The usability of the Process Mining analysis method to improve processes of the Netherlands Ministry of Defence

Graduation thesis at the Netherlands Ministry of Defence

Appendix

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Ministerie van Defensie

TU Delft

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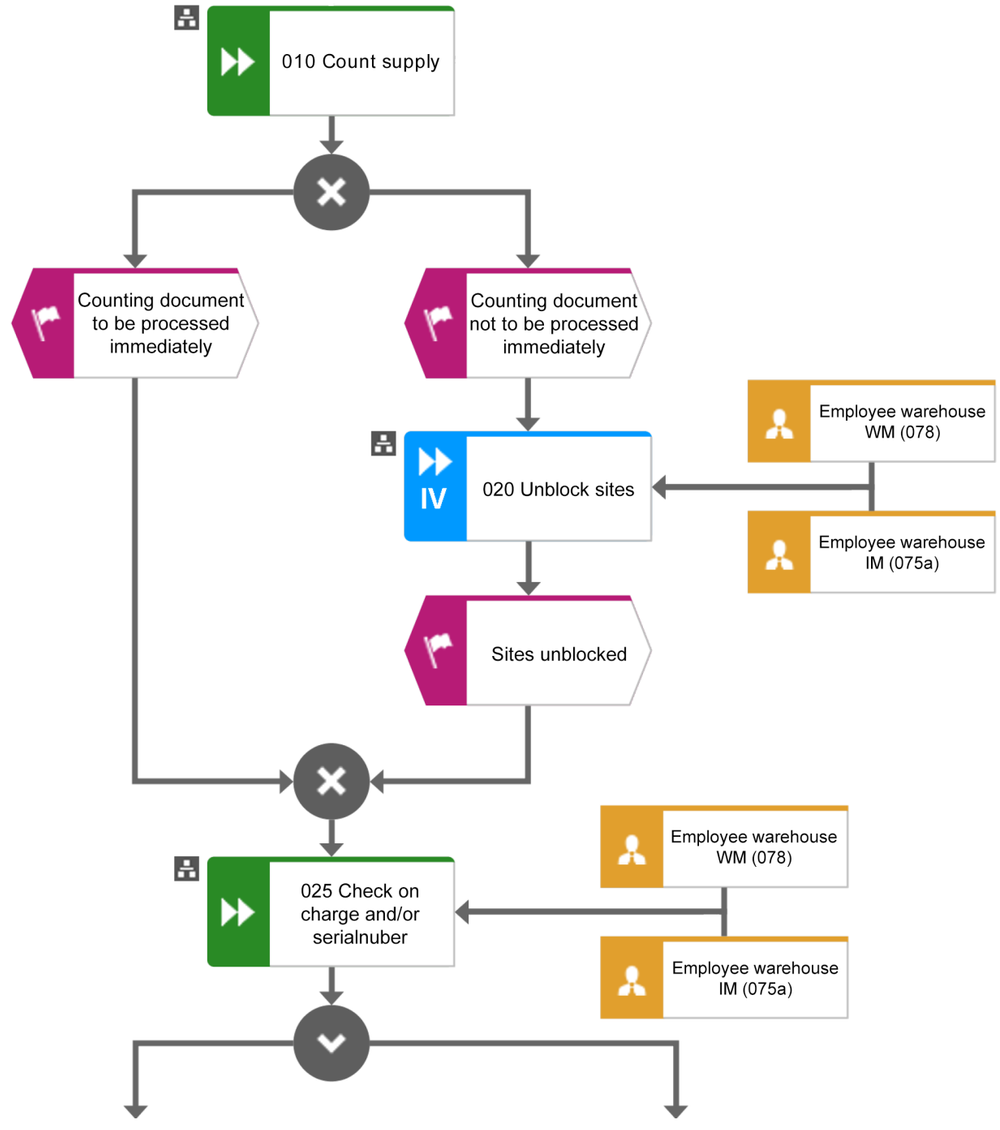
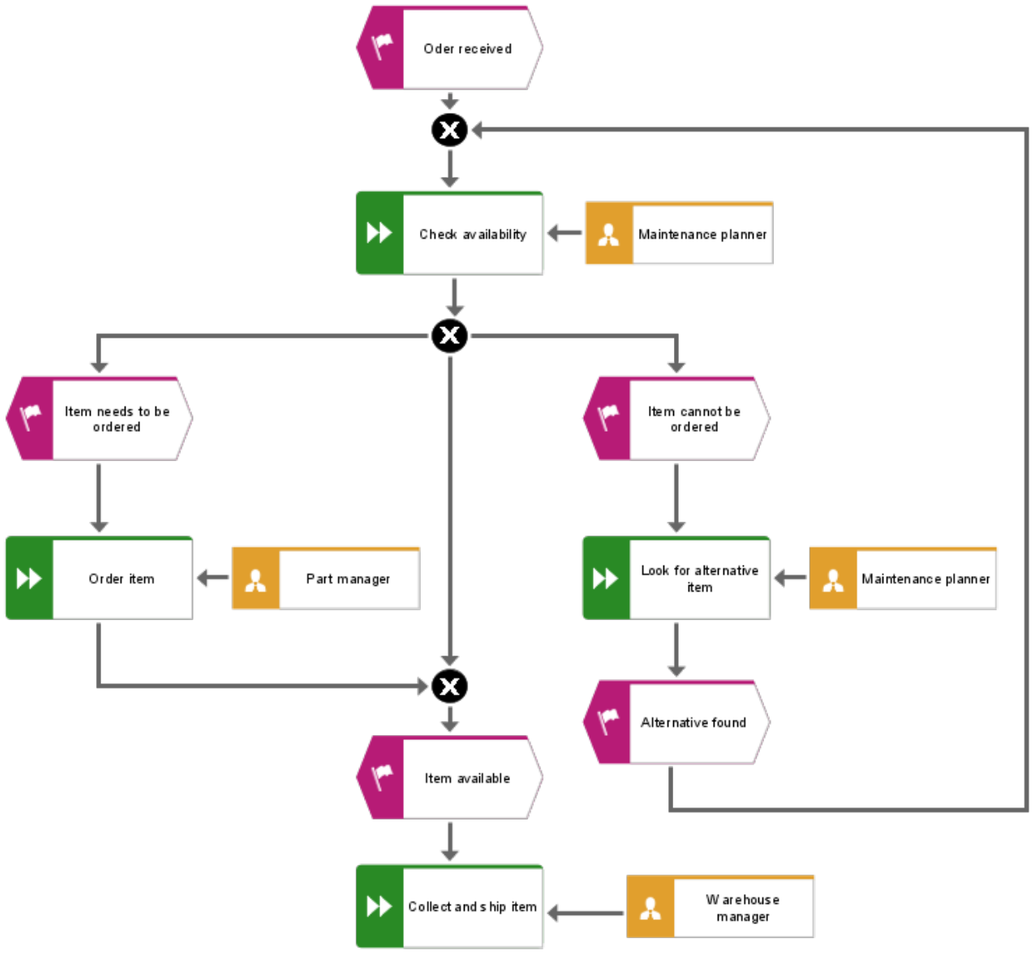


Table A.3.1: Overview of traditional BPIs

Concepts	Lean	Six Sigma	Lean Six Sigma	TQM	Lean MRO	TPM	BPR	BPI	Process Mining (PM^2)
Origin	The quality evolution in Japan and Toyota	The quality evolution in the United States and Motorola	The combination of Lean and Six Sigma	The United States Navy	Aviation and aerospace industries	The quality evolution in Japan and Toyota	The increased competition in the United States	The increased competition in the United States	The rise of big data and accessibility of computing power
First mentioned	1988	1986	2001	1985	2005	1971	1990	1990	2015
Theory	Remove waste	Remove variation	Remove waste and remove variation	Focus on customers	Remove waste and improve scheduling	Autonomous maintenance and employee commitment	Use modern information technology	Understand and streamline processes	Align de facto and with de jure process models
Process view	Improve flow in processes	Reduce variation to reduce defects and improve processes	Achieve fastest rate of improvement in customer satisfaction, cost, quality, process speed and flexibility	Improve and uniform processes	Improve and speed up flow in processes	Develop preventive maintenance programme for the life-cycle of the equipment	Radically redesign business processes with modern information technology	Incremental process improvement	Discovering, conforming, and enhancing business processes
Involvement	Whole organisation	Project team	Whole organisation and separate project teams	Whole organisation	MRO department	Small maintenance teams	Whole organisation	Project team	Multidisciplinary team
Methodologies	Understanding customer value, value stream analysis, 7 deadly wastes, 5S, flow, pull, perfection, just-in-time	Define, measure, analyse, improve (or design), control (or verify)	Define, measure, analyse, improve, control, 5S, value stream mapping, redesign, single unit flow, total productive maintenance	Plan, do, study, act	Value stream analysis, 7 deadly wastes, 5S, flow, pull, perfection, just-in-time, theory of constraints	Creating new attitude toward maintenance based on six elements	Redesign the organisation based on six principles of reengineering	Organizing for improvement, understanding the process, streamlining, measure and control, continuous improvement	Extract, process, mine, and analyse event data. Evaluation and improvement in a team
Primary effects	Reduce lead time	Save money	Add value	Increase customer satisfaction	Reduced TAT	Reduces breakdowns, accidents, and equipment failures	Performance improvements	Reduces waste and bureaucracy	Gain quantitative and factual knowledge about processes
Secondary effects	Reduces inventory, increases productivity and customer satisfaction	Achieves business goals, improves financial performance, and product quality	Achieves business goals, reduces inventory, increases productivity, customer satisfaction, improves financial performance, and product quality	Achieves customer loyalty and improves performance	Maximize asset availability and minimizing downtime	Reduces delays, downtime, and increase employee commitment	-	Simplified operations and increased (internal and external) customer satisfaction	Improvements can be monitored and verified
Criticism	Reduces organisations flexibility, causes congestion in the supply chain, not applicable in all industries	Does not involve everybody, does not improve customer satisfaction, does not have a system view	Not mentioned	No tangible improvements, resource-demanding, unclear notion	Documented successful implementations are scares	No strict activities	A strict focus on technology and efficiency while not mentioning the soft side	Outdated and inflexible as a methodology	Demanding high quality data and structured processes

Figure A.3.1: Fictional process model



Process mining software requires data and there are several ways to obtain this. In his book, Van der Aalst (2016) distinguishes four types of mechanisms: files (events are stored in a single file), databases (events are stored in a stand-alone database and are (periodically) extracted via a connection), adapters (events are stored in a different application and are (periodically) extracted through a dedicated piece of software), and streaming (events are captured as they occur while emitted through an event bus or web service).

Figure A3.1 shows the workflow of collecting and processing data from heterogeneous sources by Van der Aalst. According to this figure, data from different data sources can, according to the ETL (Extract, Transform, and Load) process, be collected into a data warehouse. This is a central logical repository where an organization's transactional and operational data are stored. Data from different sources can be combined based on a corresponding classifier. For example, costs of a project stored in an accounting program can be linked to the actual events of the same project stored in the ERP while both use the same project (case) IDs. Using a data warehouse is optional. Data can also be extracted directly for further processing. This is the case when a data dump is made from an ERP. During the extracting, the relevant events need to be selected and stored in a minable format. Commonly used formats are CSV, XLS, MXML, and XES. XES (eXtensible Event Stream) is the successor of MXML (Mining eXtensible Markup Language) and it is a standard for (process mining) event data, this however, does not make it the most popular format. CSV (comma-separated values) is the most basic format and is seen frequently when extracting datasets. After extracting, the data are filtered. This is an iteratively process. Based on initial analysis results, a focus on the more interesting events is made (for example, only events dealing with a certain system). During the extraction, the dataset is decreasing in size, while during filtering, only a temporary selection is made. Then the data are ready to be mined.

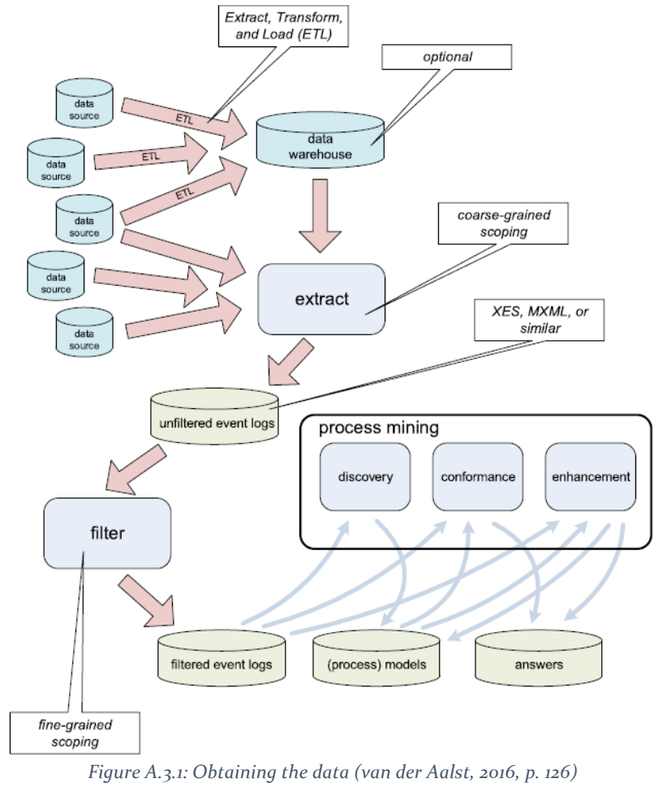


Figure A.3.1: Obtaining the data (van der Aalst, 2016, p. 126)

Van der Aalst mentions five important challenges when extracting event logs. Correlation: combining data from different sources in a way they all have the correct case IDs. This sometimes requires additional efforts. Timestamps: some databases do not record timestamps or they use deviant clocks or time zones. When manual adjustment is not possible, last resort is to "guess" the timestamp to at least create ordering. Snapshots: when cases have a lifetime extending the recorded period an incomplete image is composed. Two solutions are extending the recorded period or remove cases with a missing start or end event. Scoping: ERP systems like SAP have thousands of tables with data. Selecting the correct ones is a specialist and time-consuming job. Granularity: events can have different levels of granularity. To detailed information can for example be grouped to create useable data. This, however, is time-consuming.

Van der Aalst also identified 108 data quality problems (2016, p. 151). These problems mostly concern missing or incorrect information, but Van der Aalst does not mention technical problems like corruption of data files. In order to explain those risk, a practical data extraction from a CSV file is described. CSV files are filled with lines of readable text. Every line is another event and the different attributes are separated by a comma, tab, or other predefined punctuation mark. This makes it easy to manipulate but also sensitive to errors. For example, the following text comes from a CSV file:

```
Case ID     Description Timestamp   Operator    Type
IM0952268   Replaced several servers      02/05/17 13:43:43 Tjiang, TH;
      Analysis/Research
IM0952284   Works after changings servers : J1094552 and J1094553 02-05-2017
18:00 Hoogeveen, S;     Closed
```

By the naked eye, it is difficult to see, but between every attribute there is a tap. However, between "servers" and " : J1094552" there is one extra. This is a common problem of log files: the logging software places too many separators because a punctuation mark in comments is seen as a separator. The effect is that the process mining software believes ": J1094552 and J1094553" is the timestamp, "02-05-2017 18:00" is the operator, etc. Before the data are imported it should be verified and corrected. Doing this (partial) manually delivers the best result. (That is why popular media states that data scientist spent sixty percent of their time cleaning and organizing data (Press, 2016).)

In Microsoft Excel, the use of Macros can speed up the process significantly. Below an example is given of a Macro merging two cells and another Macro looking for a misplaced cell and, after merging it, shifting the row into order.

```
Sub Shift()
       ActiveCell.Offset(0, -5).Range("A1:B1").Select
       Application.Run "Dataset.xlsm!Merge"
       ActiveCell.Offset(0, 2).Range("A1:D1").Select
       Selection.Cut
       ActiveCell.Offset(0, -1).Range("A1").Select
       ActiveSheet.Paste
       ActiveCell.Offset(0, 4).Range("A1").Select
       Selection.End(xlDown).Select
End Sub

Sub Merge()
       Dim c As Range, txt As String
       For Each c In Selection
           txt = txt & c.Value & "; "
       Next c
       Selection.ClearContents
       txt = Left(txt, Len(txt) - 2)
       Selection(1).Value = txt
End Sub
```

Still, for every instance, the error needs to be inspected manually, making it a time-consuming job. Another example can be found below.

```
<?xml version="1.0" encoding="UTF-8"?>
<eventlist>
<event>
  <attribute type="AUFK-AUFNR">000340220241</attribute>
  <attribute type="JCDS-USNAM">V00121149</attribute>
  <attribute type="JCDS-UTIME">111400</attribute>
  <attribute type="JCDS-UDATE">20151013</attribute>
  <attribute type="ADCP-FUNCTION">Planner &amp;amp; Voortgangscontroleur</attribute>
  <attribute type="TJ02T-TXT30">Voorgecalculeerd</attribute>
  <attribute type="TJ02T-TXT04">VOCA</attribute>
  <attribute type="AUFK-AUART">PM02</attribute>
  <attribute type="ADCP-DEPARTMENT">CLAS/11LMB/111HRSTPEL/PRODBEST</attribute>
</event>

<event>
  <attribute type="AUFK-AUFNR">000340220241</attribute>
  <attribute type="JCDS-USNAM">V00121149</attribute>
  <attribute type="JCDS-UTIME">101339</attribute>
  <attribute type="JCDS-UDATE">20160113</attribute>
  <attribute type="ADCP-FUNCTION">Planner &amp;amp; Voortgangscontroleur</attribute>
  <attribute type="TJ02T-TXT30">Technisch afgesloten</attribute>
  <attribute type="TJ02T-TXT04">TAFS</attribute>
  <attribute type="AUFK-AUART">PM02</attribute>
  <attribute type="ADCP-DEPARTMENT">CLAS/11LMB/111HRSTPEL/PRODBEST</attribute>
</event>
</eventlist>
```

This is a fragment of an XML file, but it does not follow the standard format for Microsoft Excel to convert it into a CSV file. Therefore, the file first needs to be transformed. Again, Macros are used.

```
Sub convert()
       Columns("A:A").Select

       Selection.Replace What:="</attribute>", Replacement:="", LookAt:=xlPart,
       SearchOrder:=xlByRows, MatchCase:=False, SearchFormat:=False, ReplaceFormat:=False
       Selection.Replace What:="  <attribute type=""", Replacement:="", LookAt:=xlPart,
       SearchOrder:=xlByRows, MatchCase:=False, SearchFormat:=False, ReplaceFormat:=False
       Selection.Replace What:="""", Replacement:="", LookAt:=xlPart, SearchOrder:=xlByRows,
       MatchCase:=False, SearchFormat:=False, ReplaceFormat:=False

       Selection.TextToColumns Destination:=Range("A1"), DataType:=xlDelimited,
       TextQualifier:=xlDoubleQuote, ConsecutiveDelimiter:=False, Tab:=False, Semicolon:=False,
       Comma:=False, Space:=False, Other:=True, OtherChar:=">", FieldInfo:=Array(Array(1, 2),
       Array(2, 2)), TrailingMinusNumbers:=True

       Range("C1").Select
       ActiveCell.FormulaR1C1 = "=CONCATENATE(""<"",RC[-2],"">"",RC[-1],""</"",RC[-2],"">"")"

       Range("C1").Select
       Range(Selection, Selection.End(xlDown)).Select
       Selection.FillDown
       Application.CutCopyMode = False
       Selection.FillDown
       Columns("C:C").Select
       Selection.Copy
       Columns("A:A").Select
       Selection.PasteSpecial Paste:=xlPasteValues, Operation:=xlNone, SkipBlanks:=False,
       Transpose:=False
       Columns("B:C").Select
       Application.CutCopyMode = False
       Selection.Delete Shift:=xlToLeft
       Columns("A:A").Select

       Selection.Replace What:="<<event></<event>", Replacement:="<event>", LookAt:=xlPart,
       SearchOrder:=xlByRows, MatchCase:=False, SearchFormat:=False, ReplaceFormat:=False
       Selection.Replace What:="<</event></</event>", Replacement:="</event>", LookAt:=xlPart,
       SearchOrder:=xlByRows, MatchCase:=False, SearchFormat:=False, ReplaceFormat:=False
       Selection.Replace What:="<></</>", Replacement:="", LookAt:=xlPart, SearchOrder:=xlByRows,
       MatchCase:=False, SearchFormat:=False, ReplaceFormat:=False
```

```
        Selection.Replace What:="<></>", Replacement:="", LookAt:=xlPart, SearchOrder:=xlByRows,
        MatchCase:=False, SearchFormat:=False, ReplaceFormat:=False
        Selection.Replace What:="<></>", Replacement:="", LookAt:=xlPart, SearchOrder:=xlByRows,
        MatchCase:=False, SearchFormat:=False, ReplaceFormat:=False
End Sub
```

The result is shown below. This file can be imported into Microsoft Excel and it will automatically place it in a table, ready to be exported as an CSV.

```
<?xml version="1.0" encoding="UTF-8"?>
<eventlist>
<event>
  <AUFK-AUFNR>000340220241</AUFK-AUFNR>
  <JCDS-USNAM>V00121149</JCDS-USNAM>
  <JCDS-UTIME>111400</JCDS-UTIME>
  <JCDS-UDATE>20151013</JCDS-UDATE>
  <ADCP-FUNCTION>Planner &amp;amp; Voortgangscontroleur</ADCP-FUNCTION>
  <TJ02T-TXT30>Voorgecalculeerd</TJ02T-TXT30>
  <TJ02T-TXT04>VOCA</TJ02T-TXT04>
  <AUFK-AUART>PM02</AUFK-AUART>
  <ADCP-DEPARTMENT>CLAS/11LMB/111HRSTPEL/PRODBEST</ADCP-DEPARTMENT>
</event>

<event>
  <AUFK-AUFNR>000340220241</AUFK-AUFNR>
  <JCDS-USNAM>V00121149</JCDS-USNAM>
  <JCDS-UTIME>101339</JCDS-UTIME>
  <JCDS-UDATE>20160113</JCDS-UDATE>
  <ADCP-FUNCTION>Planner &amp;amp; Voortgangscontroleur</ADCP-FUNCTION>
  <TJ02T-TXT30>Technisch afgesloten</TJ02T-TXT30>
  <TJ02T-TXT04>TAFS</TJ02T-TXT04>
  <AUFK-AUART>PM02</AUFK-AUART>
  <ADCP-DEPARTMENT>CLAS/11LMB/111HRSTPEL/PRODBEST</ADCP-DEPARTMENT>
</event>
</eventlist>
```

Next to importing datasets with a specific format into the process mining software, it is sometimes possible to create a direct connection between the databases of the data producing software and the process mining tool. Software like ARIS Process Performance Manager from Software AG and SAP Process Mining by Celonis provides this option. A (sometimes custom) connection needs to be set up; after this, data can be mined in real time. This gives the advantage of setting up real time dashboards for tracking processes or periodically drafting and distributing process management reports. Setting up the connection is done in collaboration with the software developer and is therefore not further discussed. It can be time-consuming, but should be a one-time activity.

