correct/somewhat correct/correct
Please explain your answer:

Question 3 evaluates if the respondent is able to present his process knowledge with the use of the S-BPM Buildbook. Every process modeler possesses exclusive knowledge regarding the part of the process he is involved in. Therefore he is also able to determine if the process model he created contains all relevant process information to describe the process. The answers to this question allow to preliminary estimate if the S-BPM Buildbook can be used to describe process models and relevant process information.

Question 4: The S-BPM Buildbook was easy to understand and intuitive to operate:
Answer: Not correct/a little correct/moderately correct/somewhat correct/correct
Please explain your answer:

Question 4 elicits how the respondent fared while learning the S-BPM Buildbook and how he experienced the handling of the same. In this context the term “easy” is a purely subjective conviction. This phrasing is used under the assumption that a respondent evaluates a tool as easy if he can use it without difficulties with his existing knowledge. In conjunction with Questions 1, 2, and 3 it is possible to determine the intuitiveness of the S-BPM Buildbook depending on the existing modeling knowledge.

- **Question 5: What did you like when using the S-BPM Buildbook?**
- **Question 6: What did you not like when using the S-BPM Buildbook?**

Questions 5 and 6 serve to further evaluate positive and negative aspects the respondent experiences while operating the S-BPM Buildbook. Both questions are open questions and enable the respondent to freely express his experiences.

4.3.2 Initial Situation and Procedure

The case study was carried out at the “Center für industrielle Produktivität” (center for industrial productivity; CiP) at the Technical University Darmstadt. The CiP is an initiative by the TU Darmstadt and McKinsey & Company with the aim to educate and research in the fields of real life production processes.

The surveyed process represents a production process for hydraulic cylinders including the delivery of the raw material, the manufacturing of the single components, the internal logistics, and the final assembly of the cylinders. The production process, the various workstations (the subjects) and their interactions are

clearly defined, although not documented in an explicit form. This led to the conclusion to use the Workshop Approach as initial point for the survey, with a slight trend towards the Communication Approach: The subjects could be identified and defined, but not the complete communication happening between the subjects. The messages had to be identified by the survey participants during the actual survey.

The production process was disassembled into five subjects each represented by a representative subject owner. The predefined subjects were:

- Manufacturing
- Washing Station
- Logistics
- Assembly 1
- Assembly 2

The workstations “Manufacturing” and “Washing Station” are both operated by the same actor but because the stations are operated independently from each other they were split into two Subjects.

The four participating actors received a 20 minutes long introduction into the S-BPM method and the S-BPM Buildbook via a power point presentation (the presentation can be found in the appendix). Each of the participants is an actor in the production process and theoretically any actor is able to operate at any workstation. After the introduction each actor was assigned to one of the predefined subjects, inhabited the role of a representative subject owner and was given the task to model his respective subject behavior by using the S-BPM Buildbook.

The actors then began to model their processes simultaneously. During the survey the actors autonomously began to mutually review each other’s process models. After approximately two hours all actors had completed their respective process models. Figure 33 provides some impressions of the survey. Figure 34 shows the subject behaviors the interviewees modeled with the S-BPM Buildbook. The bigger versions of the modeled processes, including the results of the optical recognition algorithm, can be found in the appendix

Figure 33: Impressions of the survey

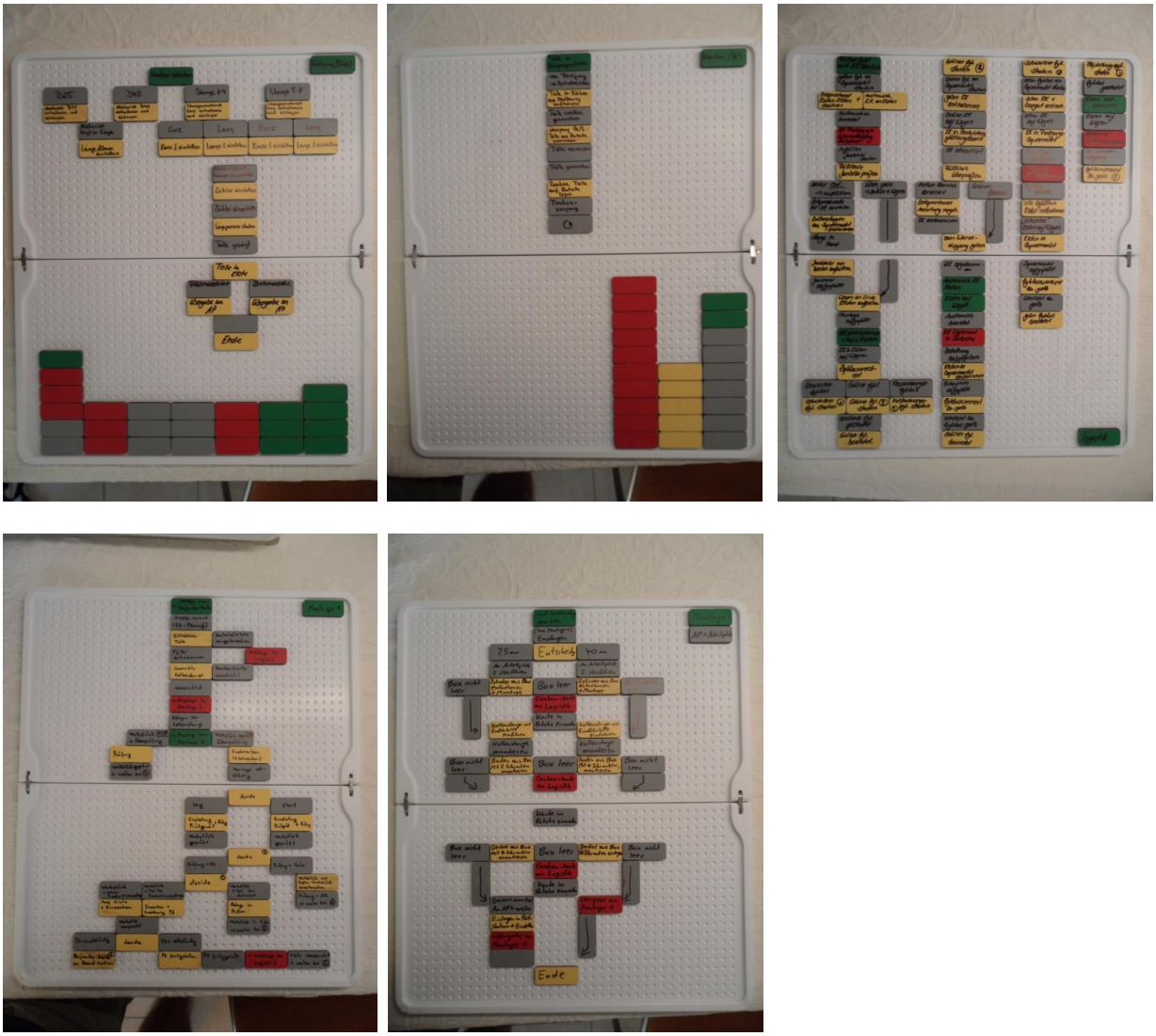


Figure 34: (top left to bottom right) Manufacturing, Washing Station, Logistics, Assembly 1 and Assembly 2

Following the process survey the participants filled out and answered questionnaires. Because one participant had to leave early only three filled out questionnaires are available. (The answered questionnaires can be found in the appendix)

4.3.3 Conclusion of the second Case Study

The case study and the evaluation of the questionnaires reveal that the the S-BPM Buildbook allows novices to model subject behaviors of varying complexity. According to the answered questionnaires all of the participating students had only little to no knowledge in the field of process management and process modeling.

The evaluation of the questionnaires further shows that the S-BPM Buildbook was very well received by the participants. The S-BPM Buildbook is described as clear to understand, having a reasonable structured, being intuitive to operate, and as motivating and fun to work with. The respondents criticized the lack of some sort of commentary plug to add additional process information not covered by the given plugs. Additionally, the message/transition plug of the S-BPM notation was perceived as somewhat unnecessary.

Although the S-BPM Buildbook seems to be as intuitive as intended, due to the small number of participants and surveyed processes it is not possible to make a general statement. The results are exemplary and additional surveys with different approaches have to be performed to provide enough results for a proper empirical evaluation.

5 Summary and Outlook

Process Models are the initial point for process analysis and process improvement and are created by process surveys. A survey itself is a process and the resulting process model is decisive for future changes of the surveyed process. This requires the process survey itself to be as efficient as possible. By describing process survey approaches as process models a basis for analyzing and improving the survey process itself is provided.

Subject-oriented Business Process Management implements the concept of natural language into the process management environment and shifts the traditional focus from process activities towards the involved subjects. The S-BPM Open Control defines activity bundles which describe processes in a non sequential order but still maintaining the necessary guidelines to prevent an arbitrary execution of said activities. The implementation of modeling by restriction allows describing functional process models that can be altered and adapted in accordance to specific requirements.

The described process models to survey processes can be refined with additional messages and activities to better reflect real life procedures in accordance to each specific application. The process models of the survey approaches provide guidelines for executing process surveys and a basis for analyzing and improving the survey process itself.

The first case study at the broadcasting company shows that the described approaches are suitable for a practical application although further studies are necessary to determine the suitability of every approach for any kind of process and organization. In addition the proposed approaches can be further enhanced with phases like analysis, optimization or implementation of the improved process and so create process models that cover the whole range of business process management. Such an enhanced process model describes the complete process to survey processes, analyze the surveyed process, improve and optimize the process, and the implementation of the new/improved process.

The SBPM Buildbook offers a way to directly involve the process knowledge carriers and end users into the modeling procedure of the survey. The results from the second case study verify that the modeling tool is fast to learn and intuitive to operate for modeling novices. The optical recognition software closes the gap between a tangible modeling interface and advanced process documentation, process management and model administration. However, a case study with an appropriate scope is required to gain empirical and statistical results regarding a practical application with different survey approaches and process types. The proposed

recognition software is a first concept and needs further testing and development to refine the recognition algorithm and to allow a conversion of the generated XML files to be used with other common modeling tools.

