EFPF: European Connected Factory Platform for Agile Manufacturing

European Factory Platform

WP2: Requirements Elicitation and Pilot Scenarios

D2.3: Requirements of Embedded Pilot Scenarios Vs: 1.0

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Short Abstract

This deliverable describes the requirements of the three embedded pilot scenarios on the EFPF platform and federated ecosystem. An overview of the requirements gathering activity is provided. Requirements are captured and organised as user stories and activity diagrams. The gathered requirements are prioritised using the MoSCoW method. The captured requirements are used to drive and guide the development activities in the EFPF project.

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This deliverable is subject to final acceptance by the European Commission.

Further Information

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Executive Summary

The purpose of this EFPF deliverable D2.3 'Requirements of the Embedded Pilot Scenarios' is to gather and analyse the requirements concerning agile collaborations, lot-size-one manufacturing and other technology needs of the EFPF pilot partners. The analysis of the gathered requirements kicks off the relevant development and integration activities in the EFPF project. The requirements gathering and analysis activity takes into account the Description of Action (DoA), the requirements from the pilot domains captured from the pilot partners (i.e. manufacturing companies) based on their knowledge, expertise and more specifically needs in the particular domains. Additionally, requirements are expressed as user stories in order to present them in a familiar way to technical partners, ready for the initiation of the technical development activities.

The requirements gathering and analysis activity reported in this deliverable involved interaction with and within pilot partners, who had the main role to specify their requirements on the EFPF platform. The technical partners assisted the pilot partners in the "translation" of these requirements into epics, user stories and activity diagrams. The technical partners also assisted the pilot partners in analysing and prioritising the requirements for implement (i.e. development and integration) activities in the project.

This document captures the pilot requirements that will be used in conjunction with the platform requirements (in T2.4) to provide specific implementation and integration guidelines to the technical partners in the EFPF project.

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0 Introduction

0.1 EFPF Project Overview

EFPF – European Connected Factory Platform for Agile Manufacturing – is a project funded by the H2020 Framework Programme of the European Commission under Grant Agreement 825075 and conducted from January 2019 until December 2022. It engages 30 partners (Users, Technology Providers, Consultants and Research Institutes) from 11 countries with a total budget of circa 16M€. Further information: efpf.org

In order to foster the growth of a pan-European platform ecosystem that enables the transition from "analogue-first" mass production, to "digital twins" and lot-size-one manufacturing, the EFPF project will design, build and operate a federated digital manufacturing platform. The Platform will be bootstrapped by interlinking the four base platforms from FoF-11-2016 cluster funded by the European Commission, early on. This will set the foundation for the development of EFPF Data Spine and the associated toolsets to fully connect the existing platforms, toolsets and user communities of the 4 base platforms. The federated EFPF platform will also be offered to new users through a unified Portal with value-added features such as single sign-on (SSO), user access management functionalities to hide the complexity of dealing with different platform and solution providers.

0.2 Deliverable Purpose and Scope

The purpose of this document is to elaborate the requirements of three embedded pilot scenarios on the EFPF platform and federated ecosystem. The three embedded pilots in the EFPF project specifically represent the typical scenarios for agile collaborations, mass-customisation and lot-size-one manufacturing in various domains. The elaboration of embedded pilot requirements in this deliverable will guide the technical developments in the EFPF project and shape-up the project outcomes to adequately address the industrial needs.

This deliverable provides an overview of the three embedded pilots and describes the business needs and technical requirements of pilot partners as Epics and User-Stories respectively. The user stories are complemented with activity diagrams to highlight the perceived interactions between different types of users or activities, which need to be supported by the EFPF solutions. At the end, a prioritisation of requirements (or user-stories) is carried out using the MoSCoW prioritisation method.

0.3 Target Audience

The primary target audience of this deliverable are the technical teams in the EFPF project. The requirements in this deliverable will be translated into implementation tasks that will be carried out by EFPF partners to realise an open digital platform and federated ecosystem. The Public nature of this deliverable will make it useful for other projects/initiatives focusing on the development of smart factory and digital manufacturing solutions.

0.4 Deliverable Context

This deliverable is the first document to capture the requirements of three embedded pilots in the EFPF project. More understanding of the EFPF project and its objectives can be acquired from the project website: https://www.efpf.org/

0.5 Document Structure

This deliverable is broken down into the following sections:

- **Section 1: Methodology for Gathering Pilot Requirements:** This section provides an overview of the requirements gathering methodology and introduces to the various aspects of the requirements gathering and prioritising exercise carried out in the project
- **Section 2: Aerospace Pilot:** Defines the embedded pilot scenario and requirements from the aerospace sector
- **Section 3: Furniture Pilot:** Defines the embedded pilot scenario and requirements from the furniture sector
- **Section 4: Circular Economy Pilot:** Defines the embedded pilot scenario and requirements from the circular-economy sector
- **Section 5: Prioritisation of Requirements – MoSCoW:** This section presents the user stories of the embedded pilots from earlier sections, but prioritised using the MoSCoW method
- **Section 6: Summary:** Provides an overview of the deliverable, highlights the key findings and provides direction for future work
- **Annexes**:
    - **Annex A**: Document History
    - **Annex B**: References

0.6 Document Status

This document is listed in the Description of Action as “Public” since it provides information for anyone interested in the EFPF ecosystem.

0.7 Document Dependencies

This document has no preceding documents or further iterations.

0.8 Glossary and Abbreviations

A definition of common terms related to EFPF can be found at this link: https://www.efpf.org/glossary

0.9 External Annexes and Supporting Documents

Annexes and Supporting Documents:

- None

0.10 Reading Notes

- None

1 Methodology for Gathering Pilot Requirements

Requirements gathering is an interactive process where several interactions lead to the understanding of a specific need or requirements. Requirements are the statements about an intended functionality of the system, which specify what and how should be implemented. In the case of EFPF project, the requirements need to highlight specific needs of embedded pilots and also represent of the needs (of similar entities) in the wider domain or pilot sectors. The requirements themselves may evolve as user or pilot partners interact with the defined statements or the implemented functionality from each requirement. For the EFPF platform and federation services to be effectively designed, implemented, and measured, the conformance to pilot requirements must be specific, unambiguous and clear.

The requirements elicitation and documentation methodology adopted in the EFPF project involved close engagement between technical and pilot/user partners over a short period of time (from M1-M4 of EFPF project). The requirements elicitation process is elaborated in Section 1.2. During the requirements elicitation process, the pilot requirements were documented as epics, user-stories and activity diagrams. In the context of EFPF project, these terminologies mean the following:

- **User Story:** A user story is an informal, natural language description of one or more features needed of the EFPF platform and federated ecosystem.
- **Epic:** An epic is a big chunk of work that has one common objective e.g. a business function or business requirement. One epic can be broken down into several user stories
- **Activity Diagram:** An activity diagram is a way to describe a process by representing the flow from one step to another, where a step can relate to an operation either by a human, organisation or software. We use activity diagrams to represent user stories in more detail.

The documentation of requirements in the form of epics, user stories and activity diagrams allow technical teams to easily understand the required features (e.g. new technology or enhancement in existing technology) from target users' perspective. The pilot requirements in this deliverable will provide basis for the definition of platform requirements (in D2.4), which will provide a description of what is needed to deliver the federated EFPF platform in several iterations.

Cooperation between technical teams and pilots is constantly necessary and encouraged during the course of the project in order to identify the evolution of requirements typical of ICT projects. Therefore, the initial requirements will be extended, and then new requirements will be elicited with new pilots in later project phases.

1.1 Embedded Pilot Scenarios

There are three embedded pilots in the EFPF project focusing on agile collaborations and lot-size-one manufacturing in aerospace, furniture manufacturing and circular economy sectors. The pilot scenarios are described in their respective sections 2, 3 and 4 of this deliverable.

1.2 Requirements Elicitation Process

While gathering the embedded pilot requirements in the EFPF project, some of the conventional techniques were used. These include: user and technical meetings, direct and indirect consultations with different stakeholders, studying documentation (from 4 base EU

projects COMPOSITION[1], DIGICOR[2], NIMBLE[3] and vf-OS[4]), and researching tools and solutions being used by the pilot partners and also those that are available in the market. Several focused meetings (i.e. physical meetings and teleconferences) were conducted to establish a consensus view and to point out the conflicts in defining requirements in the shape or form that make them understandable and meaningful for the technical teams. These meetings helped the pilot and technical partners to express their views on the EFPF platform and federation. Direct consultations included one-by-one and joint sessions with pilot partners to understand specific needs at the level of individual company and domain of operation e.g. aerospace, furniture manufacturing and circular economy. Indirect consultations involved interactions with pilot supporting partners (HAW, CERTH, AID) to understand the pilot domains in terms of specific manufacturing processes, technology needs, and existing state of art. Study of documentation from base projects imply the analysis of technology use and adoption during the base project lifetime and an understanding of expected extensions during the EFPF project.

The aforementioned techniques helped to define the pilot requirements both at business and technology levels and also helped in highlighting domain specific vs cross-domain commonalities. Then all requirements were written down into epic and user story formats. The refinement of user stories was carried out in several interactive sessions involving technical and pilot partners, leading to the development of this deliverable.

1.3 User Stories

A user story is an informal, natural language description of one or more features of a software system. User stories are written by and/or from the perspective of an end user. The scope of the user stories is carefully defined to facilitate ease-of-understanding for the development teams and serve as a basis for communication.

In the EFPF project, a user story is composed of three parts:

- User role (Red)
- Desired action (Purple)
- Receive benefit (Green)

As an example:

As a <user_role>, I want <desired_action> so that <receive_benefit>

Each user story is completed by an 'Acceptance Criteria' to provide means for the verification and acceptance of the implemented features. The Acceptance criteria reinforces the scope of the user story and provides clear indicator for the completion of the required functionality. Each user story must have one or more acceptance criteria, allowing the technical teams to test when the desired actions from the user story are implemented.

As an example:

Acceptance criteria: • Capability to search for logistics services and retrieve results according to indicated parameters (i.e.: origin, destination, delivery time, etc.)

[1] [1] https://www.composition-project.eu/
[2] https://www.digicor-project.eu/
[3] https://www.nimble-project.org/
[4] https://www.vf-os.eu/

1.4 Epics

An epic captures a large body of work corresponding to the development of a system. It is essentially a large user story that can be broken down into a number of smaller stories. In the EFPF project, epics are used to represent business needs at a higher level of granularity. As an example:

Epic: *Enable SMEs to take part in closed-loop supply chain activities of collecting, processing and selling industrial recyclable materials via a marketplace while using governance rules and smart contracting*

Included user story: As an SME owner, I want an easy way to collect recyclable material in order to reduce costs and optimise resources.

Included user story: As a Production manager, I want to monitor and optimise the processing of recyclable materials in order to sell energy and other derivates on demand.

1.5 Activity Diagrams

Activity diagrams are graphical representations of interrelated activities and actions that can be performed by one or more entities. Activity diagrams are usually drawn in Unified Modelling Language (UML) to model both computational and organisational processes as well as data flows. Activity diagrams are also used to show flow of control between different activities.

In the documentation of embedded pilot requirements, the activity diagrams are used to elaborate the flow of control and data between different actors or activities that are described in the respective user story.

- Existing functionality/software at user premises (green)
- Needed functionality from EFPF (red)
- Manual activity (black)

As an example:

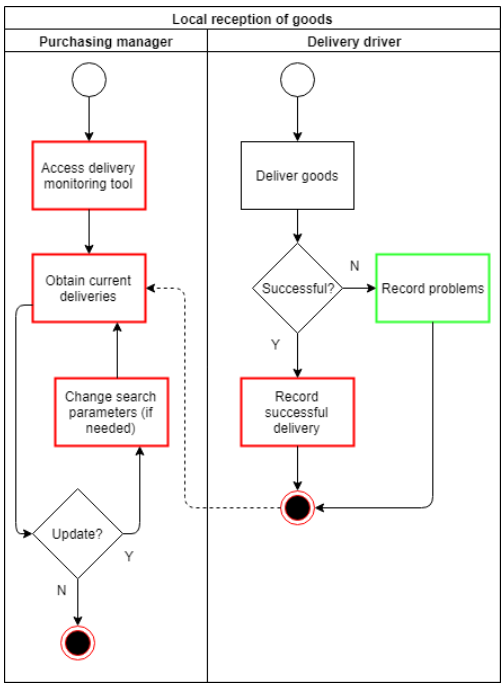


Figure 1: Example of an activity diagram

1.6 MoSCoW Method for Requirements Prioritisation

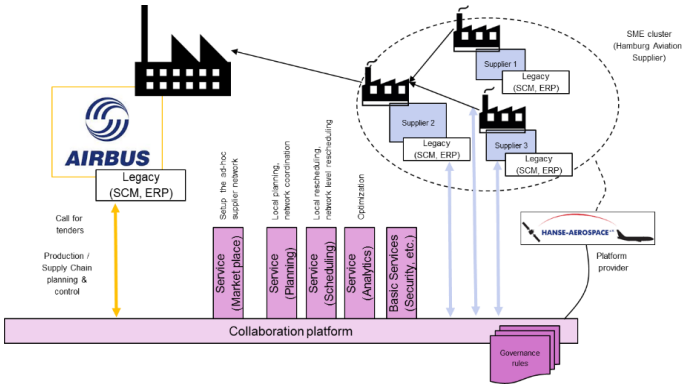
The MoSCoW method is a prioritisation technique used in software development to reach a common understanding with stakeholders on the importance of each requirement. In the EFPF project, MoSCoW method is used to prioritise the user stories for implementation activities based on the following priorities:

- **Must:** User stories marked as *Must* are critical for the pilot partners and also critical to highlight the value-proposition of EFPF. They represent the user's highest priority that development teams have to fulfil.
- **Should:** User stories marked as *Should* are highly important but that not critical for the pilot partners. They highlight the need for EFPF to fulfil, so that development teams channel their efforts also into these.
- **Could:** User stories marked as *Could* are considered 'borderline'. If there are resources left (time, effort, budget, etc.) then these will be addressed by development teams.
- **Would:** User stories marked as *Would* seldom get implemented in the current project as they represent the user stories with the lowest priority according to pilot partners. These will be addressed if in a new iteration of requirements elicitation, they are ranked with a higher priority.

As this deliverable describes the requirements captured from the pilot partners in the EFPF project, the next step towards the analysis of gathered requirements is to perform MoSCoW based prioritisation of the requirements – in Section 5. Further on, the prioritised requirements will be passed on to the technical development teams for the actual solution development.

It is foreseen that the development will be scrum-based for EFPF platform and Data Spine. Development teams will pick up user stories based on the priority set up by the MoSCoW method. In this respect, the user stories marked as *Must* and *Should* will be selected and implemented first.

2 Aerospace Pilot



In the aerospace manufacturing sector, highly customised products such as commercial aircraft, often require very specific solutions developed and provided by small but innovative high-tech companies. The customer demands, e.g. for novel cabin features, must be developed and produced in very short time with close collaboration of OEMs and high-tech SMEs. This typically requires, an ad-hoc production / supply network and currently this is best served via a local cluster around the OEM. As soon as the parties are geographically separated, the OEM and the innovative SMEs (organised in industrial clusters), need ICT solutions (technical platform, novel governance approaches, coordination tools and services) to simplify the ad-hoc setup and management of collaborative production in the agile network and to manage the IPR, etc.