Figure A.3.2 Visualisation of a process in Disco

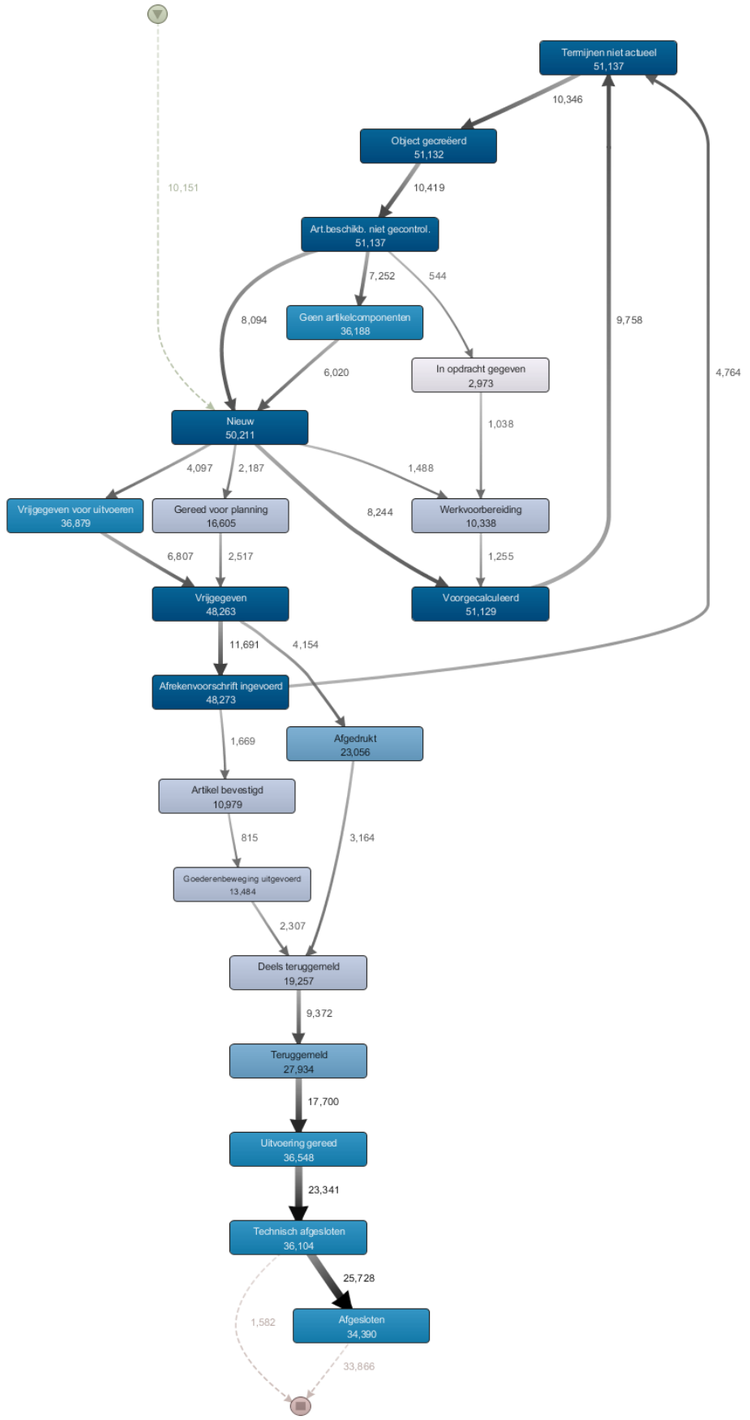


Figure A.3.3 Social network based on handover of work

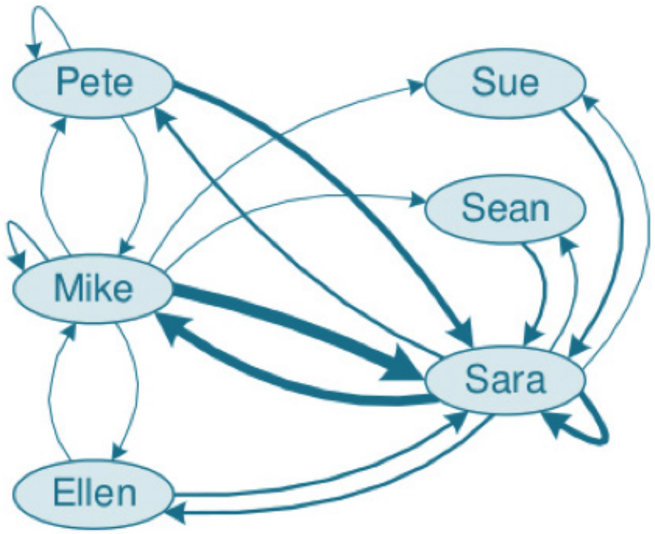


Figure A.3.4 Dotted chart made in ProM

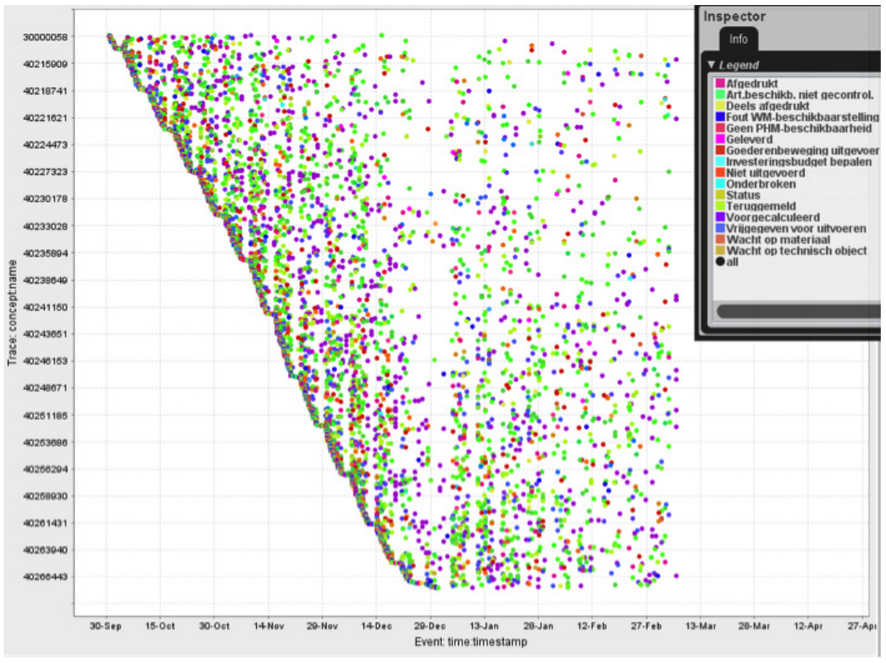


Table A.3.2 List of process mining developers on July 2017

Start	Software name	Software developer	Country
2005	ProM	The Process Mining Group	The Netherlands
2007	ARIS Process Performance Manager	Software AG	Germany
2007	Interstage Automated Process Discovery	Fujitsu, Ltd.	Japan
2008	StereoLOGIC Discovery Analyst	StereoLOGIC	The United States
2009	The Process Mining Factory	Icris	The Netherlands
2010	Apromore	The Apromore Initiative	Australia
2011	Celonis Process Mining	Celonis GmbH	Germany
2011	Perceptive Process Mining	Perceptive Software	The United States
2012	Disco	Fluxicon	The Netherlands
2012	QPR ProcessAnalyzer	QPR	Finland
2013	Process Mining Solution	Coney	The Netherlands
2013	SNP Business Process Analysis	SNP Schneider-Neureither & Partner AG	Germany
2015	minit	Gradient ECM	The United States
2015	myInvenio	Cognitive Technology Ltd.	Malta
2015	XMAnalyzer	XMPro	The United States
2016	Lana	Lana Labs GmbH	Germany
2016	ProcessGold	ProcessGold International B.V.	The Netherlands

Figure A.3.5 Mining a process in ProM

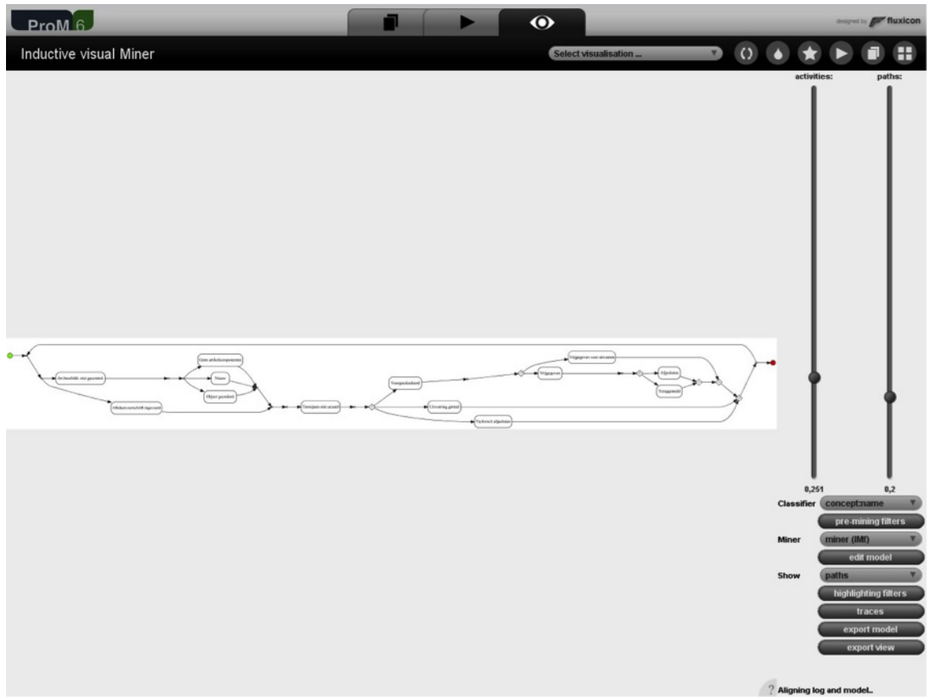


Figure A.3.6 Creating a dotted chart in ProM

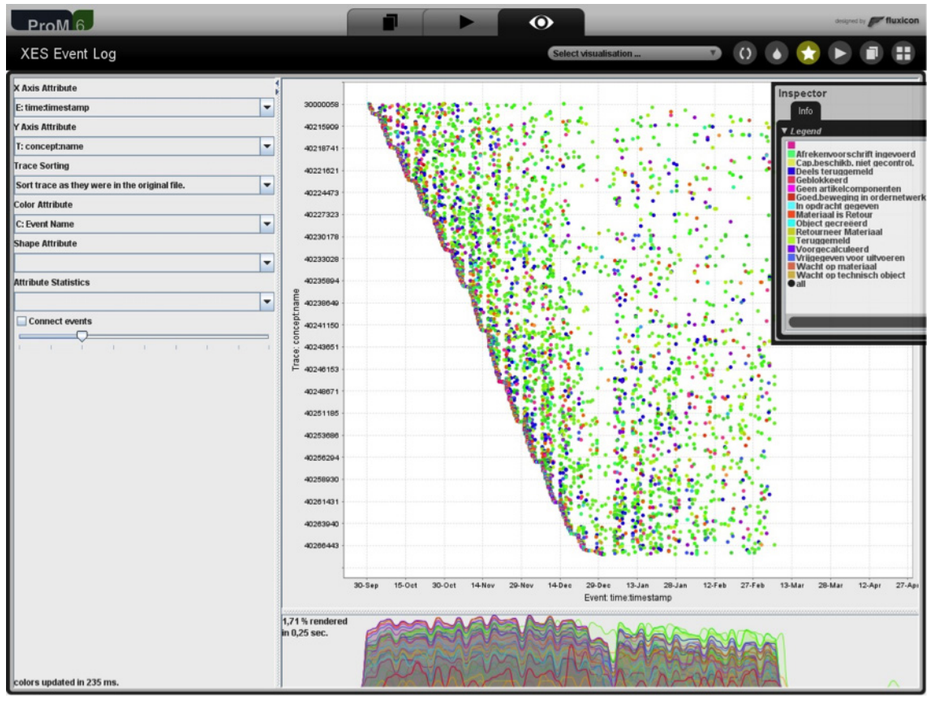


Figure A.3.7 Mining a process in Disco

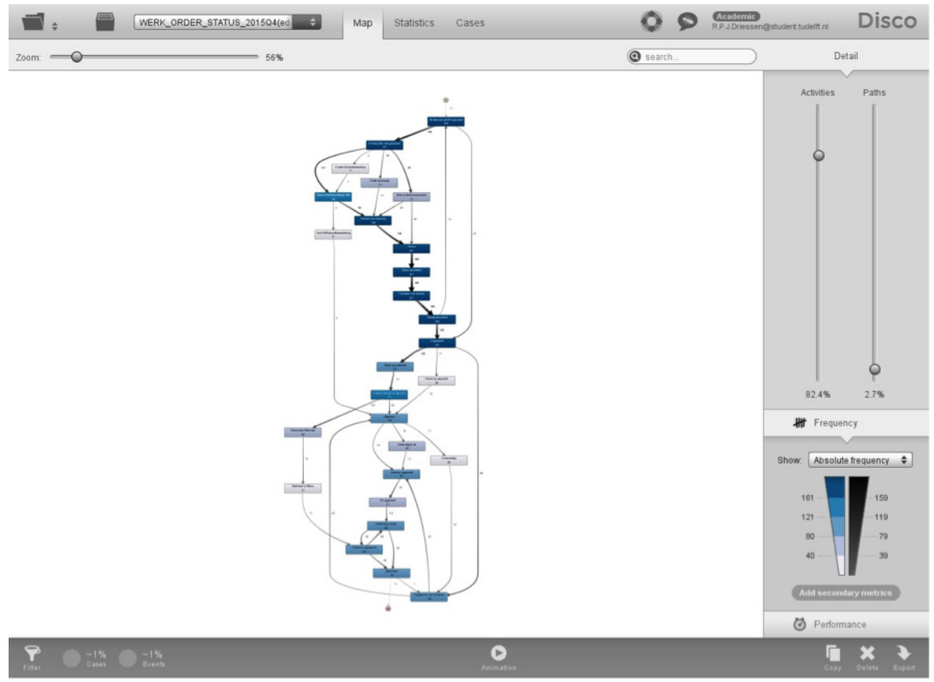


Figure A.3.8 Showing statistics from the dataset in Disco

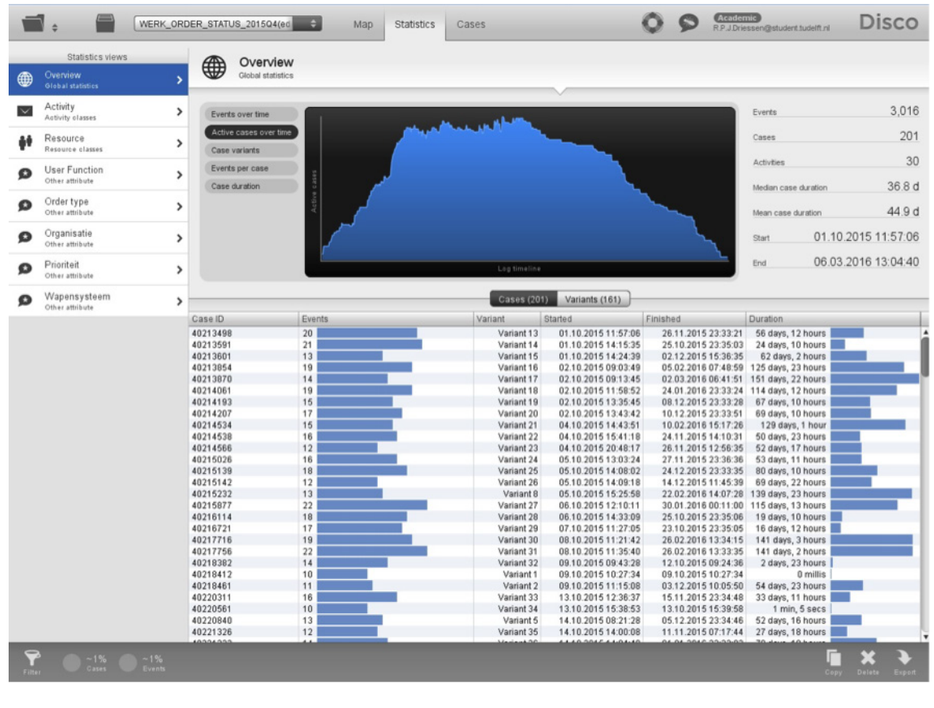


Figure A.3.9 Analyst view from ARIS PPM

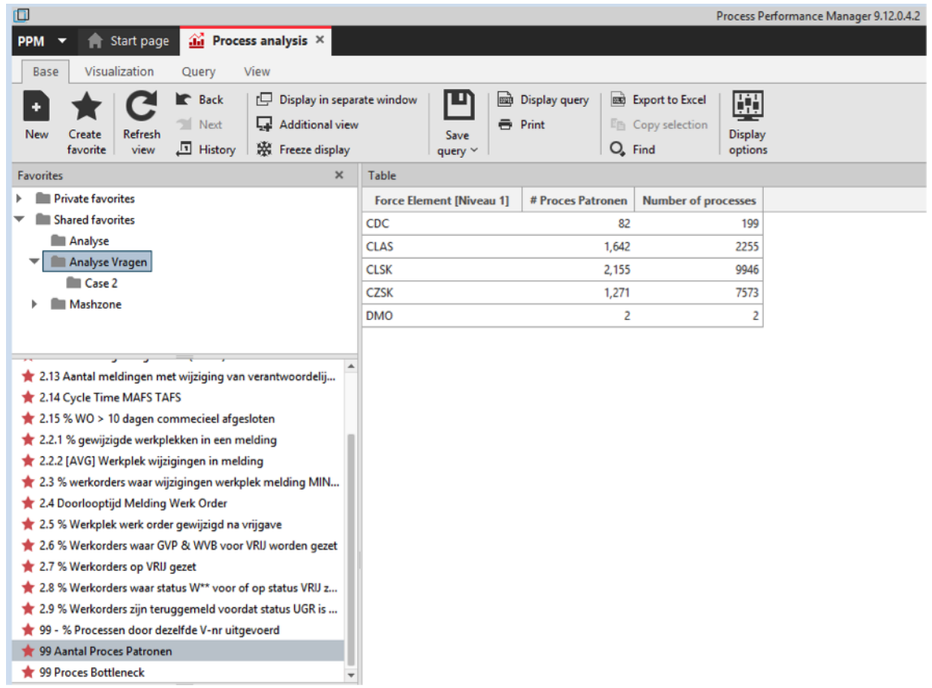


Figure A.3.10 Dashboard from ARIS PPM

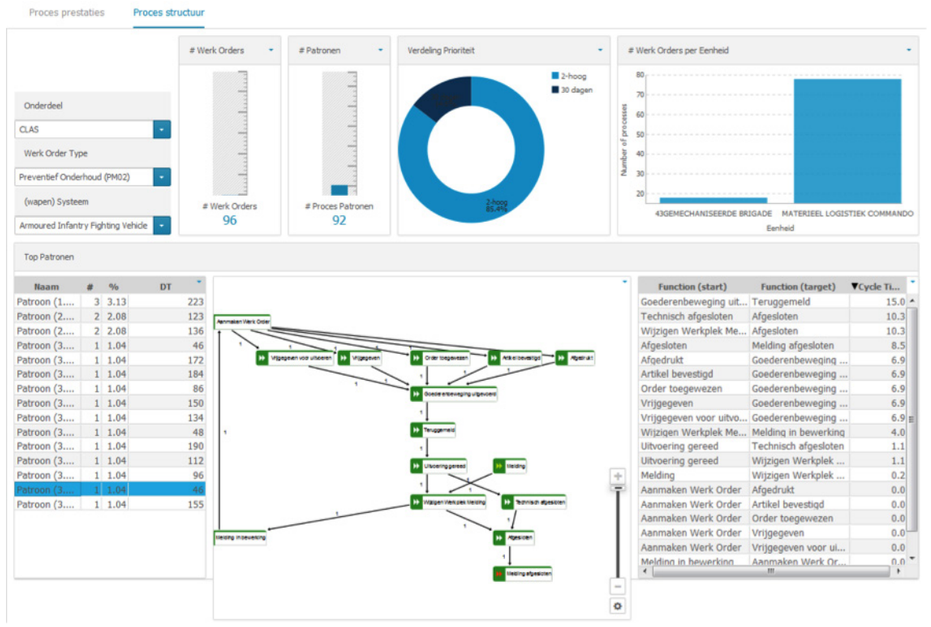


Table A.3.3 A functional comparison of three process mining software packages
(Partly based on Kebede, 2015)

Features	ProM (v6.7)	Disco (v2.0)	ARIS PPM (v9.12)
Supported platform	Standalone	Standalone	Standalone & server/client (dashboard)
Supported import format	XES, MXML, BPMN, CSV	XES, MXML, CSV, XLSX	CSV, databases via JDBC, SAP via RFC
Supported output models	BPMN, WF, Petri Net, EPC, Heuristic, etc.	Fuzzy model	Fuzzy model, EPC
Supported log size	Unlimited	Up to 5 million	Unlimited
License	Open source	Evaluation & commercial	Evaluation & commercial
Filtering data	✓	✓	✓
Process discovery	✓	✓	✓
Conformance checking	✓	X	✓
Performance reporting	✓	✓	✓
Social network mining	✓	X	X
Process visualization	✓	✓	✓
Process animation	✓	✓	X
Decision rule mining	✓	X	✓
Discriminative rule mining	✓	X	✓
Trace clustering	✓	X	✓
Delta analysis	✓	✓	✓

Section A.3.2 Classification of functions

The following explanation is a directly taken from Kebede (2015, pp. 14-19).

Filtering the data
Before an extracted event log is used it requires filtering. One of the main reason includes Information systems are not error free, either data do not reflect real transaction data or the program can malfunction. Therefore, process mining tools provide different level of filtering.