6 Appendix

6.1 Subject Behaviors in the Neural Approach

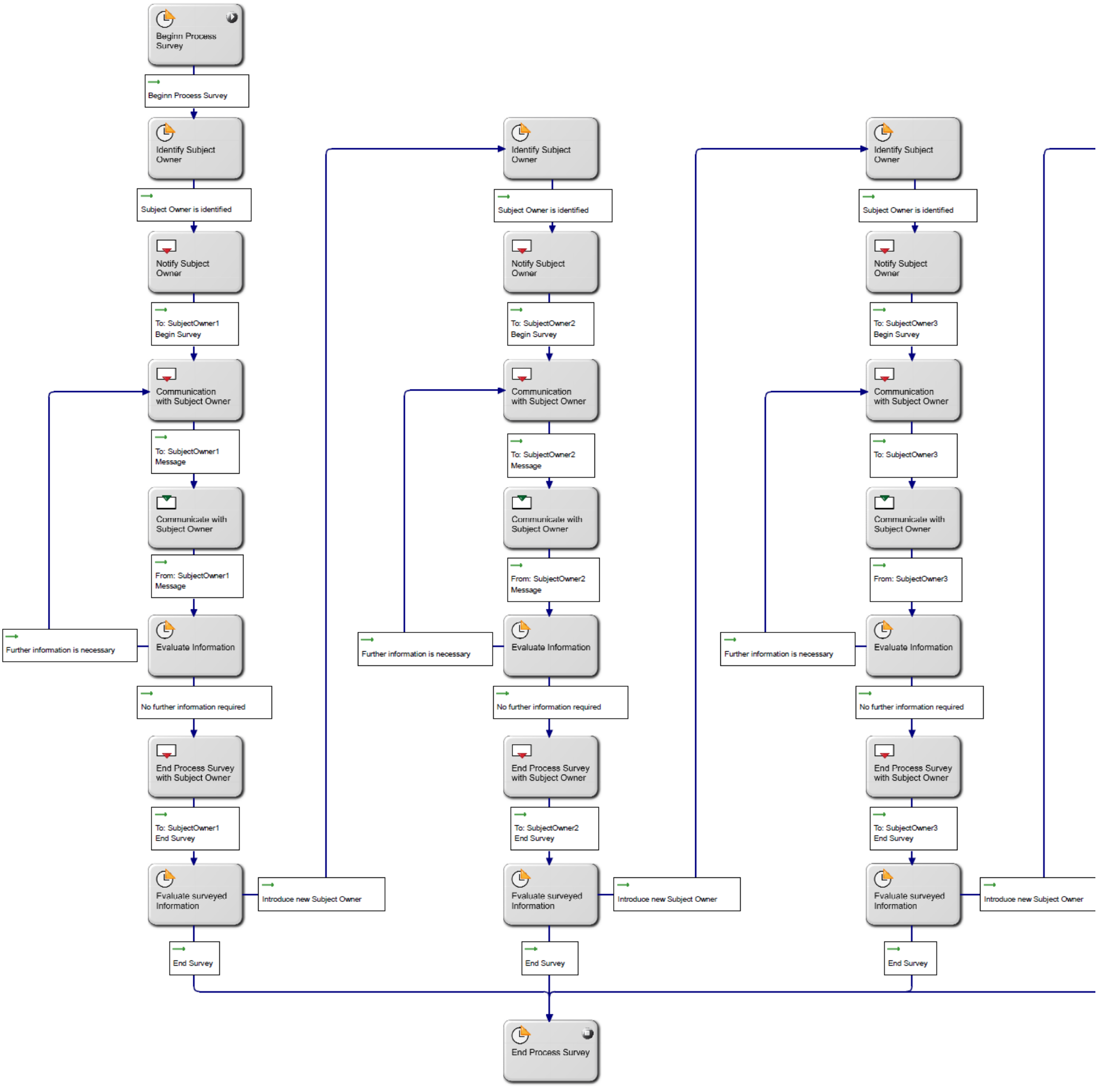


Figure 35: Subject Behavior of the Process Owner in the Neural Approach

6.2 Subject Behaviors in the Workshop Approach

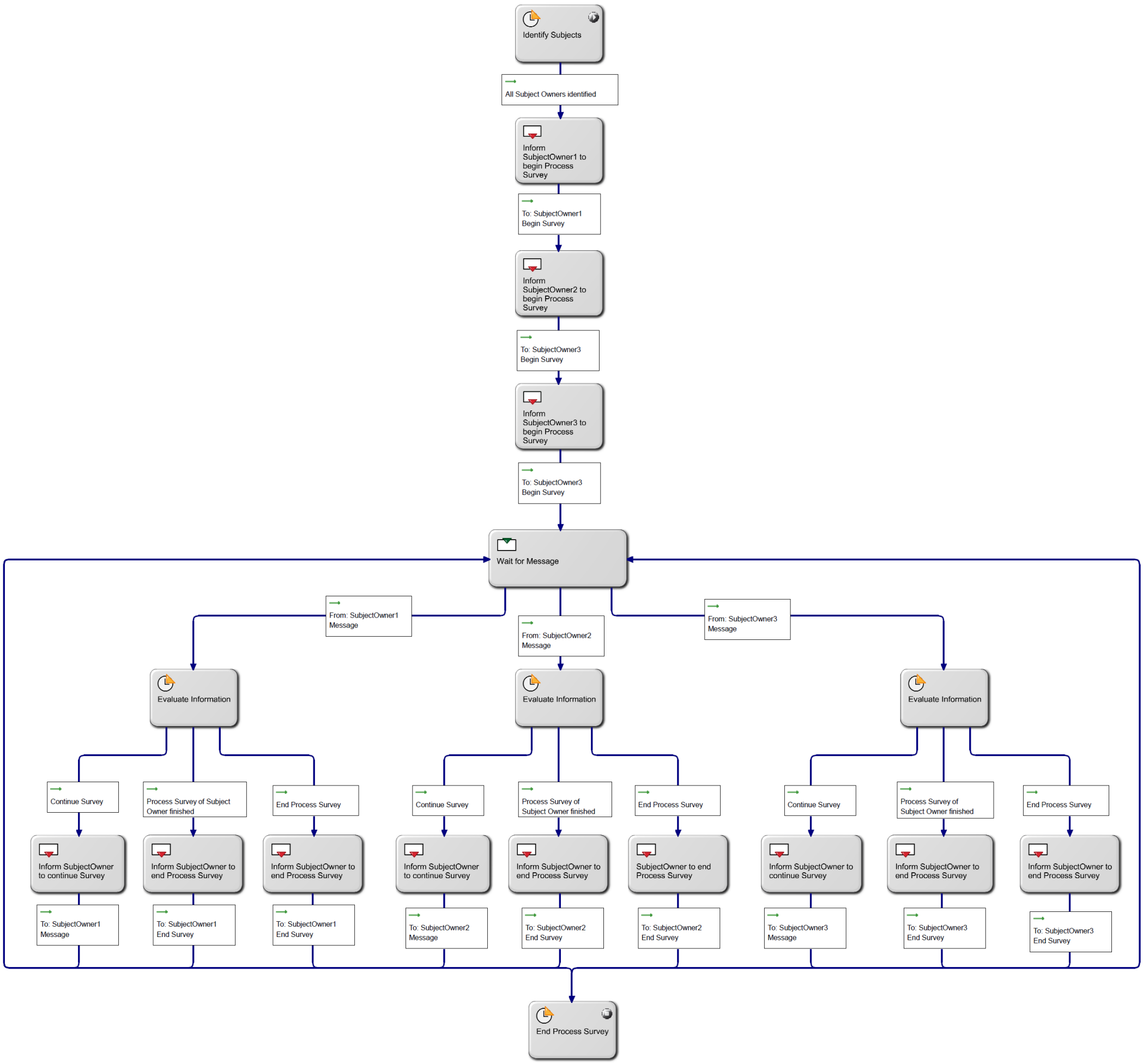


Figure 36: Subject Behavior of the Process Owner in the Workshop Approach

6.3 Subject Behaviors in the Communication Approach

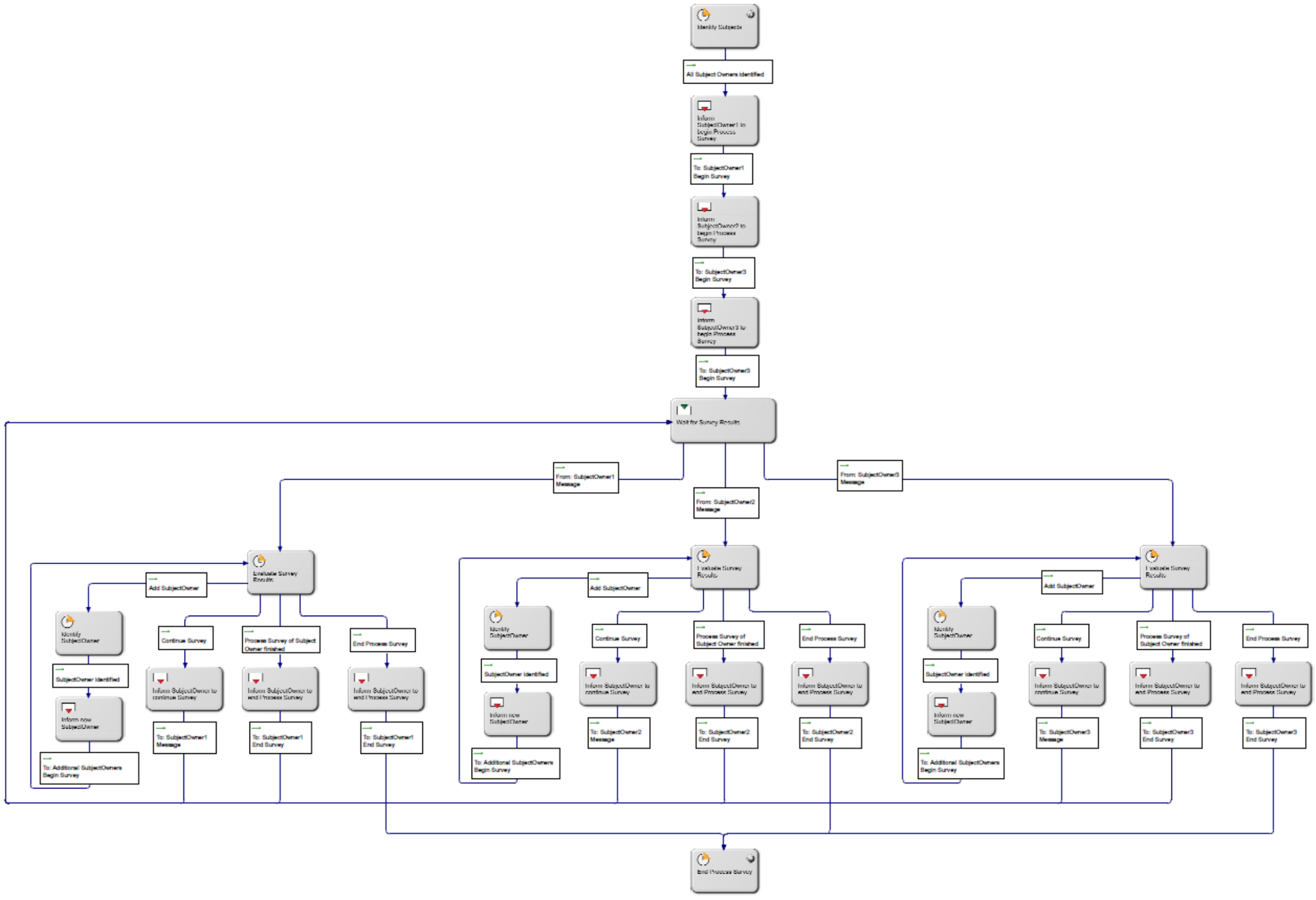


Figure 37: Subject Behavior of the Process Owner in the Communication Approach

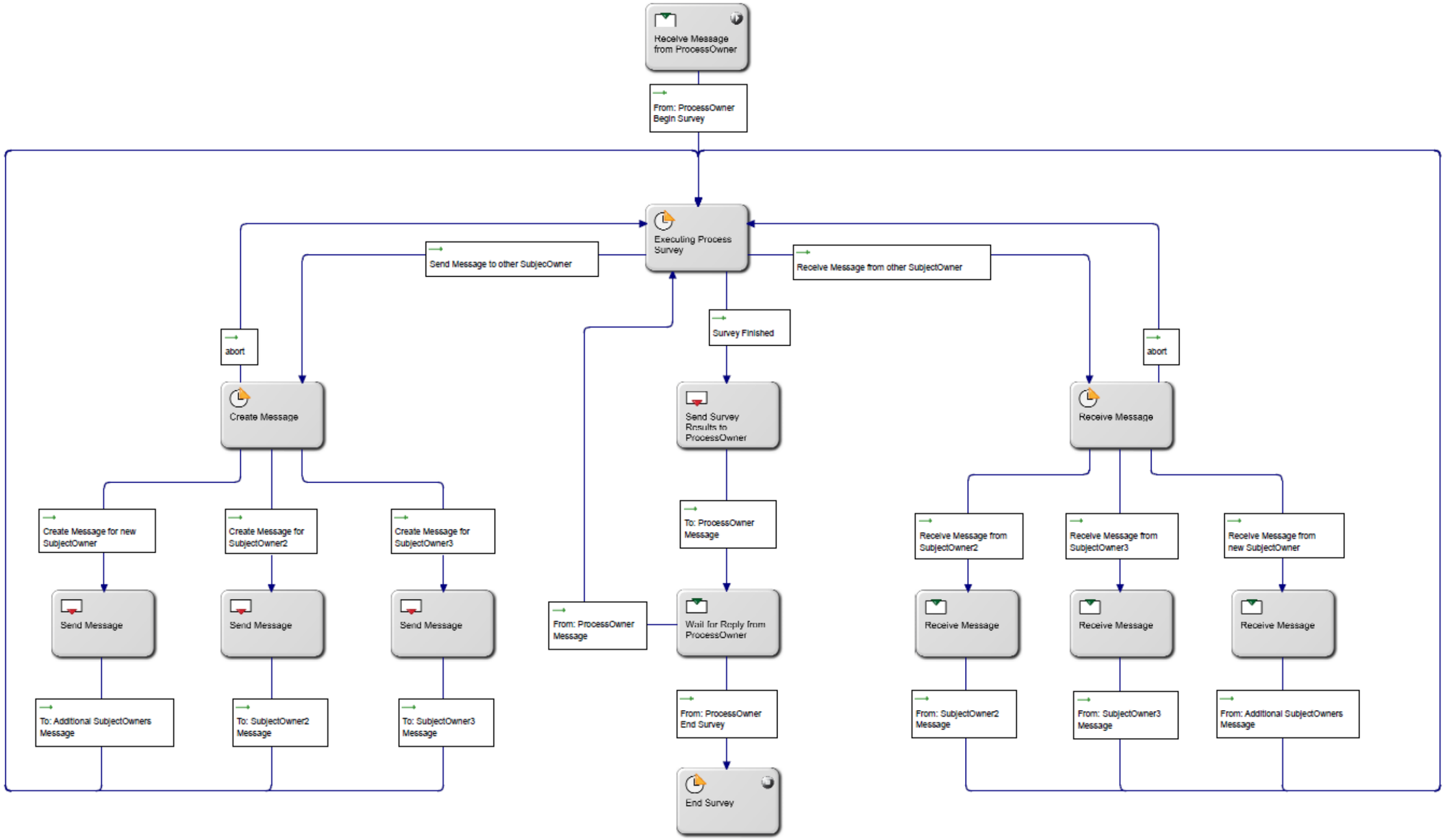


Figure 38: Subject Behavior of the Subject Owner in the Communication Approach

6.4 Technical Description of the Image Detection Algorithm

The PC version of the image detection software for the S-BPM Buildbook has been implemented in C++ using the MinGW 4.8 32bit compiler. Qt 5.1 has been used as application framework and the detection algorithm is implemented by using functions of the OpenCV library in version 2.4.4. Furthermore the software has been implemented for Android Smartphones supporting Android 2.3.3+. The Android version makes use of the OpenCV library for Android. Using a Smartphone circumvents the need to use multiple devices like a pc and a digital camera which are not always at hand and reduces the effort to transfer the captured images to the pc, a step which has to be repeated if the detection was unsuccessful due to an unqualified image. The Smartphone app provides an immediate visual feedback of the detection result. Unsuccessful detection attempts can be repeated immediately, while successful results can be post processed and shared with other users or devices using the built in Android share dialog.

6.4.1 Image Detection Algorithm

The image detection algorithm itself can be divided up into three parts. First the perspective of the image has to be transformed to align the board with the grid which will be used for the block and connection detection algorithm. After the alignment of the image, the second step is the detection of the blocks itself. The third step is to detect connections and reference them to the blocks they link with each other.

After a successful execution, the individual blocks and detections can be labeled and the connection direction can be changed if necessary.

Perspective Transformation

This step makes use of the *warpPerspective* method provided by the OpenCV library. It performs the perspective transformation by mapping a so called "donor" pixel of the source image to each pixel in the destination image.[119] For this transformation to work, the border points of the S-BPM Buildbook in the source image have to be known. Currently, the user has to enter these points manually starting at the top left and continuing clock wise. In our software for MS Windows, the user can do this by a single left click on each corner of the S-BPM Buildbook in the correct order. The Android version supports touch input to enter the points. The transformation starts as soon as all four points have been entered.

[119] OpenCV - Geometric Image Transformations, [Online], Available: http://docs.opencv.org/modules/imgproc/doc/geometric_transformations.html#warpperspective. [Accessed 18 08 2013]

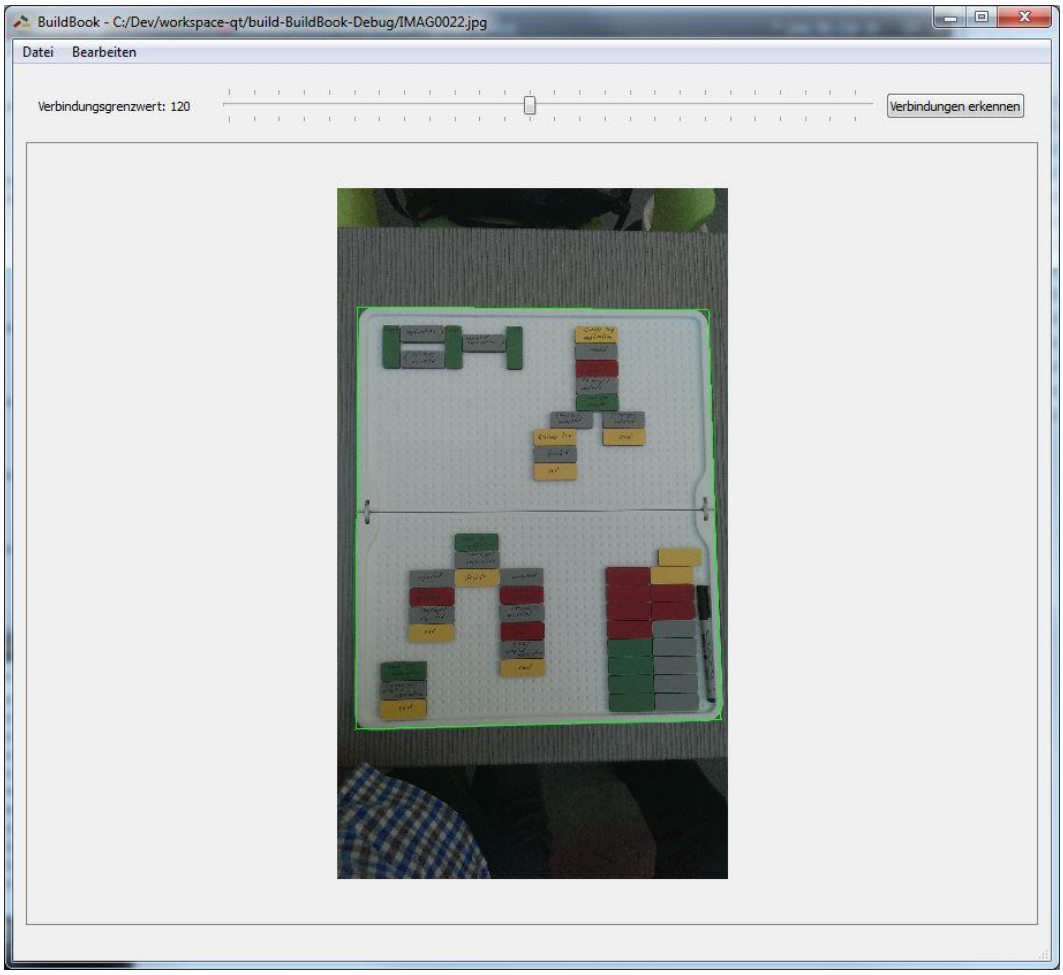


Figure 39: Setting the border points (green frame)

After the transformation is complete, the detection grid is aligned onto the image so that it matches the S-BPM Buildbook´s grid by using the S-BPM Buildbook´s dimensions, grid margin and grid size. Every point on the grid is mapped to a reference pixel on the image. For practical reasons only the dimensions for the top half of the S-BPM Buildbook are provided and mirrored to get the dimensions for the whole S-BPM Buildbook.