The Aerospace Pilot in the EFPF project addresses the ad-hoc setup of a production network involving Airbus Hamburg and local SME suppliers represented by the Hanse-Aerospace (HAW) association. This pilot focuses on realising two high-level scenarios:

- OEMs like Airbus is interested in rapidly integrating SME innovations into existing aircraft programs and building agile supply chains. Existing Airbus tools and platforms need complementary solutions for integrating SMEs directly in the supply chain. These solutions, such as tender decomposition, match-making, team building and smart contracting, can be provided by the EFPF platform
- SME clusters like Hanse-Aerospace and its member companies expect mature digital manufacturing tools for supporting agile collaborations between SMEs, shop-floor connectivity and data analysis. EFPF can provide a unified interface to distributed tools to address the diverse digitalisation needs of SMEs in the aerospace sector

An overview of Aerospace Pilot stakeholders and expected outcomes is provided in the following table:

Classification Type	Pilot: “Ad-hoc Supplier Network in the Aviation Domain”
Problem description	• Setup and management of complex supply chains in the aviation domain, involving local SMEs organised in industrial clusters for lot-size-one products e.g. aircraft • Ad-hoc collaborations within a local SME network using a technology platform that facilitates visibility of distributed activities through the adoption of smart factory solutions
End users	A-D, WOM, IAI, AAM, 3DI
End user type	OEM, SMEs
Product type	Highly customised aircraft modules

2.1 User Roles

The user roles defined in the Aerospace Pilot include:

- **Purchasing manager/ Procurement Manager/ (Strategic) Buyer /Ordering Officer**: These roles belong to the purchasing department in a manufacturing company and are involved in purchasing processes
- **Sales Engineer/ Sales Manager/ Director Sales:** These roles belong to the sales department of a manufacturing company and are responsible for product sales related decision making
- **Engineer (Design/ Product/ Qualification etc.)**: This role belongs to the Engineering Department and is involved in the product design and development phases
- **Project Manager/ Project Leader:** This role belongs to the Project Management Department and is responsible for the management of running (e.g. production) projects
- **HR Manager/ Personnel Officer:** This role belongs to the HR Department and is involved in the recruitment and human resource management activities
- **Marketing Manager:** This role belongs to the Marketing Department and is responsible for company and product marketing activities
- **Customer Service Manager/ Customer Support Manager:** This role belongs to the Customer Service Department and is responsible for the customer support, service and relationship management

2.2 Epic 01: SMEs Sant to Sell Products or Services (non-complex, built-to-print) by Using B2B Catalogues

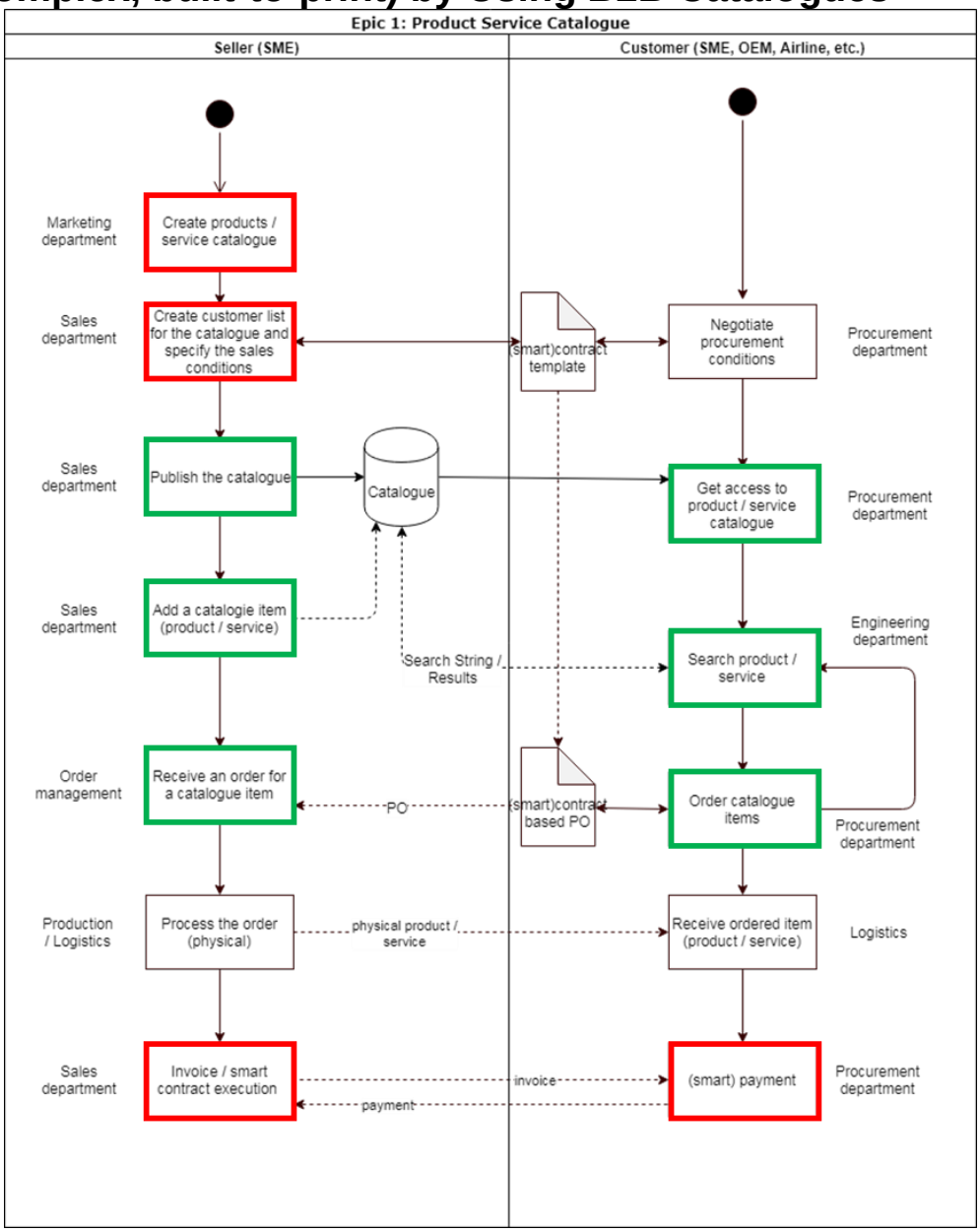


Figure 2: Activity diagram showing issue of Epic 01

2.2.1 User story: Place products and services in catalogue and offer them to a predefined user group

As staff working for the sales or marketing department, I aim to place our products and services in a catalogue, so that potential customers (predefined user group like A/C OEM, Airlines, MRO, 1st-tier suppliers) can search for them easily, which leads to a better visibility of our capabilities to the respective customer groups.

Acceptance Criteria:

- Ability to place products and services with applicable detailing descriptions as well as other specific information (lead-time, purchase conditions etc.) in the form of a catalogue
- Ability to search for different products and services, presented in predefined categories

- Ability to include or exclude certain customers/suppliers for the products and services (white list/black list)
- Ability to take into account lead-times and price ranges when searching for products and services
- Ability to receive (supplier) / provide (customer) more information of the project standing behind the search of the specific products and services
- Ability to get contact details or the possibility to get into contact with potential partner companies
- Ability to provide legal framework as contractual basis for potential partners (e.g. initiate smart contract as an option)
- Ability to provide information for customer directly out of factory connector (e.g. spare part status ("in production"/"Under quality review"/"Ready to ship" or similar)
- Ability to perform all order related communications (order administration/payment etc.) via EFPF based on ATA Spec2000 standard
- Ability to track and trace shipment

2.2.2 User story: Define a product / service catalogue

As a Marketing Manager, I want to define catalogues for the products and services of my company so that those products / services can be offered to selected customers (companies).

Acceptance criteria:

- Products / services can be listed in catalogues and those catalogues can be linked to selected customers

2.2.3 User story: Create product / service catalogues for customers and specify sales conditions

As a Sales Manager, I want to create the B2B catalogue for specific customers and specify the sales conditions (prices, delivery terms and conditions, etc.) so that items (products / services) in the catalogue are offered to selected customers (companies) with those specified sales conditions (prices, etc.) negotiated in (smart) contract templates.

Acceptance criteria:

- B2B catalogue for dedicated customers can be created and contract terms and the (smart) contract template can be specified

2.2.4 User story: Finding suppliers for specific products and services on an ad-hoc basis

As staff working for the purchasing, engineering or project management department, I aim to find partners for a variety of specific products and services, so that my company has the full overall view of available suppliers on the market without the need of huge research efforts, to be able to work with the best products (price/lead-time/quality) and suppliers (reliability/communication/quality).

Acceptance Criteria:

- Ability to search for suitable products and services on an ad-hoc-basis based on a rating system taking into account parameters like delivery reliability/quality and several other ones. Outcome: Supplier having the correct expertise, experience, required quality standards, certificates, and the capacity for successful collaboration
- Ability to get contact details or the possibility to send invitations to potential suppliers

2.3 Epic 02: SME Want to Sell Spare Parts via B2B Catalogues Using either Smart or Performance-based Contracts for Automated Order Processing, Invoicing etc

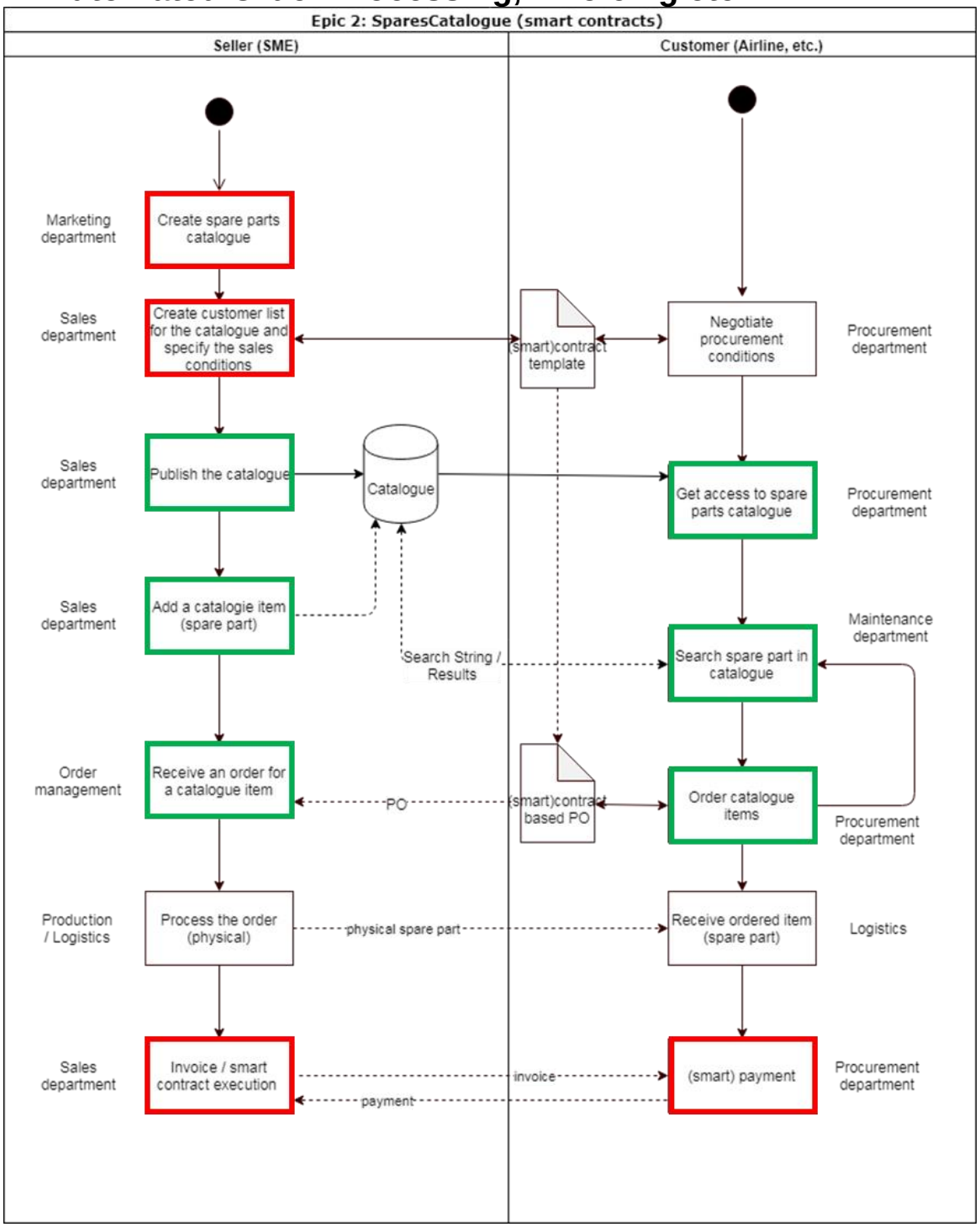


Figure 3: Activity diagram of Epic 02 using smart contracts

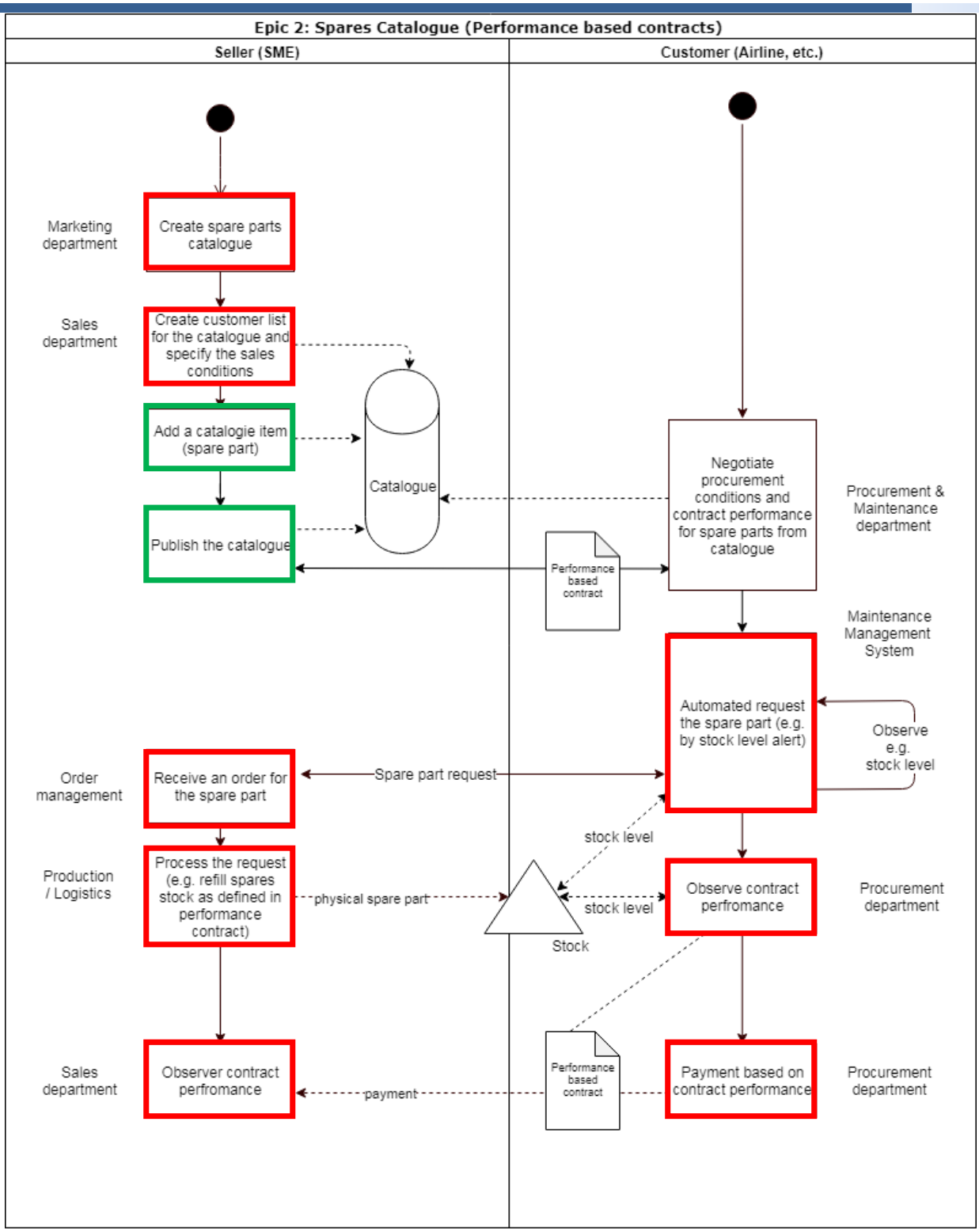


Figure 4: Activity diagram of Epic 02 using performance-based contracts

2.3.1 User story: Place spare parts in catalogue and offer them to a predefined user group

As staff working for the sales or marketing department, I aim to place relevant spare parts in a catalogue, so that potential customers (predefined user group like A/C OEM, Airlines, MRO, 1st-tier suppliers) can search for them easily to find the relevant supplier.