Process Discovery
Process mining techniques supporting discovery do not assume an a-priori model, i.e., based on an event log, some model is constructed. From the model, a process mining tool can be evaluated based on the support for the following criteria's:

- Structure of the process: Analyse discovery capability for unknown or existing process models;
- Routing options: get a detail view for one or more paths within the process flow;
- Frequent path: identifying which path most cases follow;
- The distribution of cases over path: getting a visualization in to and identify what occurs in the process flow when different cases are dispersed through a given path;
- Mining Loops: in a given process, it is possible to find same task executed multiple times that can occur in a number of instances introducing loops to the process model. For instance, in an event log $L_1 = [(a, c)^2, (a, b, c)^3, (a, b, b, c)^2, (a, b, b, b, c)^1]$ a loop of length one occurs at task b. Process mining tools apply different algorithms to deal with loops.

Conformance Checking
Conformance checking signals the need for a better control of the process. Other discrepancies may reveal desirable deviations. For instance, employees may deviate to serve the customers better or to handle circumstances not foreseen by the process model. In fact, flexibility and non-conformance often correlate positively. When checking conformance, it is important to view deviations from two angles: (a) the model is "wrong" and does not reflect reality ("How to improve the model?"), and (b) cases deviate from the model and corrective actions are needed ("How to improve control to enforce a better conformance?"). Conformance checking techniques supports both viewpoints.

By comparing what really happened (as seen in the data) and what should have happened (as captured by organizational process models or business rules), process mining can detect (un-)desirable deviations in the actual execution of business.

The key factor to conformance checking include:

- Exception from normal path: detect outliers from the deviating process path;
- The degree to which the rule holds: checks whether the referencing process model fits in discovered model;
- Compliance checks: comparison ability between the real and ideal process.

Trace Clustering techniques
Trace clustering operation enables to split unstructured process into homogeneous subsets and for each subset, a process model is created. Most real-life processes rules are not strict rather flexible for example those in healthcare and customer service to mention. The analysis result for process model extraction are similarly unstructured One of the major factors to unstructured output is having a diversity of an event logs. Nevertheless, dividing in to structured process variant, it is possible to create homogenous subsets of cases.

Social Network mining
Given a log with resources information, process mining can discover relationships between resources (such as delegation of work and clusters of resource networks).

Decision rule mining
Machine learning algorithms are applied on top of business process models in order to give insight into a process model. Starting from a discovered process model (i.e., a model discovered by conventional process mining algorithms), it is possible to enhance models by including patterns, i.e., each choice is analysed and linked to properties of individual cases and activities if it is applicable.

Performance reporting
Performance measures (KPI) is possible because of events in the log have been coupled to model elements through replay and include the following actions:

- Waiting and service times: Statistics such as the average waiting time for an activity can be projected onto the process model. Activities with a high variation in service time could be highlighted in the model.
- Cycle time analysis: i.e., the time spent in the process from start to finish by a case or group of cases. Primarily measured in time units. This figures are available as statistics in process mining tools
- Bottleneck detection and analysis: The multi-set of durations attached to each place can be used to discover and analyse bottlenecks. The places where most time is spent can be highlighted. Moreover, cases that spend a long time in a particular place can be further investigated.
- Flow time analysis: the overall flow time can be computed. One can also point to two arbitrary points in the process, say a and c, and compute how many times a case flows from a to b. The multi-set of durations to go from a to b can be used to compute all kinds of statistics, e.g., the average flow time between a and b or the fraction of cases taking more than some pre-set form.
- Utilization of resources: While replaying the model, times and frequencies are collected that can show how a resource performs.

The resulting process model will consist of all the above information in order to answer key performance issues.

Process visualization
By replaying recorded data, process mining can animate past process executions in various forms with the goal of enabling effective extraction of information (i.e. visual analytics).

Discriminative Rule Mining
Based on the study indicates that process deviation can be analysed through the following steps:
1. Inspecting the deviation using process mining tool
2. Applying association rule mining
3. Discussion with the business domain experts

In our case, based on the tool we compare, it is possible to apply deviation rules and methods in advance. Moreover, in order to find the root cause, it is important to ask the following questions: Where does the process deviate? Which cases? Which locations in the process? How does the process deviate? What is going "wrong"?

Delta Analysis

Delta analysis compares the derived process model with respect to a reference model which is either the workflow model or the model originally used to configure the system. This analysis is important to answer the problems related to business alignment as long as events are logged and a control over the process is maintained.

Figure A.5.1 Count stock and inventory (P.2.3.06)

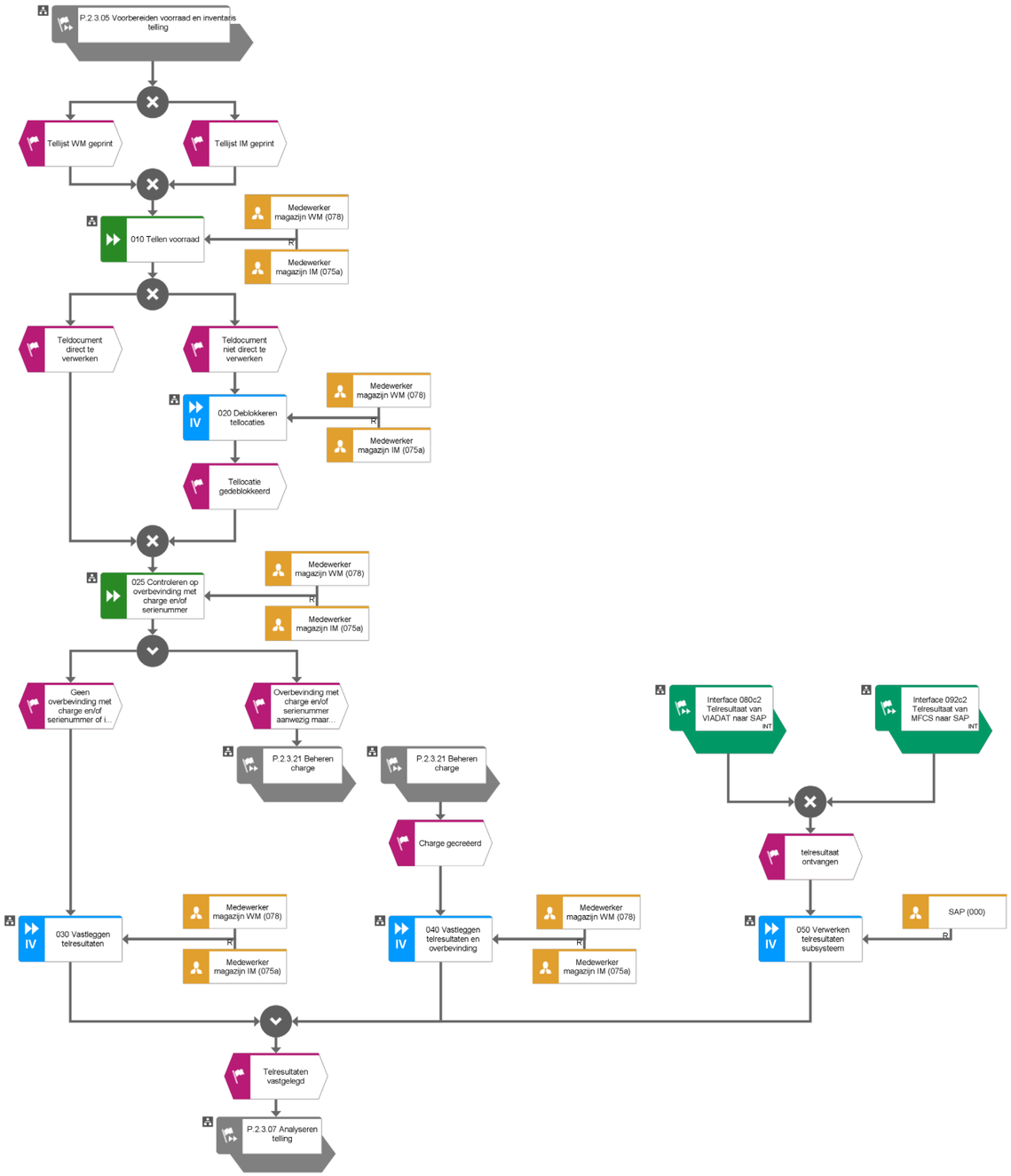


Figure A.5.2 Part of the DEMO model of MoD's ammunition chain

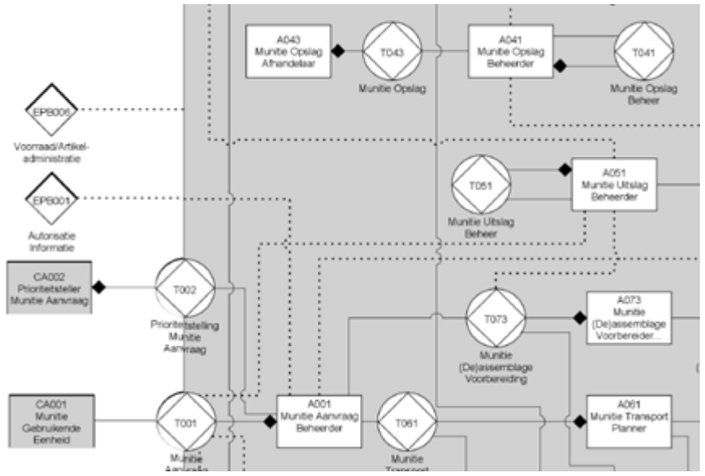
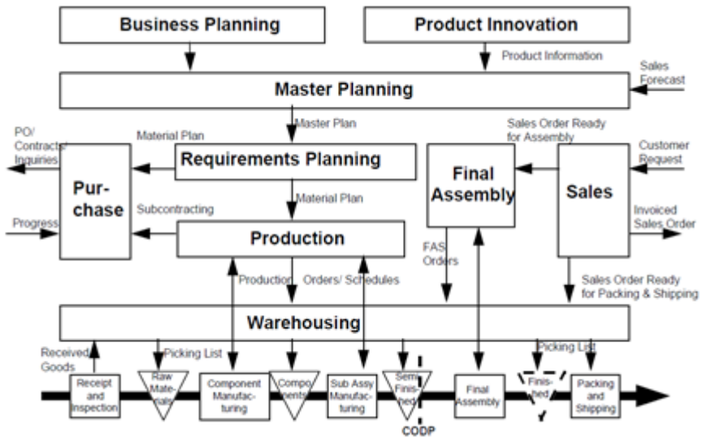


Figure A.5.3 Example of a view of a DEM model
(Baan, 1996, p. 14)



The symbols used by MoD for modelling in ARIS. They are ordered by their use in the ARIS-HOBE. An EPC can use almost all symbol, while a FAD only uses a small selection in order to keep an overview.

Event-driven Process Chain (EPC)

Event	**Event** Represents a trigger or result and can also show a change of status. Is always the first and last symbol of a process and normally is also positioned between two functions.
∧	**AND junction (AND)** All follow-up activities after this symbol are executed.
X	**OR-junction (XOR)** One of the follow-up activities after this symbol is executed.
V	**AND/OR-junction (OR)** One or more of the follow-up activities after this symbol are executed.

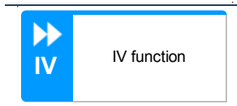
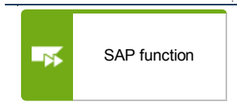
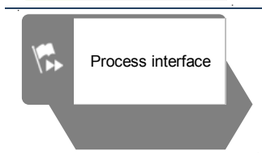
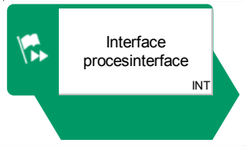
Organizational chart

Organizational unit	**Organizational unit** Represents a department or sub-department (e.g. HR).
Position	**Position** Represents a job description (e.g. HR manager).
Role	**Role** Represents a task description. It is assigned to a person who is responsible for the execution of a activity. Can also be SAP.
Internal person	**Internal person** Represents a specific person (e.g. John Doe).

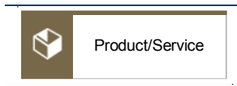
Entity Relationship Model (ERM)

Entity type	**Entity type** Type of a real-world object connected to the process.
D attribute	**D (descriptive) attribute** Descriptive property of entity types or relationship types (e.g. name).
K attribute	**K (key) attribute** Identifying property of entity types or relationship types (e.g. identification number).
Relationship type	**Relationship type** Logical link between two entity types (e.g. can have a).

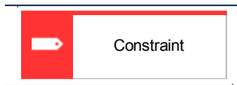
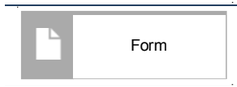
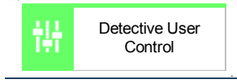
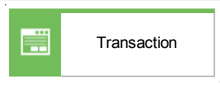
Function Tree

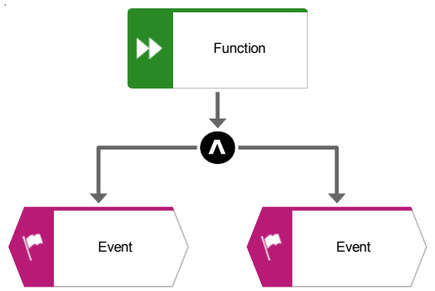
	**Function** A part of the process, consisting of one or multiple activities.
	**IV function** Special type of function and is executed by a digital system (normally software).
	**SAP function** Special type of IV function and is executed by SAP (sometimes the IV function is used to represent activities by SAP).
	**Process interface** Coupling to other process models. Also called the “off-page connector”.
	**Process interface extern** Coupling to other external process models (at different organisation).
	**Interface process interface** Coupling to other process models positioned in other departments.

Product/Service Tree

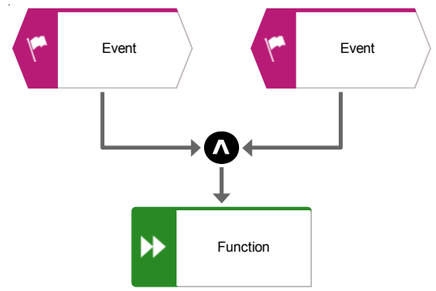
	**Product/Service** Output of a process.

Function Allocation Diagram (FAD)

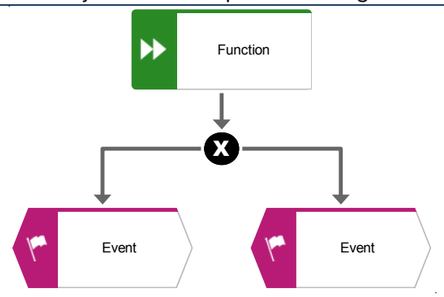
	**Constraint** When a function must meet certain conditions.
	**Form** When data coming from a function is printed to a form.
	**Reporting** When reports are used as input to a function.
	**Detective User Control** A type of internal control mechanism to improve or control a function.
	**Transaction** A software request (normally for SAP) to search for or manipulate data (e.g. IW33: show order).



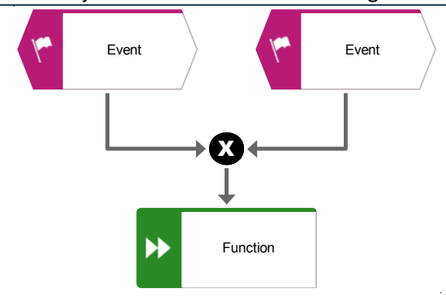
AND-junction: both paths are obligated



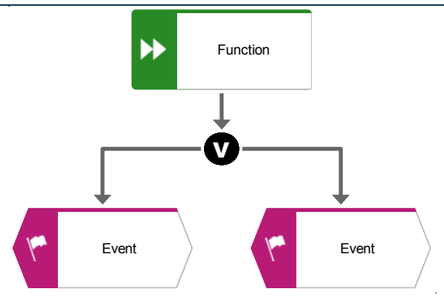
AND-junction: both events are obligated



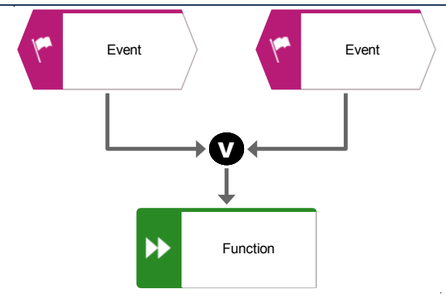
OR-junction: one of the paths is active, but not both



OR-junction: one of the evens is active, but not both



AND/OR-junction: one or both of the paths are active



AND/OR-junction: one or both of the events are active

P.0 Beheer systemen
P.0.1 Beheer SAP-systemen
P.0.1.01 Beheren (stam-)data -customizing-
P.0.1.02 Ontwikkelen en instellen batches
P.0.1.05 Beheren externe berichtsturing
P.0.1.06 Beheren charges
P.0.1.07 Beheren Klassen en Kenmerken
P.0.1.08 Beheren partnerafspraken
P.0.1.10 Beheren inhoud Catalogus
P.0.1.13 Beheren Core Interface (CIF)
P.0.1.15 Beheren generieke SAP instellingen
P.0.1.17 Beheren conditierecords
P.0.1.18 Beheren werkelijke configuratie

N2. Processen beheer SAP
P.0.2.01 Registreren issues
P.0.2.02 Beheren wijzigingen
P.0.2.02A Beheren wijzigingen ITIL
P.0.2.03 Beheren incidenten
P.0.2.04 Beheren problemen
P.0.2.10 Beheren gebruikers
P.0.2.12 Beheren regulier operationeel proces
P.0.2.13 Beheren SAP support
P.0.2.14 Behandelen EWA Operationeel Beheer
P.0.2.15 Beheren Continuiteit - Operationeel Beheer
P.0.2.16 Dagelijkse monitoring Operationeel Beheer
P.0.2.17 Beheer Online Help
P.0.2.20 Managen transporten
P.0.2.22 Managen landschap
P.0.2.30 Plannen en organiseren release
P.0.2.32 Ontwerpen release
P.0.2.33 Bouwen release
P.0.2.34 Voorbereiden test
P.0.2.35 Uitvoeren test
P.0.2.36 Afhandelen testbevindingen
P.0.2.37 Bewaken release voortbrenging
P.0.2.38 Uitvoeren Quality Gate en R-meeting
P.0.2.40 Genereren attribuutdata
P.0.2.50 Archiveren gegevens
P.0.2.61 Beheren productieomgeving

N1B. Business scenario's
B.0.2.01 Beheren issues
B.0.2.02 Ondersteunen voortbrenging en gebruik
B.0.2.03 Voortbrengen release
B.0.2.04 Archiveren

P.0.3 Ondersteunen gegevensbeheer
P.0.3.05 Archiveren gegevens
P.0.3.06 Beheren data materieel logistiek

Table A.5.1 The process mining decision chart

	Characteristic	++	+	+/-	-	--
1	Availability of the minimum required attributes	Available	n/a	n/a	n/a	Unavailable
2	Number of roles involved in the process	n/a	Many	n/a	Few	None
3	Number of decision points	n/a	Many	Few	None	n/a
4	Number of activities	n/a	Many	Few	n/a	None
5	Lead time (average)	n/a	Short	Long	n/a	n/a
6	Quality of dataset	n/a	High	n/a	Low	n/a
7	Methods of importing data	Off-the-shelf adapter	n/a	Adapter can be developed or file-based data import	n/a	None
8	Possibility to filter on attributes	Yes, profound	n/a	Yes, superficial	No	n/a
9	Nature of process	Manufacturing or auditing	Finance and office-administration or maintenance	Logistics	Product development	n/a
10	Process maturity (years of experience)	n/a	Mature	Immature	n/a	n/a
11	Availability of process model	n/a	Yes, of high quality	Yes, of low quality or no	n/a	n/a
12	Mandated is known	Yes	n/a	n/a	No	n/a

P.0.5 Beheren documenten
P.0.5.01 Beheren Document Info Record
P.0.5.03 Beheren documenten zonder DIR

P.1 Projectmatig Werken, Verwerven en Afstoten
P.1.1.01 Vrijgeven ATB
P.1.1.02 Maken aanvraag tot offerte
P.1.1.03 Wijzigen Aanvraag tot offerte
P.1.1.04 Verwerken offerte(s)
P.1.1.05 Maken bestelling
P.1.1.06 Wijzigen bestelling
P.1.1.07a Maken contract
P.1.1.07b Wijzigen contract
P.1.1.10a Beheren leverancier logistiek
P.1.1.10b Beheren leverancier financieel
P.1.1.10c Beheren fabrikant
P.1.1.10d Beheren interne leverancier
P.1.1.10e Activeren geplande wijzigingen Leverancier
P.1.1.11 Beheren inforecord
P.1.1.12 Beheren servicestam
P.1.1.16 Eenvoudig inkopen
P.1.1.20 Beheren leverancierslijst
P.1.1.21 Beheren Aanbestedingscodes
P.1.1.22 Beheren contracttypen
P.1.1.23 Beheren inkoop teksten
P.1.1.24 Beheren levertijden
P.1.1.25 Beheren masterdata FMS
P.1.1.26 Beheren contractstatussen
P.1.1.27 Beheren operationele inkoopproces
P.1.1.28 Beheren EC vergunning
P.1.9.01 Monitoren Verwerving
P.1.Z_Archief