Block Detection

After the grid has been aligned, the block detection begins. At the moment, three different types of blocks can be distinguished, each represented by a different color which will be used for our detection algorithm. The procedure works the same for each block color. First the *GaussianBlur* filter provided by OpenCV is applied to make the image smoother.[120] Since the blocks are going to be filtered by their color, the image has to be converted into the HSV color space first. HSV defines colors more naturally by hue, saturation and value. Then the color filter is applied by using

[120] OpenCV - Image Filtering, [Online], Available: http://docs.opencv.org/modules/imgproc/doc/filtering.html#gaussianblur [Accessed 18 08 2013].

OpenCV's *inRange* method with filter ranges according to the block color.[121] Because HSV represents the color's hue from 0 to 255 as a 360° circle but the *inRange* method applies only a filter with a min and max value, color range that exceeds 360° has to be applied correctly. I.e. a range from 250 to 5 has to be applied as two range filters from 250 to 255 and 0 to 5 connected with a bitwise “or” . All other ranges can be applied directly. The saturation and value ranges are the same for all colors. Results however have shown that these ranges should also be set according to the color. After the filter has been applied, a binary map where each pixel occupied with a block is represented by *true* is the result. Next, the contours of each block have to be detected and filled with the value *true* to avoid holes in the blocks which could lead to undetected blocks.[122] This step is necessary because the color filter will not detect text the user has written onto a block as part of the block itself.

In the last step, each point on the Buildbook´s grid is checked against its position in the filter map, whether it could be part of a block. If a block candidate has been found, the other grid points that the block should occupy are also checked against the filter map, since the block candidates´ dimensions on the grid are known. If every point of the block candidate on the grid is represented as *true* on the filter map, a block has been found and it is added to the list of detected blocks. If the block candidate cannot be validated, the validation is repeated, but with the assumption that the block candidate is placed vertically instead. If no block has been detected, the algorithm proceeds with the next point, until every point on the grid has been checked.

Connection Detection

Connections are represented as the areas occupied by the connection blocks. It is also possible to concatenate multiple connection blocks. For each connection area, the detection algorithm links “attached” blocks to each other.

Again, the *GaussianBlur* method is applied to reduce detection errors and after that, the *inRange* method is used to receive a binary map that represents the positions of the connections blocks but other than in the block detection algorithm, the OpenCV default color space for images, BGR, is used instead. [123,124] The Android version of the app uses RGB color space. For the *inRange* method, the same value for each parameter is used. The parameter values for the filter are crucial for the detection,

[121] Operations on Arrays, [Online], Available: http://docs.opencv.org/modules/core/doc/operations_on_arrays.html#inrange [Accessed 18 08 2013]
[122] OpenCV - Finding contours in your image, [Online], Available: http://docs.opencv.org/doc/tutorials/imgproc/shapedescriptors/find_contours/find_contours.html [Accessed 18 08 2013]
[123] OpenCV - Image Filtering, [Online], Available: http://docs.opencv.org/modules/imgproc/doc/filtering.html#gaussianblur [Accessed 18 08 2013].
[124] Operations on Arrays, [Online], Available: http://docs.opencv.org/modules/core/doc/operations_on_arrays.html#inrange [Accessed 18 08 2013]

since the grey blocks and the white background thresholds can vary according to the lightning conditions of the image. The application allows the thresholds to be set manually in case of a bad detection results.

For each point on the grid that is not already occupied by a block, the resulting map is checked whether the point is part of a connection or not. If it is, all neighbor points are checked as well. If a neighbor is part of a block, the block is added to the actual connection´s list of blocks. If the neighbor is part of a connection, we repeat the steps for this point and all its neighbors in a recursive manner similar to floodfill algorithms. At last, each block in the connections´ list of blocks is linked with every other block in the list. This enables the user to connect multiple blocks with a single connection.

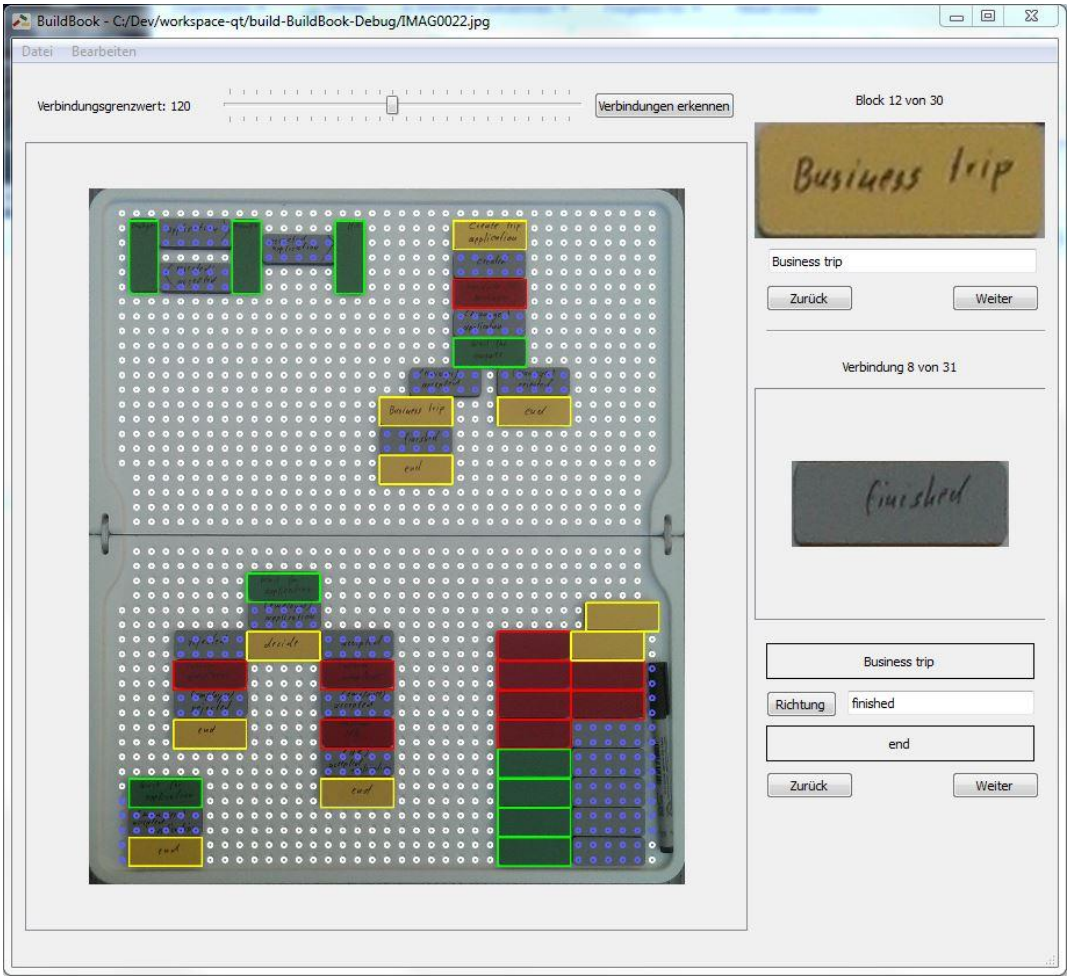


Figure 40: Optical Recognition of a Subject Behavior

6.4.2 Post Processing

After the detection is complete, the user gets visual feedback to verify if it was successful. The aligned grid is represented by white circles so that the user can check if the alignment is correct. Detected connections are marked as blue circles, while the detected blocks are shown by rectangles according to the block color.

For a successful detection, the lightning conditions of the image are crucial. An image that is too dark can result in the background being detected as connection blocks, and an image that is too bright could result in no connections being detected at all. To address this issue, the user can set the connection detection threshold with a slider. Furthermore, since the software is not able to detect block and connection labels automatically, the GUI enables the user to enter the descriptions manually and to change the connection direction. For each detected block, a preview of the image is shown, so that the user has a visual reference to the label. For each detected connection between two blocks, the already entered descriptions of these blocks and a preview image of the connection itself are shown. The direction of the connection is represented from top to bottom, where the top block is the connection source and the bottom block is the connection destination. The direction can be swapped by a simple button click. While the detection algorithm also works with lower image resolutions, high image resolution is recommended for the block preview. The images used for testing the application have a resolution of 2592x1944 pixels. After the user has finished the processing of the detected image, it can be exported as an XML-File. In addition, the transformed image and the resulting image feedback are saved as jpeg file as well.

6.4.3 XML File

The XML-File is being kept as simple as possible. It contains the name of the project and the block and connection elements. Both elements have an incrementing id attribute, each starting at 1. For each block, its name, color, position on the Buildbook grid and size, in Buildbook grid measures, is stored as elements with suitable attributes. For each connection, its source and destination block id and its name is stored. Former references to the source image like pixel coordinates are omitted.

6.4.4 Future Improvements

The current algorithm lacks of several features that could be added in future versions.

Image Transformation

First of all, the S-BPM Buildbook position in the untransformed image has to be provided manually by the user. In future versions, the user could be supported by an automatic board detection algorithm. To achieve such functionality, the S-BPM Buildbook would have to be modified in a way to either mark the corner points or the sides with detectable colors or patterns that make the S-BPM Buildbook itself distinguishable from its surrounding and content. Nevertheless, the user should

always have the possibility to adjust the detected S-BPM Buildbook position manually.

Image Lightning Conditions

Another problem is the lightning condition when the image is taken. Currently, the threshold for connection detection can be adjusted by the user to improve the detection result but a feature would be to automatically detect a suitable threshold. One approach to achieve this goal would be to analyze the brightness values of the whole image and set the threshold accordingly. Another approach would be to use the brightness of the Buildbook´s border as reference for the background.

Android Support

The Android version of the image detection software supports devices running Android 2.3.3+. Nevertheless, older Smartphones often lack the necessary memory and appropriate camera resolution needed for the software to work properly, and therefore a Smartphone with Android 4.0+ is recommended. The memory consumption could be reduced by optimizing the detection algorithm itself making it more suitable for the Android architecture.