Acceptance Criteria:

- Ability to place spare parts with applicable detailing descriptions as well as other specific information (lead time, purchase conditions etc.) in the form of a catalogue.
- Ability to search for different spare parts, presented in predefined categories
- Ability to include/exclude (white/black list) certain customers/suppliers for spare parts
- Ability to take into account lead times and price ranges when searching
- Ability to receive (supplier) / provide (customer) more information of the project standing behind the search of the specific spare part
- Ability to provide legal framework as contractual basis for potential partners (e.g. framework contracts with service levels regarding reaction time, availability, performance, quality etc.)
- Ability to provide information for customer directly out of factory connector (e.g. spare part status (in production, under quality review, ready to ship, or similar)
- Ability to perform all order related communications (order administration/payment etc.) via EFPF based on ATA Spec2000 standard
- Ability to track and trace shipment

2.4 Epic 03: Multiple SMEs Want to Use Scaling Effects by Pooling their Procurement Needs and Joint Orders of Supply using B2B Catalogues and Digital Platforms

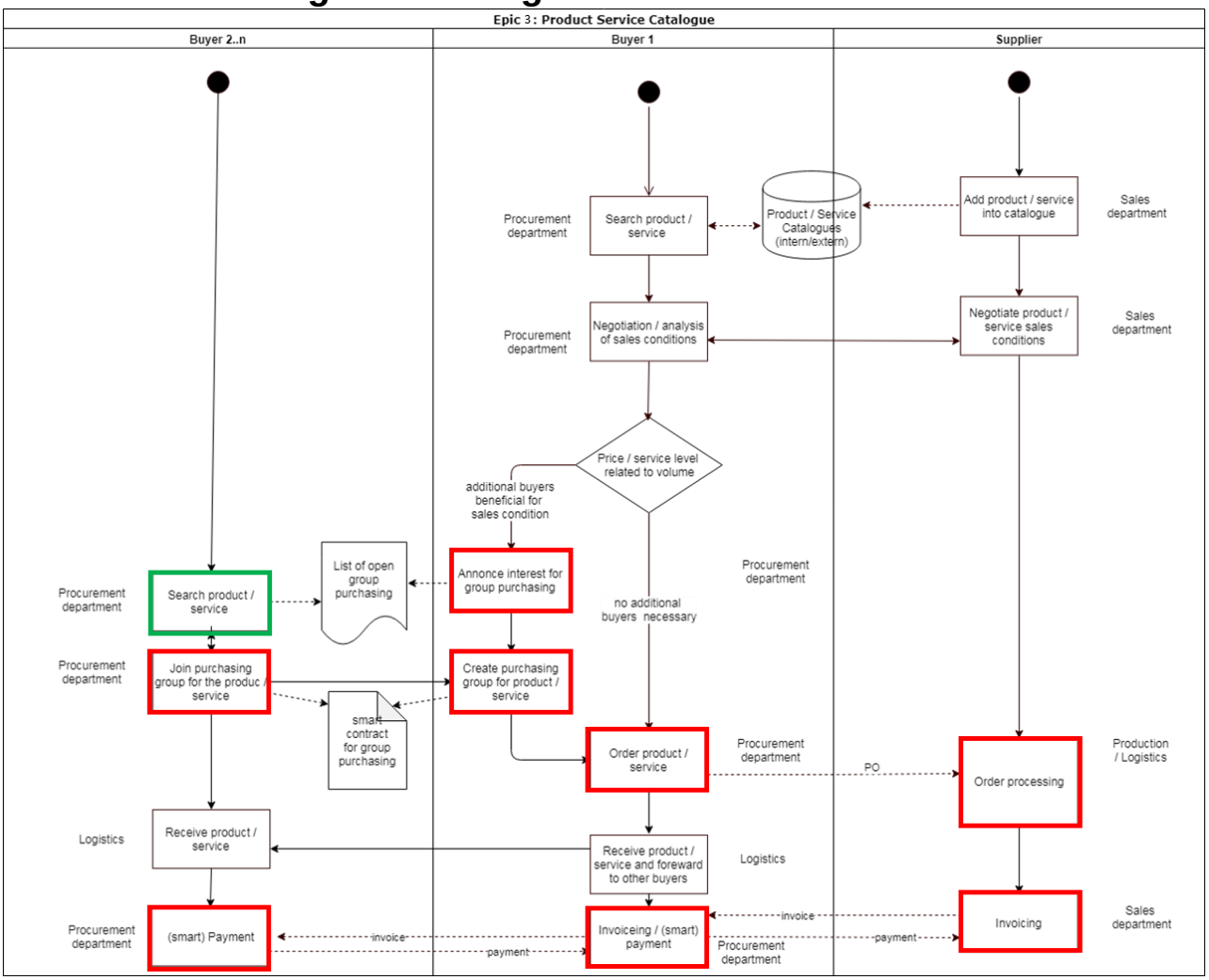


Figure 5: Activity diagram for Epic 03

2.4.1 User story: Find partners for joint purchase of consumables

As staff working for the purchasing department, I aim to find partners for joint purchase of consumables, so that potential savings are identified and lower purchasing prices secure the competitive position with long lasting perspective.

Acceptance Criteria:

- Ability to search for different consumables providers
- Ability to search for consumables also taking into account needed quantities (e.g. via internal or external catalogues). Outcome: Partner companies needing same consumables for similar time periods
- Ability to provide possibility to search also time-related (when do the materials and products have to be physically available at respective company facility)
- Ability to get contact details or the possibility to get into contact with potential partner companies (send invitation)
- Ability to provide legal framework as contractual basis for potential partners and the possibility to initiate smart contract and joint order
- Ability to perform all order related communications (order administration/payment etc.) via EFPF based on ATA Spec2000 standard

2.4.2 User story: Finding partners for joint purchase of (raw) materials and products with high MOQ

As staff working for the purchasing department, I aim to find partners for joint purchase of (raw) materials and products with high MOQ, so that my company is able to get into market with competitive pricing also from the lot size one perspective.

Acceptance Criteria:

- Ability to search for different (raw) material and products providers
- Ability to search for (raw) material and products also taking into account needed quantities (e.g. via internal or external catalogues). Outcome: Partner companies needing same (raw) materials and products for similar time periods
- Ability to provide possibility to search also time-related (when do the materials and products have to be physically available at respective company facility)
- Ability to get contact details or the possibility to get into contact with potential partner companies (send invitations)
- Ability to provide legal framework as contractual basis for potential partners and the possibility to initiate smart contract and joint order
- Ability to perform all order related communications (order administration/payment etc.) via EFPF based on ATA Spec2000 standard
- Ability to track and trace shipment

2.4.3 User story: Place tender also for 1st suppliers and downwards

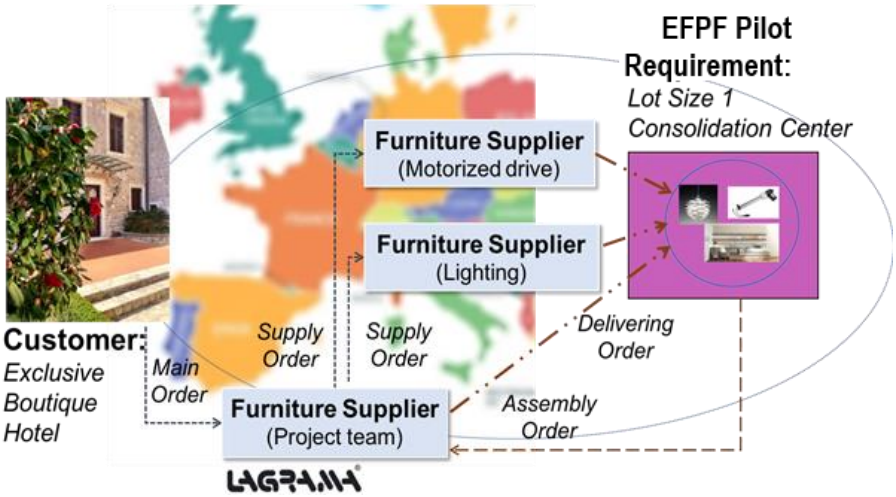
As staff working for the purchasing or engineering department, I aim to have only one portal available to place tenders for my sub-suppliers for specific products and services, so that I can get quotations in an efficient way that also allows automatic comparison of the relevant quotations taking into account different provided frame conditions of the suppliers.

Acceptance Criteria:

- Ability to search for suppliers with specific products and services

- Ability to place a tender with all relevant information (kind of product/service with detailed description/ timeline/conditions of purchase/deadline for quotation etc.) taking into account a defined “receiving” group of companies
- Ability to be contacted for queries from the suppliers
- Ability to receive quotations for the needed product and services

3 Furniture Pilot



The need to find new customer segments in order to increase turnover is pushing furniture manufacturers to diversify both production systems and supply chains. The traditional clients of the Home Furnishing segment, who buy from a catalogue with different options to personalise the furniture, coexist with new clients from the Contract segment (hotels, offices, …) that demand an integral service of furnishing and decoration. Sometimes this service is provided entirely by a third party (decorator, interior designer) and sometimes it must be provided by the furniture manufacturer who accepts the order.

This new form of business requires substantial modification of "traditional" supply chains, since now, it must be the furniture manufacturer that seeks other suppliers of functional or decorative elements (e.g. lighting and textiles), or someone in charge of the complete installation of the project. The production process is also affected, since in this case it is oriented towards the manufacture of unique products that deviate from the company's catalogue. These unique products are manufactured in unit-sized lots, customized for a specific project.

The furniture manufacturing pilot in the EFPF project, envisions the creation of a *Lot Size 1 Consolidation Center* to control small scale stocking and consolidation points for large manufacturers, such as LAGRAMA. For LAGRAMA, the supply network of products that are not manufactured in the company (lighting, textiles, etc.) is defined from scratch for each customer order. This need for establishing an agile network of collaborators (or connected factories) in the Furniture Manufacturing sector require advance tools. These tools range from facilitating search, selection and evaluation of suppliers, monitoring of distributed manufacturing processes, coordination of deliveries, and planning of both internal and external activities as well as new business models for collaborative manufacturing.

In this respect, this pilot focuses on LAGRAMA as a large manufacturer/supplier and responsible for receiving and realising customer orders and for coordination of various suppliers. The pilot scenario is about LAGRAMA receiving an order for the furnishing and decoration of five rooms of a small thematic hotel, each of them inspired by different decorative concepts. Such a business concept is typically known as a Boutique Hotel and is in a growing demand at the furniture marketplace. LAGRAMA is expected to manufacture all furniture for each room (beds, bedside tables, wardrobe, bathroom furniture, etc.) and supply and coordinate the installation of the other elements required in each room (lighting, bedding, curtains, carpets and decoration objects). A *Lot-Size-1 Consolidation Center* is envisioned at LAGRAMA or near the installation point.

EFPF is expected to improve the efficiency of supply chain creation and operations based on the provisioning of digital tools and secure information exchange channels. In particular, the EFPF platform will facilitate the selection of the appropriate suppliers, the coordination of the production and service phases between suppliers from different countries, and the monitoring of the execution of the entire project. A key consideration will be to make visible

both the internal productive phases of LAGRAMA as well as those of the suppliers. This will aid transparency in the supply chain and identify potential problems related to compliance with manufacturing, delivery or installation dates.

	Pilot: "Lot size 1 Furniture Manufacturing for a Boutique Hotel"
Problem description	• "Boutique" Hotel Supply chain selection: Management of a complete decoration and manufacturing project for furnishing unique thematic rooms in an exclusive hotel that involves the participation of a supply network, with local SMEs as well as from other countries • Lot-Size-1 Consolidation Center: Coordination of the manufacture of furniture for lot size-1 projects in LAGRAMA, involving the local supply network of the company composed of various SMEs controlled via the Lot-Size-1 Consolidation Center
End user	LAGRAMA / local suppliers / international suppliers / SMEs
End user type	SMEs
Product type	Highly customised rooms, involving different type of products

3.1 User Roles

The following user roles are defined to elaborate the user stories in this pilot:

- **Managing director**: Head of the company and highest figure of authority and decision making. There is only one person with this role in the company. Potential bottleneck or delays if this person is not available for continuing any active process.
- **Production manager**: This role is in charge of the internal and outsourced manufacturing processes of the company. This role is responsible for managing the materials and components as well as the involved resources in order to achieve an efficient production.
- **Sales manager**: This role defines the sales objectives and plans and organises the activities of a sales team according to an agreed budget, evaluating the achievements made by the commercial agents.
- **Purchasing manager**: This role is responsible for buying or approving the acquisition of goods and services required for the manufacturing processes and other activities in the company at competitive prices.
- **System administrator**: This role defines the management of the internal systems of LAGRAMA. This is also in charge of any integration task with external systems.

Additionally, the following abbreviations are used are used in activity diagrams.

- **LAG**: LAGRAMA as furniture manufacturer
- **PAR**: Partner in the collaboration, which can be manufacturer or service provider
- **SUP**: Supplier of materials or components or service provider
- **DEL_PRO**: Provider of logistics services, mainly transportation
- **CUS**: End customer of LAGRAMA, such a store or retailer

3.2 Epic 04: Search for Products, Services or Supply Partners to Meet Production Objectives

3.2.1 User story: Send and receive orders

As a Production manager, I want to send orders to suppliers and receive orders from customers so that I can improve the efficiency of the supply process

Acceptance criteria:

- Mechanisms to send/receive orders
- Availability to track the status of both received and sent orders

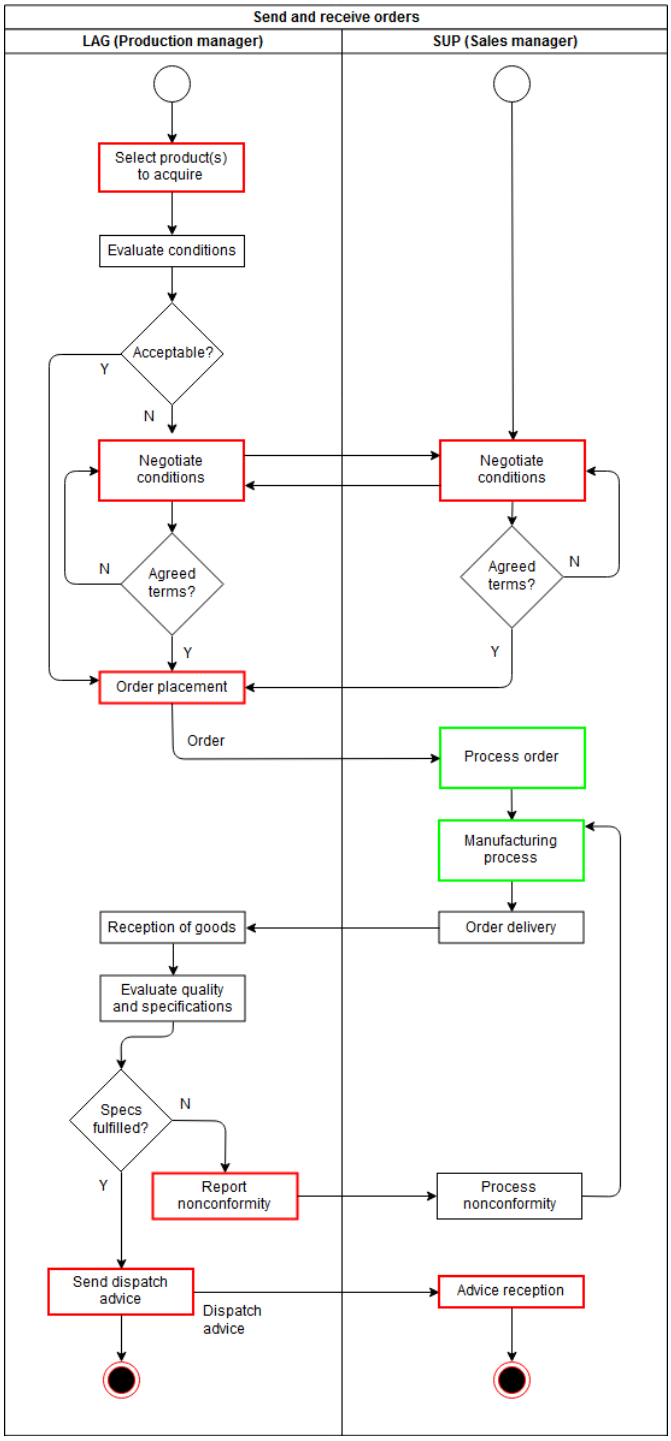


Figure 6: Activity diagram of showing flow of activities in send and receive orders

3.2.2 User story: Search of products and services

As a Purchasing manager, I want to search for particular products and services so that I can define a specific supply chain for the production of particular goods

Acceptance criteria:

- Search mechanisms available in the platform to get a collection of products and services according to criteria
- Availability of text-based search and search by exploring the different categories of products and services available in the platform
- Mechanisms to filter the retrieved collection of products by specific properties (i.e.: price, colour, etc.)