P.2 Bevoorraden en Administratief Materiaalbeheer
P.2.0.01 Beheren MPO
P.2.0.02 Vastleggen PPA
P.2.0.03 Beheren FS-FE (Operationele eenheid)
P.2.0.04 Beheren inventarisautorisatie
P.2.0.05 Ondersteunen Reorganisatie
P.2.0.06 Vastleggen MC
P.2.0.07 Vastleggen EPA
P.2.0.08 Beheren voorraadautorisatie
P.2.0.09 Beheren artikel
P.2.0.10 Koppelen goederengroep aan werkplek
P.2.0.11 Vastleggen voorraad / inventaris telstrategie
P.2.0.14 Beheren organisatorische maatregel
P.2.0.15 Beheren procesroutemodel
P.2.0.16 Vastleggen basis transportgegevens ECC
P.2.0.17 Beheren verplaatsingen
P.2.0.18 Beheren verplaatsingsstappen
P.2.0.20 Beheren reorganisatie-herindeling
P.2.0.25 Beheren stamgegevens binnen magazijnnummer
P.2.0.26 Beheren magazijnlocaties
P.2.0.31 Beheren Formatieplaats
P.2.0.33 Beheren Persoon
P.2.0.34 Beheren Verzendgegevens
P.2.0.36 Beheren klanten
P.2.0.38 Beheren Verpakkingsvoorschrift
P.2.0.39 Vastleggen Charge zoek(uitslag)strategie
P.2.0.40 Beheren listing en uitsluiting
P.2.0.41 Vastleggen planningsgegevens
P.2.0.42 Vastleggen stuurgegevens kwaliteitscontrole
P.2.0.60 Vastleggen verwisselbaarheden
P.2.0.74 Beheren Nato Stock Nummer
P.2.0.75 Beheren planningsprofiel
P.2.0.76 Beheren prognoseprofiel
P.2.0.77 Beheren Routing
P.2.0.78 Beheren poolmiddelen
P.2.0.99 Tijdelijke PMF oefenrollen
P.2.1.00 Monitoren informatiebetrouwbaarheid
P.2.1.01 Monitoren Charges
P.2.1.02 Monitoren uitlevering
P.2.1.03 Monitoren aanlevering
P.2.1.04 Monitoren loonbewerking
P.2.1.05 Monitoren Magazijnnummer
P.2.1.06 Monitoren Voorraad(-bewegingen)
P.2.1.07 Monitoren kwaliteitscontrole
P.2.1.08 Monitoren kwaliteitsmelding
P.2.1.09 Monitoren NCS rapportages
P.2.1.10 Monitoren klantorder
P.2.1.11 Monitoren openstaande bruikleen
P.2.1.12 Monitoren Retour ATB
P.2.1.13 Monitoren ATB
P.2.1.14 Monitoren prioriteitenplanning
P.2.1.15 Monitoren Verkoopcontract
P.2.1.16 Monitoren klantaanvraag
P.2.2.01 Bewaken inventaris autorisatie versus vulling
P.2.2.02 Vaststellen behoefte
P.2.2.03 Aanmaken transportbestelling
P.2.2.04 Voorspellen behoefte
P.2.2.05 Toewijzen verplaatsingen
P.2.2.06 Boeken goederenontvangst
P.2.2.10 Inslaan artikel
P.2.2.11 Aanmaken aanlevering
P.2.2.12 Verzorgen Service-invoer
P.2.2.14 Uitpakken artikel
P.2.2.15 Plannen poolmiddel
P.2.2.16 Innemen poolmiddel
P.2.3.01 Monitoren attesten
P.2.3.02 Beheren X-dock
P.2.3.03 Beheren attest
P.2.3.05 Voorbereiden voorraad en inventaris telling
P.2.3.06 Tellen voorraad en inventaris
P.2.3.07 Analyseren telling

P.2.3.08 Controleren charge termijnen
P.2.3.09 Aanmaken controlepartij
P.2.3.10 Vastleggen kwaliteitscontrole resultaten
P.2.3.11 Nemen gebruiksbeslissing
P.2.3.12 Uitvoeren voorraadmutatie
P.2.3.13 Aanmaken kwaliteitsmelding
P.2.3.14 Afhandelen kwaliteitsmelding
P.2.3.15 Uitvoeren overboeking voorraadbeheer
P.2.3.16 Massaal overboeken voorraad
P.2.3.18 Uitgeven artikel in bruikleen
P.2.3.19 Innemen artikel uit bruikleen
P.2.3.20 Communiceren NCS-NL
P.2.3.21 Beheren charge
P.2.3.22 Voorbereiden logistieke productieorder
P.2.3.23 Uitvoeren logistieke productieorder
P.2.4.01 Aanmaken uitlevering
P.2.4.02 Picken artikel
P.2.4.03 Verpakken artikel
P.2.4.08 Laden uitlevering
P.2.4.09 Boeken goederen afgifte
P.2.4.10 Aanmaken verkoopcontract
P.2.4.11 Aanmaken klantaanvraag
P.2.4.12 Aanmaken klantorder
P.2.4.15 Herindelen klantorder
P.2.4.17 Bepalen behoefte aanvulling picklocatie
P.2.4.18 Uitgeven poolmiddel
P.2.8.01 Voorbereiden archiveren artikeldocument
P.2.9.01 Monitoren van Bevoorrading

P.2 EHS Bev en Admin Materieelbeheer
P.2.0.61 Beheren UN lijststof
P.2.0.66 Beheren AVIB en MSDS
P.2.0.67 Beheren Gevaarlijke Stoffenstam Magazijnbeheer

P.3 Financien
P.3.1.01 Opstellen en vaststellen beleidsvisie
P.3.1.02 Opstellen en vaststellen BPB-aanschrijving
P.3.1.03 Opstellen richtlijnen defensieplan
P.3.1.04 Vaststellen produkt defensieplan
P.3.2.01 Aanmaken/beoordelen budgetmutatievoorstellen CN1
P.3.2.02 Aanmaken/beoordelen budgetmutatievoorstellen CN2
P.3.2.04 Aanmaken begrotingsmutatievoorstellen CN1
P.3.2.05 Aanmaken/beoordelen begrotingsmutatievoorstellen CN2
P.3.2.07 Aanmaken begrotingsmutatievoorstellen neutraal CN2
P.3.2.09 Verzenden begroting naar Minfin
P.3.2.11 Beoordelen begrotingsmutatievoorstellen
P.3.2.12 Vrijgeven budgetten
P.3.2.13 Externe verantwoording
P.3.2.15 Vaststellen produkt bedrijfsplan
P.3.2.16 Aanmaken budgetmutatievoorstellen Topdown CN1
P.3.2.17 Aanmaken/beoordelen begrotingsmutatievoorstellen Topdown CN1
P.3.2.18 Toevoegen begroting T+20
P.3.2.19 Aanmaken en beoordelen bedrijfsplan defensie
P.3.3.01a Administreren middelenreservering
P.3.3.01b Administreren Voorlopige middelenbesteding
P.3.3.01c Administreren middelenbesteding
P.3.3.03 Betalen facturen
P.3.3.04 Beheren kasmiddelen
P.3.3.05a Administreren vorderingen
P.3.3.05b Beheren vorderingen
P.3.3.06 Verwerken afschrift
P.3.3.07 Administreren zekerheden
P.3.3.08a Boeken factuur (MM_FI)
P.3.3.08b Registreren en boeken voorschotfactuur
P.3.3.09 Scannen en registreren inkoop factuur
P.3.3.13 Administreren verkoopfactuur
P.3.4.01 Administreren grootboek
P.3.4.06 Afsluiten periode
P.3.4.10 Vastleggen tarieven prestatiesoort
P.3.4.11 Aanpassen verrekenprijs
P.3.4.12 Vastleggen activiteitenplan
P.3.4.13a Monitoren toepassing BTW
P.3.4.13b Uitvoeren vooraangifte BTW
P.3.4.13c Opstellen CBS rapportage
P.3.4.14 Uitvoeren auditverzoek
P.3.4.15 Berekenen belastingen tbv aangifte
P.3.4.16 Monitoren verkoop processen
P.3.5.01 Afsluiten termijnvalutacontracten
P.3.5.16 Bepalen BTW Oorlogsschepen
P.3.6.01 Beheren Grootboekrekeningen
P.3.6.02 Beheren Kostenplaatsen
P.3.6.03 Beheren Kostensoorten
P.3.6.04 Beheren Budgetplaats(groep)en
P.3.6.05 Beheren Budgetposities/-groepen
P.3.6.06 Beheren Fondsen/-groepen
P.3.6.09 Beheren Banken
P.3.6.10 Beheren Prestatiesoorten/-groepen
P.3.6.11 Beheren Interne Orders/-groepen
P.3.6.12 Beheren Functiegebieden / -gebiedgroepen
P.3.6.13 Beheren Afleidingsregels
P.3.6.14 Beheren WKR stamgegevens
P.3.7.1 Verwerken in Kasverplichtingenadministratie
P.3.7.2 Verwerken in grootboek adm
P.3.7.3 Verwerken in kosten adm
P.3.9.01 Monitoren Financien
P.3.Z_Archief

P.4 Onderhouden & Wapensysteemmanagement
P.4.0.01 Beheren Toegestane Configuratie
P.4.0.02 Invoeren Feitelijke Configuratie
P.4.0.03 Beheren Artikelstuklijst
P.4.0.06 Archiveren en exporteren Feitelijke configuratie
P.4.0.10 Beheren Configuratieprofiel
P.4.0.11 Beheren Variant tabel

P.4.0.12 Beheren Relatie
P.4.0.25 Beheren Meetpunten en Tellers
P.4.0.26 Beheren Taaklijst
P.4.0.27 Beheren Werkplek
P.4.0.28 Beheren PO-plan
P.4.0.29 Beheren PO-strategie en Cyclusset
P.4.0.32 Beheren Kwalificatie
P.4.0.33 Beheren Vereistenprofiel
P.4.0.34 Beheren stamgegevens met ECM
P.4.0.37a Voorbereiden aanpassing ILS-producten
P.4.0.37b Aanpassen ILS-producten
P.4.0.38 Beheer ILS-producten niet SAP
P.4.0.39 Afronden aanpassing ILS-producten
P.4.0.42 Audit FFC en Serienummer inventarisatie
P.4.0.45 Beheren Invoerlijst Meetwaarden
P.4.0.46 Beheren parkeerplaats
P.4.0.47 Beheren terrein
P.4.0.51 Beheren controlemethode
P.4.0.52 Beheren Stamcontrolekenmerk
P.4.0.53 Beheren Controleplan
P.4.2.10a Voorbereiden LSA
P.4.2.10b Uitvoeren LSA
P.4.2.12a Voorbereiden onderzoek oplossings-alternatieven
P.4.2.12b Uitvoeren onderzoek oplossingsalternatieven
P.4.2.16a Voorbereiden beheren systeemplan
P.4.2.16b Beheren systeemplan
P.4.2.21 Selecteren ILS-probleemeigenaar
P.4.2.23a Voorbereiden ILS-order
P.4.2.23b Aansturen uitvoering ILS-order
P.4.2.25 Bepalen vervolgstappen ILS-proces
P.4.2.70 Registreren ILS-Melding
P.4.2.71a Voorbereiden onderzoek normoverschrijding
P.4.2.71b Uitvoeren onderzoek normoverschrijding
P.4.2.73a Formuleren beoordelingsopdracht
P.4.2.73b Beoordelen wijzigings- of verbetervoorstel
P.4.2.81 Controleren afhandeling ILS-opdracht
P.4.3.01 Genereren Behoefte Correctief Onderhoud
P.4.3.02 Genereren behoefte preventief onderhoud
P.4.3.03 Genereren behoefte overige werkzaamheden
P.4.3.04 Monitoren en genereren behoefte Componenten Onderhoud
P.4.3.07 Onderhouden operationele status technisch systeem
P.4.3.09 Aanvragen poolmiddel
P.4.3.10 Beoordelen meldingen en orders
P.4.3.11 Technische werkvoorbereiding
P.4.3.20 Logistieke werkvoorbereiding materiaal
P.4.3.21 Logistieke werkvoorbereiding productiehulpmiddelen
P.4.3.22 Logistieke werkvoorbereiding onderhoudsobject
P.4.3.23 Plannen orders en Voortgang Bewaking
P.4.3.24 In bewerking geven orders
P.4.3.25 Creeren en uitbreiden werkelijke configuratie
P.4.3.26 Voorbereiding overdracht
P.4.3.27 Afhandeling overdracht
P.4.3.30 Uitvoeren werkzaamheden
P.4.3.31 Terugmelden uitvoeringgegevens
P.4.3.35 Aanpassen Werkelijke Configuratie
P.4.3.40 Beoordelen uitvoeringgegevens
P.4.3.50 Afhandelen order financieel
P.4.9.01 Monitoren onderhoud (bedrijfsvoering)
P.4.9.10 Monitoren Reliability
P.4.9.11 Monitoren Availability
P.4.9.12 Monitoren Maintainability
P.4.Z_Archief

P.5 Transporteren
P.5.0.01 Beheren organisatie TM
P.5.0.02 Beheren business partner TM
P.5.0.03 Beheren location TM
P.5.0.04 Beheren transportation lane TM
P.5.0.05 Beheren transportation zone TM
P.5.0.07 Beheren schedule TM
P.5.0.08 Beheren resource TM
P.5.0.09 Beheren product TM
P.5.0.10 Beheren projectnummer TM
P.5.0.11 Beheren transportation network cockpit
P.5.0.12 Beheren default route TM
P.5.0.13 Beheren calendar resource TM
P.5.0.15 Beheren freight unit building rule TM
P.5.0.16 Beheren planning profile TM
P.5.0.17 Beheren selection profile TM
P.5.0.20 Beheren condition TM
P.5.0.21 Beheren incompatibility definition TM
P.5.0.22 Beheren incompatibility setting TM
P.5.0.30 Beheren rate table TM
P.5.0.31 Beheren scale TM
P.5.0.32 Beheren Transportation Charge Calculation Sheet (TCCS)
P.5.0.33 Beheren freight agreement TM
P.5.1.01 Aanmaken forwarding order
P.5.1.02 Opslaan transportation requisition
P.5.2.00 Beheersen transportproject
P.5.2.01 Aanmaken transportation proposal
P.5.2.02 Uitvoeren transportplanning
P.5.2.03 Aanmaken freight booking
P.5.5.01 Voorbereiden uitvoeren transport
P.5.5.03 Uitvoeren transport
P.5.5.04 Tracking en tracing transport
P.5.7.01 Inkopen en afroepen transportdienst
P.5.7.02 Aanmaken freight settlement document
P.5.9.01 Monitoren transport TM
Z_Archief P.5.0.06 Beheren departure calendar TM

P.6 Inzetten militaire capaciteit
P.6.0.01 Bepalen gewijzigde situatie

Section A.5.3 Manage incidents (P.0.2.03)

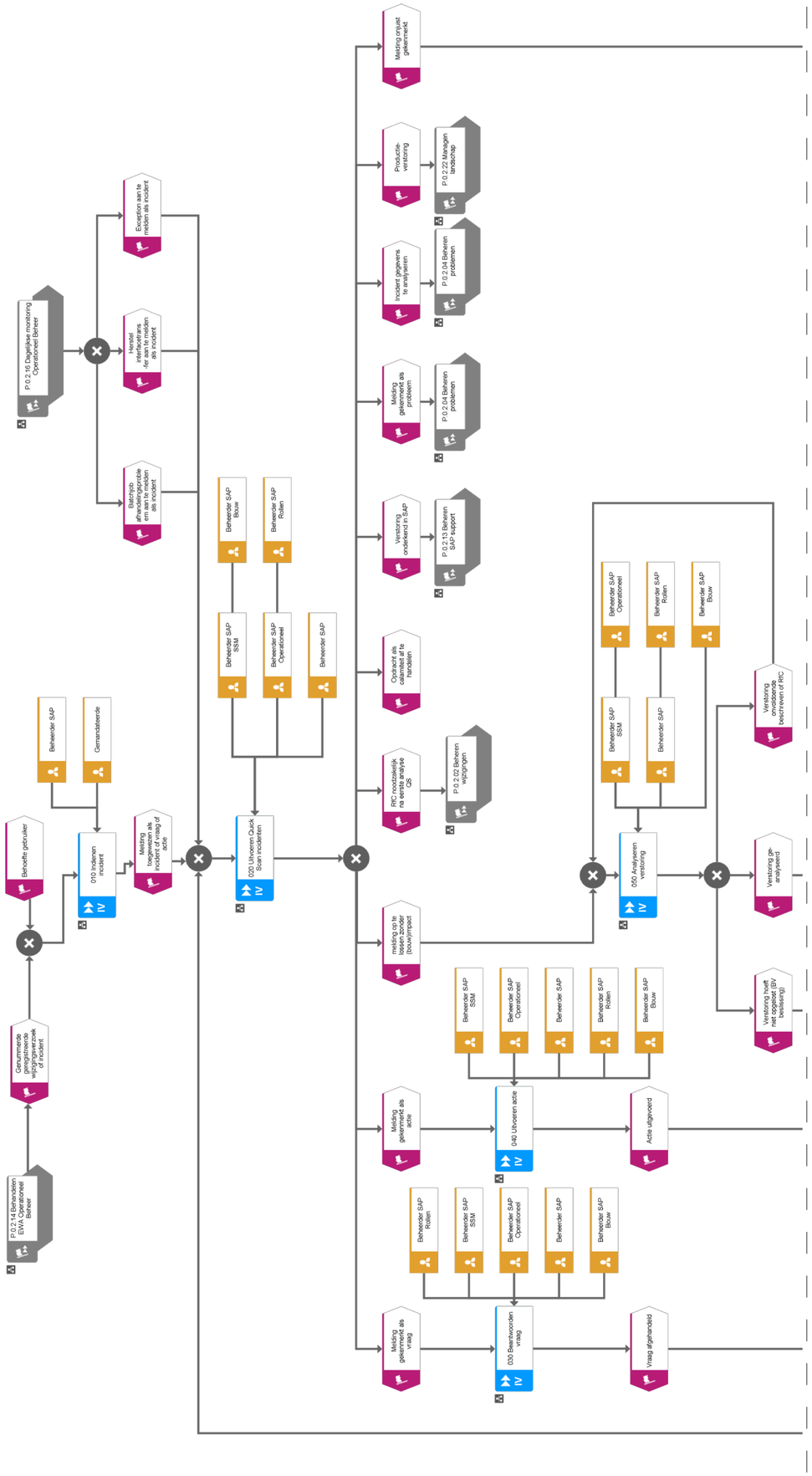
This process manages the activities that are needed when someone experiences a problem with SAP. For example, the software is crashing, a user account is not working, or data are missing. Just like the RfC-process, the incident management process is supported by SSM. Activities are logged in forms in the database and in some occasions in attached reports. The process model is shown in Figure A.5.4 and the decision chart in Table A.5.2.

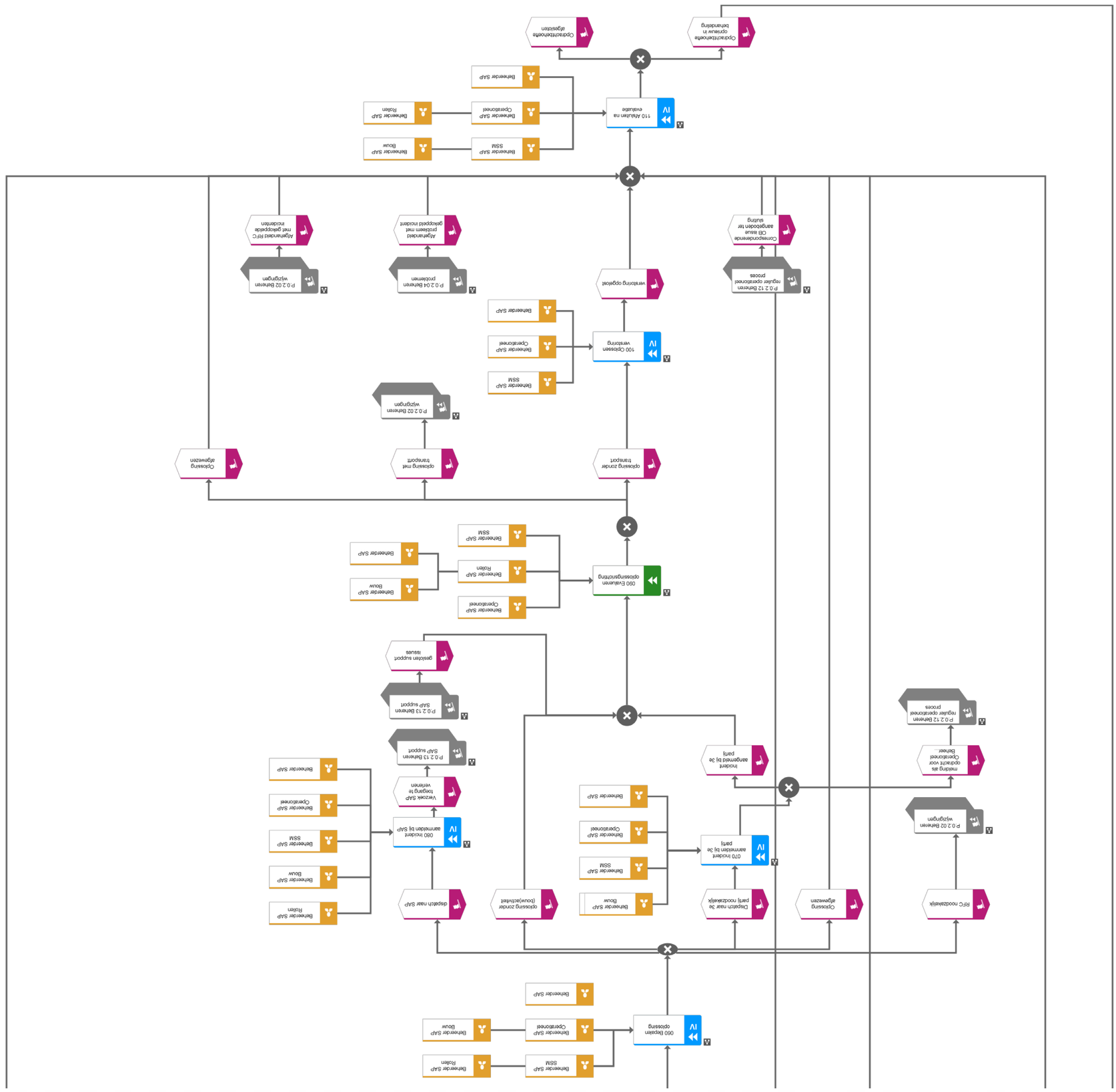
Table A.5.2: Manage incidents (P.0.2.03)

	Characteristic	Result	Score
1	Availability of the minimum required attributes	Yes	++
2	Number of roles involved in the process	6	+
3	Number of decision points	6	+
4	Number of activities	11	+
5	Lead time (average)	Days	+
6	Quality of dataset	High	+
7	Methods of importing data	Adapter needed or file-based	+/-
8	Possibility to filter on attributes	Yes, superficial	+/-
9	Nature of process	Office-administration	+
10	Process maturity (years of experience)	2011	+
11	Availability of process model	Yes, of high quality (EPC)	+
12	Mandated is known	Yes	++
	Result		**12**

In comparison with the RfC-process, this process requires less roles and less consultation. When familiar problem occurs, the administrator can solve it on its own. Only complicated problems require the full process. On average, this reduces the lead time, giving it an extra point in the decision chart. The process has a part that is predictable (solving common problems) and a part that is less predictable (solving new problems). This distinction is being made during the activity “perform quick scan incidents”, making it a valuable filter. However, the rest of the filtering capabilities are thin. The remainder of the process gets the same scores as the RfC-process. Its score indicates moderate to high process mining benefits. Again, a direct connection between SSM and ARIS PPM would improve the score.