6.5 Communication Drafts and Subject Behaviors of the First Case Study

6.5.1 First Communication Draft

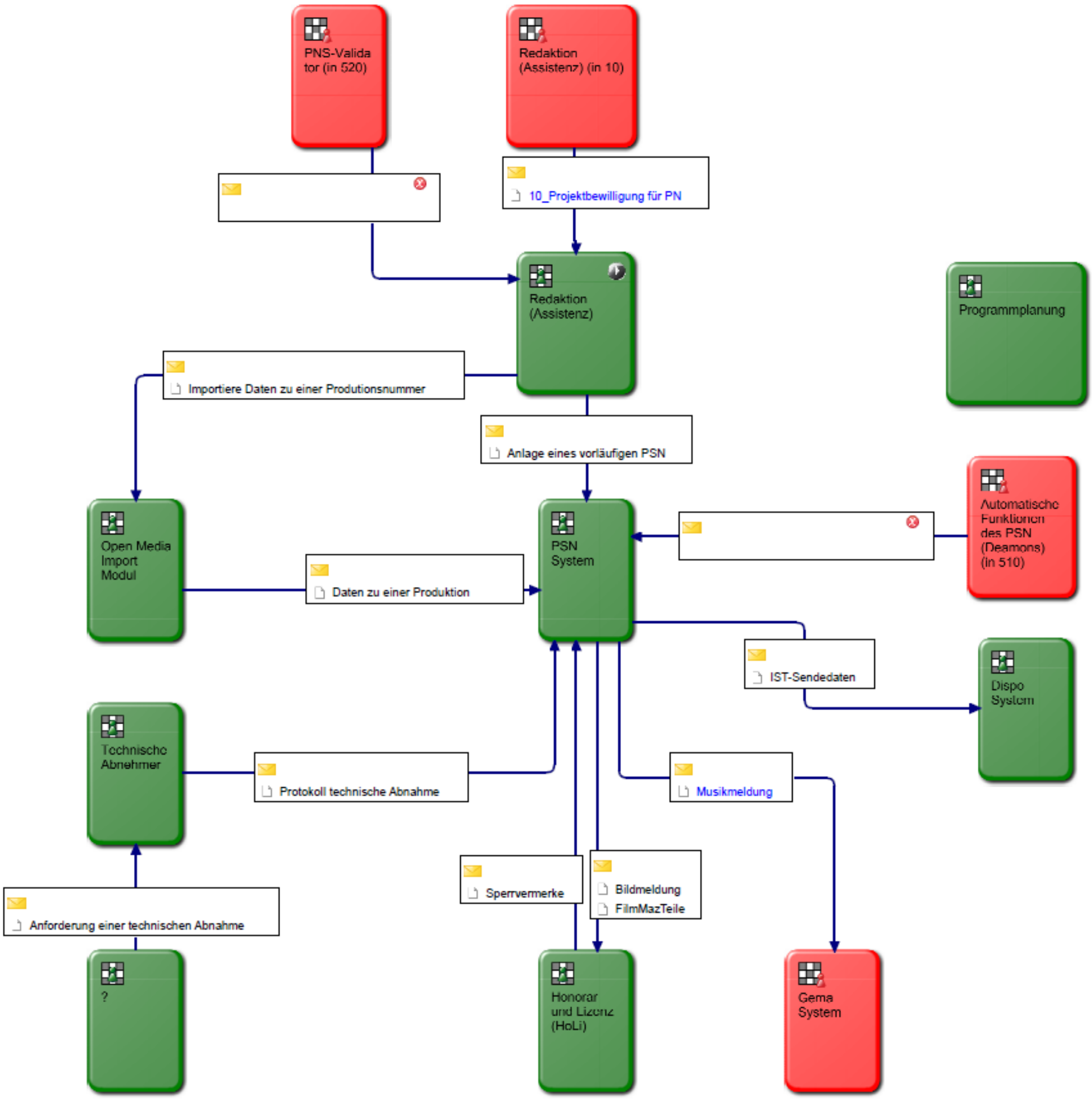


Figure 41: First Communication Draft of the PSN-Module

6.5.2 PSN-Module

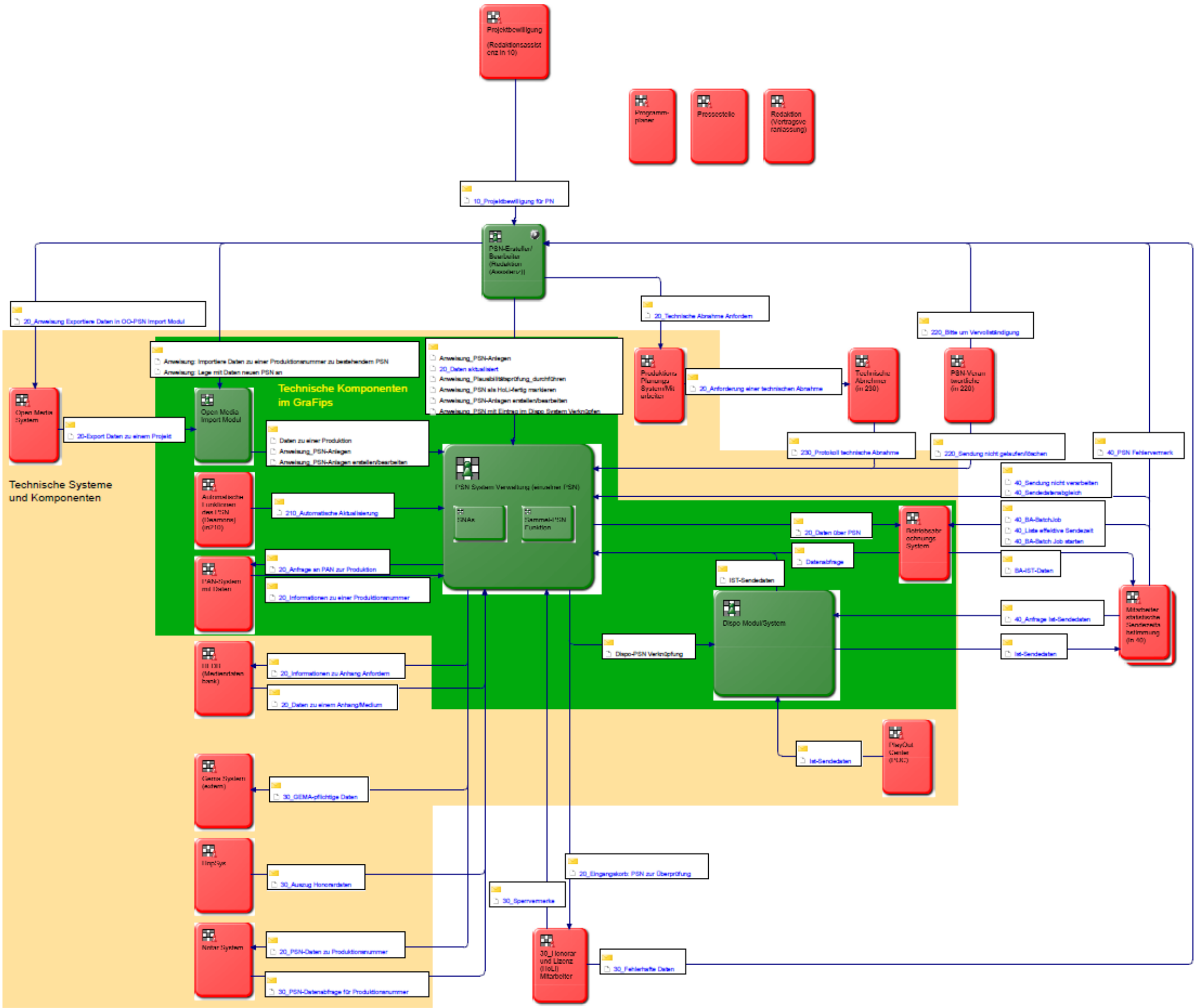


Figure 42: Finalized main part of the PSN-Module

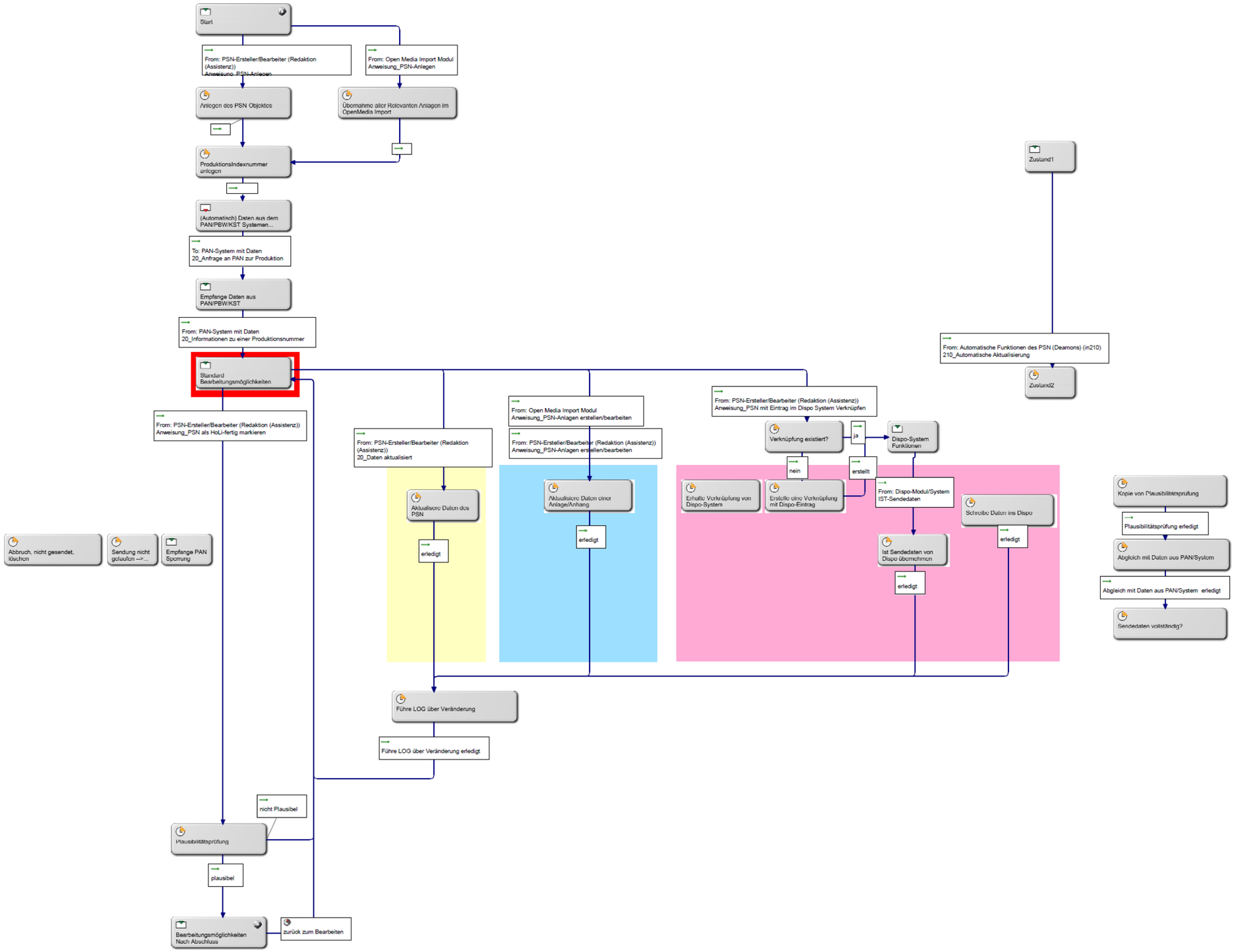


Figure 43: Subject Behavior of the PSN-System Administration (PSN-System Verwaltung)

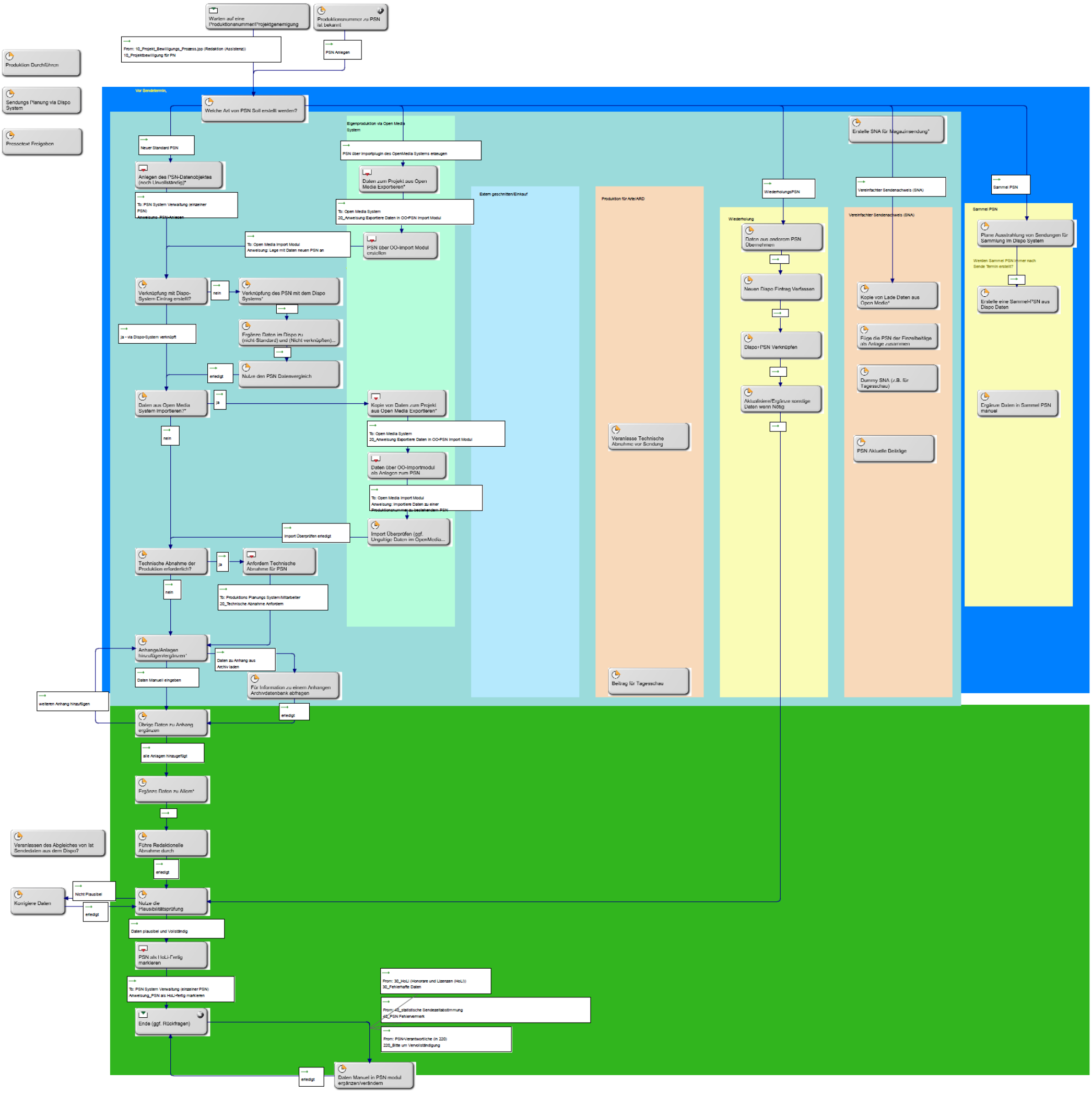


Figure 44: Subject Behavior of the PSN-Creator/Editor (PSN-Ersteller/Bearbeiter)