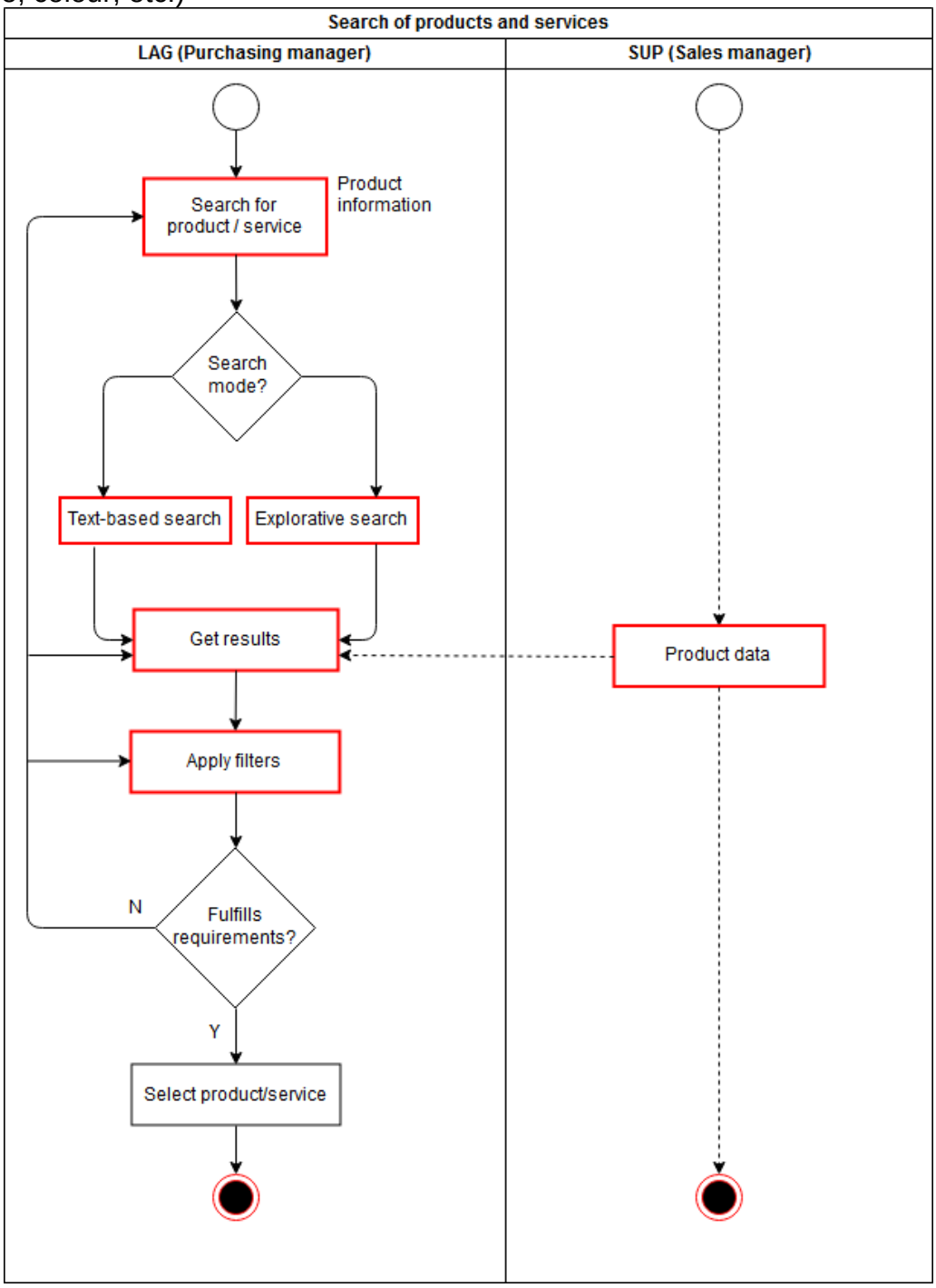


Figure 7: Activity diagram of showing flow of activities in search of products and services

3.2.3 User story: Request for quotation of customised product

As a Purchasing manager, I want to send requests for quotation of customised product so that I can evaluate the adequacy of the parties to be involved in the supply chain

Acceptance criteria:

- Mechanisms to send a request for quotation (RFQ) to other members of the platform indicating the particular product or service, quantity and particular considerations through the platform
- Reception of response of the RFQ indicating the quotation and particular considerations from the supplier party
- Grouping capabilities in order to have a clear and maintainable tracking of the RFQ processes carried out through the platform

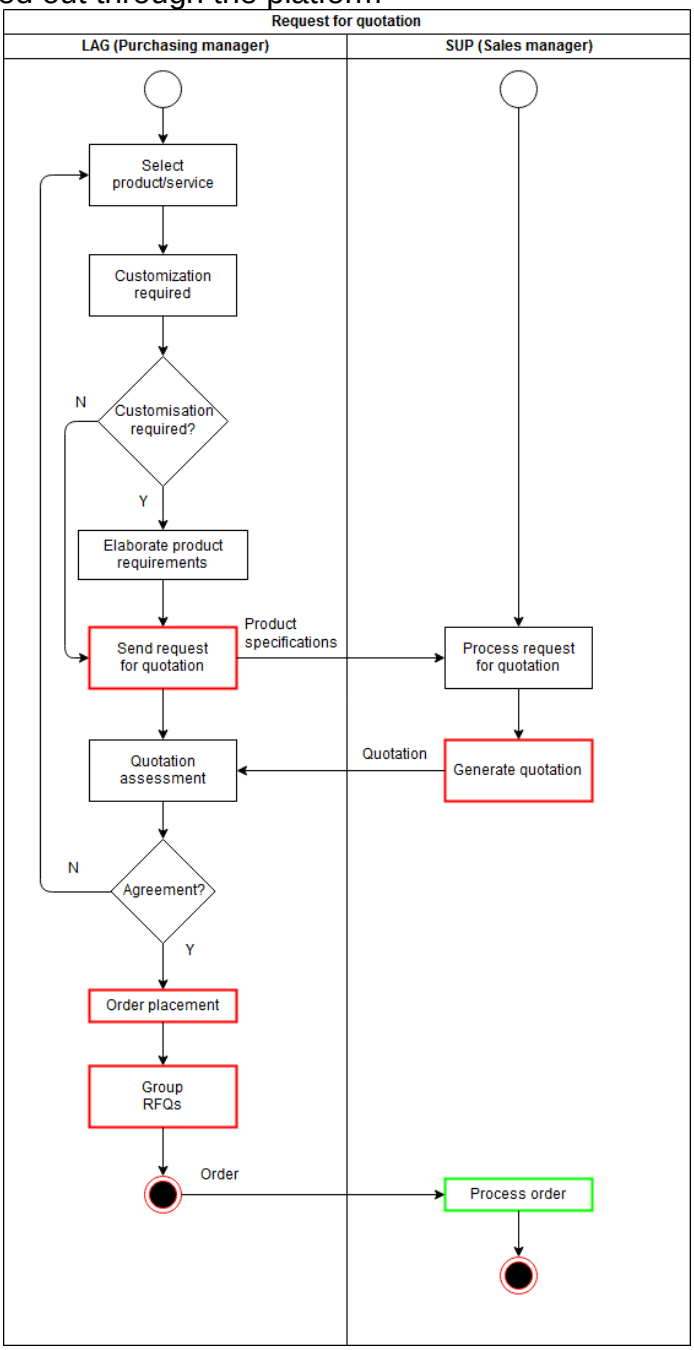


Figure 8: Activity diagram of showing flow of activities in request for quotation

3.2.4 User story: Exchange product catalogue

As a Sales manager, I want to exchange catalogues of products and services with other members of the platform so that I can detect opportunities to improve the configuration of the supply chain

Acceptance criteria:

- Capability to share information of products and services with other companies as well as obtain catalogue information from other parties
- The deletion of products is implicitly considered as an update of the catalogue data

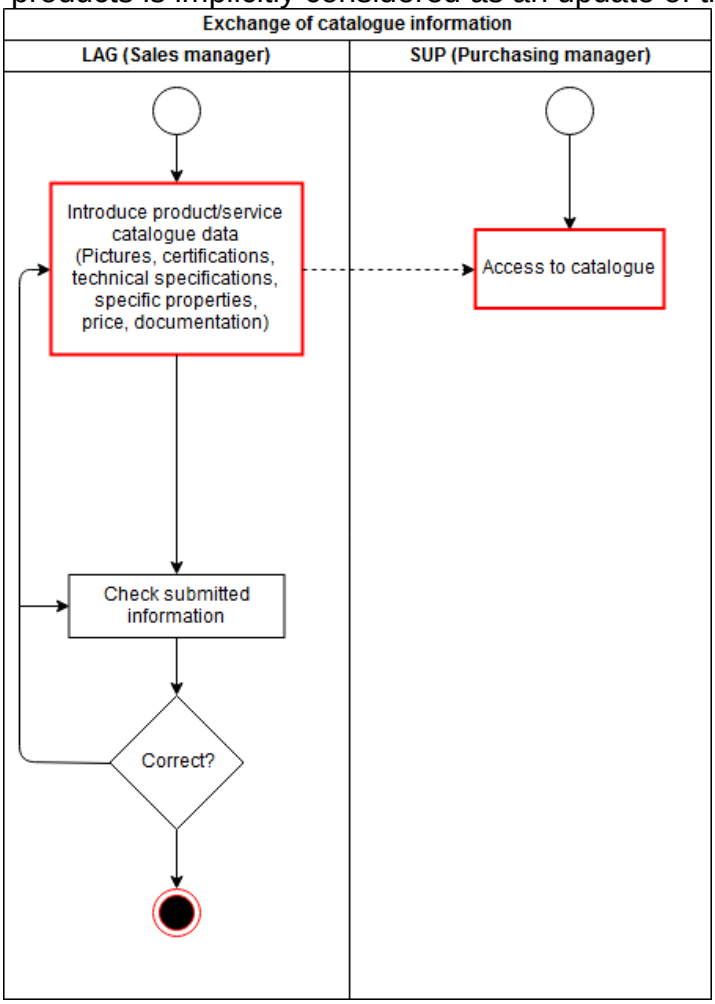


Figure 9: Activity diagram of showing flow of activities in exchange product catalogue

3.2.5 User story: Customer analytics

As a Sales manager or Production manager, I want to condense more information of my customers so that I can arrange more business relationships with them

Acceptance criteria:

- A repository of customer's information
- Analytics of relationships established with these customers through the platform, such as negotiations, information requests, accepted and rejected tender bids, etc.

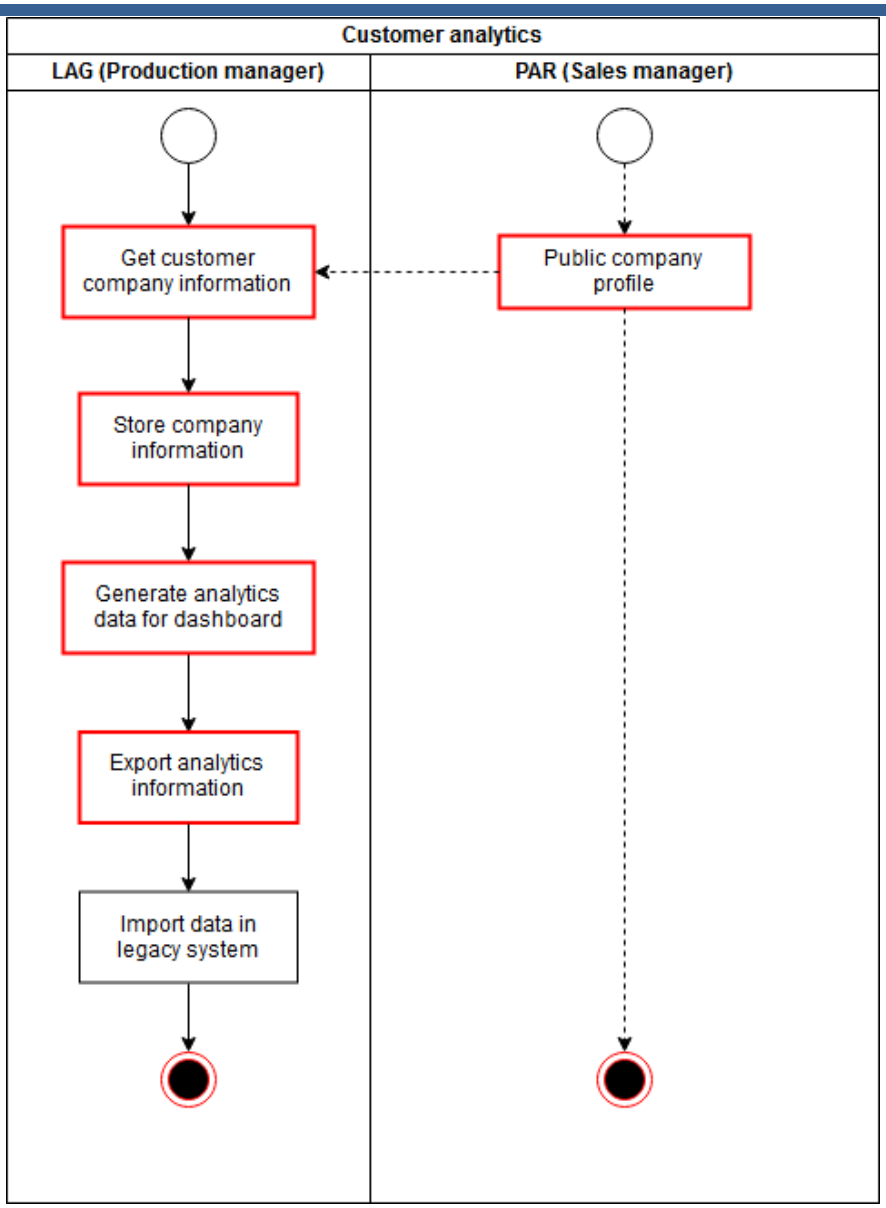


Figure 10: Activity diagram of showing flow of activities in customer analytics

3.3 Epic 05: Publish Tenders and Special Supply Requests Inviting Groups of Companies to Participate

3.3.1 User story: Invitation to join collaboration platform

As a Production manager, I want to manage my contacts in an organised manner so that selected companies could be invited to participate in a particular supply chain

Acceptance criteria:

- A list of available contacts
- Select and invite companies to take part in a supply chain

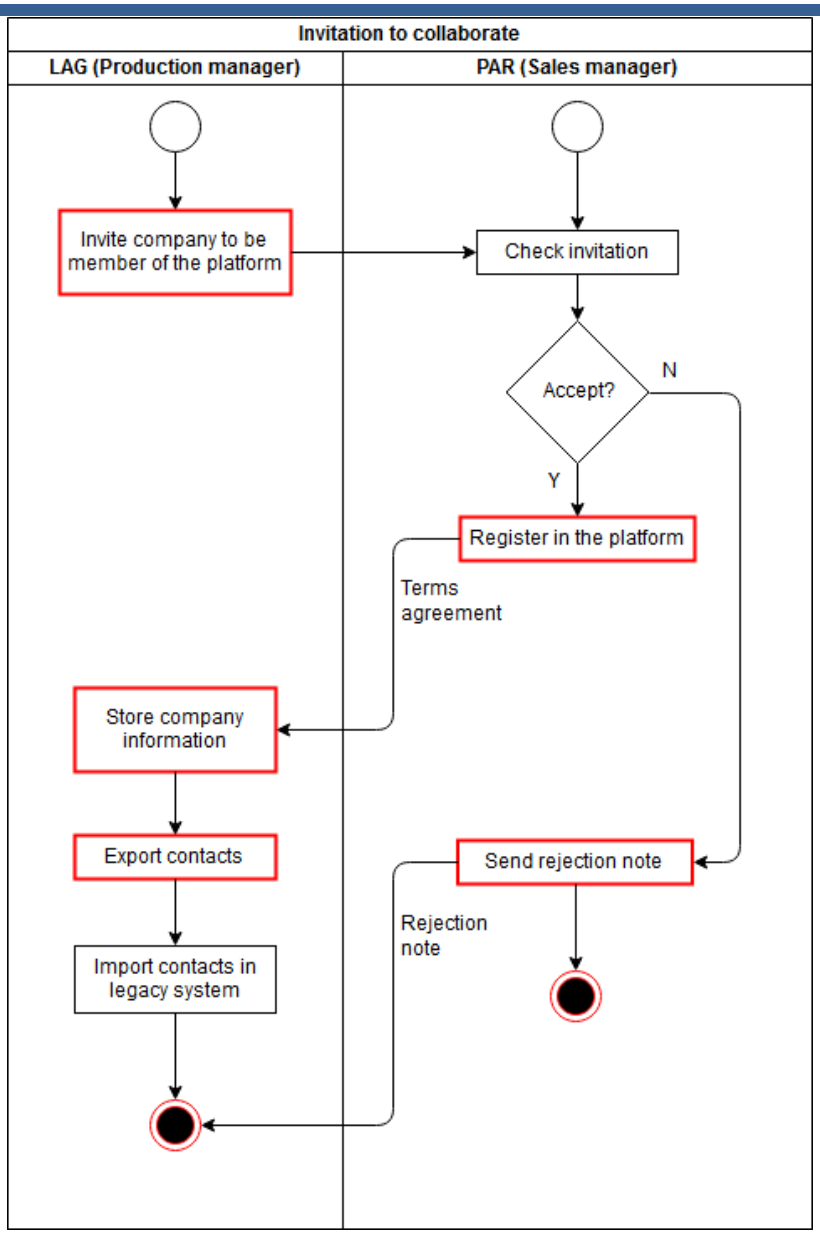


Figure 11: Activity diagram of showing flow of activities in invitation to collaborate

3.3.2 User story: Tender publication and tender bid assessment

As a Purchasing manager, I want to publish a tender so that I can get proposals for covering the supply of the different product parts

Acceptance criteria:

- Publication of a supply tender with detailed information
- Invitation to companies to participate in a tender
- Mechanisms to obtain a detailed description of supplies (i.e.: raw materials, components, substances) provided by the suppliers to assess its level of quality
- Arrangement a reverse auction to catch the best applicants for the required element in terms of quality-price ratio
- A transparent environment where every applicant can be aware of the basic information of the bids (i.e.: price and delivery time) submitted by other members in the auction