Figure A.5.4 Manage incidents (P.0.2.03)




Operationele afgesloten
Operationele opnieuw in behandeling
110 Afsluiten na evaluatie
Beheerder SAP
Beheerder SAP Operationeel
Beheerder SAP Rollen
Beheerder SAP SSM
Beheerder SAP Bouw
090 Escalerend oplossingsrichting
Beheerder SAP
Beheerder SAP Operationeel
Beheerder SAP Rollen
Beheerder SAP SSM
Beheerder SAP Bouw
oplossing met transport
oplossing zonder transport
Oplossing afgewezen
P 0 2 02 Beheren wijzigingen
100 Oplossen verstoring
Beheerder SAP
Beheerder SAP Operationeel
Beheerder SAP SSM
verstoring opgelost
P 0 2 04 Beheren problemen
Afgehandeld probleem met gekoppeld incident
Afgehandeld RFC met gekoppelde incidenten
P 0 2 12 Beheren regulier operationeel proces
Oorspronkelijke CB issue aangepast tbv sudring
060 Beperken oplossing
Beheerder SAP
Beheerder SAP SSM
Beheerder SAP Operationeel
Beheerder SAP Bouw
Beheerder SAP Rollen
080 Incident aanmelden bij SAP
Verzoek SAP toegang te verlenen
P 0 2 13 Beheren SAP support
dispatch naar SAP
opossing zonder (touw)activiteit
Beheerder SAP
Beheerder SAP SSM
Beheerder SAP Operationeel
070 Incident aanmelden bij Je part
Dispatch naar Je part noodzakelijk
Oplossing afgewezen
RFC noodzakelijk
Incident aangemeld bij Je part
P 0 2 13 Beheren SAP support
gesloten support issues
P 0 2 02 Beheren wijzigingen
making als opdracht voor Operationeel Beheer...
P 0 2 12 Beheren regulier operationeel proces

Section A.5.4 Archive data (P.0.3.05)

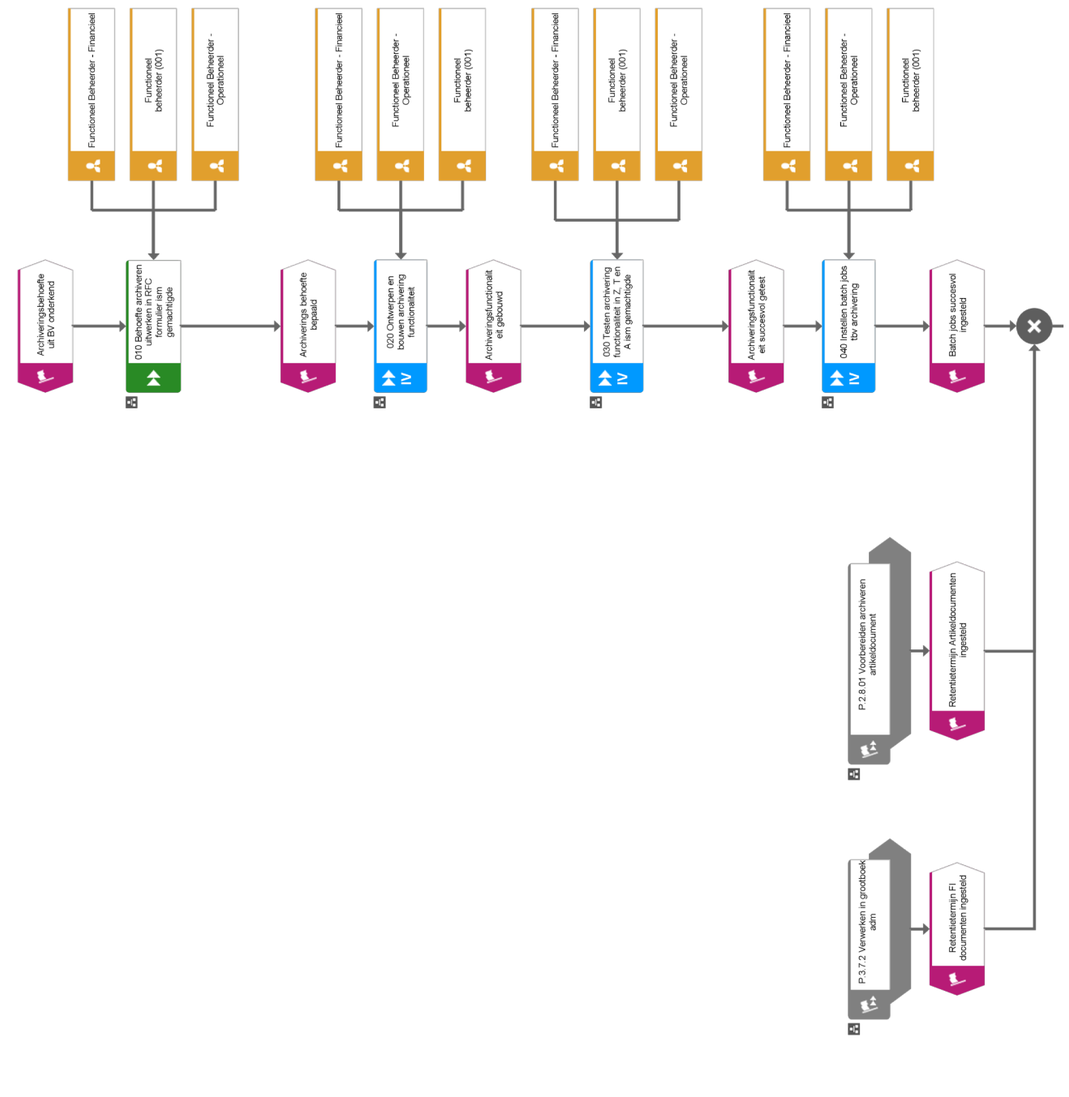
When requested, data from SAP supported processes can be collected and archived to an external database. This model describes the process around it. It is only partly supported by SAP and has a connection to the archiving software “FileNet”. The process model is shown in Figure A.5.5 and the decision chart in Table A.5.3.

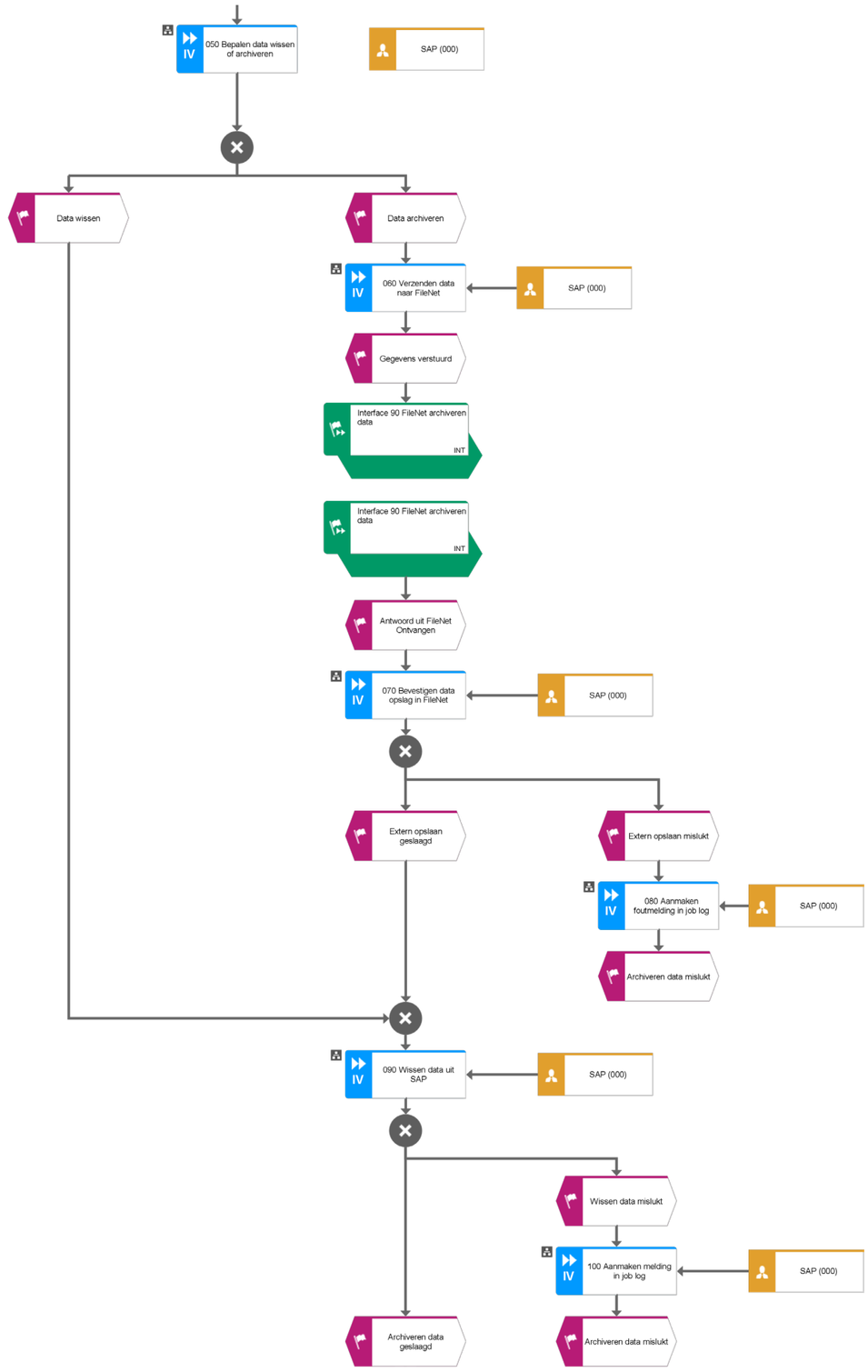
Table A.5.3: Archive data (P.0.3.05)

	Characteristic	Result	Score
1	Availability of the minimum required attributes	No	--
2	Number of roles involved in the process	4	-
3	Number of decision points	3	+/-
4	Number of activities	10	+
5	Lead time (average)	Hours	+
6	Quality of dataset	Low	-
7	Methods of importing data	Off-the-shelf adapter available in combination with file-based import	+/-
8	Possibility to filter on attributes	No	-
9	Nature of process	Office-administration	+
10	Process maturity (years of experience)	2014	+
11	Availability of process model	Yes, of high quality (EPC)	+
12	Mandated is known	Yes	++
	Result		**2**

The fact that SAP does not support the complete process by tracing its activities and logging the minimum required attributes, makes process mining already a futile methodology. Interestingly, the other characteristics also receive low scores. The process is straightforward, involved few actors, and few decisions need to be made. The quality of the dataset is low, since only few data are collected. The interface with FileNet makes it difficult to keep track of each case (the case goes off the radar for a period) and the lack of filtering possibilities gives it a score of 2 points. It is good that the decision chart gives a low score while the process already fails to comply in the first characteristic. This indicates a possible correlation.

Figure A.5.5 Archive data (P.0.3.05)




050 Bepalen data wissen of archiveren
SAP (000)
Data wissen
Data archiveren
060 Verzenden data naar FileNet
SAP (000)
Gegevens verstuurd
Interface 90 FileNet archiveren data
INT
Interface 90 FileNet archiveren data
INT
Antwoord uit FileNet Ontvangen
070 Bevestigen data opslag in FileNet
SAP (000)
Extern opslaan geslaagd
Extern opslaan mislukt
080 Aanmaken foutmelding in job log
SAP (000)
Archiveren data mislukt
090 Wissen data uit SAP
SAP (000)
Wissen data mislukt
100 Aanmaken melding in job log
SAP (000)
Archiveren data geslaagd
Archiveren data mislukt

Section A.5.5 Simple purchasing (P.1.1.16)

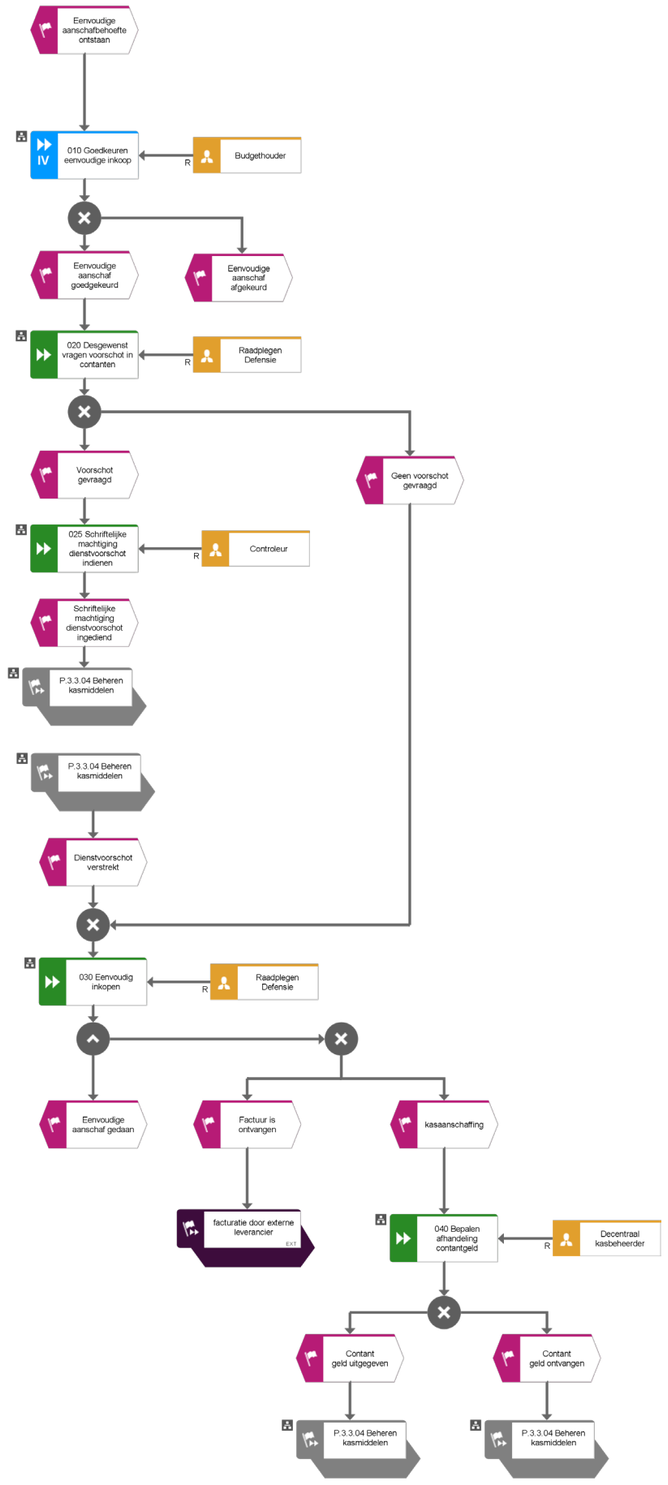
This process is addressed when required goods or services are not supplied by the regular supply channels or cannot follow these channels due to particular circumstances. The process is relatively simple and fully supported by SAP. The process model is shown in Figure A.5.6 and the decision chart in Table A.5.4.

Table A.5.4: Simple purchasing (P.1.1.16)

	Characteristic	Result	Score
1	Availability of the minimum required attributes	Yes	++
2	Number of roles involved in the process	4	-
3	Number of decision points	4	+/-
4	Number of activities	5	+/-
5	Lead time (average)	Days	+
6	Quality of dataset	High	+
7	Methods of importing data	Off-the-shelf adapter available	++
8	Possibility to filter on attributes	Yes, superficial	+/-
9	Nature of process	Office-administration	+
10	Process maturity (years of experience)	2012	+
11	Availability of process model	Yes, of high quality (EPC)	+
12	Mandated is known	Yes	++
	Result		**10**

As already reported, it is a relatively simple process. This can also be deduced from the few roles that are involved and the number of decisions to be made. Because to that, it receives an average score. Since this process is often addressed in urgent situations, process mining can determine if the execution is fast enough and where the bottlenecks are. Adding extra attributes to filter upon, may display the level of urgency of each case. For example, the questions whether the purchase was mission critical.

Figure A.5.6 Simple purchasing (P.1.1.16)



Section A.5.6 Pick articles (P.2.4.02)

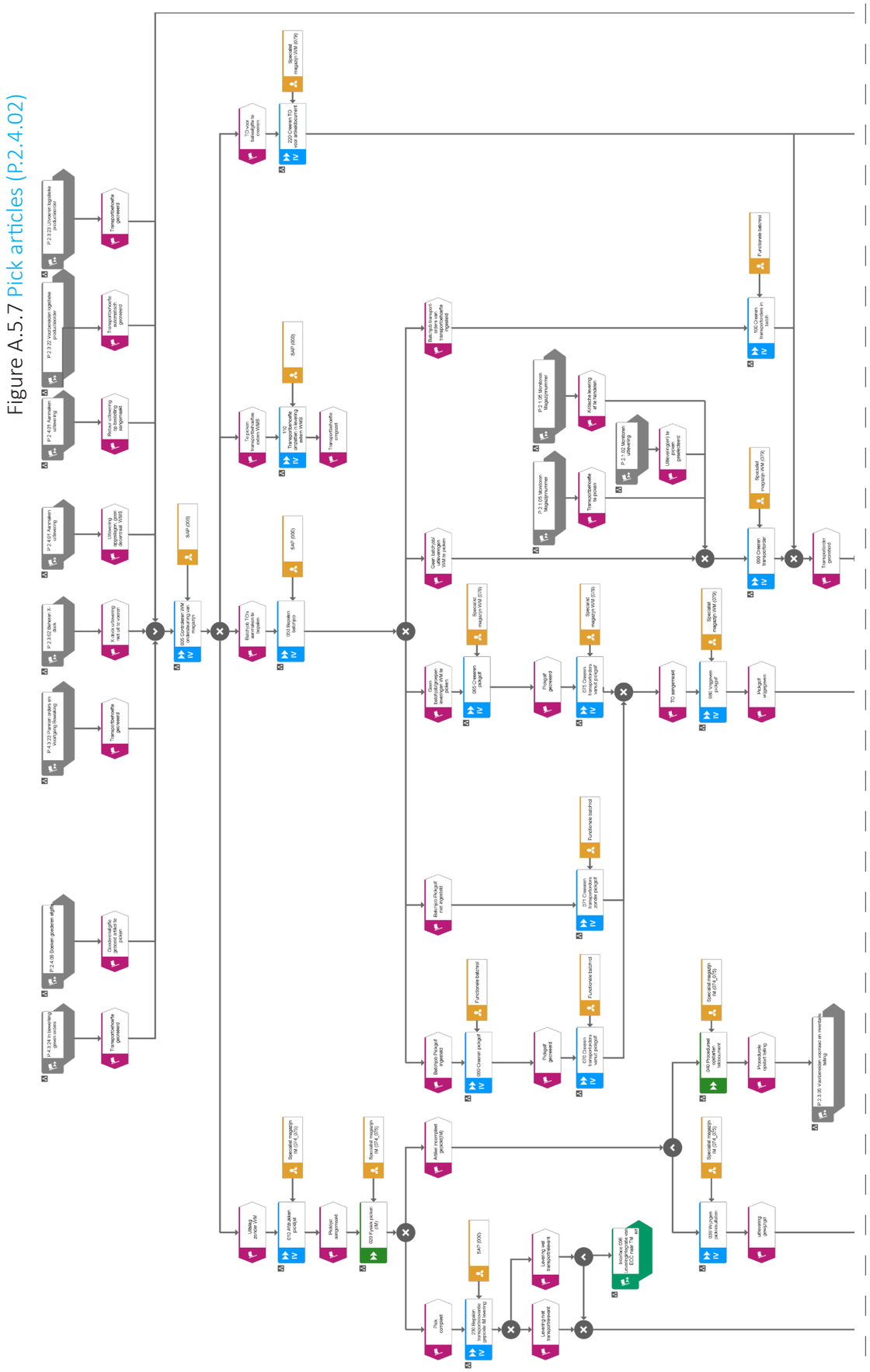
The start of this process is the presence of a picking order, customer order, assembly order, or maintenance call and its purpose is to move articles from a storage location to the location where the items are collected for further processing. The chance exists that the requested goods are not available because the administrative stock was higher than the physical inventory. This requires a specific set of actions. The picking process is complex, is supported by SAP, but also has several interfaces to other software like inventory management system VIADAT. These interfaces are automated. The process model is shown in Figure A.5.7 and the decision chart in Table A.5.5.

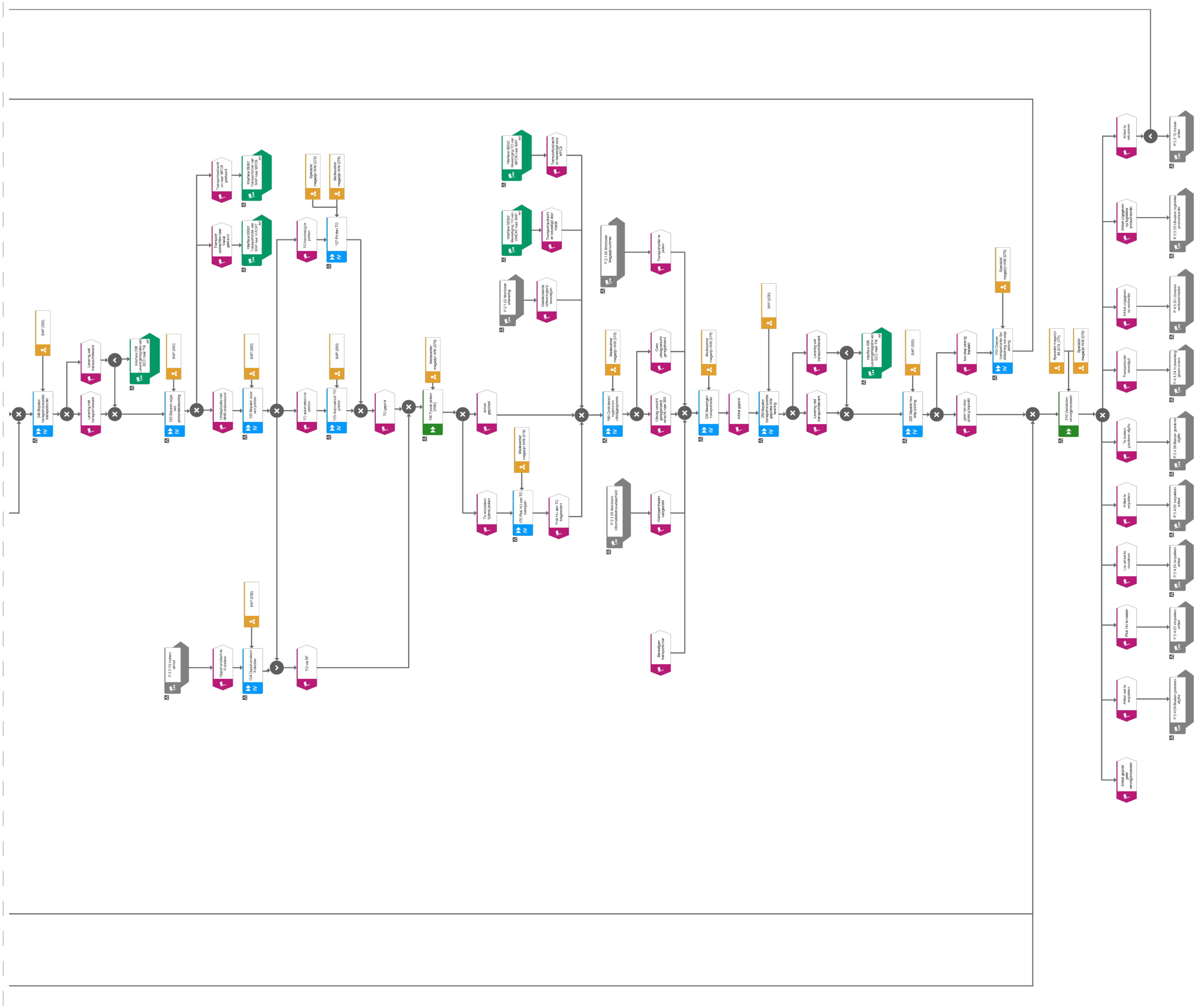
Table A.5.5 Pick articles (P.2.4.02)

	Characteristic	Result	Score
1	Availability of the minimum required attributes	Yes	++
2	Number of roles involved in the process	5	+
3	Number of decision points	12	+
4	Number of activities	31	+
5	Lead time (average)	Hours	+
6	Quality of dataset	Low	-
7	Methods of importing data	Off-the-shelf adapter available	++
8	Possibility to filter on attributes	Yes, profound	++
9	Nature of process	Logistics	+/-
10	Process maturity (years of experience)	2006	+
11	Availability of process model	Yes, of high quality (EPC)	+
12	Mandated is known	Yes	++
	Result		**13**

With 13 points, this process promised good process mining potential. The process has a level of complexity, while being fast and well supported by software. The process is executed by lower educated personnel that carries out mostly manual labour. Chances on errors are bigger and experience proof that this also reflects in the dataset. Wrong boxes are picked, codes are retyped wrongly, or wrong amounts are shipped. Using more technological aids, like RFID-tags, can improve the activities and thus the data quality. A logistical process like this may be improved by simulating the supply chain, based on numbers from the process mining analysis. With a very accurate simulation model, the analyst can tweak the process and see the results directly.