6.5.3 Project Approval Process of the PSN-Module

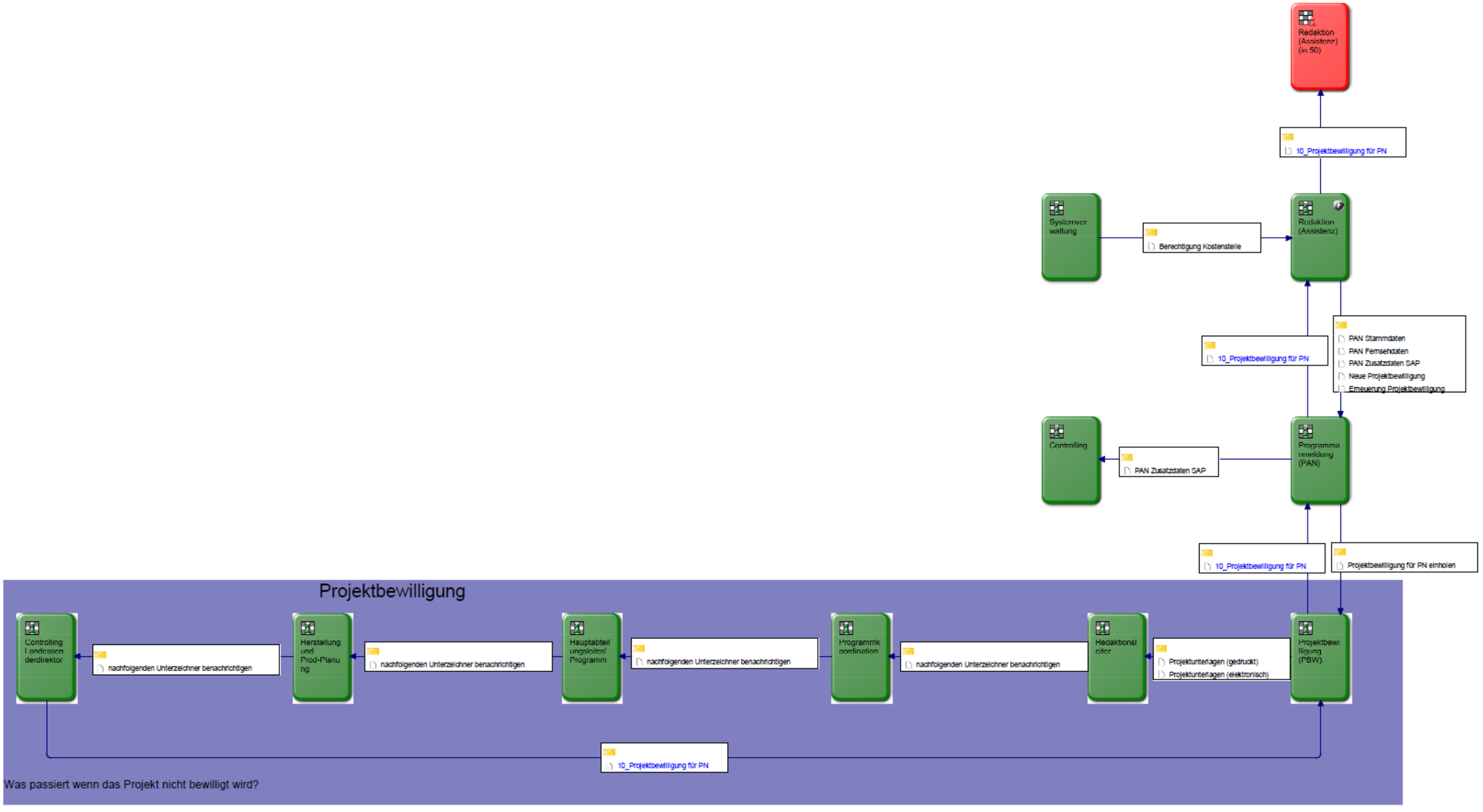


Figure 45: Project Approval Processs of the PSN-Module

6.5.4 Fee and License Process of the PSN-Module

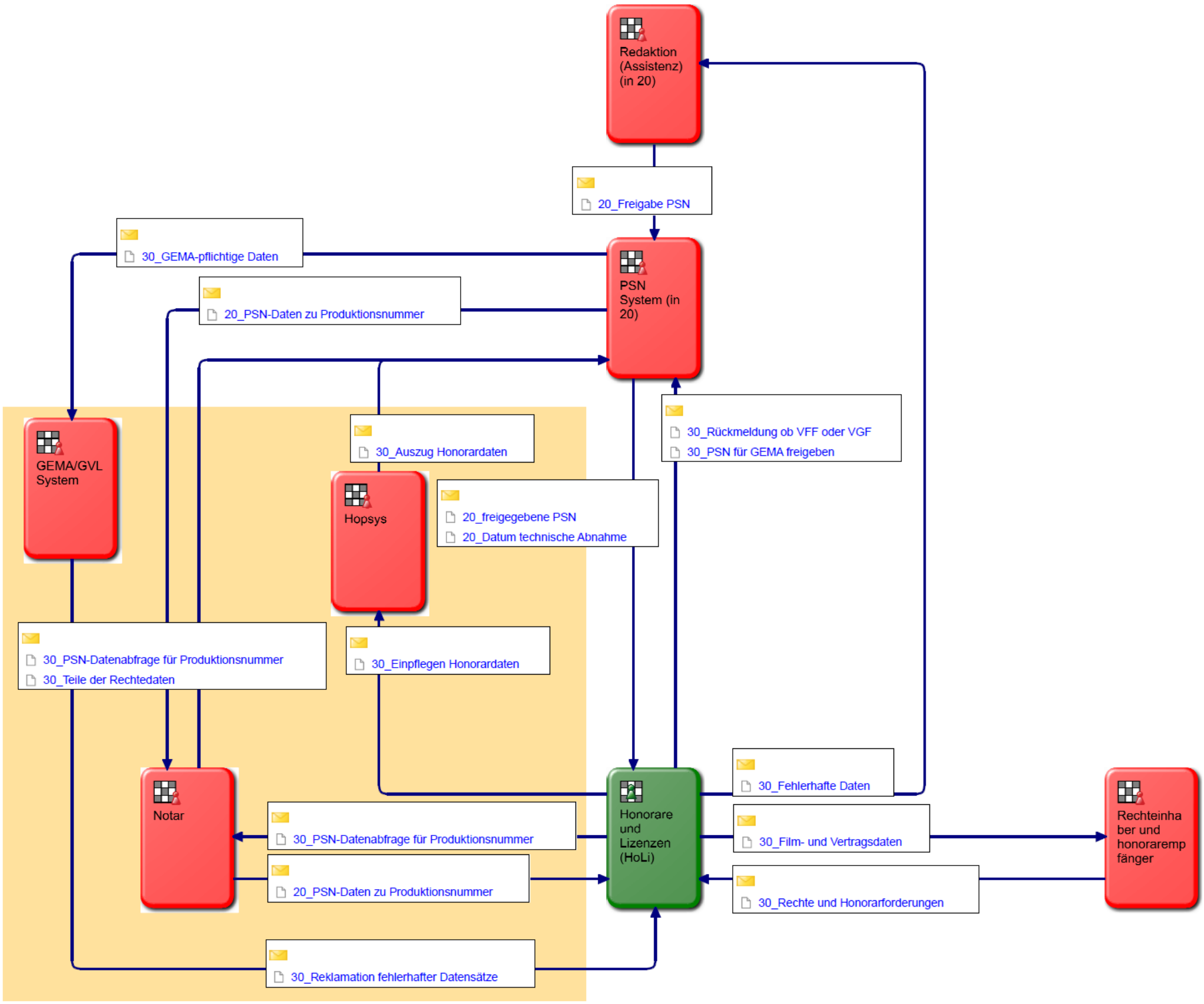


Figure 46: Fee and License Process of the PSN-Module

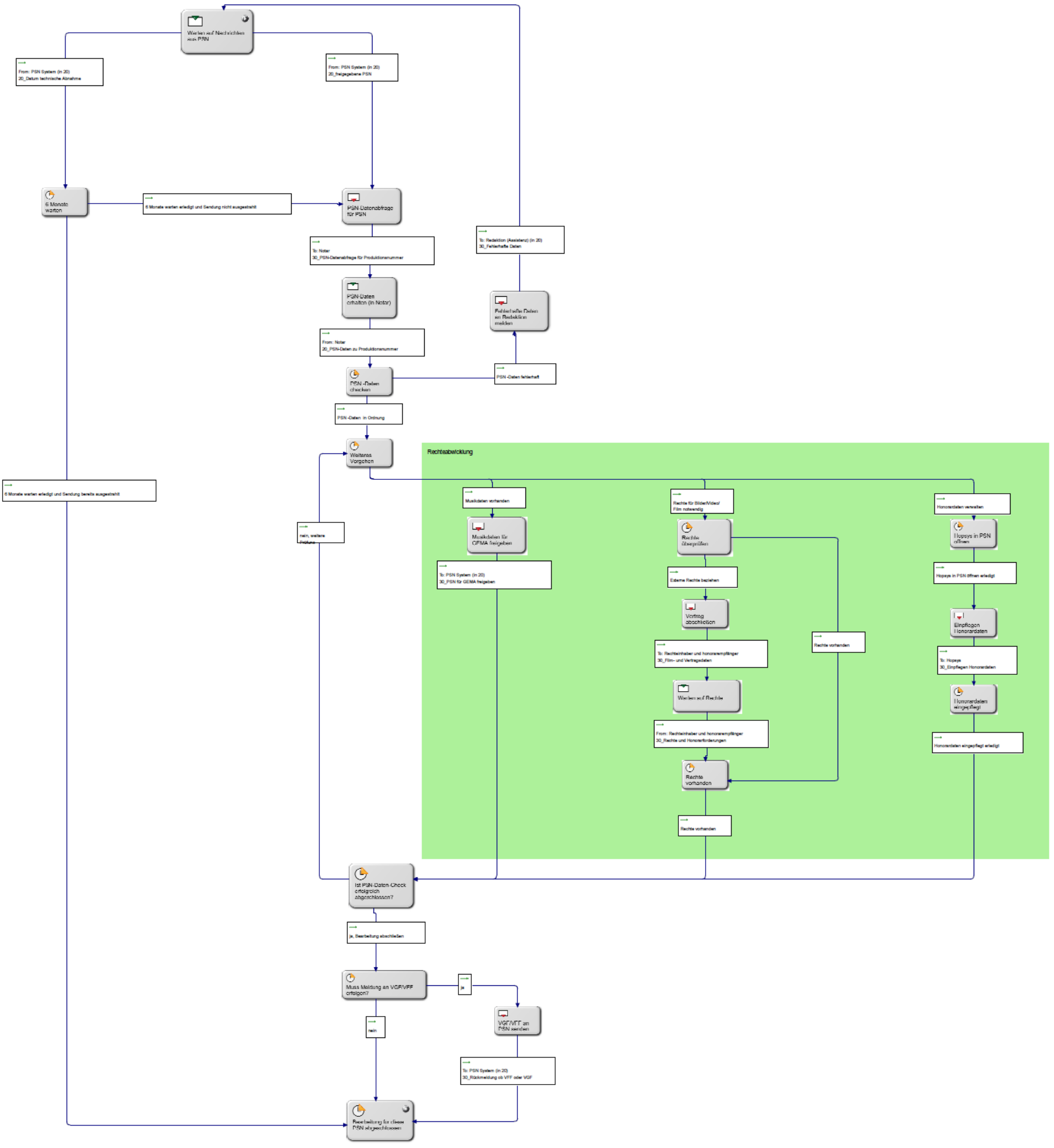


Figure 47: Subject Behavior of the Fee and License Subject (Honorare und Lizenzen)

6.5.5 Statistical Air Time Coordination of the PSN-Module

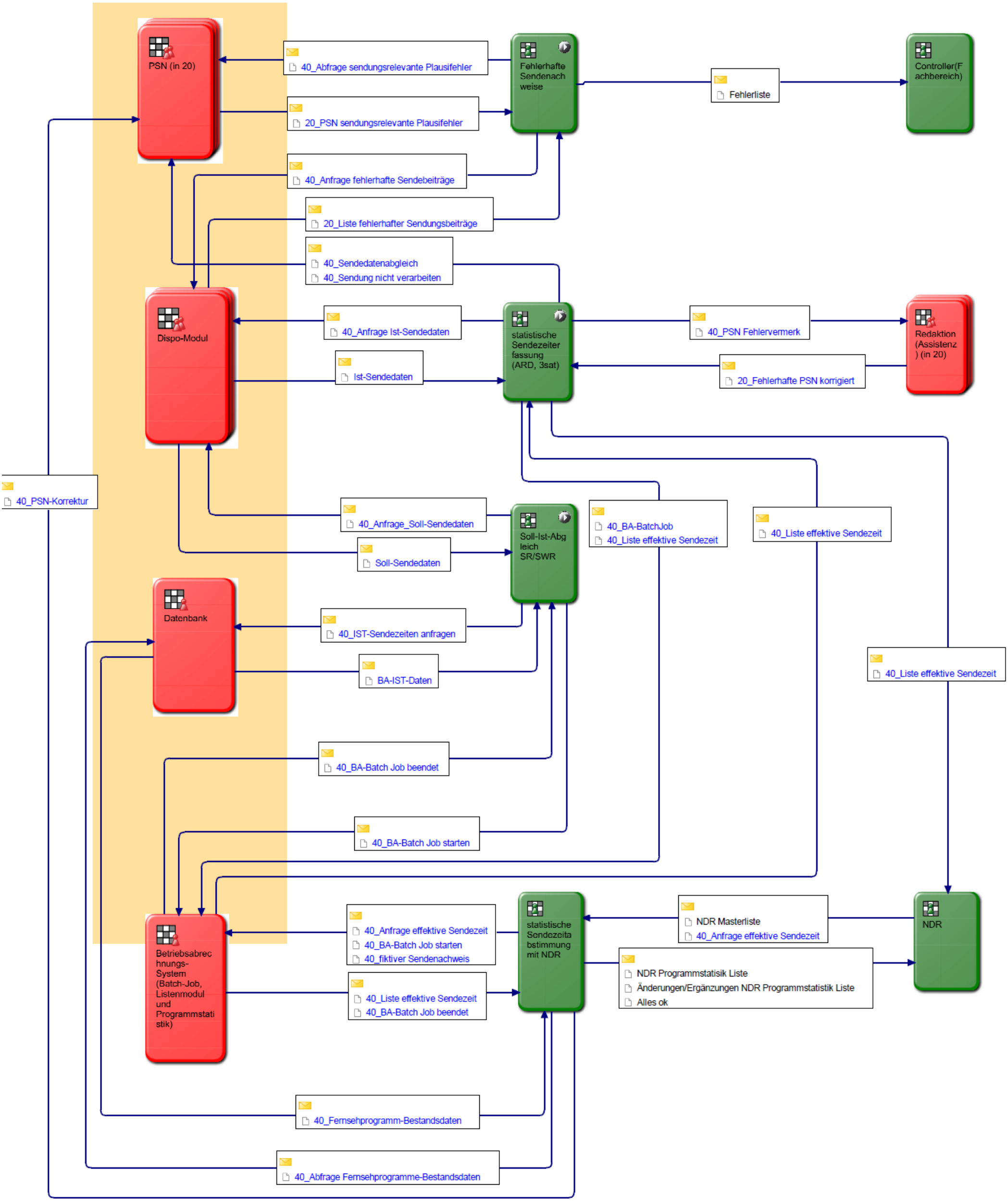


Figure 48: Statistical Air Time Coordination of the PSN-Module

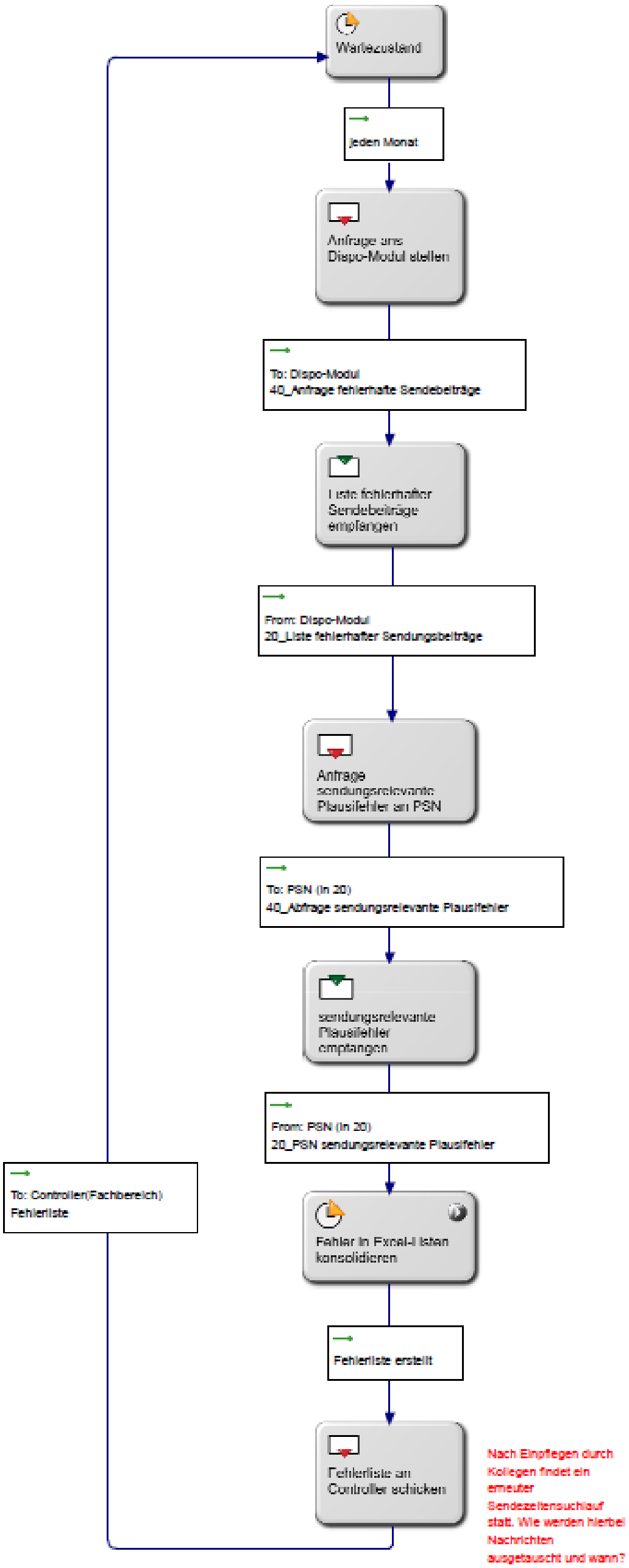


Figure 49: Subject Behavior of the Faulty Sent Verification (Fehlerhafte Sendenachweise)

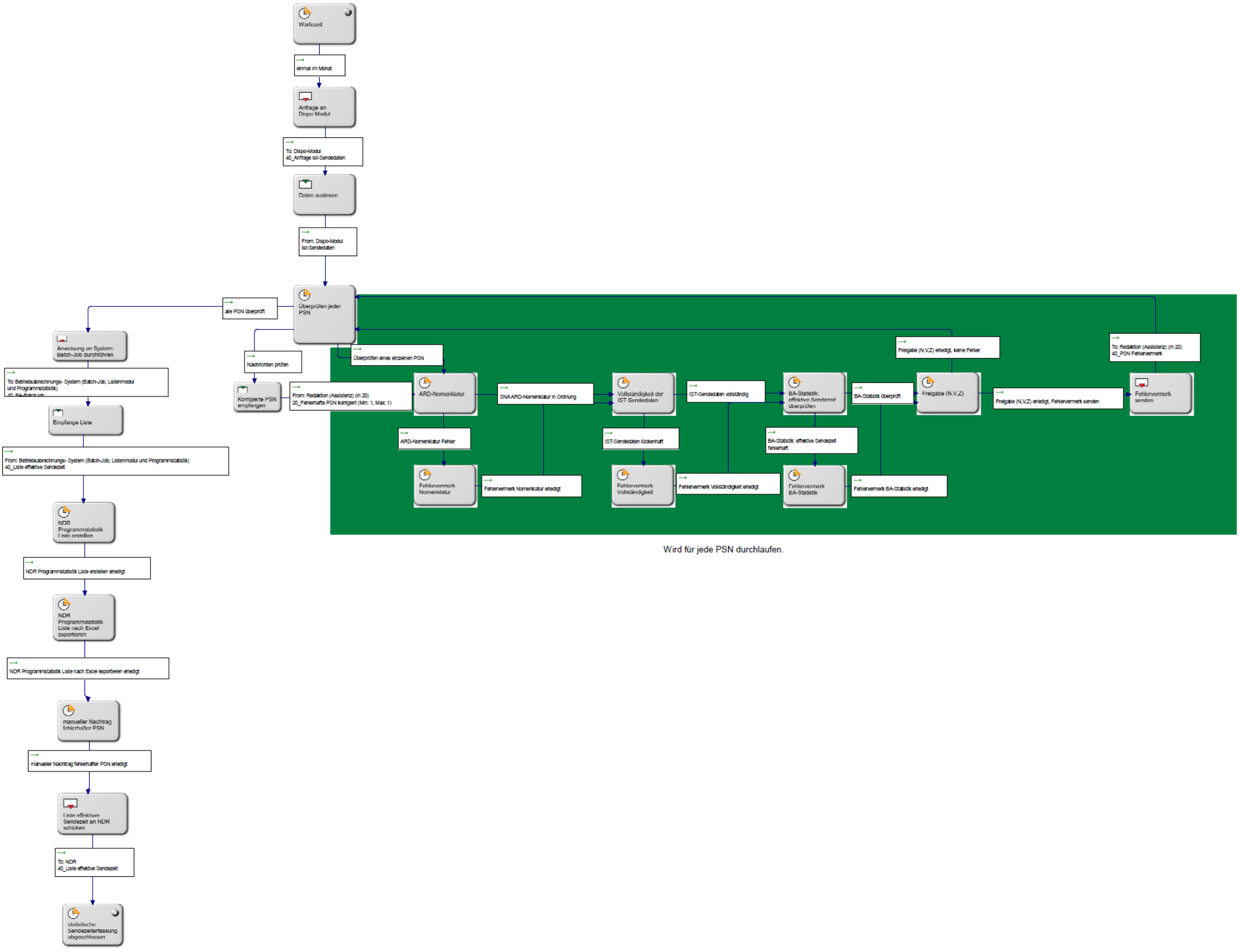


Figure 50: Subject Behavior of the Statistical Air Time Acquisition (Statistische Sendenachweiserfassung)