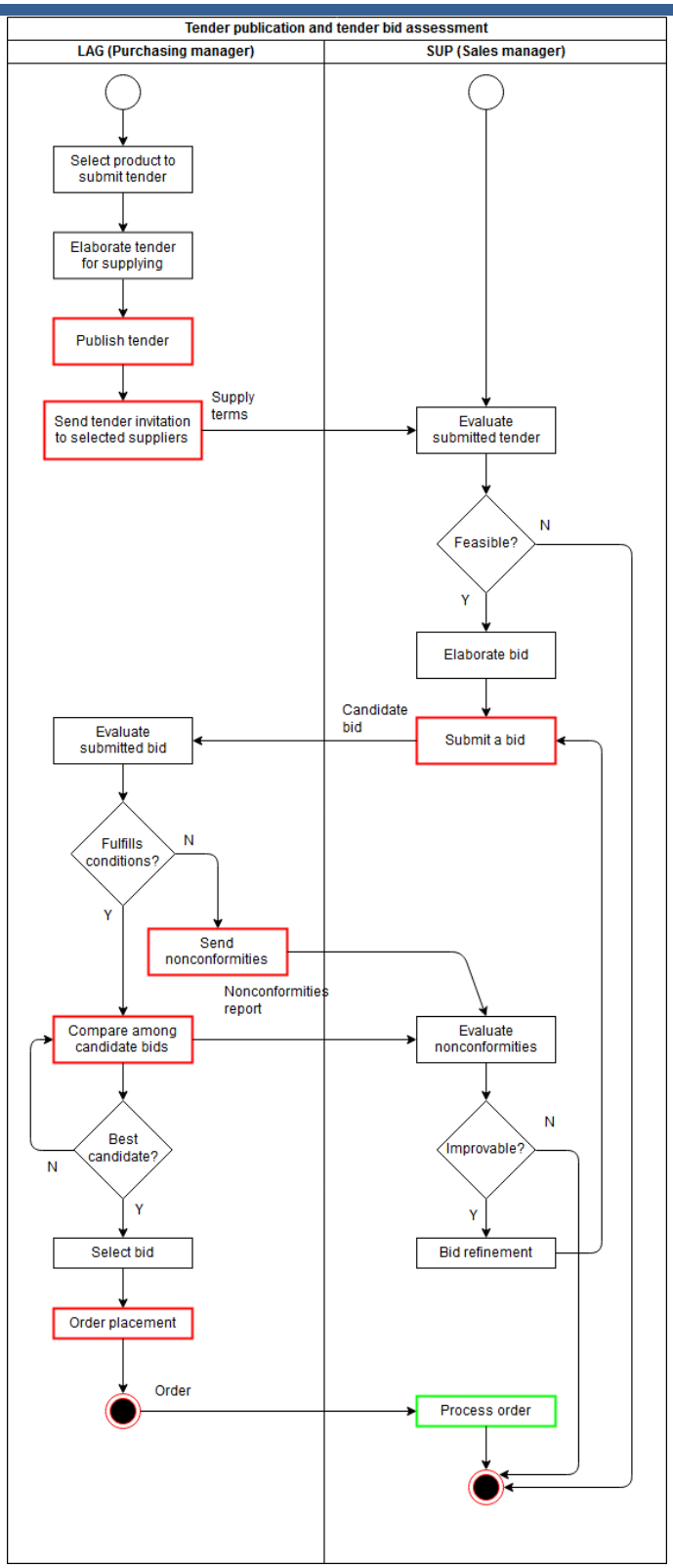


Figure 12: Activity diagram of showing flow of activities in tender publication and tender bid assessment

3.3.3 User story: Product request

As a Purchasing manager, I want to publish a product demand so that I can get product offers that fulfil the expected technical and quality requirements

Acceptance criteria:

- Mechanisms to publish a product request with detailed information in order to get information about companies able to offer supplies (i.e.: raw materials, components, substances) that can fulfil that product.

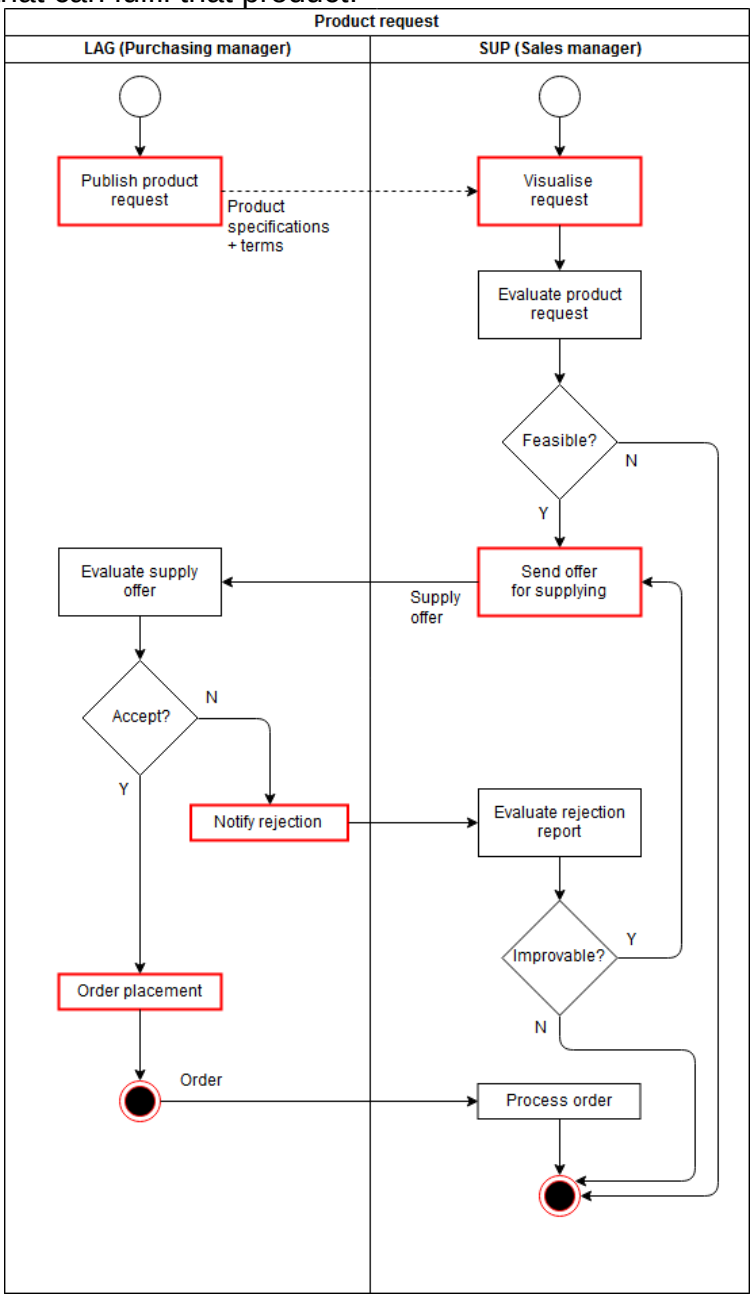


Figure 13: Activity diagram of showing flow of activities in product request

3.4 Epic 06: Monitor Production Processes in Order to Get a Schedule for Planning Activities and Take Appropriate Corrective Actions of Incidences if Unexpected Events Occur

3.4.1 User story: Production optimisation

As a Production manager, I want to speed up the production so that I can reduce the time to serve the customer

Acceptance criteria:

- Mechanisms available to configure and optimise production processes and the supply chain in order to improve its performance

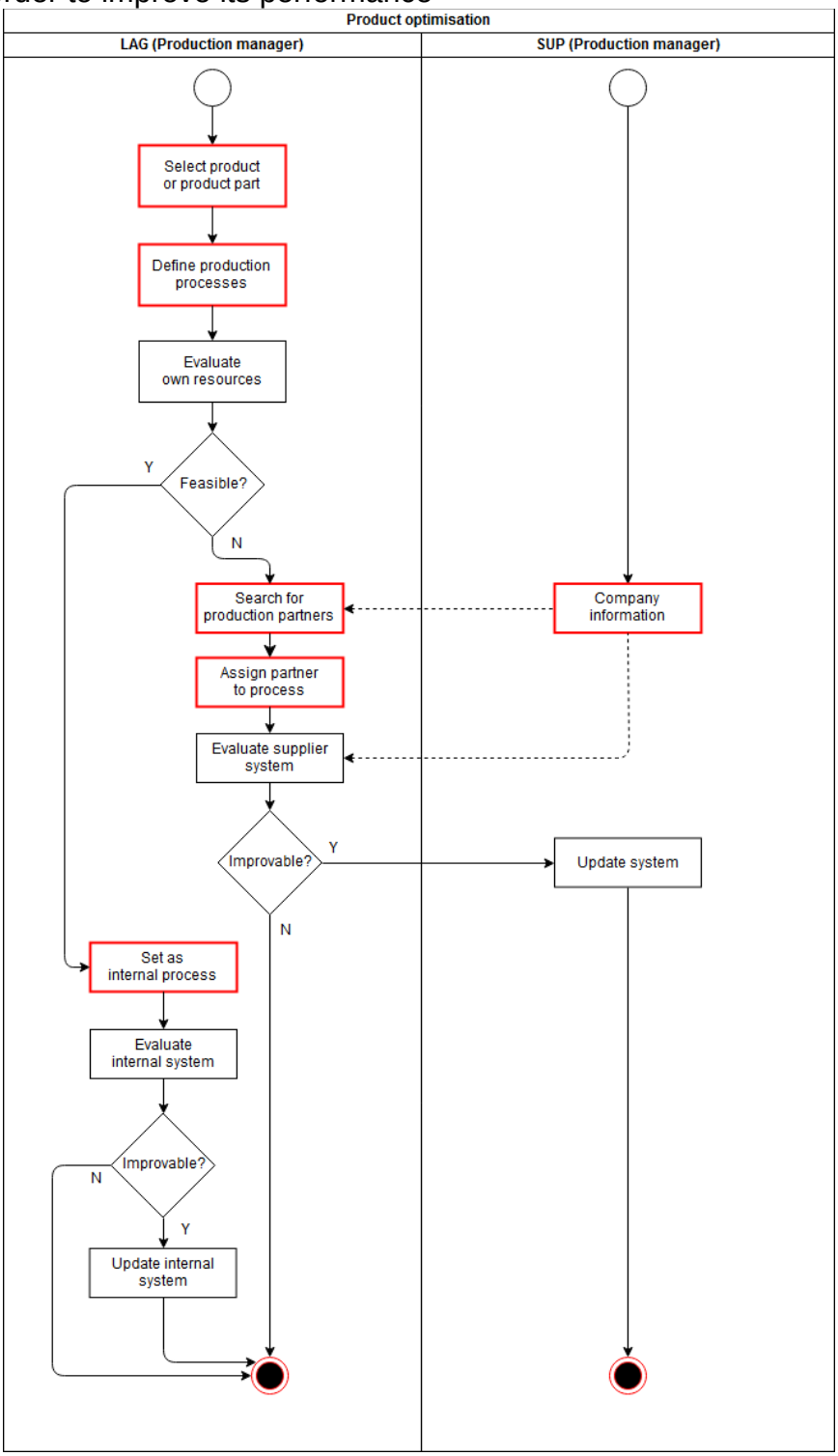


Figure 14: Activity diagram of showing flow of activities in product optimisation

3.4.2 User story: Production process monitoring in a supply chain

As a Sales, Production or Purchasing manager, I want to monitor the production process of goods I have requested so that I can detect problems during production and can keep a history for future reference

Acceptance criteria:

- Live visualisation at a glance of the production process
- Warnings to the subscribed users if some eventuality (problem or similar) is detected
- A log of the whole production process available

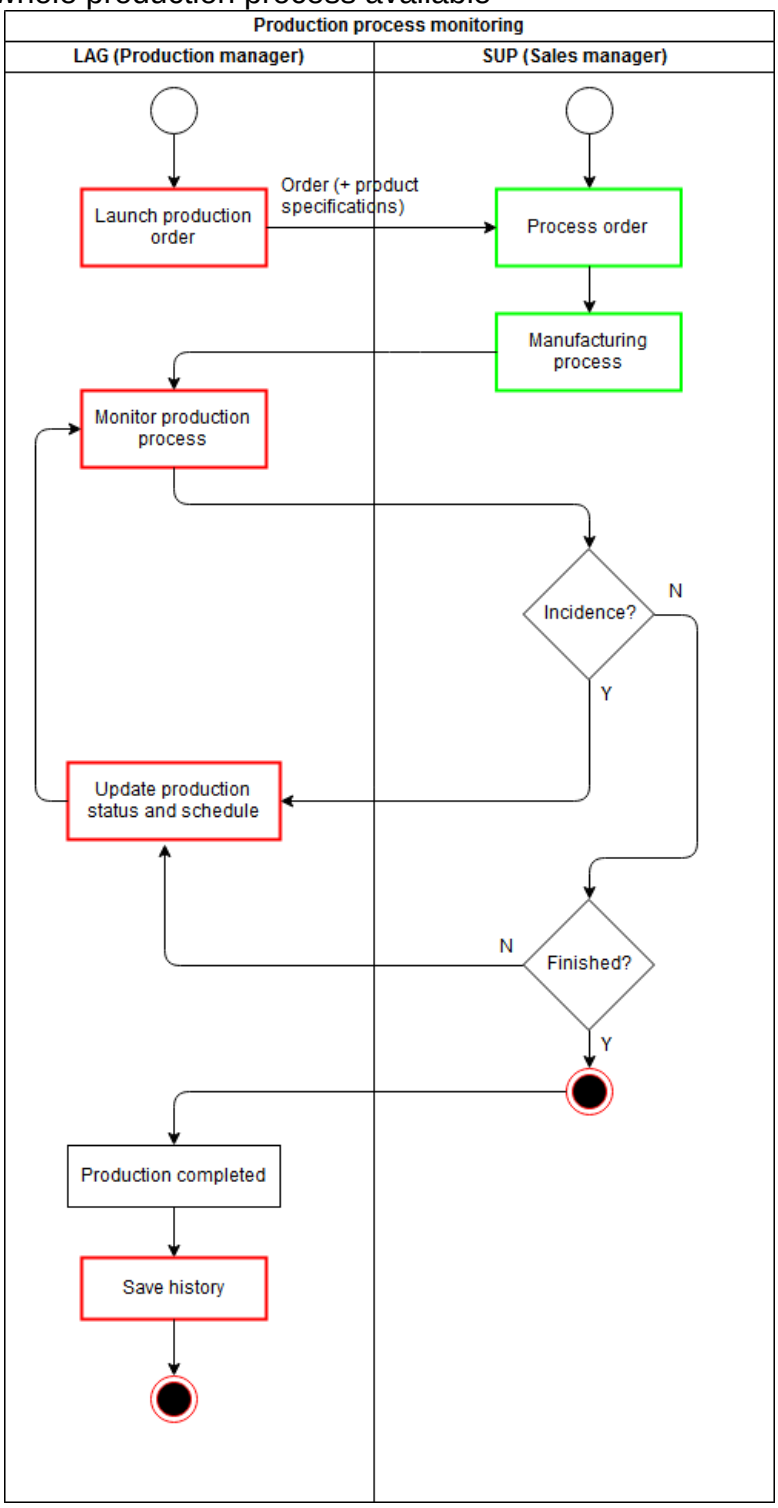


Figure 15: Activity diagram of showing flow of activities in production process monitoring

3.4.3 User story: High-level production overview

As a Managing director, I want to have a high-level overview of the enterprise processes so that I can get general information about production and delivery processes avoiding details

Acceptance criteria:

- Overview picture of the processes carried out by the company, such as production and delivery processes
- This user story is focused on the internal production processes in LAGRAMA

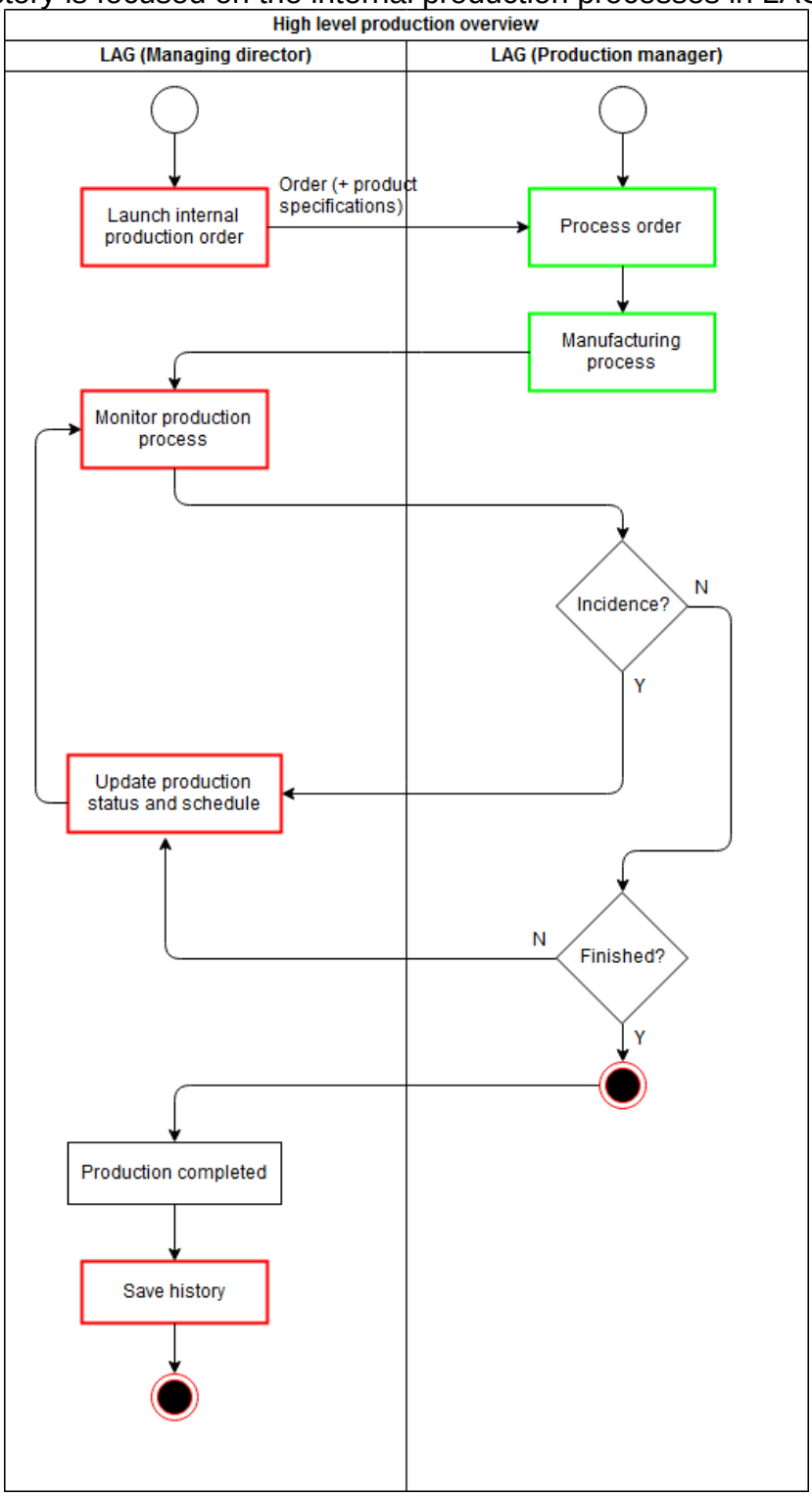


Figure 16: Activity diagram of showing flow of activities in high-level production overview