Figure A.5.7 Pick articles (P.2.4.02)





Section A.5.7 Pay invoices (P.3.3.03)

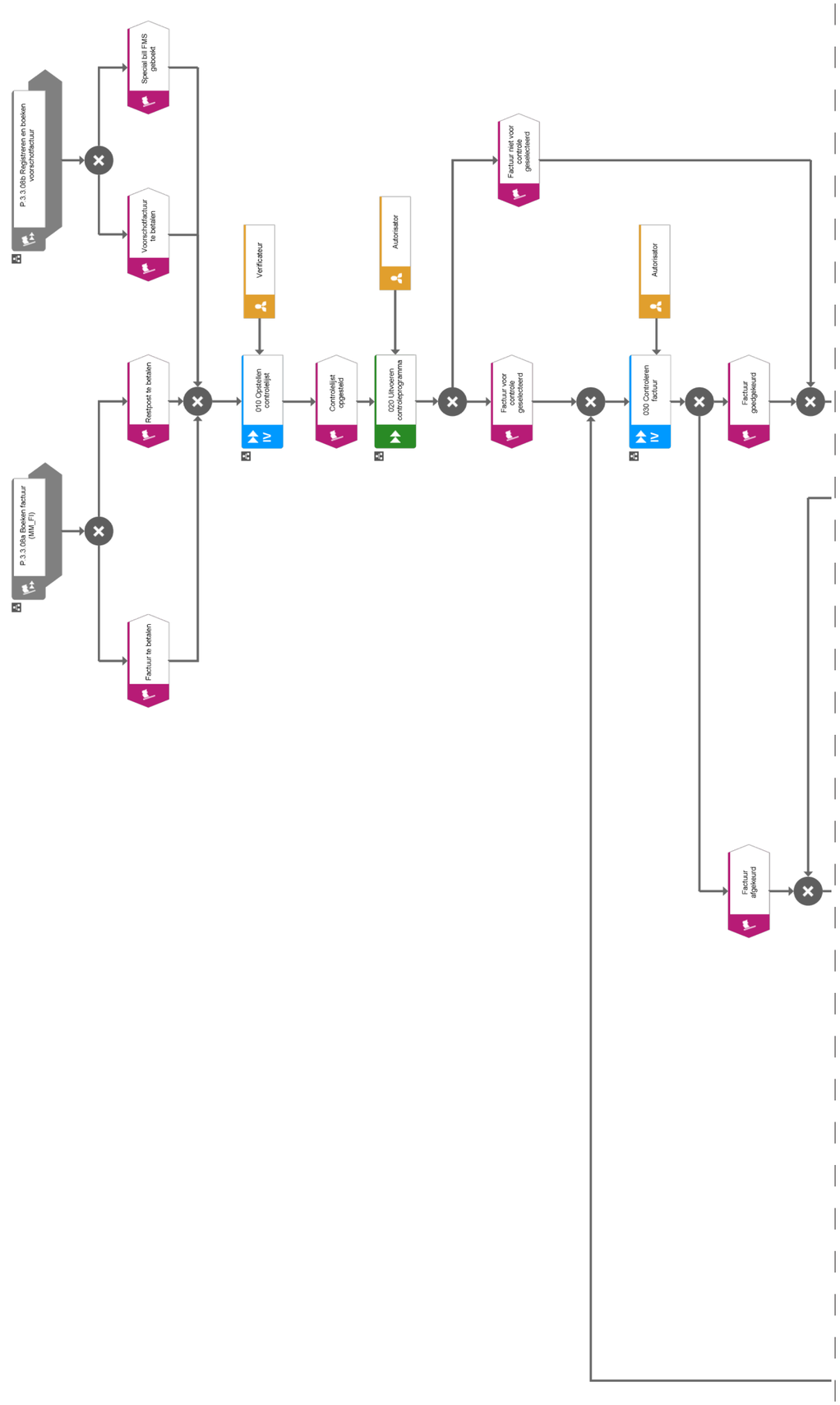
This process starts when an invoice has been released for authorization. At random, invoices are selected for a check by the authorizer. After this check, the approved invoices will be released for payment. A payment file is created and offered to the home banker. The process is clear, primarily carried out by the authorizer and paymaster, and its steps are logged by SAP. The process model is shown in Figure A.5.8 and the decision chart in Table A.5.6.

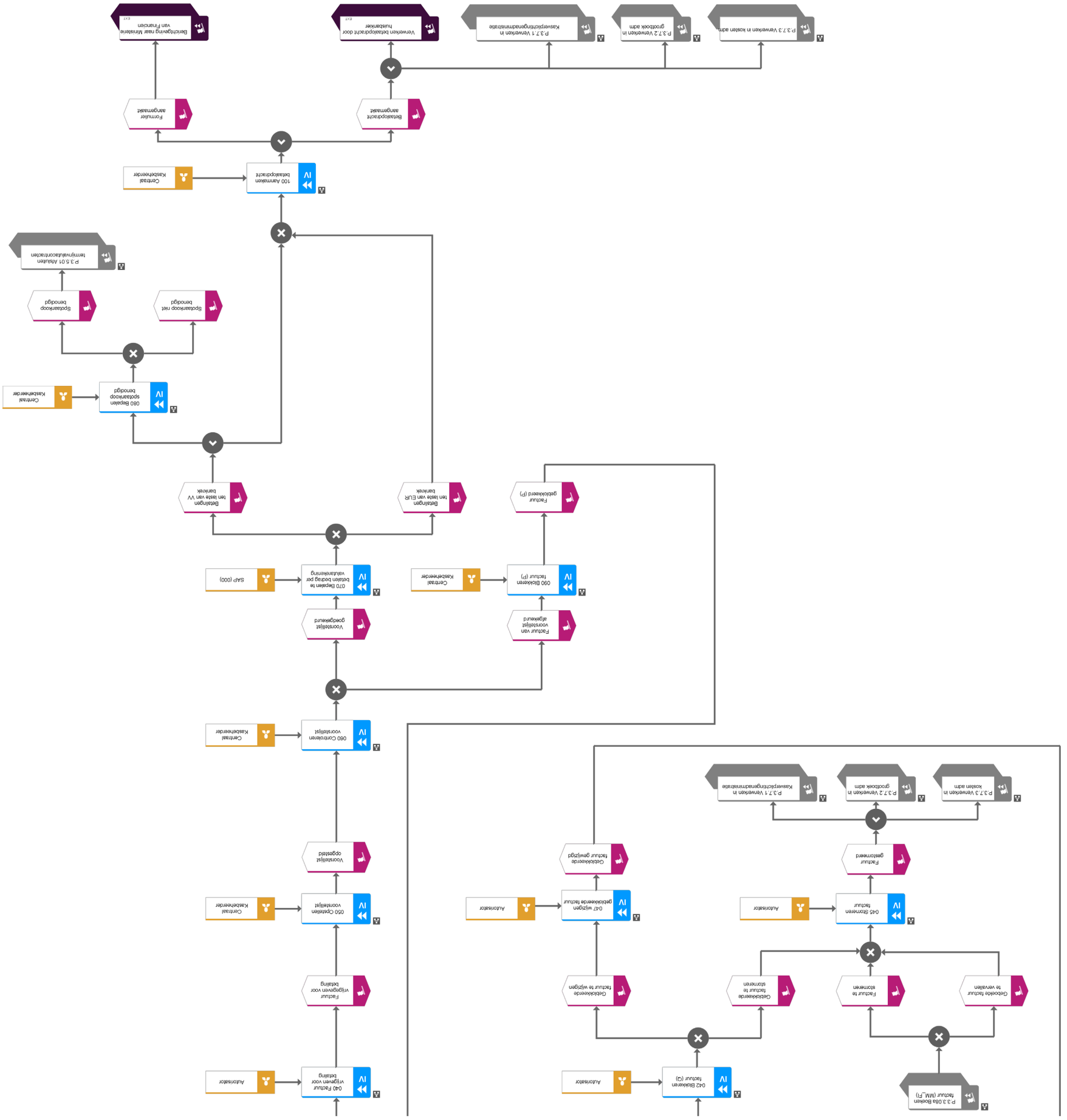
Table A.5.6: Pay invoices (P.3.3.03)

	Characteristic	Result	Score
1	Availability of the minimum required attributes	Yes	++
2	Number of roles involved in the process	4	-
3	Number of decision points	9	+
4	Number of activities	13	+
5	Lead time (average)	Days/weeks	+
6	Quality of dataset	High	+
7	Methods of importing data	Off-the-shelf adapter available	++
8	Possibility to filter on attributes	Yes, profound	++
9	Nature of process	Finance	+
10	Process maturity (years of experience)	2007	+
11	Availability of process model	Yes, of high quality (EPC)	+
12	Mandated is known	Yes	++
	Result		**14**

The process has two branches that can lead to (endless)loops in the process. This kind of loops are not exceptional, but it may cause complex (spaghetti like) process mining results. Even though it is a financial process, it has resemblances with auditing. Only a portion of the invoices is selected for an extra check. Process mining can help discovering what invoices have a higher risk being faulty, even before they are subjected to a random check. Concluding, the high score indicates sufficient improvement opportunities, while being supported by high quality data.

Figure A.5.8 Pay invoices (P.3.3.03)




P.3.3 08a Boeken factuur (MM_FI)
Gebookte factuur te verwalen
Factuur te storneren
Geblokkeerde factuur te storneren
Geblokkeerde factuur te wijzigen
045 Storneren factuur
Autonisator
Factuur gestorneerd
P.3.7.3 Verwerken in kosten adm
P.3.7.2 Verwerken in grootboek adm
P.3.7.1 Verwerken in Kasverplichtingenadministratie
042 Blokkeren factuur (Q)
Autonisator
047 wijzigen geblokkeerde factuur
Geblokkeerde factuur gewijzigd
Autonisator
050 Controleren voorstelfijst
Centraal Kasbeheerder
Voorstelfijst opgesteld
050 Opstellen voorstelfijst
Centraal Kasbeheerder
Spotaankoop niet benodigd
Spotaankoop benodigd
P.3.5.01 Afsluiten termijnvalutacontracten
080 Bepalen spotaankoop benodigd
IV
Centraal Kasbeheerder
Autonisator
040 Factuur vrijgeven voor betaling
Factuur vrijgegeven voor betaling
060 Controleren voorstelfijst
Centraal Kasbeheerder
Voorstelfijst goedgekeurd
070 Bepalen te betalen bedrag per valutasoorteering
SAP (000)
Betalingen ten laste van VV bankrek
Betalingen ten laste van EUR bankrek
090 Blokkeren factuur (P)
Centraal Kasbeheerder
Factuur afgekeurd
Factuur geblokkeerd (P)
Factuur gestorneerd
Betaalopdracht aangemaakt
Formulier aangemaakt
100 Aanmaken betaalopdracht
Centraal Kasbeheerder
Betaalopdracht door hulsbaenker
Verwerken betaalopdracht door hulsbaenker
P.3.7.1 Verwerken in Kasverplichtingenadministratie
P.3.7.2 Verwerken in grootboek adm
P.3.7.3 Verwerken in kosten adm
Bericht/gereg naar Minister van Financien

Section A.5.8 Technical work preparation (P.4.3.11)

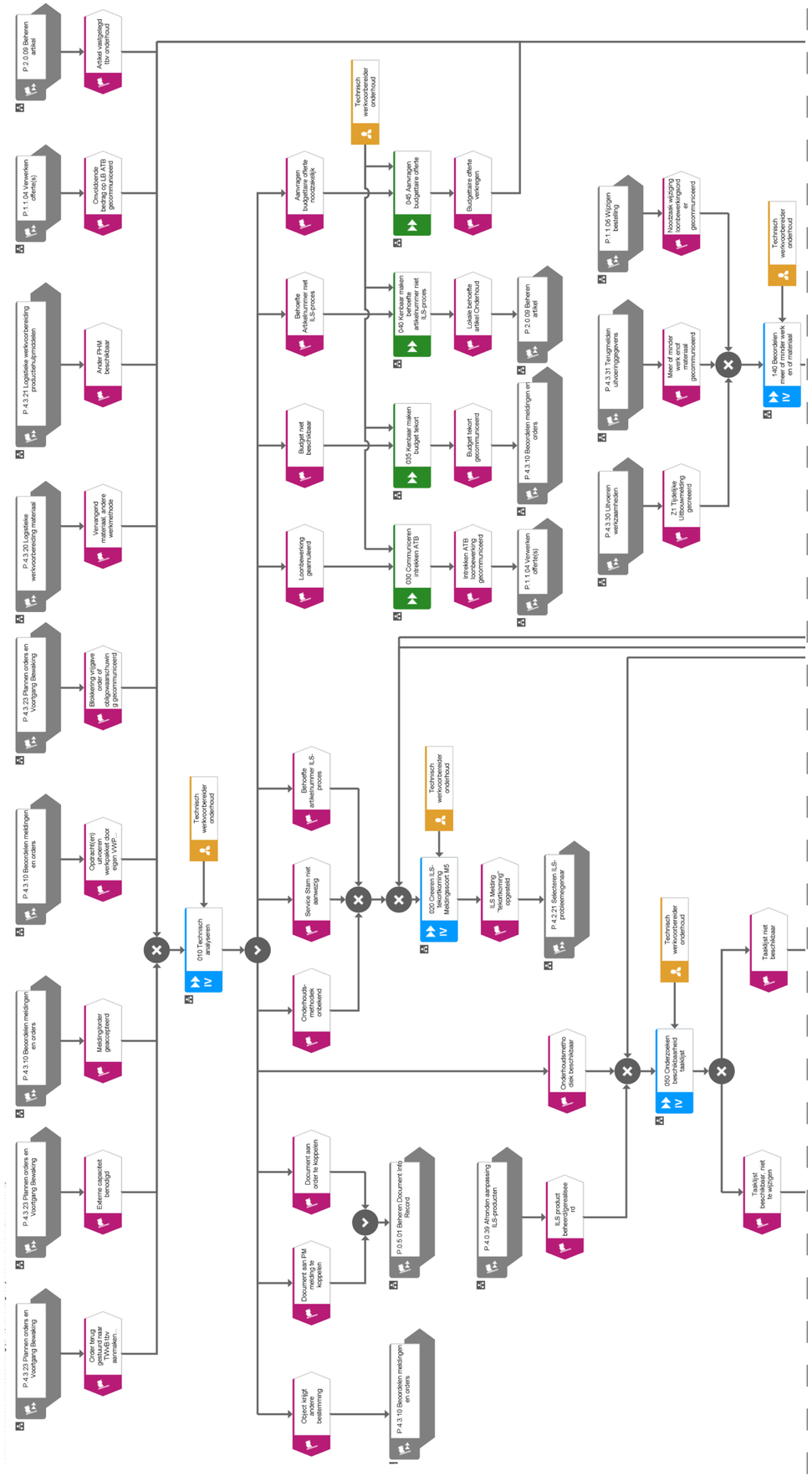
When a maintenance need is established, this process handles the technical analysis. The planner categorises the job, determines the required labour, and orders the material. The process is completely supported by SAP, but does have multiple different endings. The process model is shown in Figure A.5.7 and the decision chart in Table A.5.7.

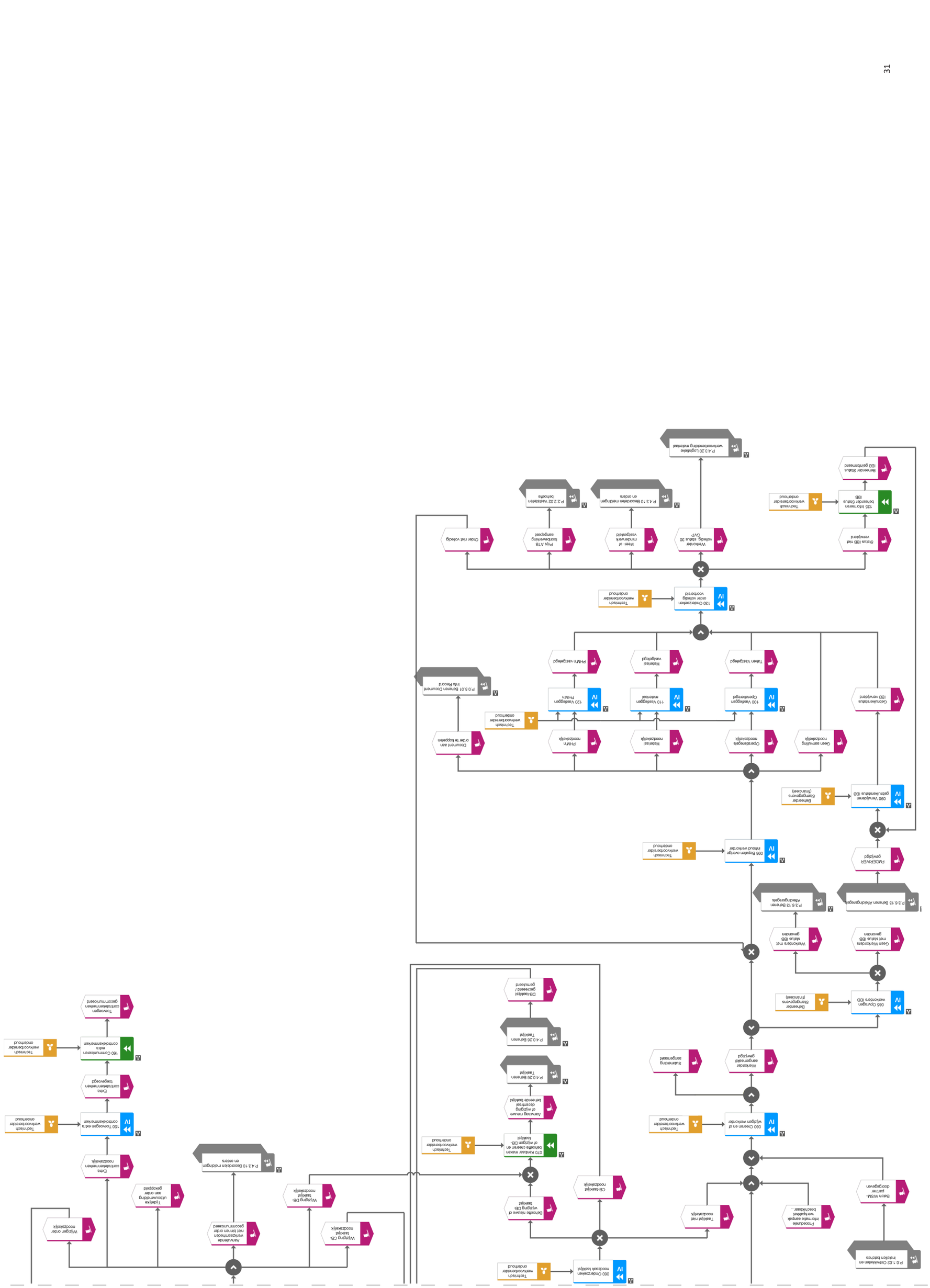
Table A.5.7: Technical work preparation (P.4.3.11)

	Characteristic	Result	Score
1	Availability of the minimum required attributes	Yes	++
2	Number of roles involved in the process	2	-
3	Number of decision points	8	+
4	Number of activities	21	+
5	Lead time (average)	Days	+
6	Quality of dataset	High	+
7	Methods of importing data	Off-the-shelf adapter available	++
8	Possibility to filter on attributes	Yes, profound	++
9	Nature of process	Maintenance	+
10	Process maturity (years of experience)	2009	+
11	Availability of process model	Yes, of high quality (EPC)	+
12	Mandated is known	Yes	++
	Result		**14**

The process receives a fairly high score. It scores well on almost all characteristics. Only the number of roles is lowering the score. MoD has multiple planners, so it would be possible to compare their activities. Overall, process mining could help improving this model.