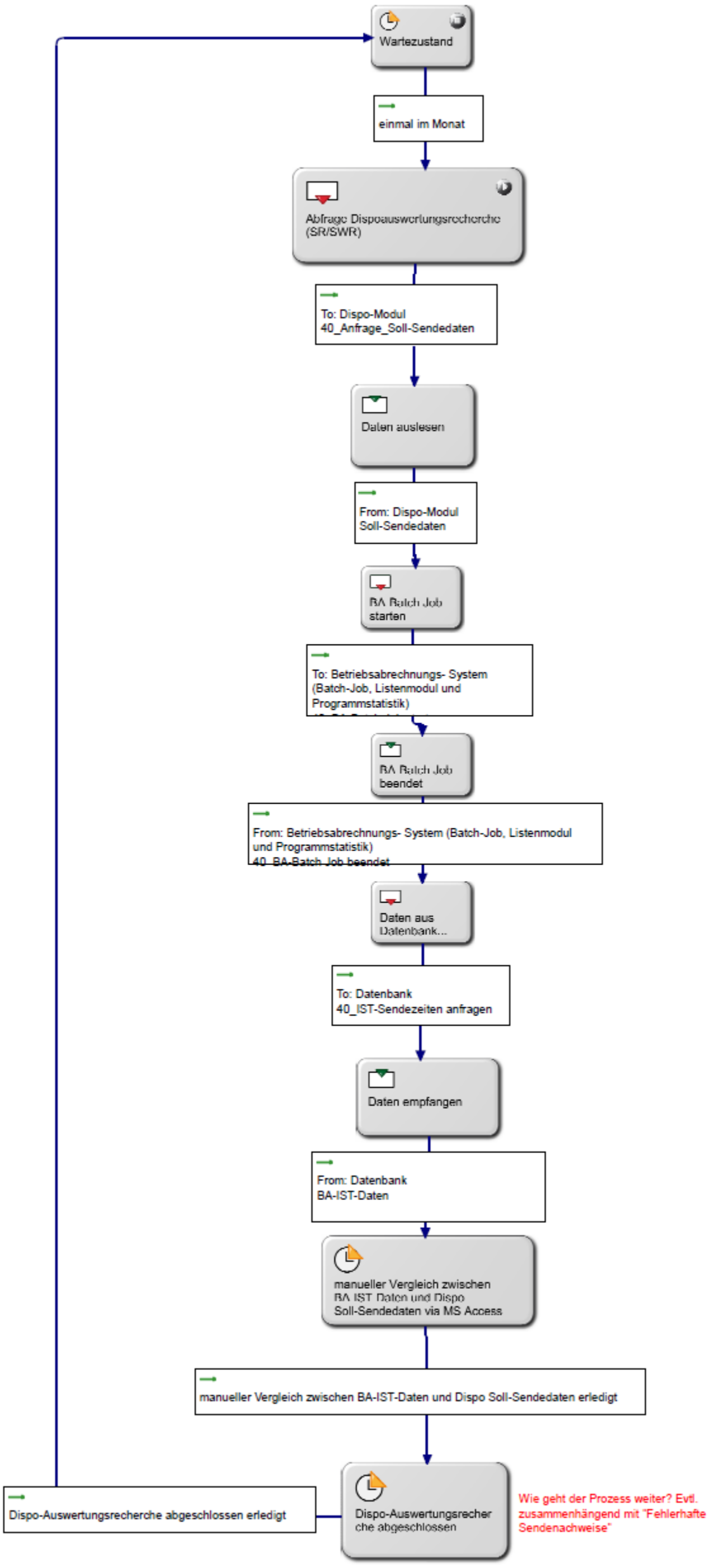


Figure 51: Subject Behavior of the As-Is/To-Be Comparison (Soll-Ist-Abgleich)

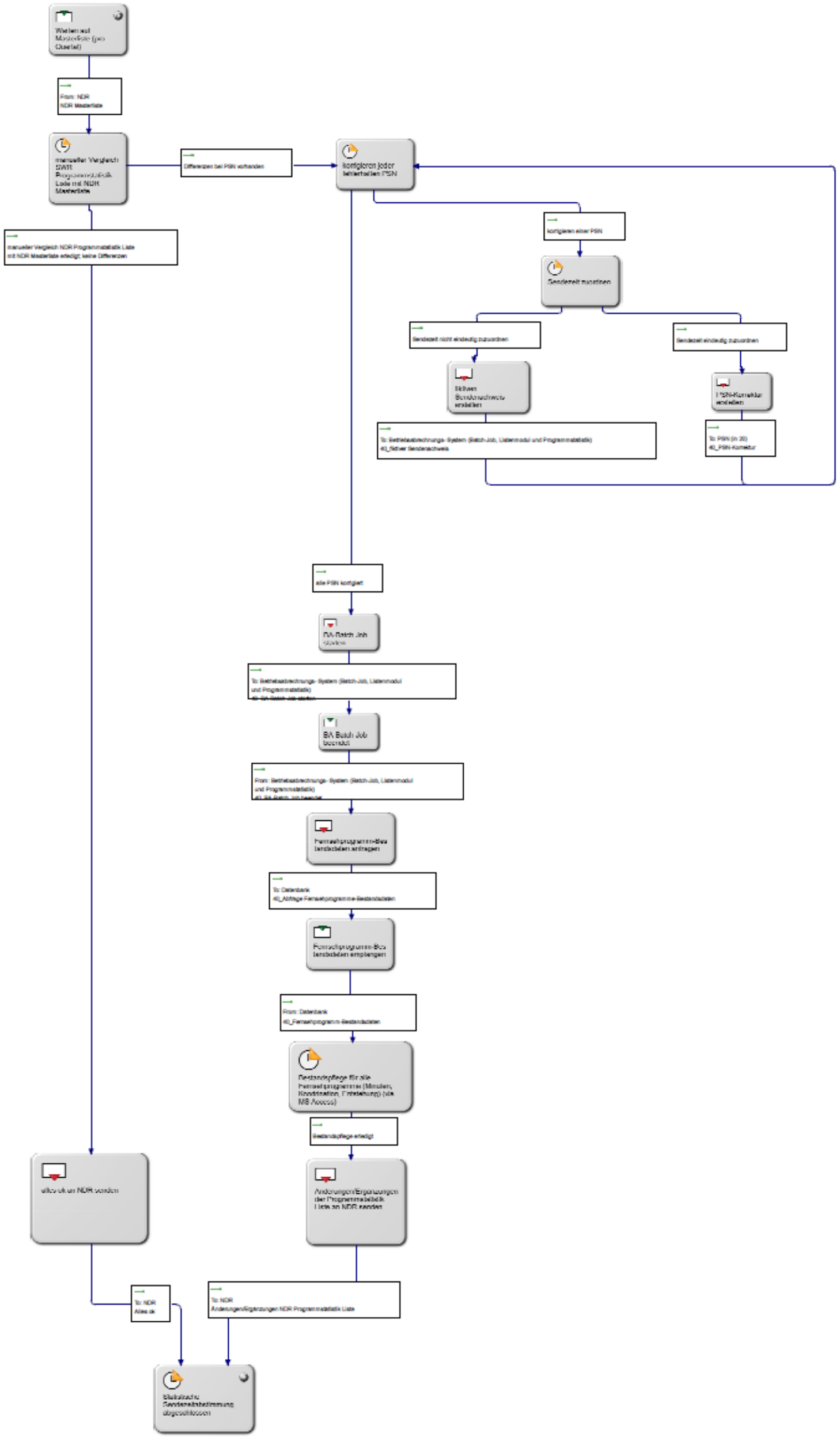


Figure 52: Subject Behavior of the Statistical Air Time Coordination with the NDR (Statistische Sendezeitabstimmung mit NDR)

6.5.6 Technical Acceptance Process of the PSN-Module

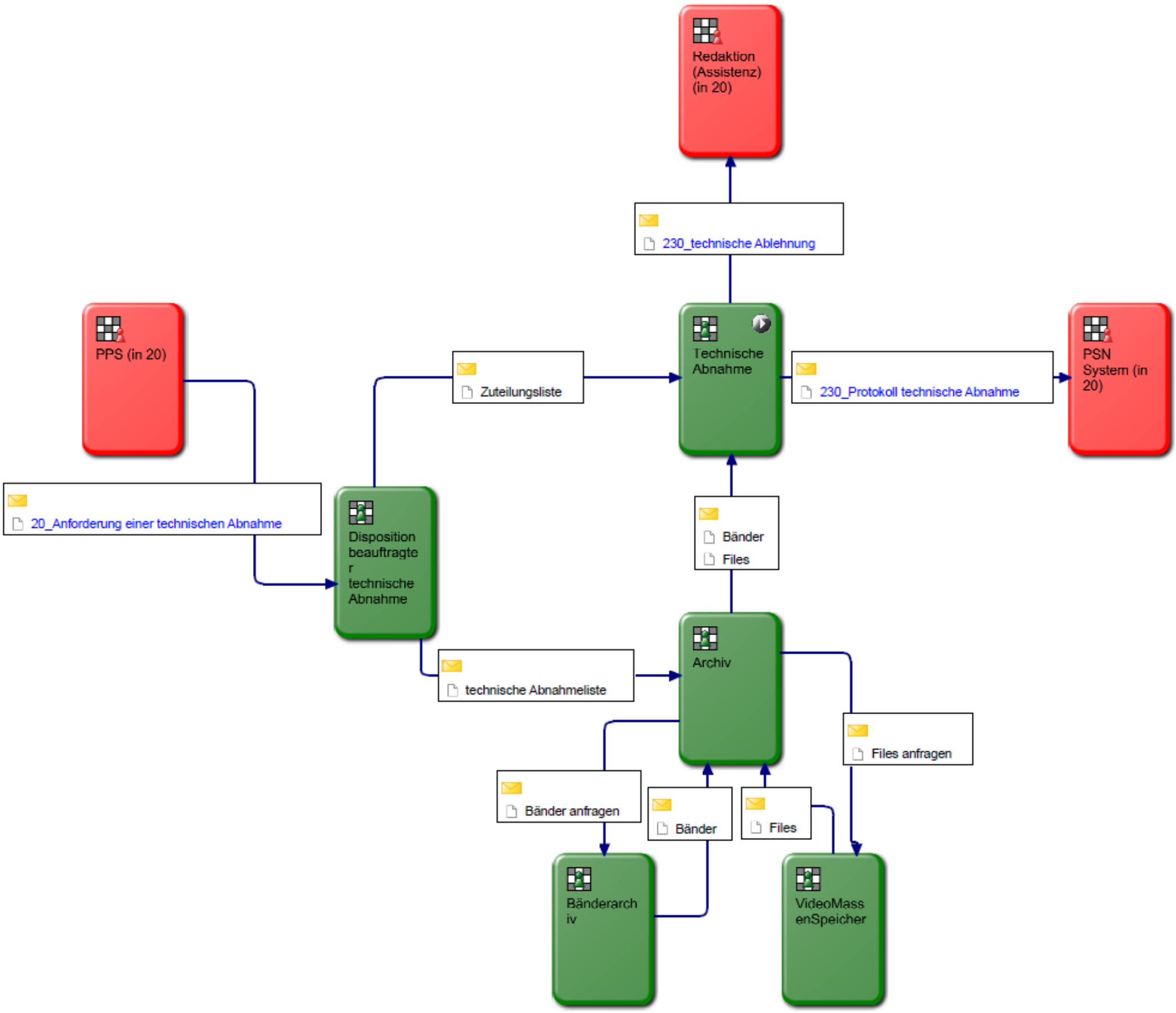


Figure 53: Technical Acceptance Process of the PSN-Module

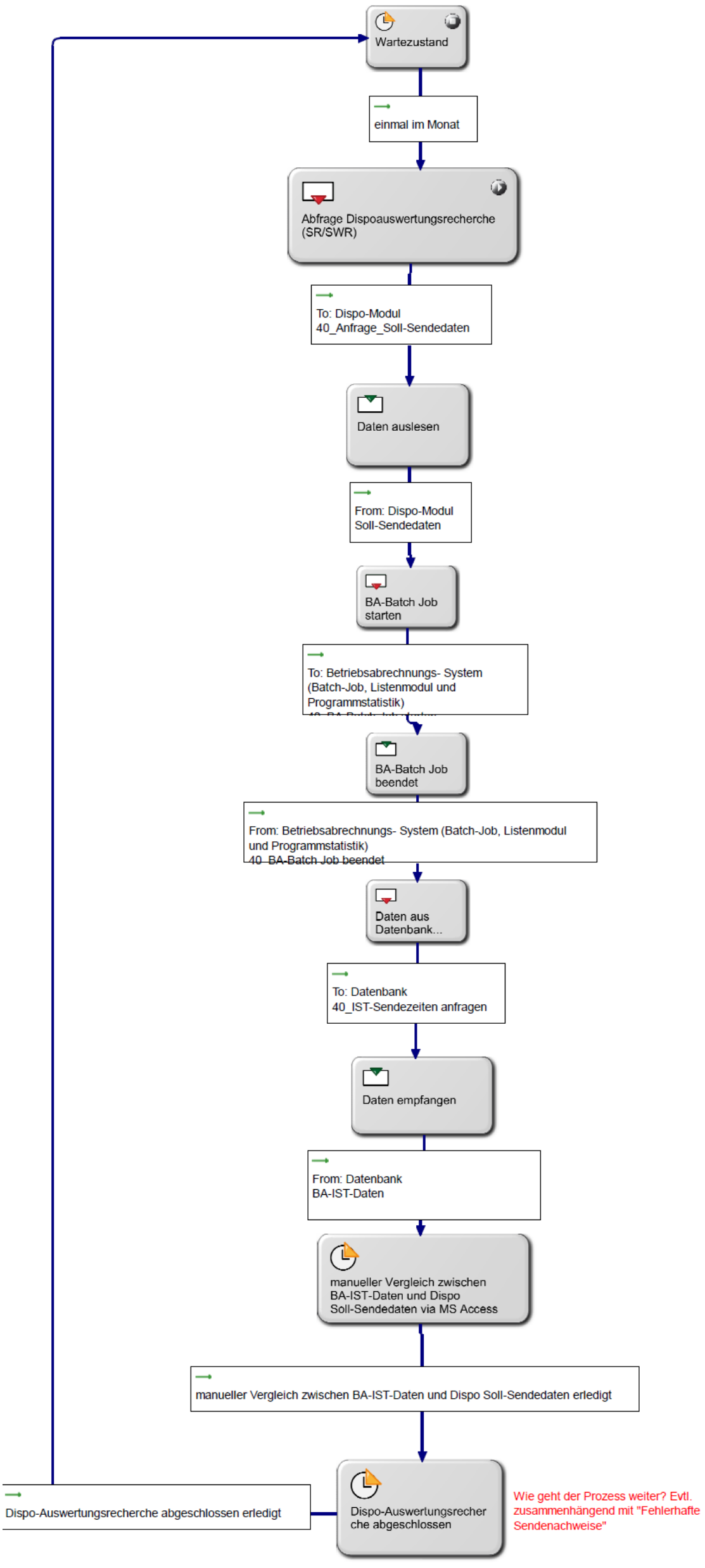


Figure 54: Subject Behavior of the Technical Acceptance (Technische Abnahme)

6.6 Instruction used for the Second Case Study

Subject-oriented Business Process Management (S-BPM)

-S-BPM uses natural language to describe processes

-Initial point of a process is the Subject

-Subject: Who acts?