3.5 Epic 07: Monitor Delivery Processes both Incoming and Outgoing in Order to Get a Schedule of Activities and Take

Appropriate Corrective Actions of Incidences if Unexpected Events Occur

3.5.1 User story: Delivery process monitoring

As a Sales manager, I want to monitor the delivery process of the produced goods all the way to the customer so that I can detect problems during delivery and customer reception while keeping a history for future reference

Acceptance criteria:

- Live visualisation at a glance of the delivery process
- Warnings to the subscribed users if some eventuality (problems or similar) is detected
- Mechanisms to get a confirmation of a success reception at the customer side
- A log of the whole delivery process available

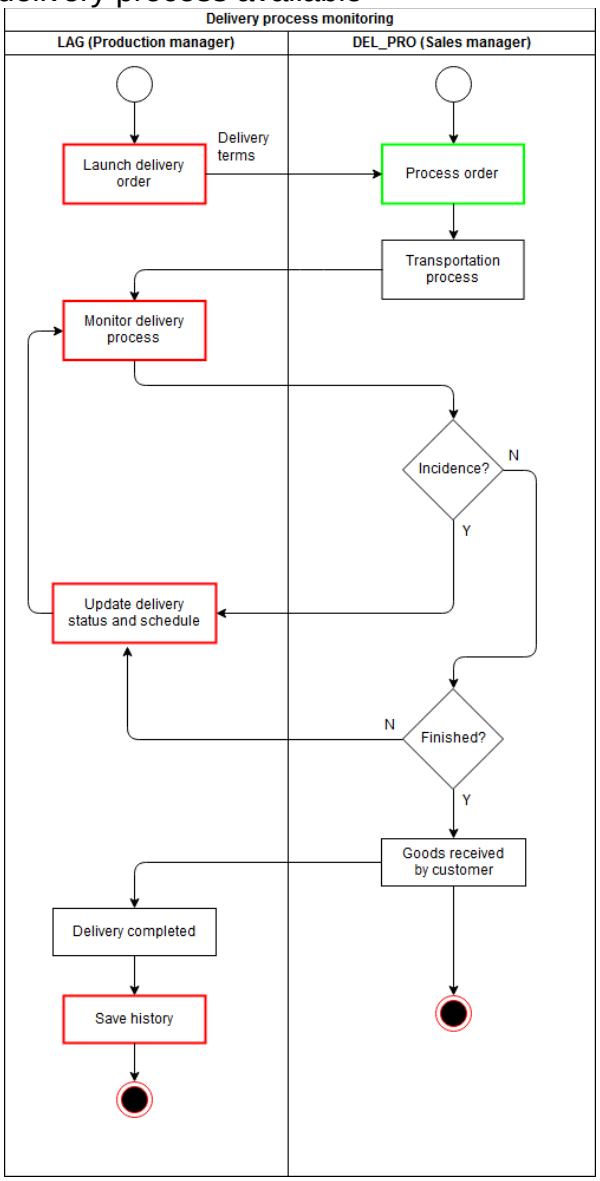


Figure 17: Activity diagram of showing flow of activities in delivery process monitoring

3.5.2 User story: Local reception of goods

As a Purchasing manager, I want to monitor the reception of goods in my facilities, so that I can be aware of any quick and unexpected problem during the reception

Acceptance criteria:

- Mechanism to report and manage nonconformities related to the supply process
- Tools for the internal management of invoices, delivery notes and stock

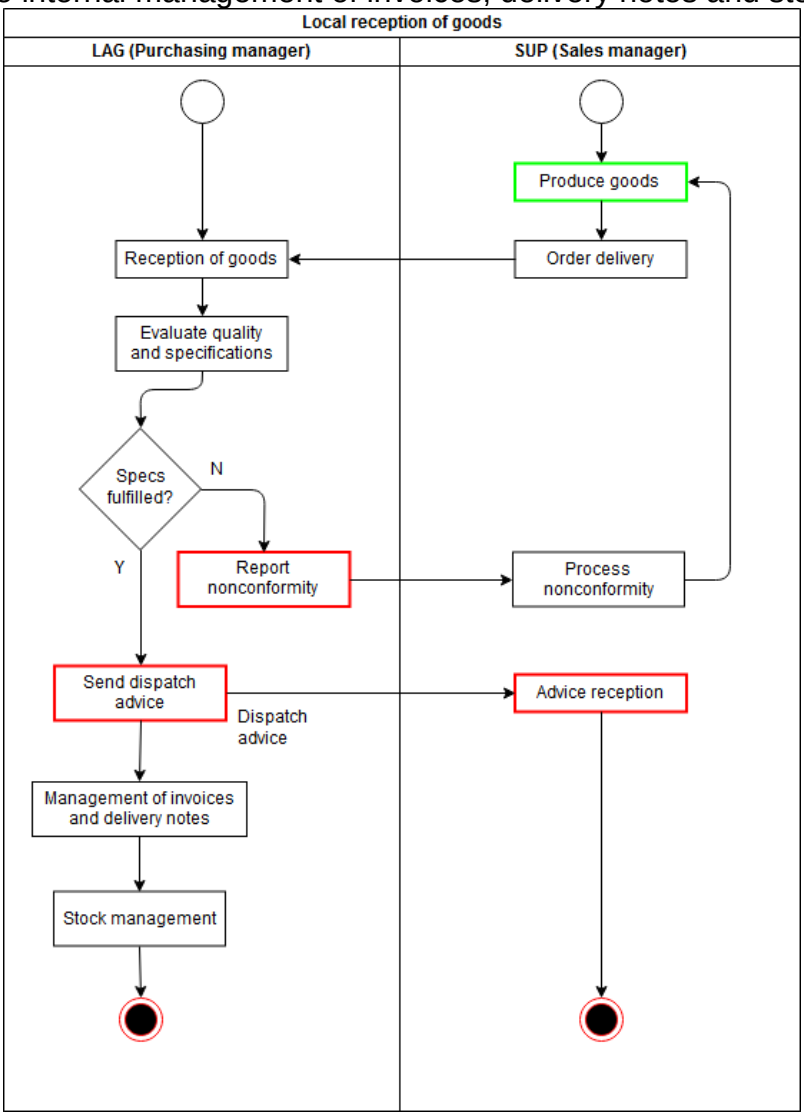


Figure 18: Activity diagram of showing flow of activities in local reception of goods

3.5.3 User story: Delivery schedule

As a Managing director, I want to have a schedule of in and out deliveries available so that I can be able to get a broader and quicker overview of the general status of the delivery

Acceptance criteria:

- Overview picture of the on-going delivery processes related to the different goods as a kind of schedule indicating deadlines and current status of each delivery

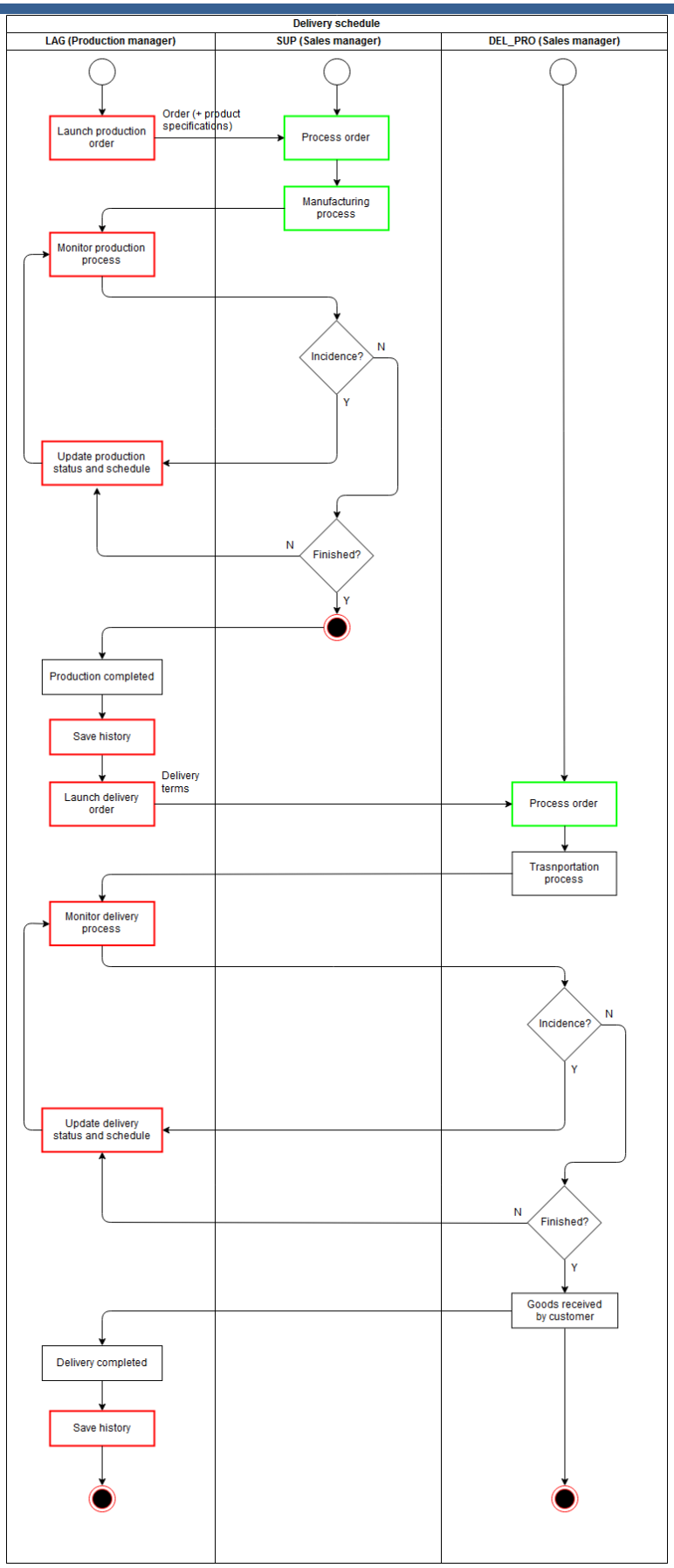


Figure 19: Activity diagram of showing flow of activities in delivery schedule

3.5.4 User story: Replace logistics provider to meet just-in-time delivery

As a Purchasing manager, I want to manufacture and deliver just-in-time so that I can reduce storage costs

Acceptance criteria:

- Mechanisms to get a detailed and general vision of the delivery status of the different goods to be sent
- Mechanisms to cancel a logistics provider and quickly replace it with another one

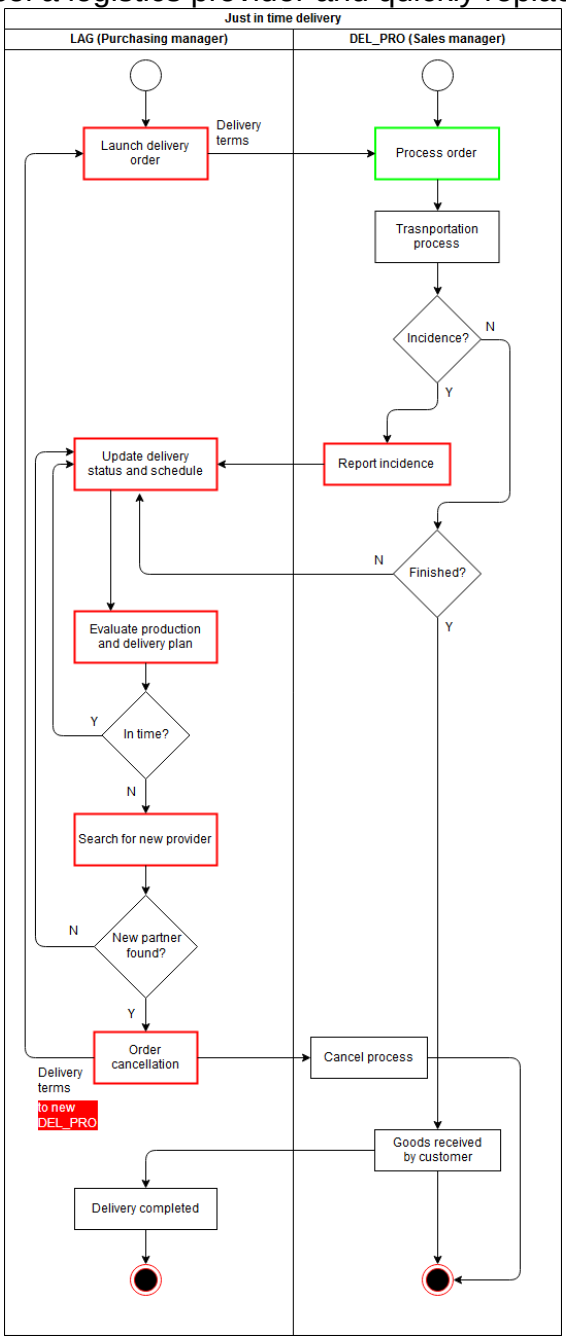


Figure 20: Activity diagram of showing flow of activities in replace logistics provider to meet just-in-time delivery

3.5.5 User stories: Set up logistics supplier in new country

As a Purchasing manager, I want to find logistics providers when delivering to a country for the first time so that I can provide an adequate delivery time at an adjusted cost

Acceptance criteria:

- Capability to search for logistics services in retrieve results according to indicated parameters (i.e.: origin, destination, delivery time, etc.)
- The management of nonconformities is not covered in this user story so it has been previously covered