Figure A.5.9 Technical work preparation (P.4.3.11)




P 0.1 02 Onkwaliteiten en risiteiten batches
Procedurele informatie aanpak werkpleket beschikbaar...
Batch WSM-partner doorgegeven
Taakplan niet noodzakelijk
Elektrische aanpassing deel van taakplan
Elektrische aanpassing deel van taakplan
060 Onderzoeken of wijziging taakplan noodzakelijk
Technisch werkvoorbereider ondertekend
070 Kleidaar maken beschrijving en of wijziging DE-taakplan
Technisch werkvoorbereider ondertekend
Aanvraag nieuwe of wijziging detectieve bitmeede taakplan
P 4.0 26 Bitteren Taakplan
P 4.0 26 Bitteren Taakplan
DB taakplan gecreeerd / gemuteerd
Wijziging DE-taakplan noodzakelijk
Aanvullende werkzaamheden niet binnen order geoommuniceerd
P 4.3 10 Beoordelen meldingen en orders
Wijziging DE-taakplan noodzakelijk
Wijzigen order noodzakelijk
Tijdelijke uitbouwmeting aan order gekoppeld
Extra contoleleidenmeting noodzakelijk
P 4.3 10 Beoordelen meldingen en orders
150 Overmuiden extra controleleidenmeting
Technisch werkvoorbereider ondertekend
Extra controleleidenmeting toegevoegd
150 Overmuiden extra controleleidenmeting
Technisch werkvoorbereider ondertekend
Toevoegen controleleidenmeting geocommuniceerd
Werkvoorder aangemaakt/ gewijzigd
Submitting aangemaakt
080 Overzien en of wijzigen werkorder
Technisch werkvoorbereider ondertekend
Taken Vastgelegd
Materiaal vastgelegd
110 Vastleggen materiaal
Materiaal noodzakelijk
100 Vastleggen Opereteregel
Operatiegegs noodzakelijk
120 Vastleggen PMI/Tn
PMI/Tn noodzakelijk
PMI/Tn vastgelegd
Technisch werkvoorbereider ondertekend
Document aan order te koppelen
P 0.5 01 Beheren Document info Record
Geen aanuiling noodzakelijk
IBB vervuldard
Gebruikersstatus IBB
090 Vervuldaren gebruikersstatus IBB
Behendar Stamgegevens (financeel)
FMOERVER gewijzigd
055 Gegeven overige inhoud werkorder
Technisch werkvoorbereider ondertekend
P 3.6 13 Beheren Afleidingsregels
P 3.6 13 Beheren Afleidingsregels
Geen Verkorders met status IBB gevonden
Verkorders met status IBB gevonden
085 Cynnagen werkorders IBB
Behendar Stamgegevens (financeel)
135 Ikkommen beheerder Status IBB
Technisch werkvoorbereider ondertekend
Beheerder Status IBB gerefformeerd
Status IBB niet vervuldard
Verkorder volledig status 30 GVP
P 4.3 20 Logbakke werkvoorbeleiding materiaal
Meer- of minderwerk vastgelegd
P 4.3 10 Beoordelen meldingen en orders
Pijp ATB loonbewerking aangepast
P 2.2 02 Vastatelen bekoefte
Order niet volledig

Section A.5.9 Carry out transport planning (P.5.2.02)

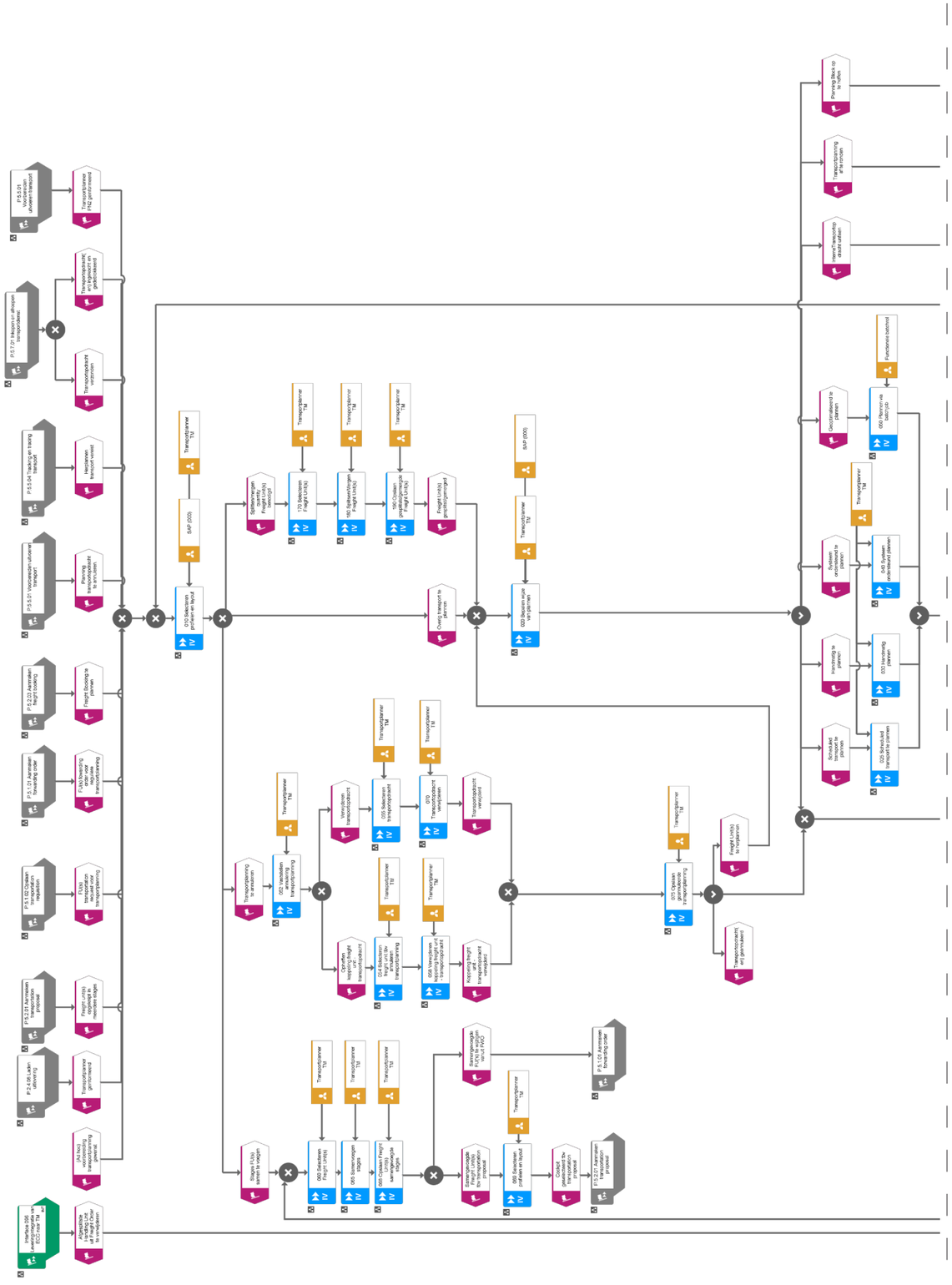
Based on a shipping request (forwarding order of delivery transportation requisition), freight units are created. These logical shipping units need to be moved from A to B. This model shows the correct process of its planning. The main flow is straightforward and mostly carried out by the transport planner. There is an interface with the software “GIS” to visualize the route and its duration. The process model is shown in Figure A.5.10 and the decision chart in Table A.5.8.

Table A.5.8: Carry out transport planning (P.5.2.02)

	Characteristic	Result	Score
1	Availability of the minimum required attributes	Yes	++
2	Number of roles involved in the process	3	-
3	Number of decision points	15	+
4	Number of activities	28	+
5	Lead time (average)	Days	+
6	Quality of dataset	Low	-
7	Methods of importing data	Off-the-shelf adapter available /GIS	++
8	Possibility to filter on attributes	Yes, superficial	+/-
9	Nature of process	Logistics	+/-
10	Process maturity (years of experience)	2011	+
11	Availability of process model	Yes, of high quality (EPC)	+
12	Mandated is known	Yes	++
	Result		**9**

The interface with GIS does not affect the decision chart nor the actual effects of process mining. This is because GIS is only used as an external information source and has only limited effect on the process. Besides that, the number of roles is very limited, giving a lower score. And the data does not show what is transported, giving limited filtering possibilities.

Figure A.5.10 Carry out transport planning (P.5.2.02)



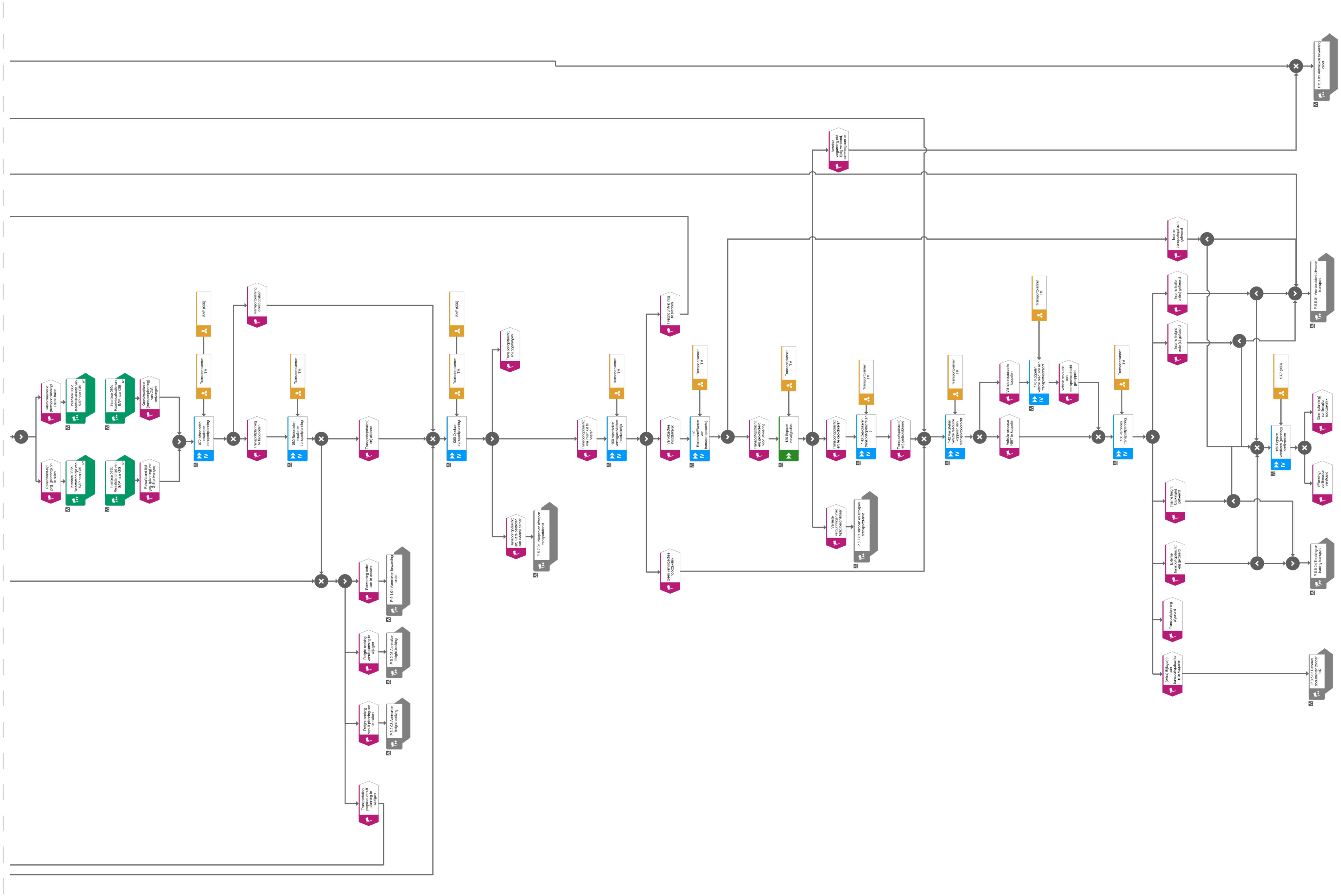
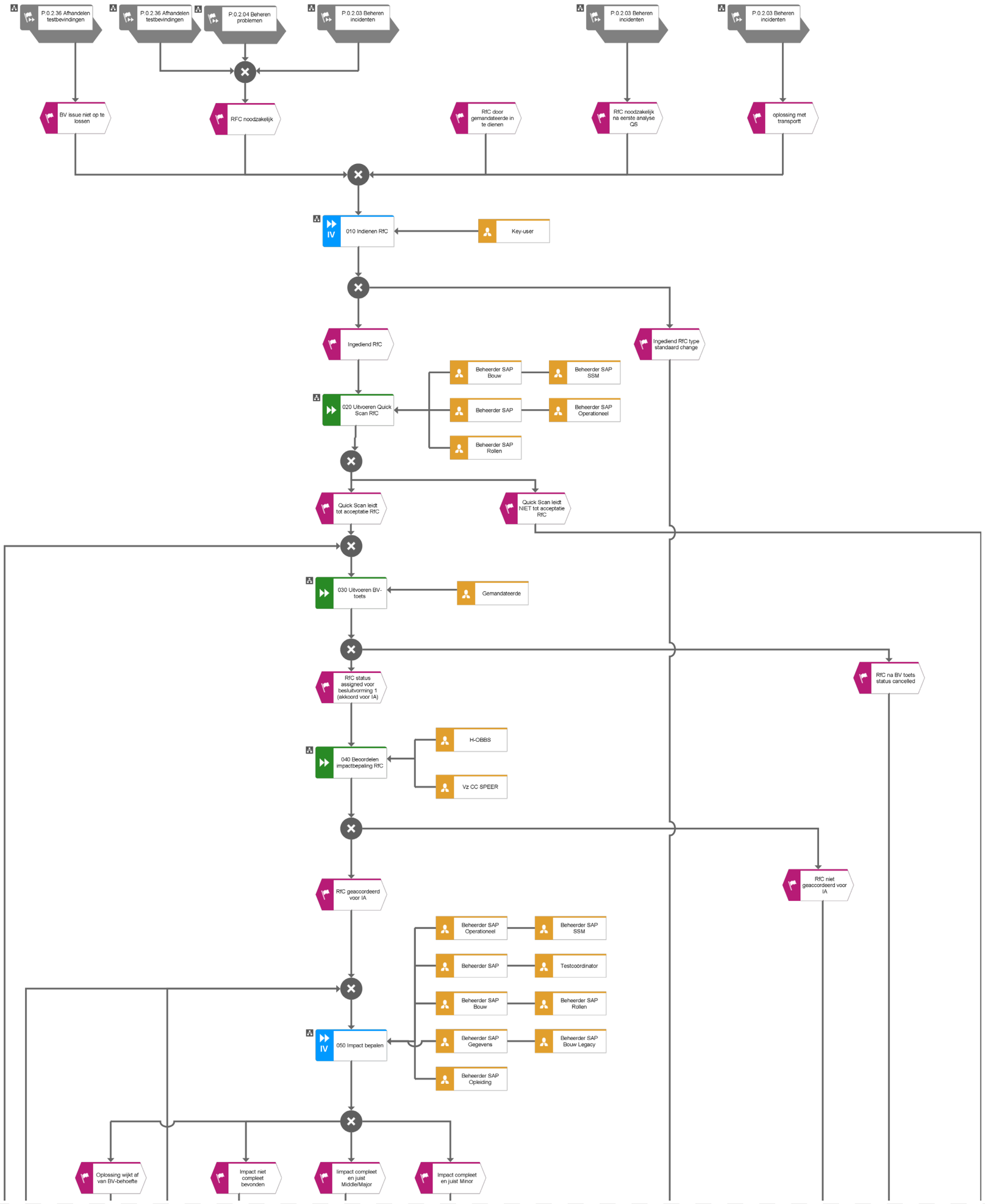


Figure A.5.11 Manage changes (RfC) (P.0.2.02)



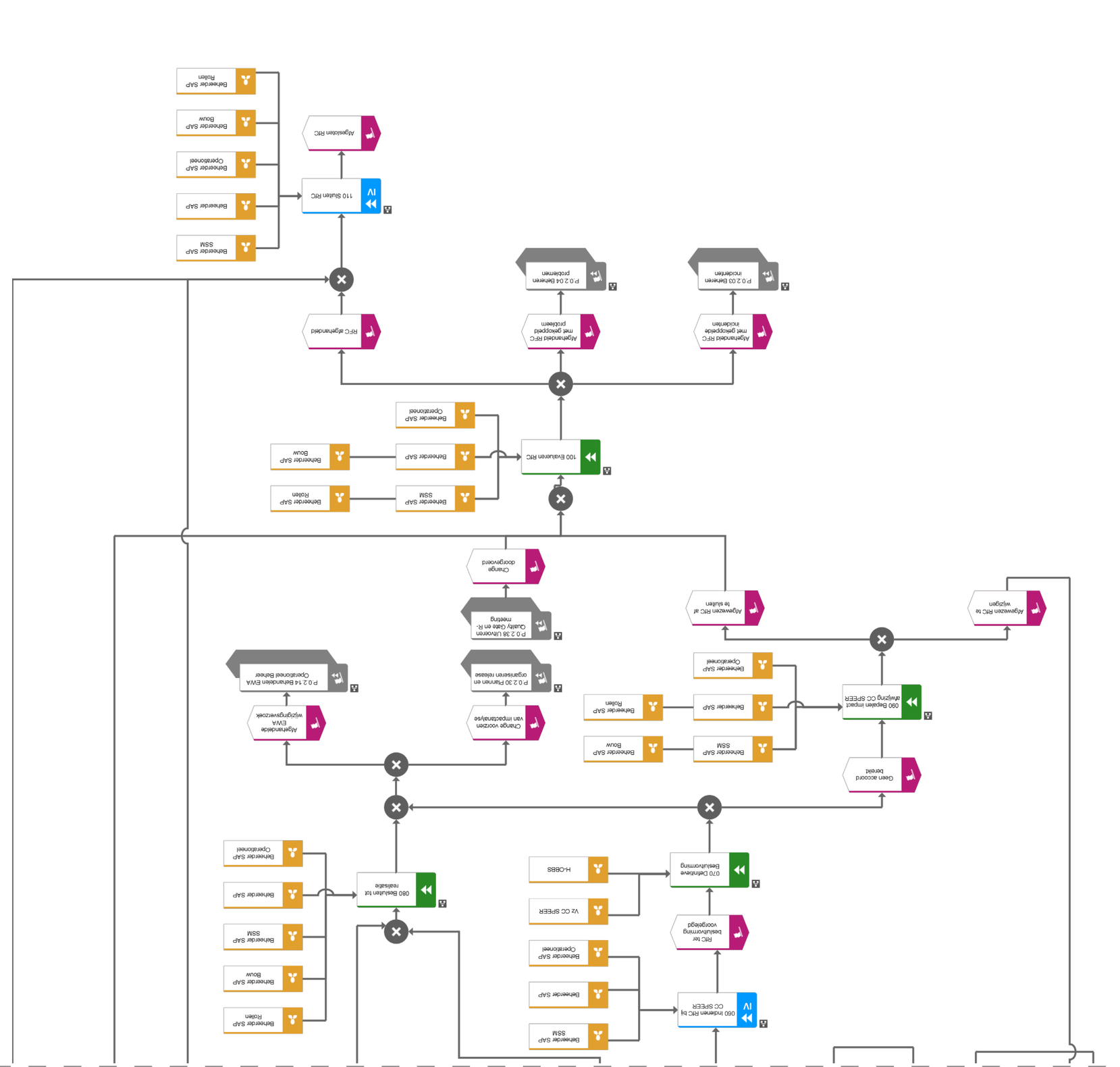
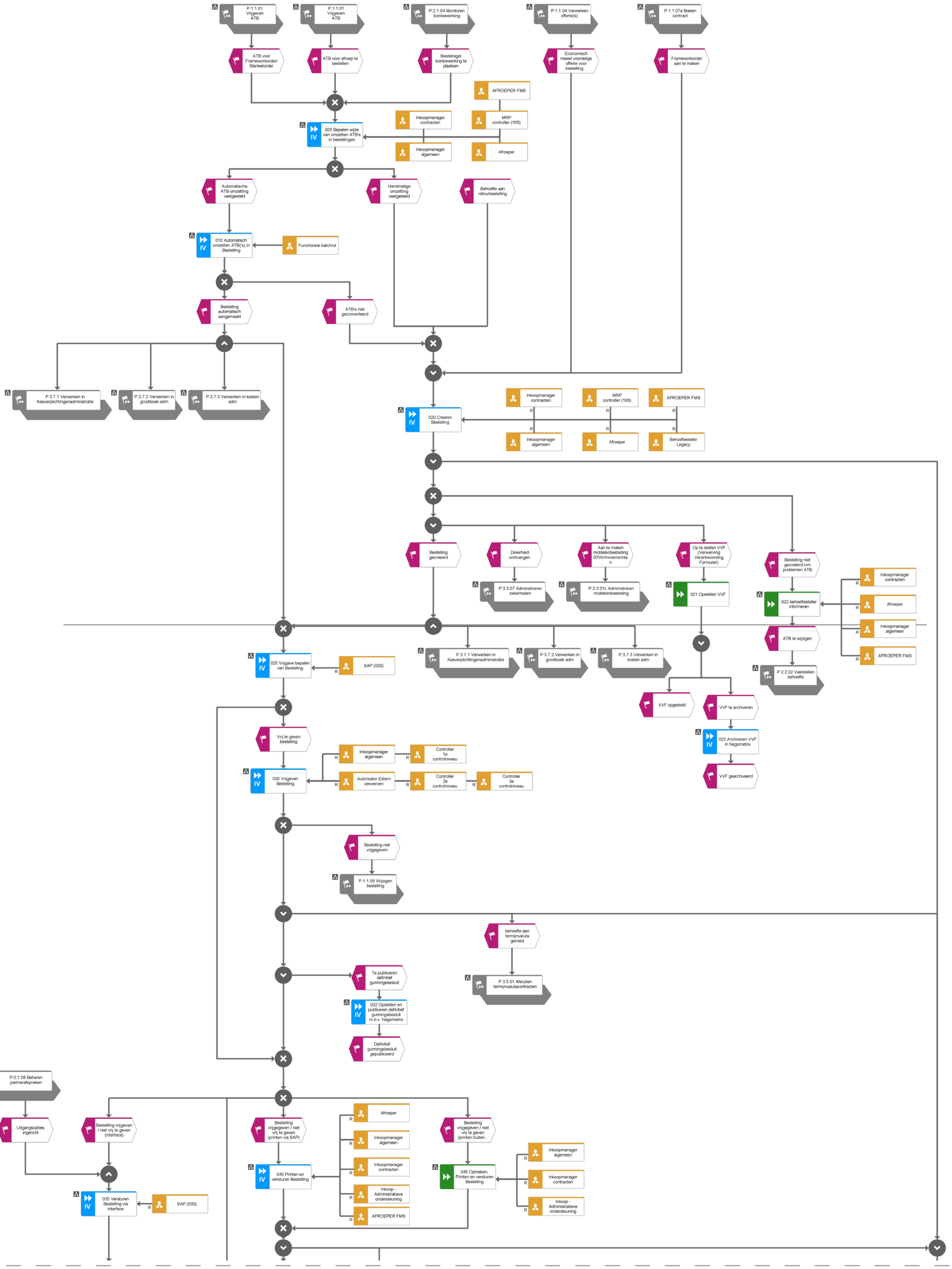