-Predicate: What does the subject?

-Object: What edits the Subject?

Subject-oriented Business Process Management (S-BPM)

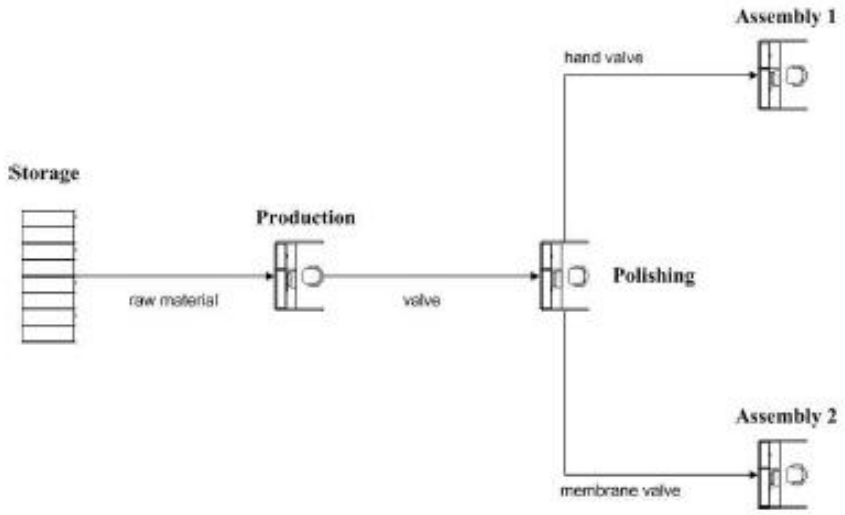
A subject behavior is defined by three states:

-„Function“: The subject executes an immediate action

-„Send Message“: The subject sends a message to another subject

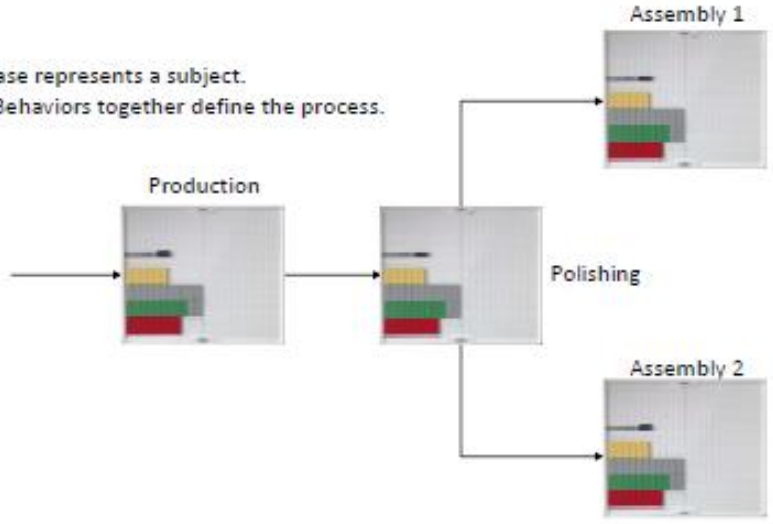
-„Receive Message“: The subject waits for a message

Example Process



The S-BPM Buildbook

The letter case represents a subject.
All Subject Behaviors together define the process.