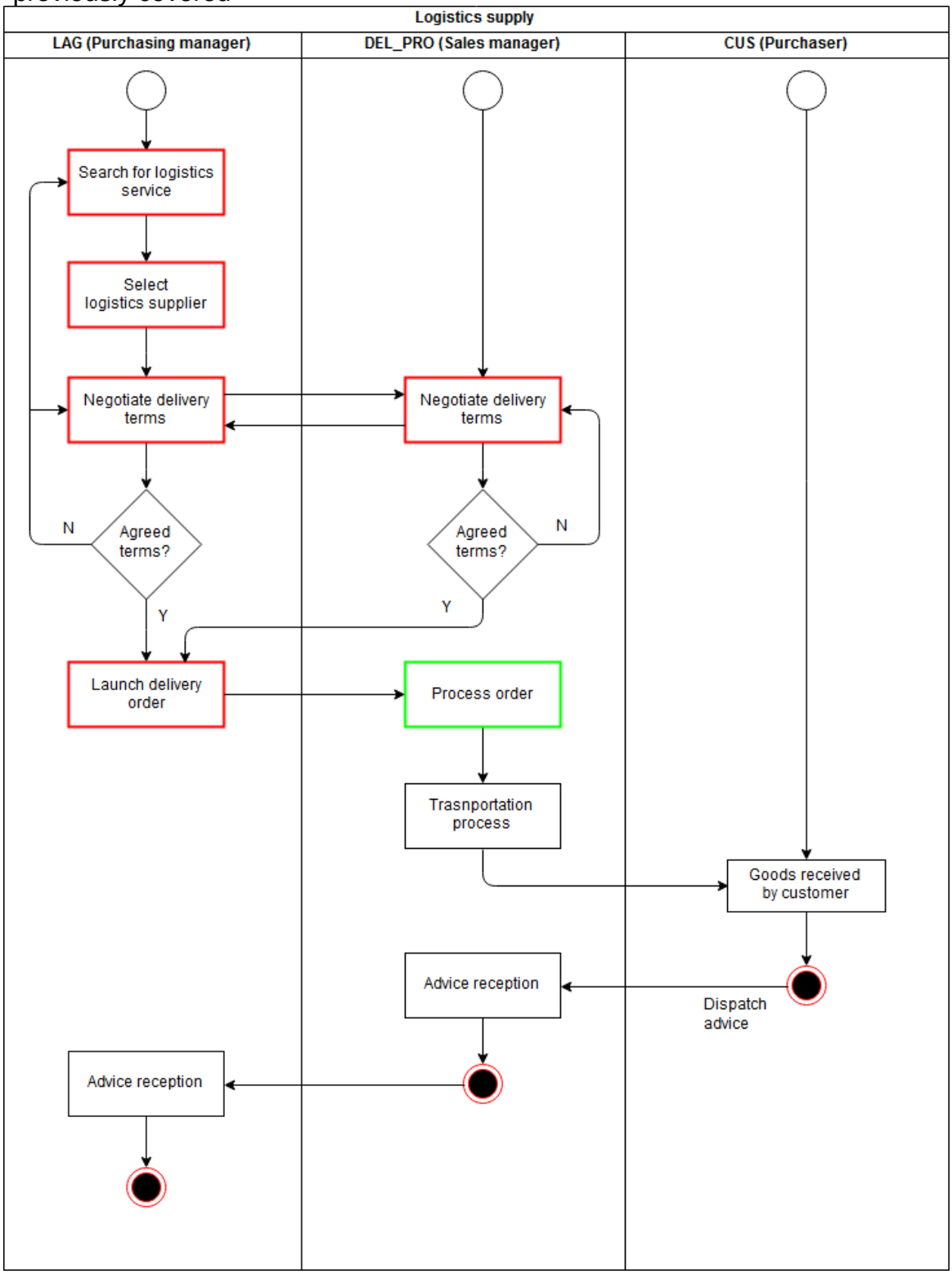
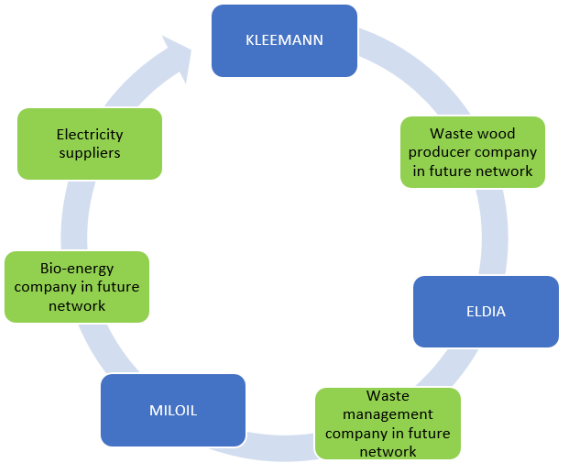


Figure 21: Activity diagram of showing flow of activities in logistics supply

4 Circular Economy Pilot

Life-Cycle assessment (LCA) is a widely used technique to assess environmental impacts associated with all the stages of a product's life from raw material extraction through materials processing, manufacturing, distribution, use, repair and maintenance, and disposal or recycling. Compliance with LCA requires manufacturing companies to establish collaborations with different stakeholders in the waste management domain. Similarly, highly customised solutions and special projects in the waste management domain require agile supply chain networks to respond to the dynamic customer demands.



In this pilot, the partner KLEEMANN (KLE), a global manufacturer of Lift Systems, Escalators, Moving Walks and a specialist in lot-size-one projects such as anti-vandal lifts, oil rigs, marine solutions, requires agile relationships with different partners and suppliers in the waste management domain in order to be compliant with LCA regulations. KLE works with waste management companies, e.g. ELDIA (ELD), the largest waste management and recycling company in Greece to dispose of solid waste. The KLE waste is screened to recover materials (paper, wood, plastics, metal, pallets, and glass) and then recycled for use in several industries from different sectors.

In this circular economy model, the value of products and materials is maintained for as long as possible, which can bring major economic benefits contributing to innovation, growth and job creation. This pilot in the EFPF project specifically focuses on realising closed-loop supply chains (CLSC) in the KLE ecosystem, where the returns processes and the manufacturers in the network have the intent of capturing additional value and further integrating all supply-chain activities.

The pilot scenario addresses the agile supply network through circular economy activities involving KLE, ELD and other European companies from the business ecosystem of KLE. At present, the supply chain and business relationships in the KLE ecosystem lack the visibility and tracking of waste. The companies also face lag in material transition phases and the ecosystem pose entry barriers for new innovative European companies to join the market. Therefore, the pilot realisation focuses on establishing Closed-Loop Supply Chains (CLSC) at the European level, where the KLE has the intent of capturing additional value and further integrating supply-chain activities through return processes. Moreover, the pilot also focuses on providing new business opportunities to European companies through their inclusion in the different levels of the waste management supply chain. The tools and serviced provided by EFPF will support the overall process to ensure risk management, regulatory and environmental compliance and for optimising the production and waste management processes. The EFPF tools and services will play a crucial role in the design, execution, monitoring and optimisation of ad-hoc collaborative processes to deliver time, cost and service improvement benefits.

	Pilot: “Lot size 1 in Closed-Loop Supply Chain”
Problem description	• Lack of a marketplace for collecting and selling industrial waste in a closed loop supply chain

	• Limited shop-floor automation and absence of real-time data or visibility in the supply chain • Complex collaboration procedures, rules and diversity of IT systems within the supply chain • Supply chain management (between KLE, ELD, MIL and other companies in the waste management ecosystem) lack IT systems integration, leading to inefficiencies at present.
End user	KLE, ELD, MIL
End user type	Large Industry, SMEs
Product type	Industrial Waste (Steel, Scrap metal, Wood)

4.1 User Roles

The user roles in this pilot are derived from three different companies:

KLEEMANN:

- **Recycling management specialist for non-hazardous material:** This role is responsible for the recycling management of the company.
- **Purchasing manager**: This role is responsible for the purchase of goods and services. Tasks among others include searching for best quality products at competitive prices, seeking collaborations with reliable suppliers and negotiating contracts and prices.

ELDIA:

- **Purchasing manager**: This role is responsible for the purchase of goods and services
- **Operations manager:** This role is responsible for the production management
- **Managing director**: This role is the head of the company and ultimate decision maker

MILOIL:

- **Purchasing manager:** This role is responsible for the acquisition of goods and services

4.2 Epic 08: Enable the Integration of IT systems in the Supply Chain to Bring More Visibility and Real-time Support Across Distributed Activities While Keeping Regulatory and Compliance Procedures

4.2.1 User story: Bins' fill level monitoring

As a recycling management specialist for non-hazardous material, I want to monitor the bins' fill level, so that I can be notified when waste is ready for collection

Acceptance criteria:

- A notification that the waste collection bins are almost full

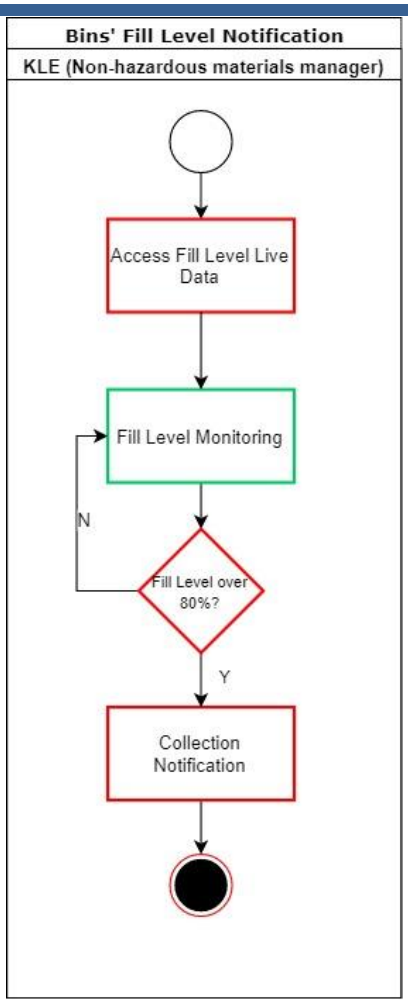


Figure 22: Activity diagram of bins' fill level monitoring

4.2.2 User story: Product processing and remote maintenance

As an Operations manager, I want to process waste material (e.g. wood) so that I meet the criteria regarding size and quality and achieve higher productivity, efficiency and profitability

Acceptance criteria:

- Mechanisms to initialise a connection with maintenance support in case of a breakdown
- Availability of ordering spare parts from specific suppliers (as suggested by the maintenance support team)

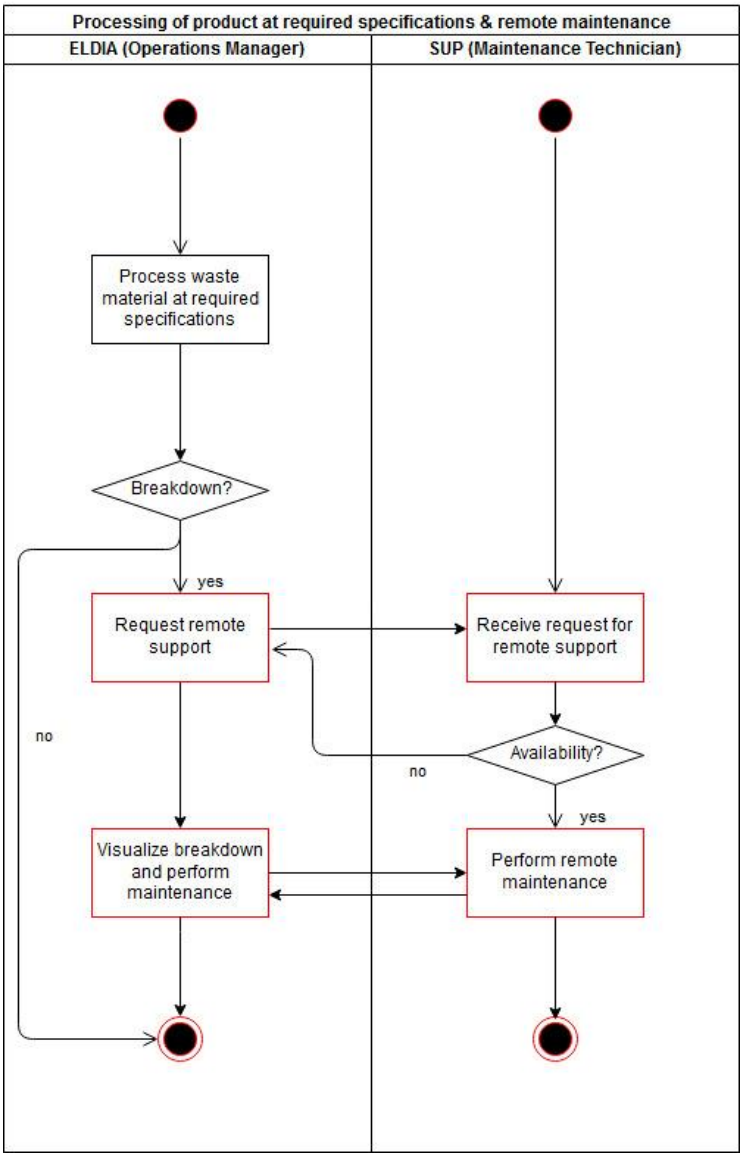


Figure 23: Activity diagram of product processing and remote maintenance

4.3 Epic 09: Reduce the Burden of Finding Relevant Partners for Lot-Size-One Tasks/Jobs through Automated Matchmaking

4.3.1 User story: Request and receive possible suppliers' details

As a recycling management specialist for non-hazardous material, I want to find a specialised waste management company, so that I can manage the collection and handling process in a more efficient way (automated and optimised) in order to reduce the management time and cost of the internal logistics and supply chain processes

Acceptance criteria:

- A list of specialised waste management companies' contacts available
- An overview of each company based on the requested service/product
- An evaluation of each company based on historical platform data (ranking)
- Selection and invitation to waste management companies to start a collaboration

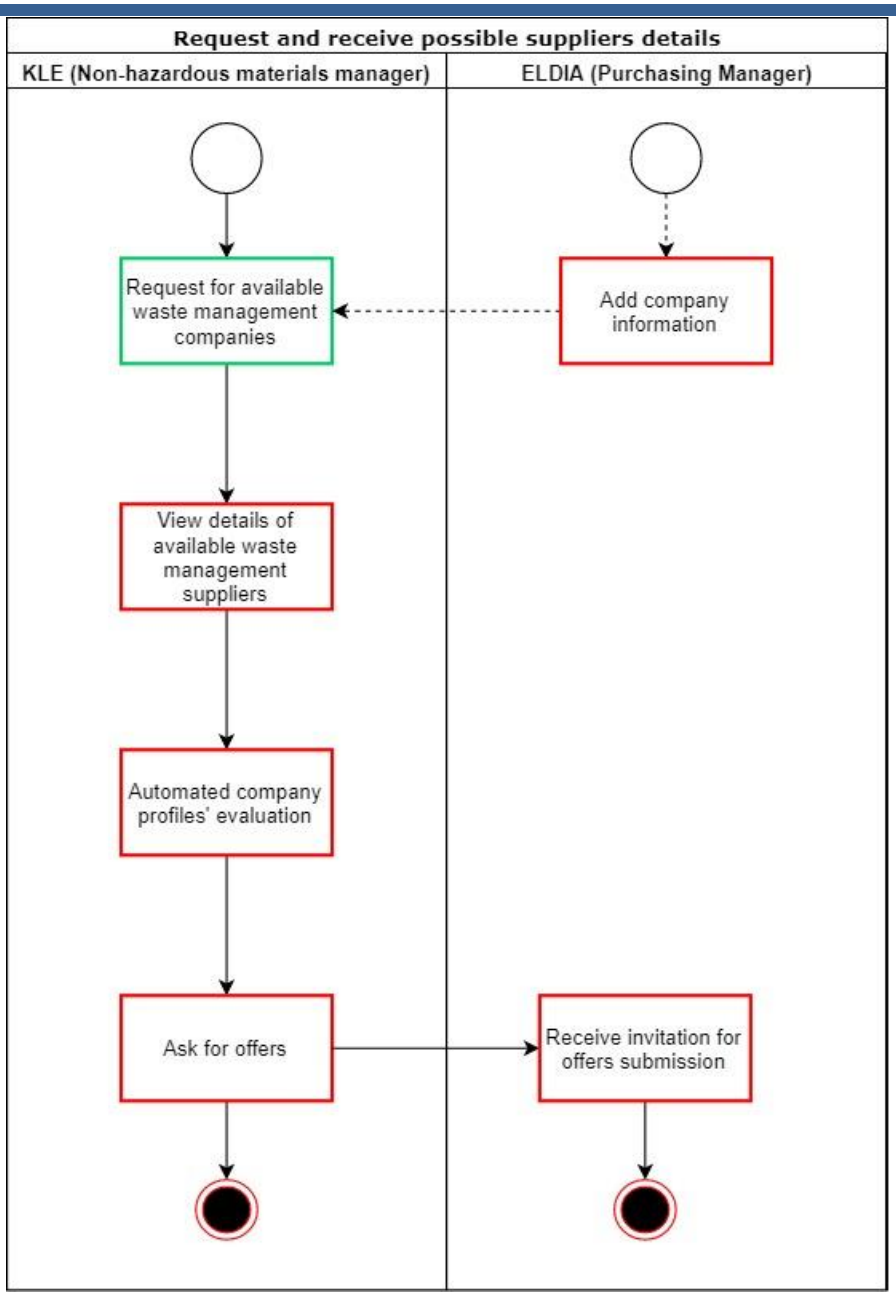


Figure 24: Activity diagram of requesting and receiving possible suppliers' details

4.3.2 User story: Online bidding process for scraps

As a Purchasing manager or Purchasing specialist, I want to negotiate prices and contracts so that I can obtain high-quality services/products at reasonable prices

Acceptance criteria:

- A repository of customers
- A history of relationships established with these customers through the platform, such as negotiations, information requests, etc.