Behandel SAP Rollen
Behandel SAP Bouw
Behandel SAP Operationeel
Behandel SAP
Behandel SAP SSM
110 Sluiten RIC
Afgesloten RIC
Behandel SAP SSM
Behandel SAP Rollen
Behandel SAP Bouw
Behandel SAP Operationeel
Behandel SAP
100 Evalueren RIC
Behandel SAP Operationeel
Behandel SAP Bouw
Behandel SAP Rollen
RFC afgehandeld
Afgehandeld RFC met gekoppelde incidenten
Afgehandeld RFC met gekoppelde problem
P 0 2 03 Behoren incidenten
P 0 2 04 Behoren problemen
Change doorgevoerd
P 0 2 38 Uitvoeren Quality Gate en R- meeting
Afgewezen RFC al te sluiten
Afgewezen RFC te wijzigen
Change voorzien van impactanalyse
P 0 2 30 Plannen en organiseren release
Afgehandelde EVA wijzigingsverzoek
P 0 2 14 Behandelen EVA Operationeel Beheer
Geen accoord bereikt
090 Beperken impact afwijzing CC SPEER
Behandel SAP SSM
Behandel SAP Rollen
Behandel SAP Bouw
Behandel SAP Operationeel
070 Definitieve Besluitvorming
H-OBBS
Vz CC SPEER
Behandel SAP Operationeel
Behandel SAP
Behandel SAP SSM
060 Indienen RFC bij CC SPEER
RFC ter besluitvorming voorgelegd
080 Besluiten tot realisatie
Behandel SAP Operationeel
Behandel SAP
Behandel SAP SSM
Behandel SAP Bouw
Behandel SAP Rollen

Figure A.5.12 Create order (P.1.1.05)



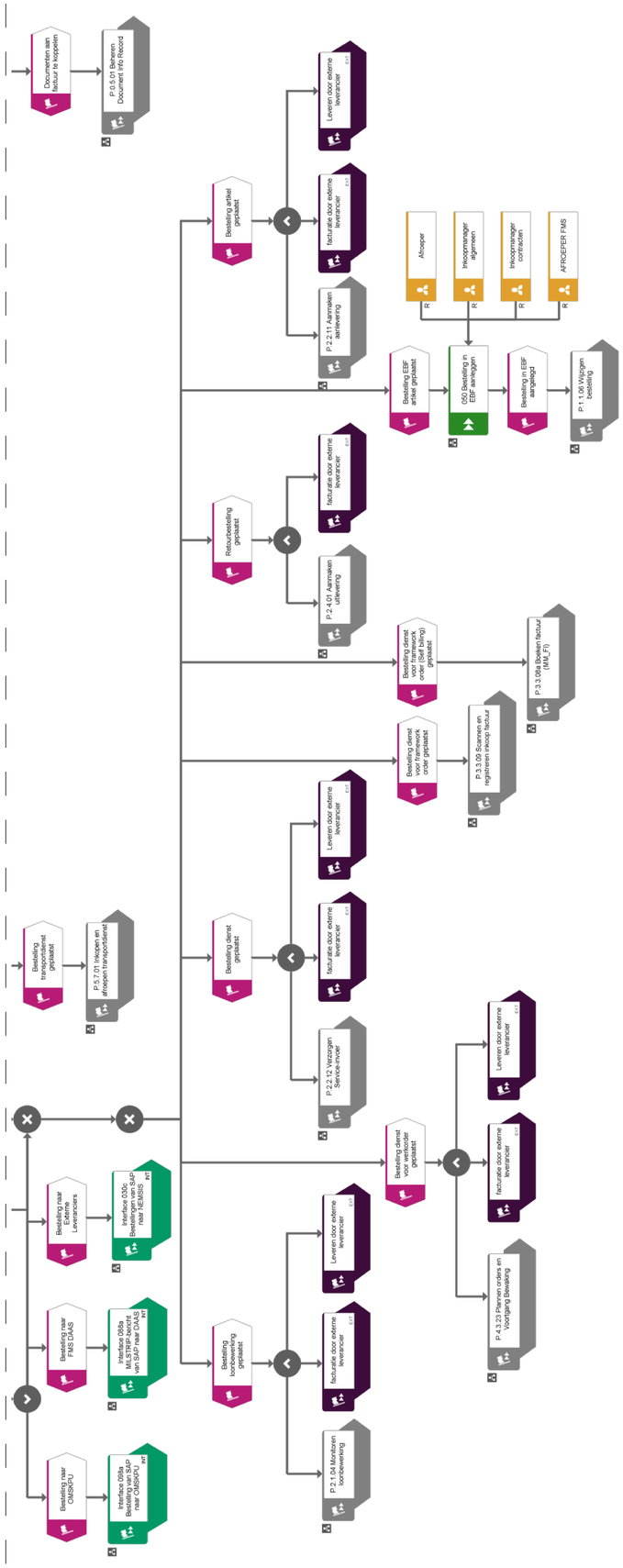


Figure A.5.13 Set up and define organisational vision (P.3.1.01)

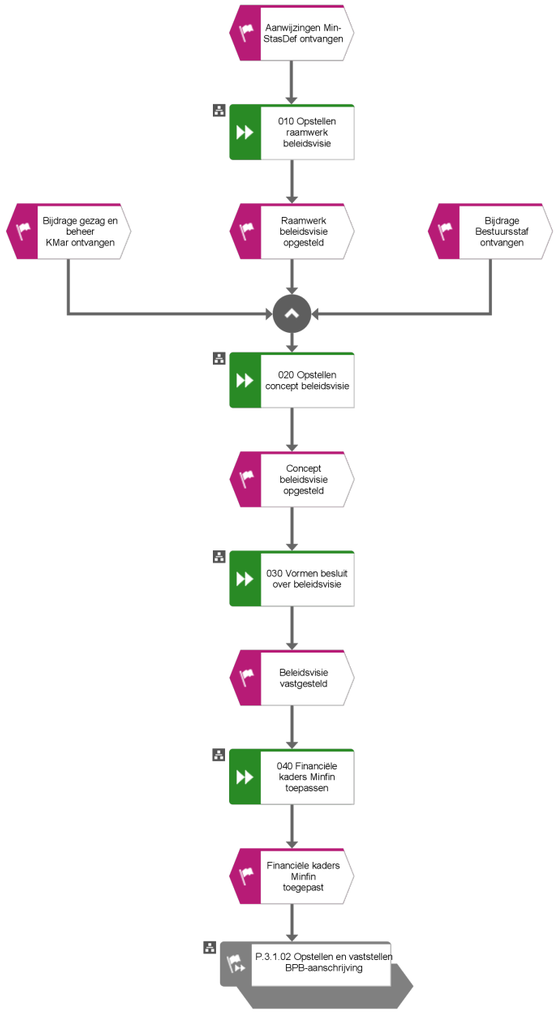


Figure A.5.14 Generate preventive maintenance need (P.4.3.02)

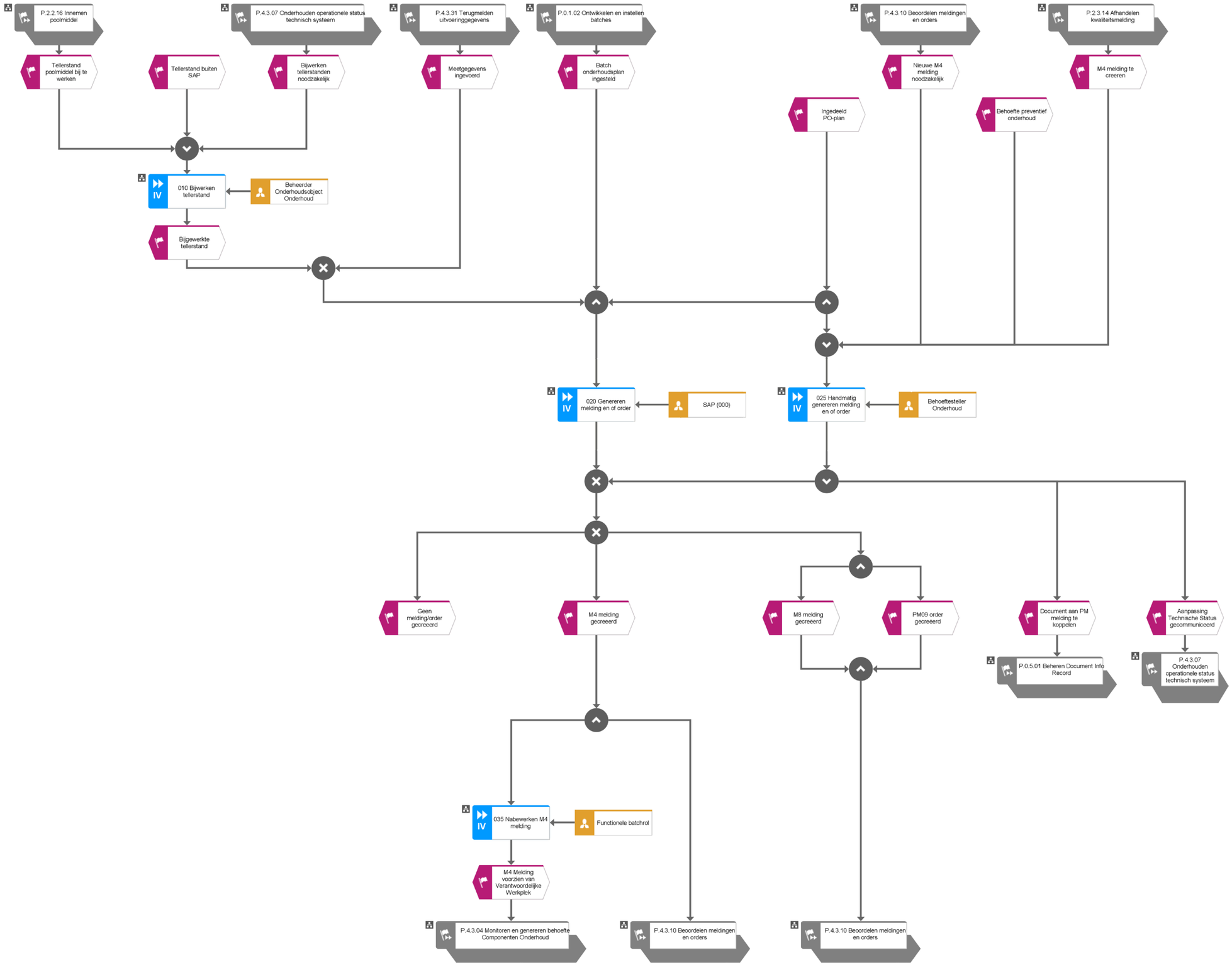
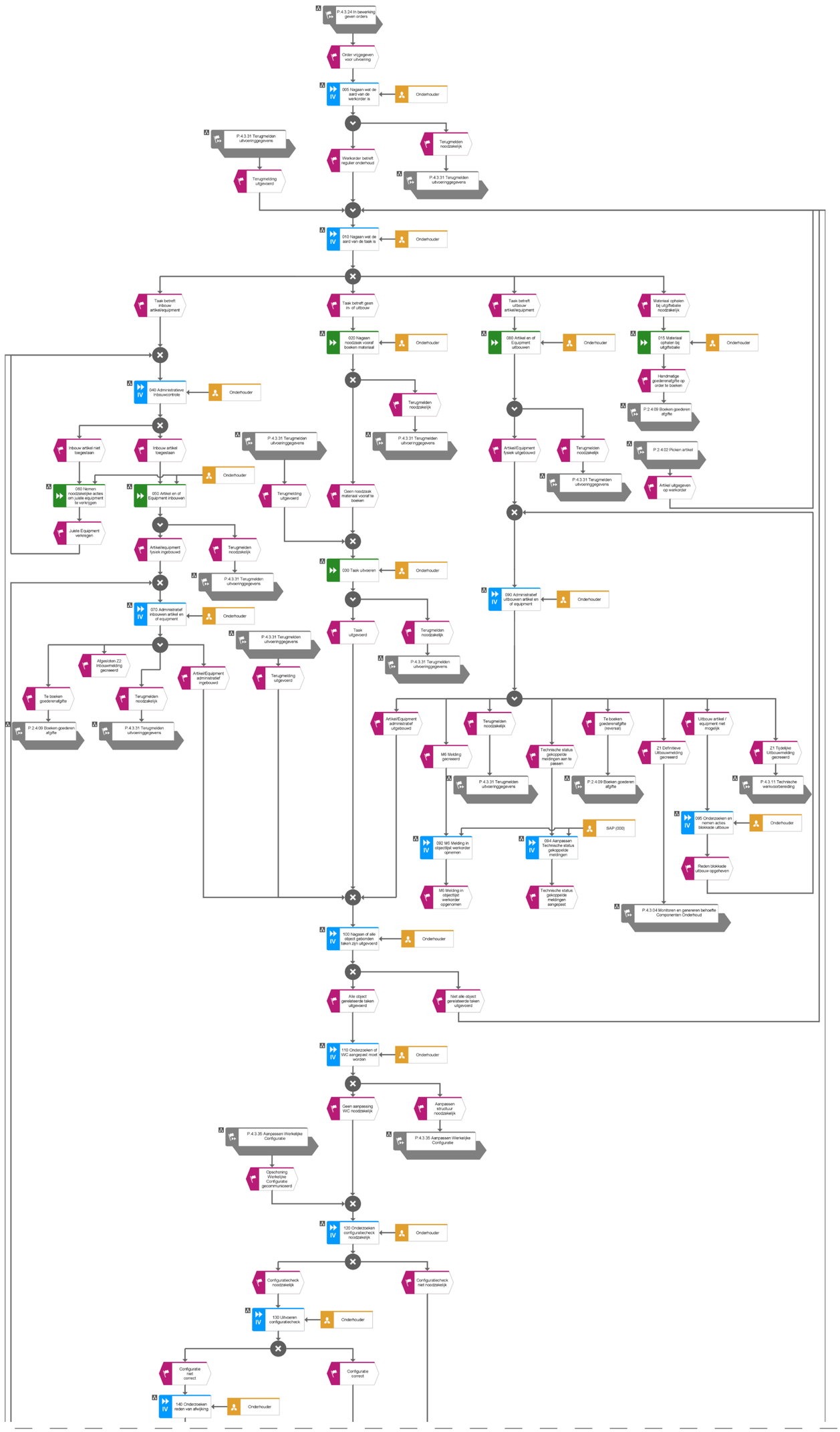


Figure A.5.15 Carry out (maintenance) work (P.4.3.30)



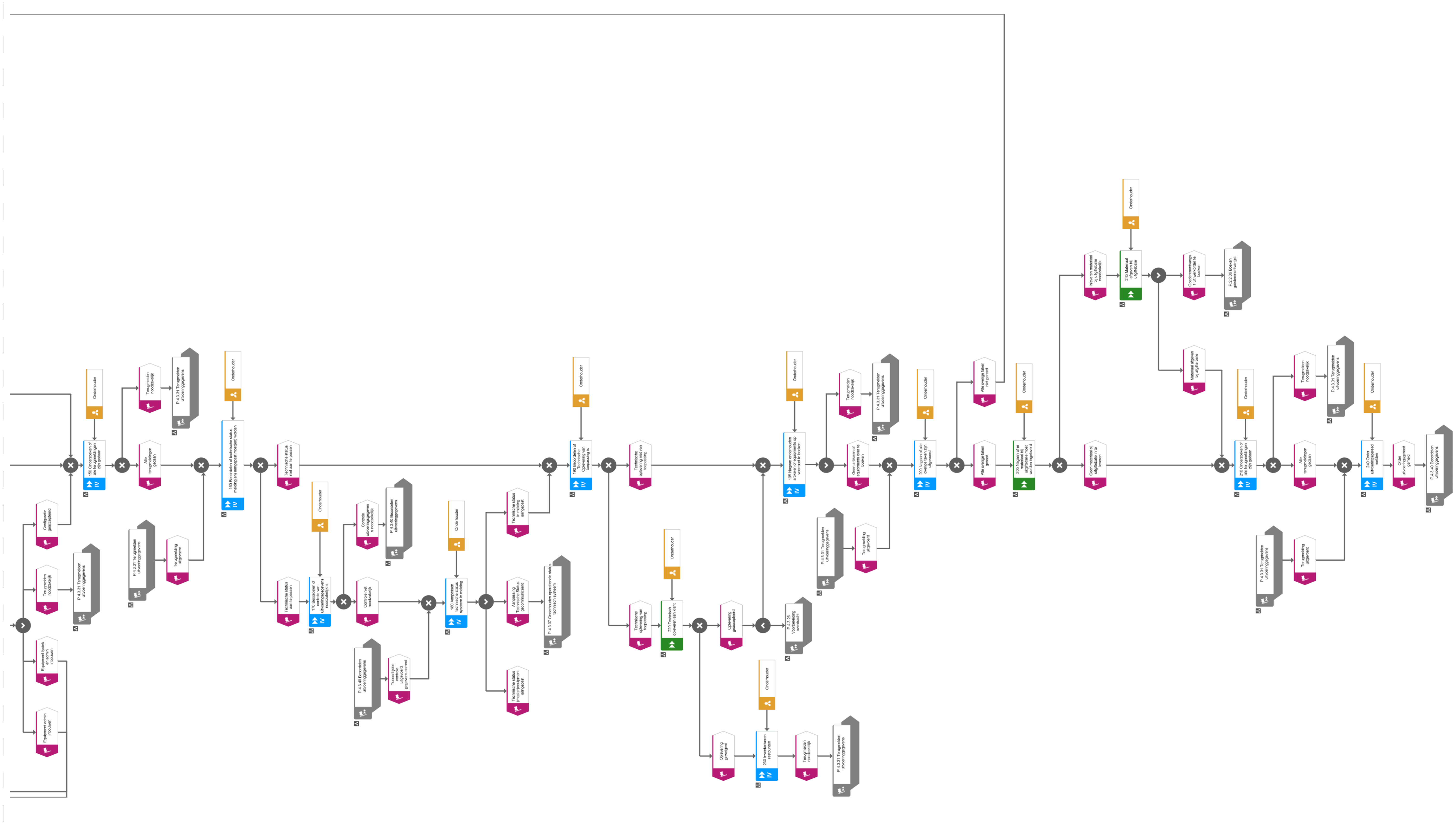
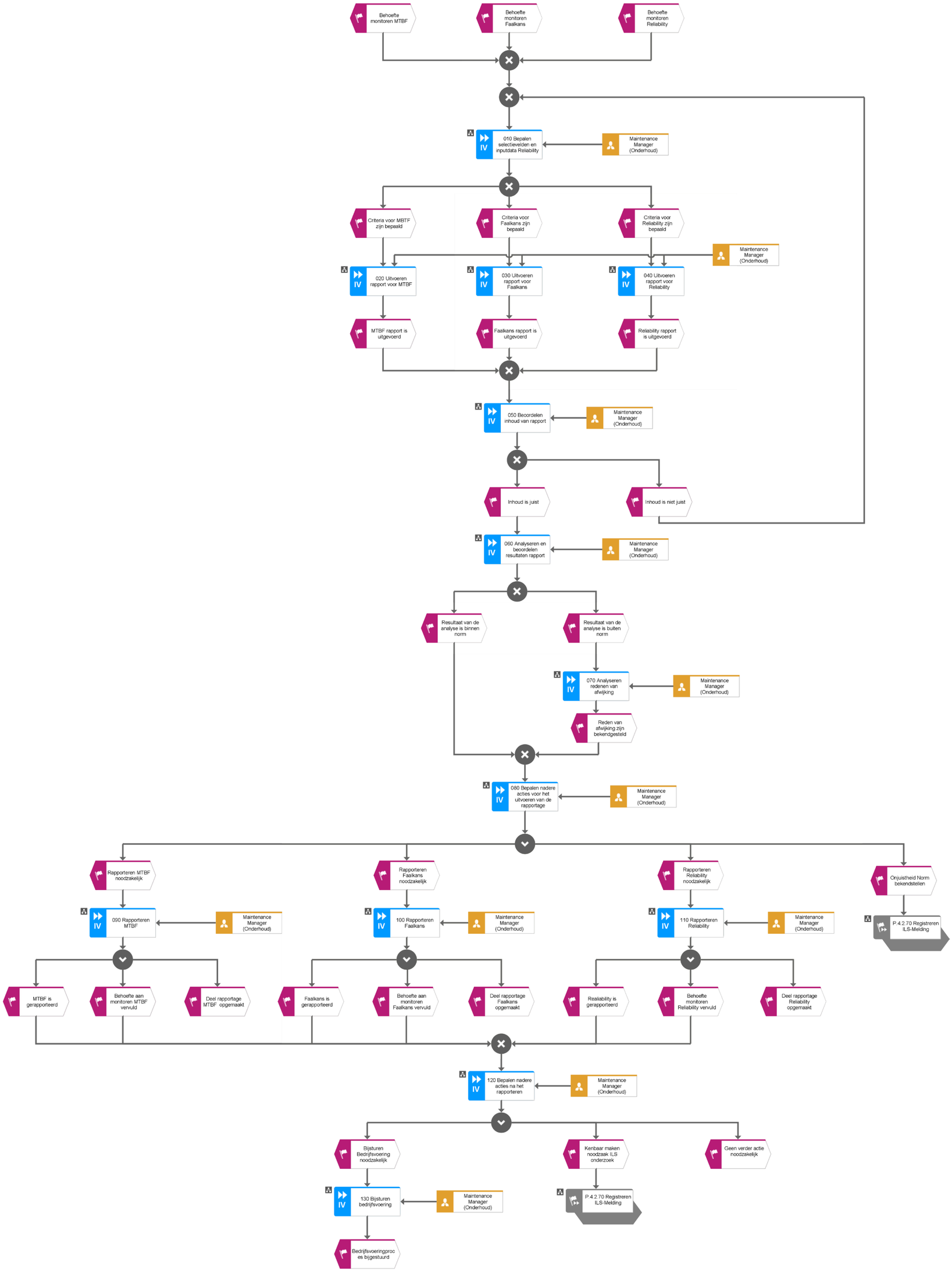


Figure A.5.16 Monitor reliability (P.4.9.10)



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