S-BPM Buildbook: Notation

Yellow Plug: Function

Red Plug: Send Message

Green Plug: Receive Message

Grey Plug: Message/Transition

Example Process: S-BPM Buildbook

Subject Behavior of the Polishing Station

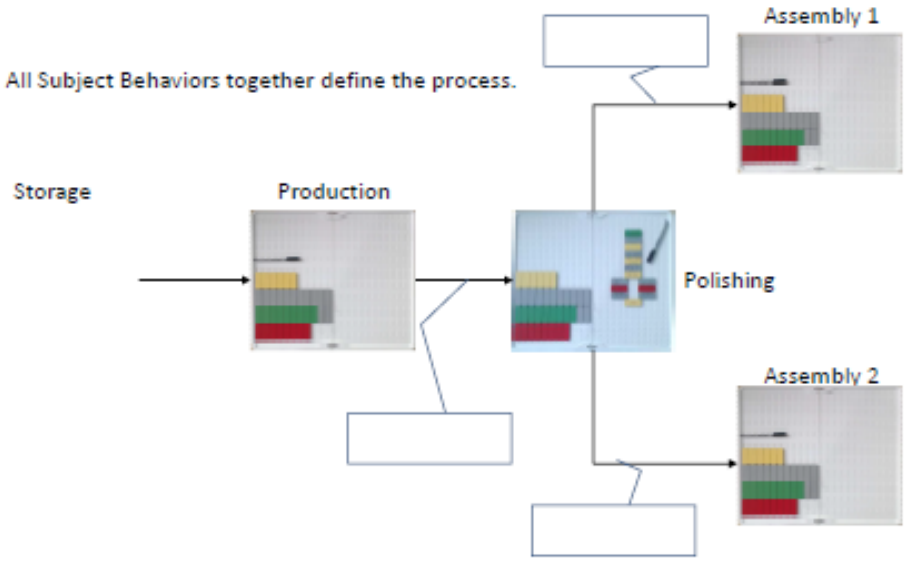
Yellow Plug: Immediate Action

Red Plug: Send Message

Green Plug: Receive Message

Grey Plug: Message/Transition

The S-BPM Buildbook



Assignment

-use the S-BPM Buildbook to describe your part of the process

-make sure that messages you send are also received

-make sure that messages you receive are also sent

-communicate with each other

6.7 Process Models and Optical Recognition Results of the Second Case Study

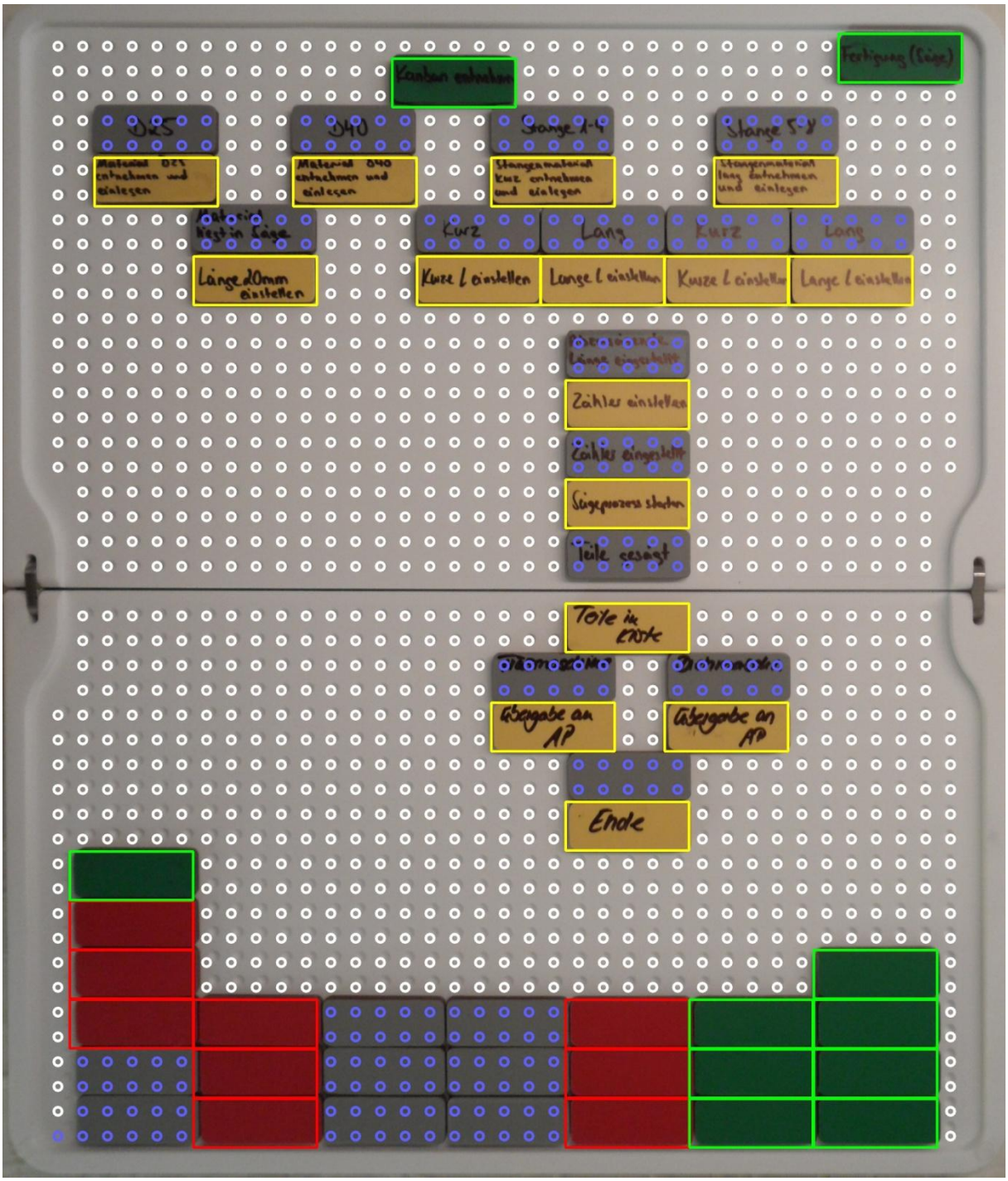


Figure 55: Manufacturing Process with Optical Recognition Results

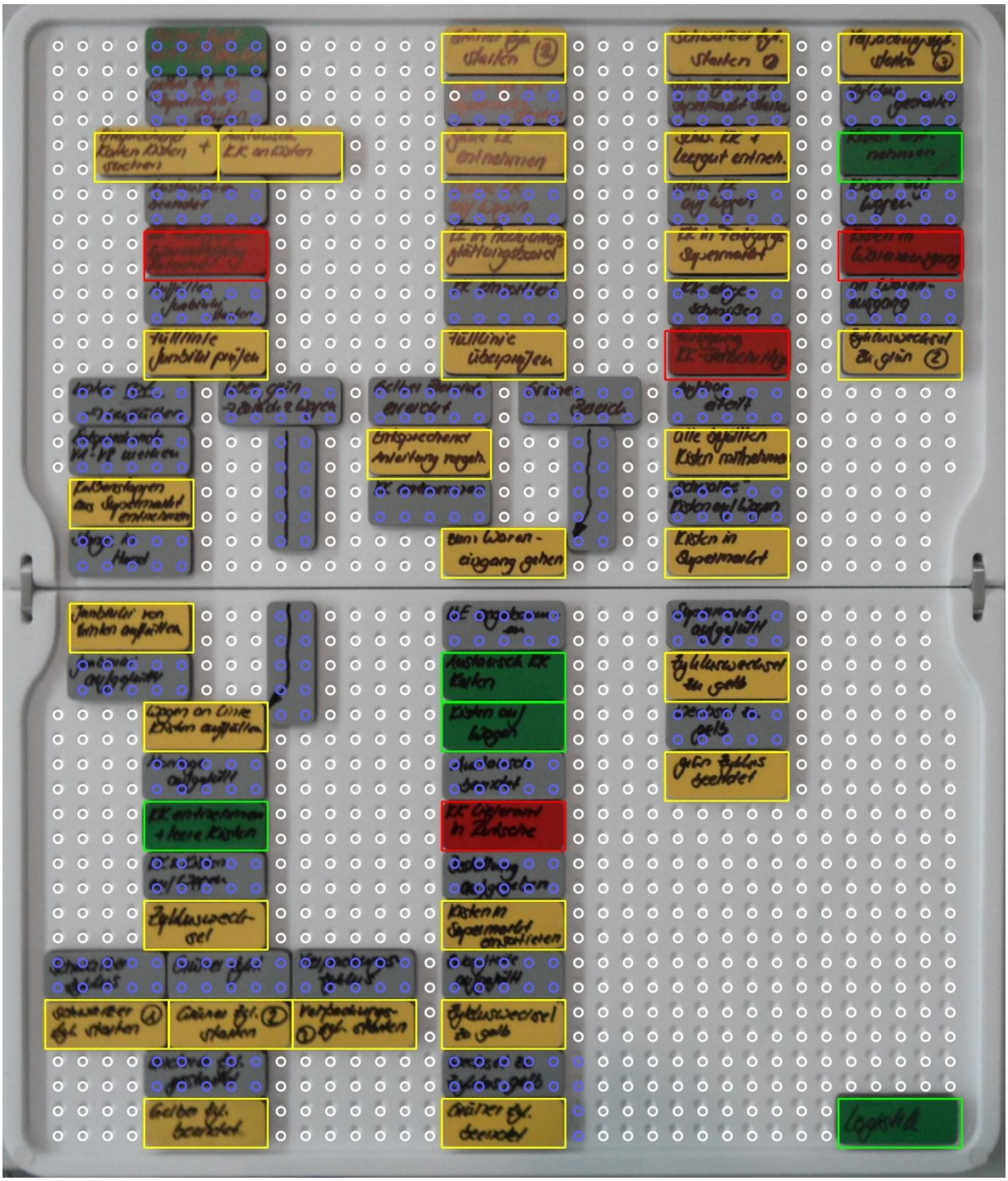


Figure 56: Logistics Process with Optical Recognition Results

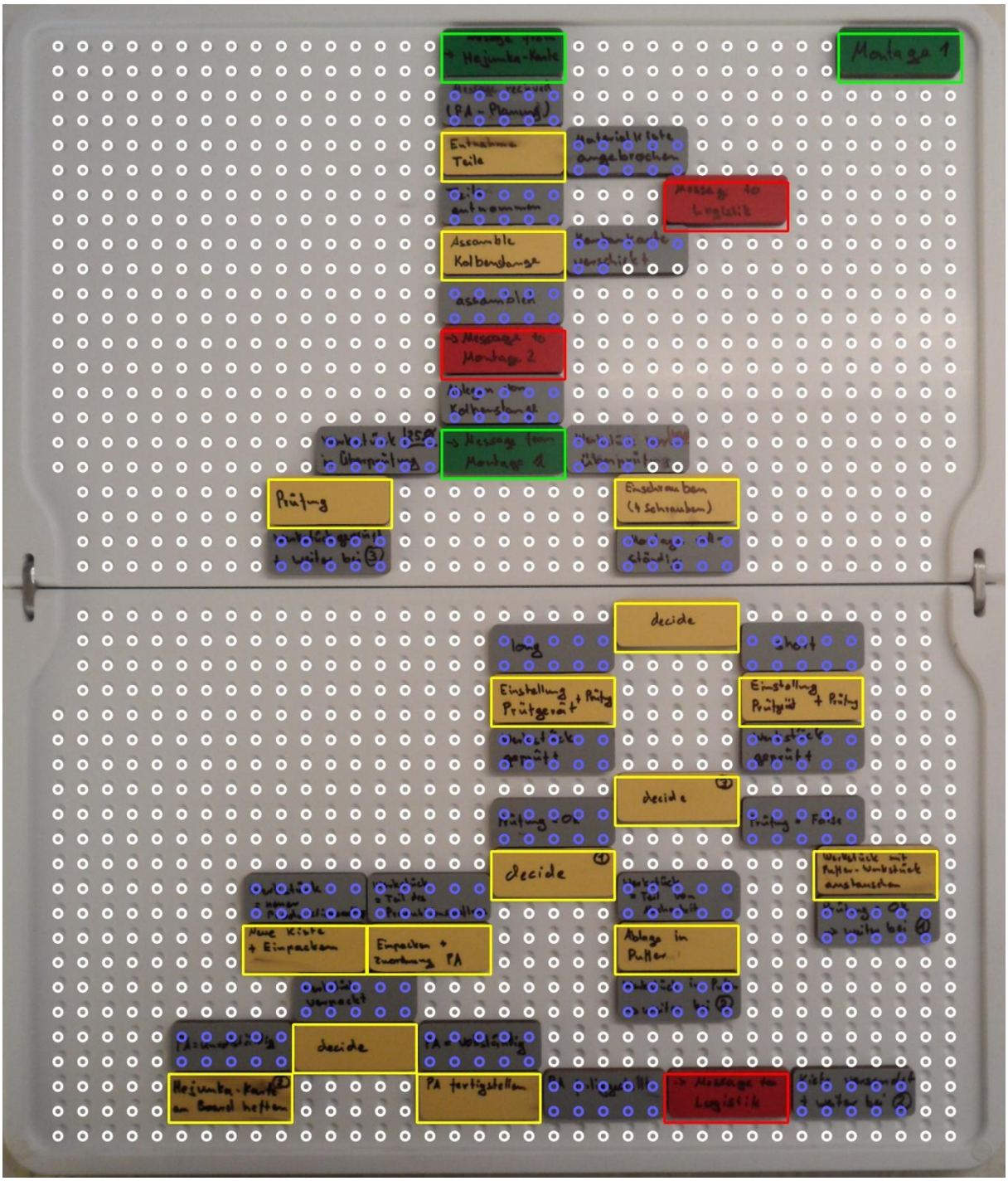


Figure 57: Assembly1 Process with Optical Recognition Results

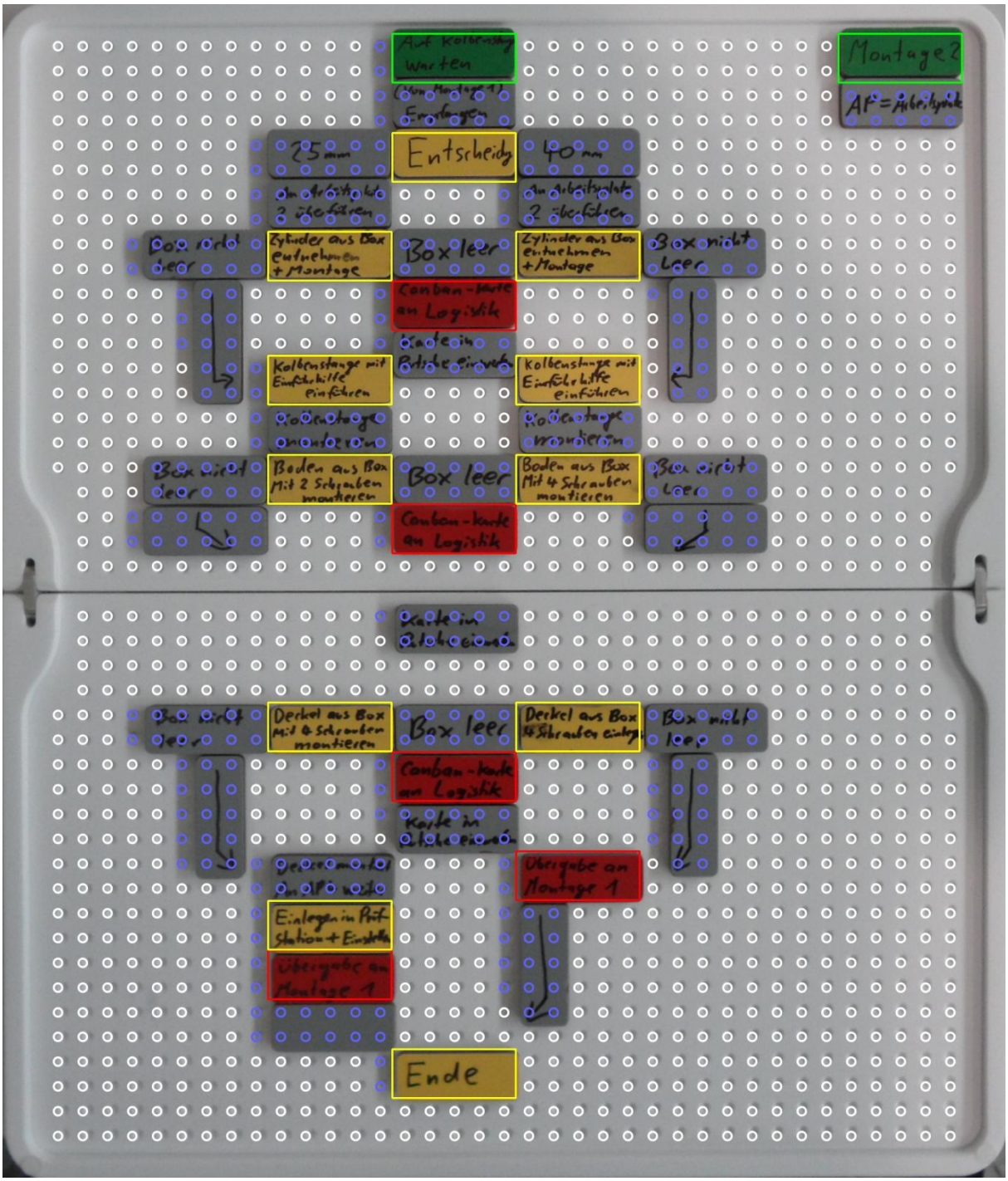


Figure 58: Assembly2 Process with Optical Recognition Results

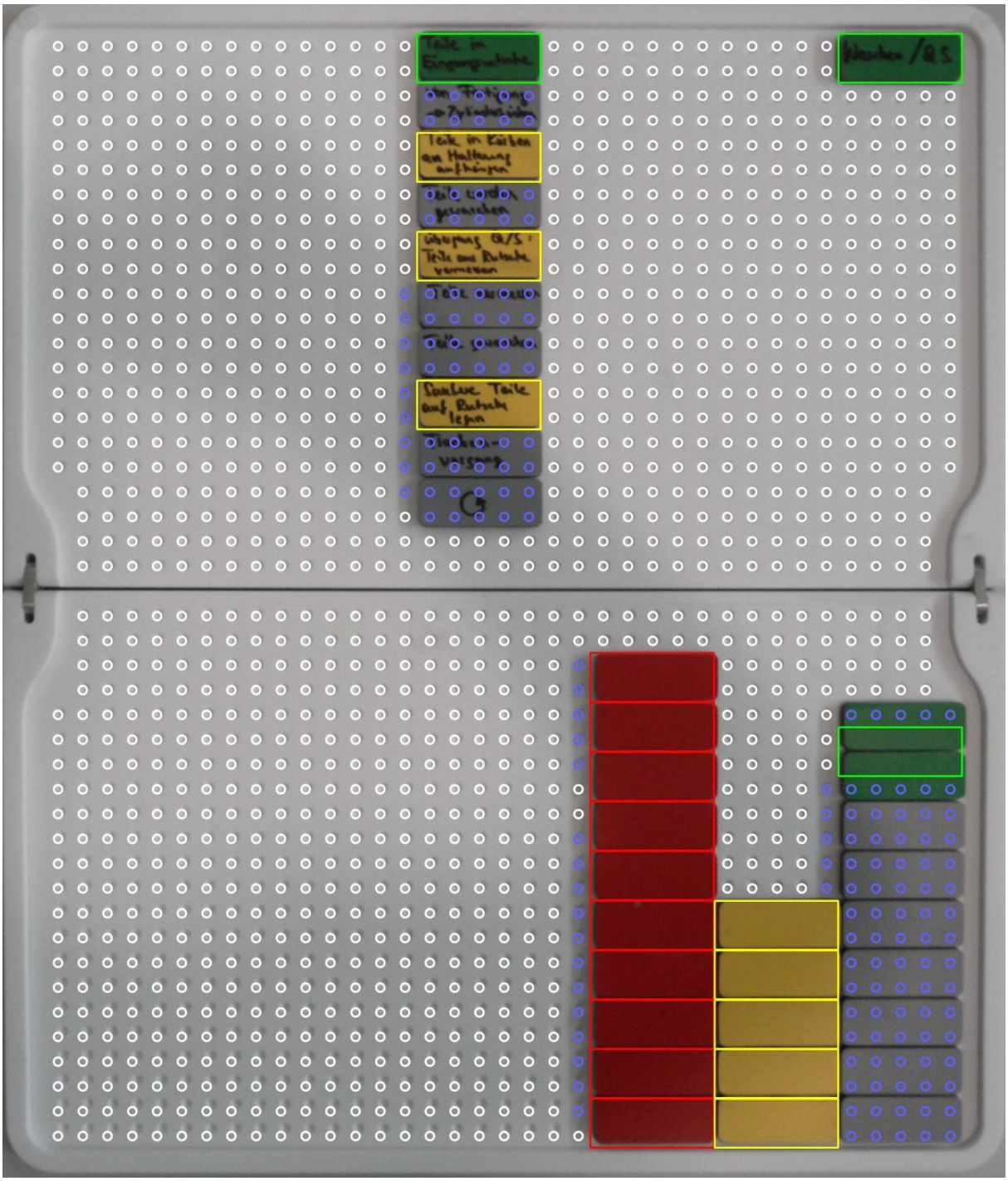


Figure 59: Washing Process with Optical Recognition Results

6.8 Filled out Questionnaires of the Second Case Study

Fragebogen: Bewertung der Prozesserhebung mit dem S-BPM Buildbook

1) **Haben Sie bereits Erfahrungen im Bereich des Prozessmanagement?**

(Ja) / Nein

Wenn ja, welche:

Lang jährige Tätigkeit Prozessoptimierung (Wertstrom-analysen, Produktionsumgestaltung usw)

2) **Haben sie bereits Erfahrungen im Bereich der Prozessmodellierung (Modellierungstools, Software, Notationen, etc)?**

Ja / (Nein)

Wenn ja, welche:

3) **Bei der Erhebung konnte ich mein Prozesswissen ausreichend darstellen:**

Stimmt nicht/stimmt wenig/stimmt mittelmäßig/stimmt ziemlich/(stimmt sehr)

Bitte begründen Sie ihre Antwort:

Erfahrung in Prozessen

Figure 60: Questionnaire 1, page 1 of 2

4) **Die Anwendung des S-BPM Buildbooks war einfach zu lernen und intuitiv:**

Stimmt nicht/stimmt wenig/stimmt mittelmäßig/stimmt ziemlich/stimmt sehr

Bitte begründen Sie ihre Antwort:

Manchmal Tutorial über „Message Flow-Aufgaben"

5) **Was hat Ihnen bei der Nutzung des S-BPM Buildbooks gefallen?**

Spielerischer Einstieg durch „Baukästen"

6) **Was hat Ihnen bei der Nutzung des S-BPM Buildbooks nicht gefallen?**

„Kommentarfunktion" hilfreich

7) **Sonstige Anmerkung:**

Bsp hilfreich! Festlegung der Tiefe der Prozessdarstellung

Figure 61: Questionnaire 1, page 2 of 2

Fragebogen: Bewertung der Prozesserhebung mit dem S-BPM Buildbook

1) **Haben Sie bereits Erfahrungen im Bereich des Prozessmanagement?**

Ja / (Nein)

Wenn ja, welche:

2) **Haben sie bereits Erfahrungen im Bereich der Prozessmodellierung (Modellierungstools, Software, Notationen, etc)?**

Ja / (Nein)

Wenn ja, welche:

3) **Bei der Erhebung konnte ich mein Prozesswissen ausreichend darstellen:**

Stimmt nicht/stimmt wenig/stimmt mittelmäßig/stimmt ziemlich/(stimmt sehr)

Bitte begründen Sie ihre Antwort:

~~Da kein Prozesswissen vorhanden.~~
~~Allerdings ähnliches Layout wie beim Lego Hands erstellt im Informatikbereich.~~ Das Prozesswissen lässt sich gut und übersichtlich darstellen.

Figure 62: Questionnaire 2, page 1 of 2

4) **Die Anwendung des S-BPM Buildbooks war einfach zu lernen und intuitiv:**

Stimmt nicht/stimmt wenig/stimmt mittelmäßig/stimmt ziemlich/stimmt sehr

Bitte begründen Sie ihre Antwort:

Es war logisch aufgebaut
Durch die Magnete jederzeit änderbar

5) **Was hat Ihnen bei der Nutzung des S-BPM Buildbooks gefallen?**

Macht Spaß, durch die Magnete und Farben
Man kann einfach eine Ordnung erstellen, durch die einzelnen Kacheln

6) **Was hat Ihnen bei der Nutzung des S-BPM Buildbooks nicht gefallen?**

- Stift war zu dick

7) **Sonstige Anmerkung:**

Tolles Board, motiviert [redacted] und [redacted] schafft Übersichtlichkeit

Figure 63: Questionnaire 2, page 2 of 2

Fragebogen: Bewertung der Prozesserhebung mit dem S-BPM Buildbook

1) **Haben Sie bereits Erfahrungen im Bereich des Prozessmanagement?**

(Ja) / Nein

Wenn ja, welche:

Vorlesung → nur abstraktes Wissen
Exkursion } Value Stream
Praktikum } Mapping

2) **Haben sie bereits Erfahrungen im Bereich der Prozessmodellierung (Modellierungstools, Software, Notationen, etc)?**

(Ja) / (Nein)

Wenn ja, welche:

Bisher nur mit MS Visio

3) **Bei der Erhebung konnte ich mein Prozesswissen ausreichend darstellen:**

Stimmt nicht/stimmt wenig/stimmt mittelmäßig/stimmt ziemlich/stimmt sehr

Bitte begründen Sie ihre Antwort:

Ich konnte das Wissen über Informations-
verarbeitung innerhalb des Prozesses +
Reihenfolge der Prozessschritte abbilden,
jedoch keine Zusatzinformationen wie
häufige Fehler, Zykluszeiten etc.

Figure 64: Questionnaire 3, page 1 of 2

4) Die Anwendung des S-BPM Buildbooks war einfach zu lernen und intuitiv:

Stimmt nicht/stimmt wenig/stimmt mittelmäßig/stimmt ziemlich/stimmt sehr

Bitte begründen Sie ihre Antwort:

Intuitives Konzept

↳ Transition - Blöcke erscheinen nicht immer nötig

5) Was hat Ihnen bei der Nutzung des S-BPM Buildbooks gefallen?

einfache Handhabung, schnelle Änderungen möglich

6) Was hat Ihnen bei der Nutzung des S-BPM Buildbooks nicht gefallen?

Keine Möglichkeit Zusatzinformationen abzubilden, Gerade im Bereich Lean Management interessieren Puffer. Diese wurden komplett vernachlässigt

7) Sonstige Anmerkung:

Figure 65: Questionnaire 3, page 2 of 2

7 List of References

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8 List of Figures

9 List of Tables

10 List of Abbreviations

BPM	Business Process Management
S-BPM	Subject-oriented Business Process Management
EPC	Event-driven process chain
SID	Subject Interaction Diagram
SBD	Subject Behavior Diagram
e.g.	For example („exempli gratia“)
cf.	compare
etc.	etcetera