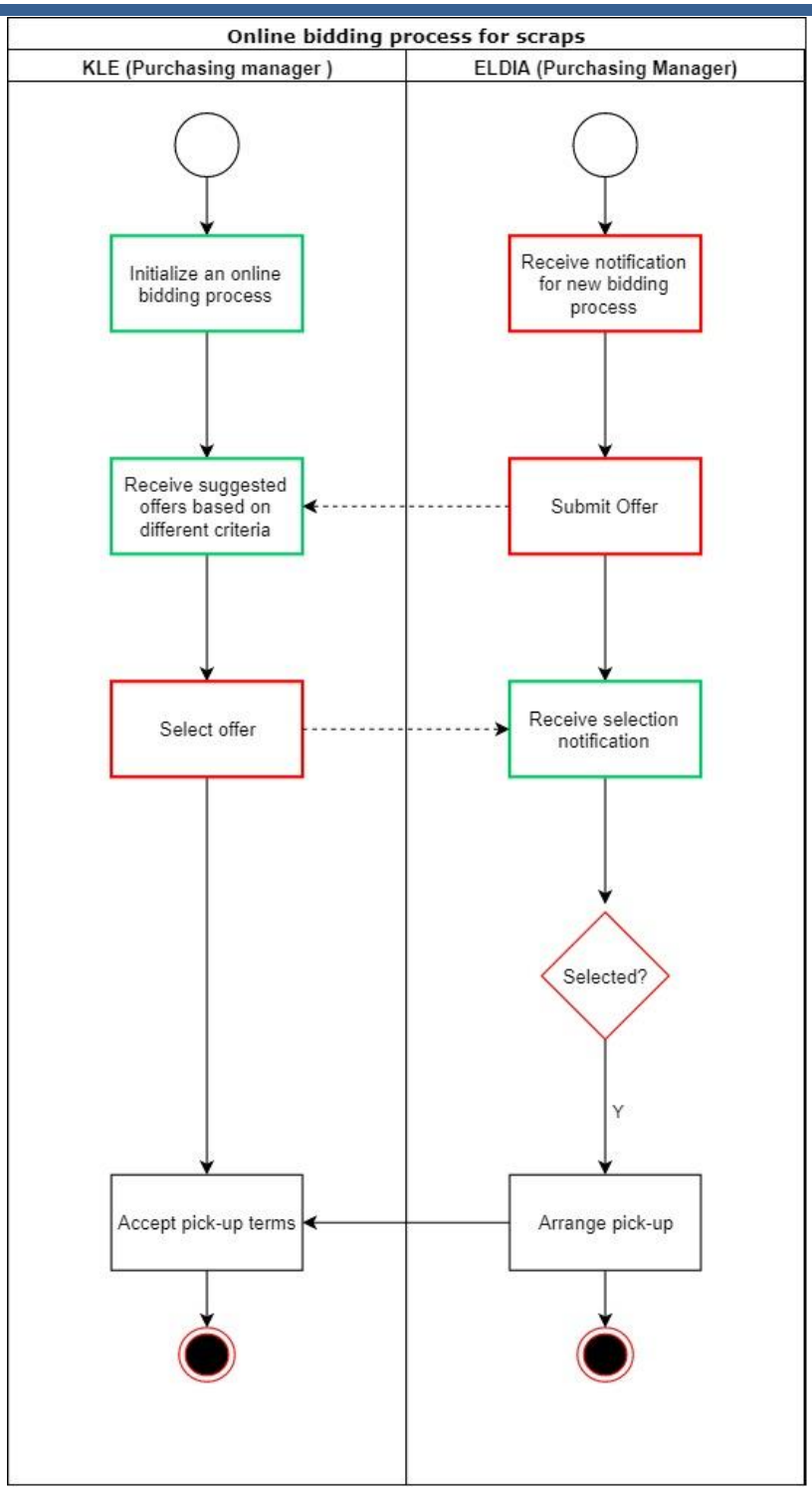


Figure 25: Activity diagram of online bidding process for scraps

4.3.3 User story: Search for customers

As a Sales Manager, I want to grow my repository of potential customers so that I can arrange more business relationships with them

Acceptance criteria:

- A repository of customers
- A history of relationships established with these through the platform, such as negotiations, information requests, etc.
- An evaluation of each company based on historical platform data (ranking)

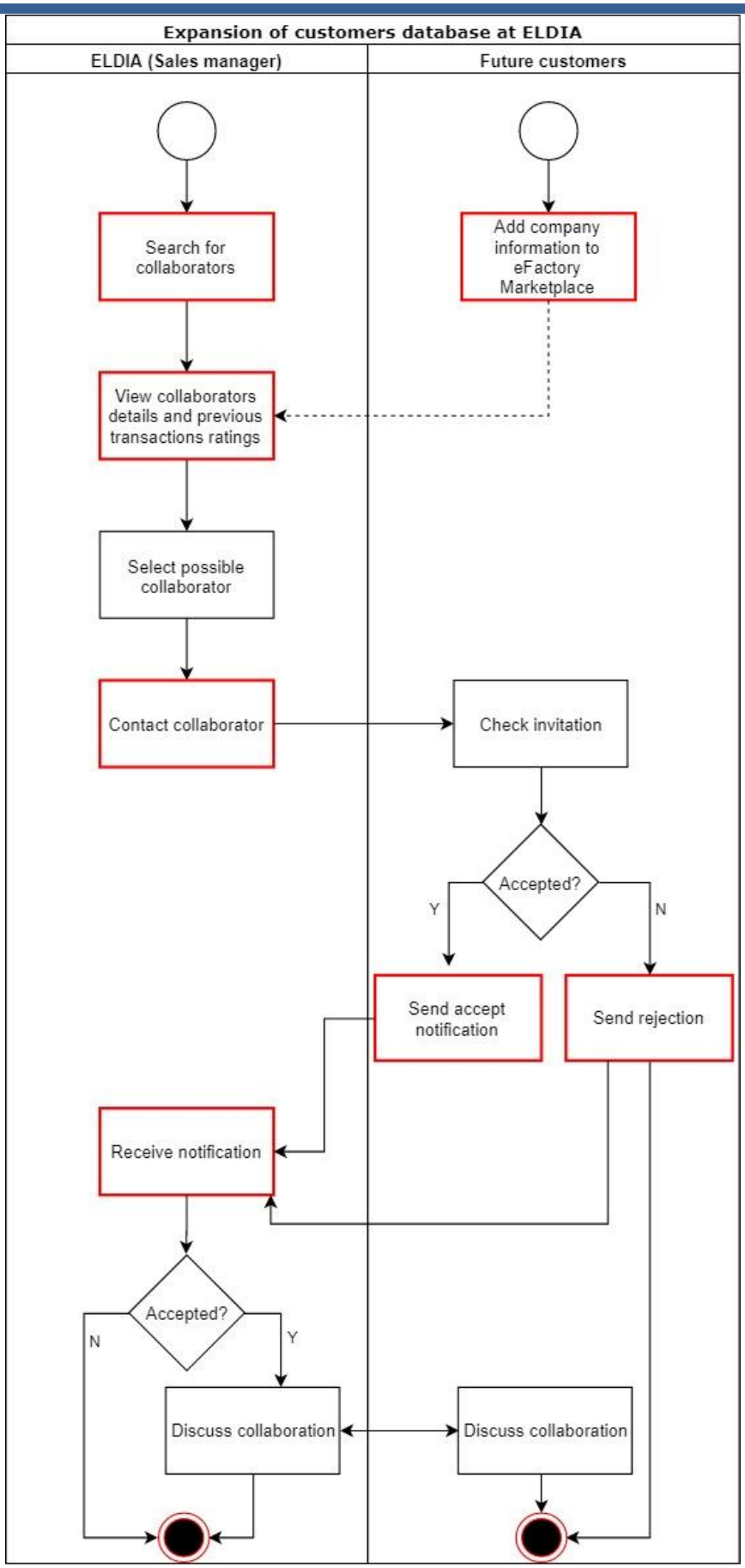


Figure 26: Activity diagram of user story search for customers

4.3.4 User story: Search for suppliers

As an Operations Manager and a Purchasing Manager, we want to search and extend the network of our suppliers so that we can arrange the purchase of more specialised equipment at reasonable prices

Acceptance criteria:

- A repository of suppliers
- A history of relationships established with these customers and suppliers through the platform, such as negotiations, information requests, etc.
- Technical characteristics of the specialised equipment
- A maintenance agreement
- An evaluation of each company based on historical platform data (rankings-shortlist) and customers' ratings
- Price and payment terms

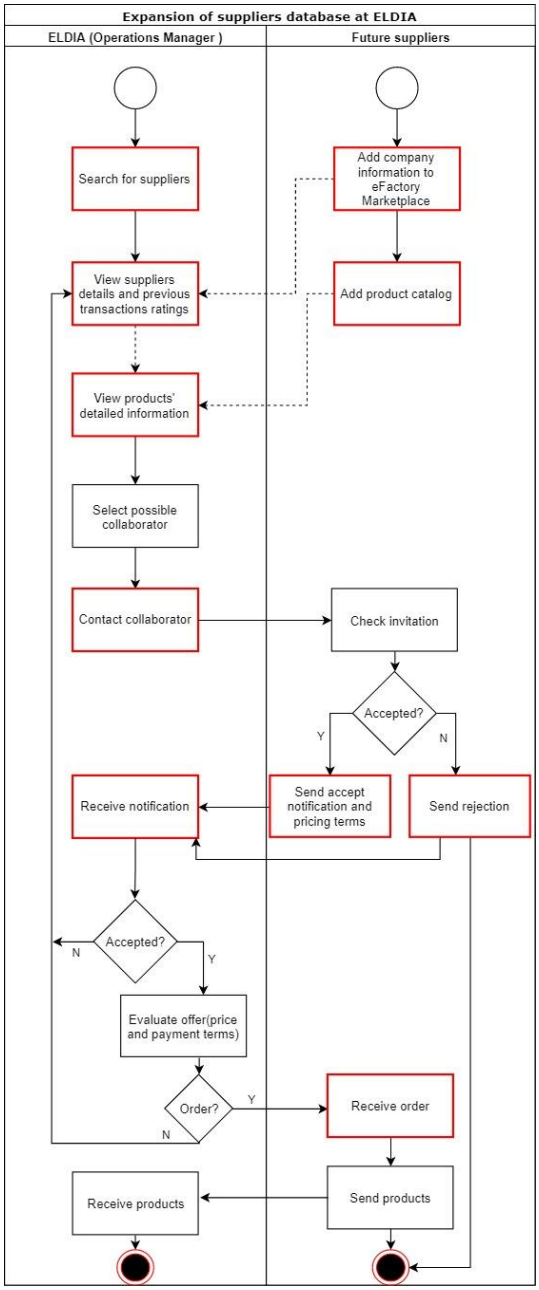


Figure 27: Activity diagram of user story search for suppliers

4.4 Epic 10: Search for Specialised Products/Services in order to Process Waste More Efficiently

4.4.1 User story: Equipment Selection and Purchasing

As a Purchasing Manager, I want to order the selected equipment from my suppliers so that I can utilise it in a specific product (e.g. wood) process

Acceptance criteria:

- Mechanisms to send/receive orders including contract agreements and banking information
- Availability of tracking the status of an order

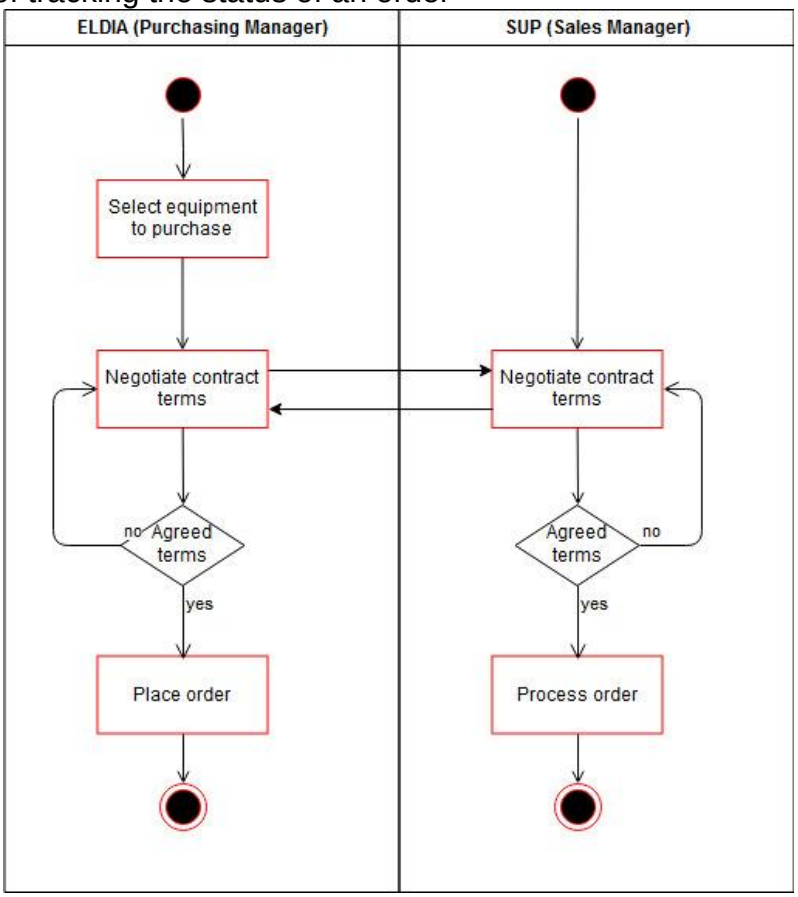


Figure 28: Activity diagram of equipment selection and purchasing

4.4.2 User story: High level market opportunities overview

As a Managing director, I want to have a high-level overview of the market opportunities based on predictions that support my decision to sell (if, whom and when).

Acceptance criteria:

- Overview picture of the price predictions carried out by the platform

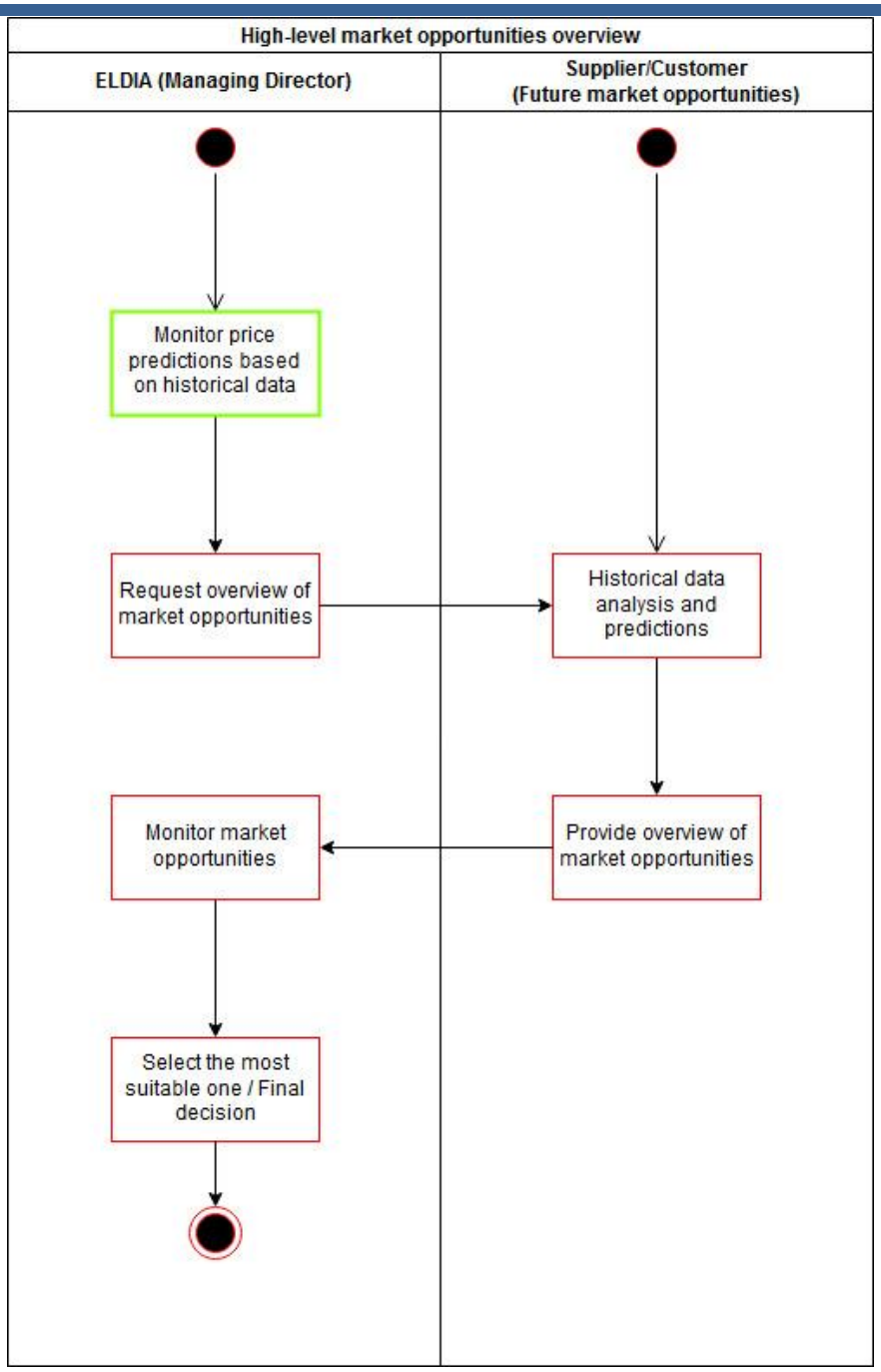


Figure 29: Activity diagram of high-level market opportunities overview

4.4.3 User story: Market research for specialised product customers

As a Sales Manager, I want to perform analytics on my customers so that I can sell them specialised product at the best price

Acceptance criteria:

- A repository of customers
- A history of relationships established with these through the platform, such as negotiations, information requests, etc.
- An evaluation of each company based on historical platform data (ranking)
- Price and payment terms

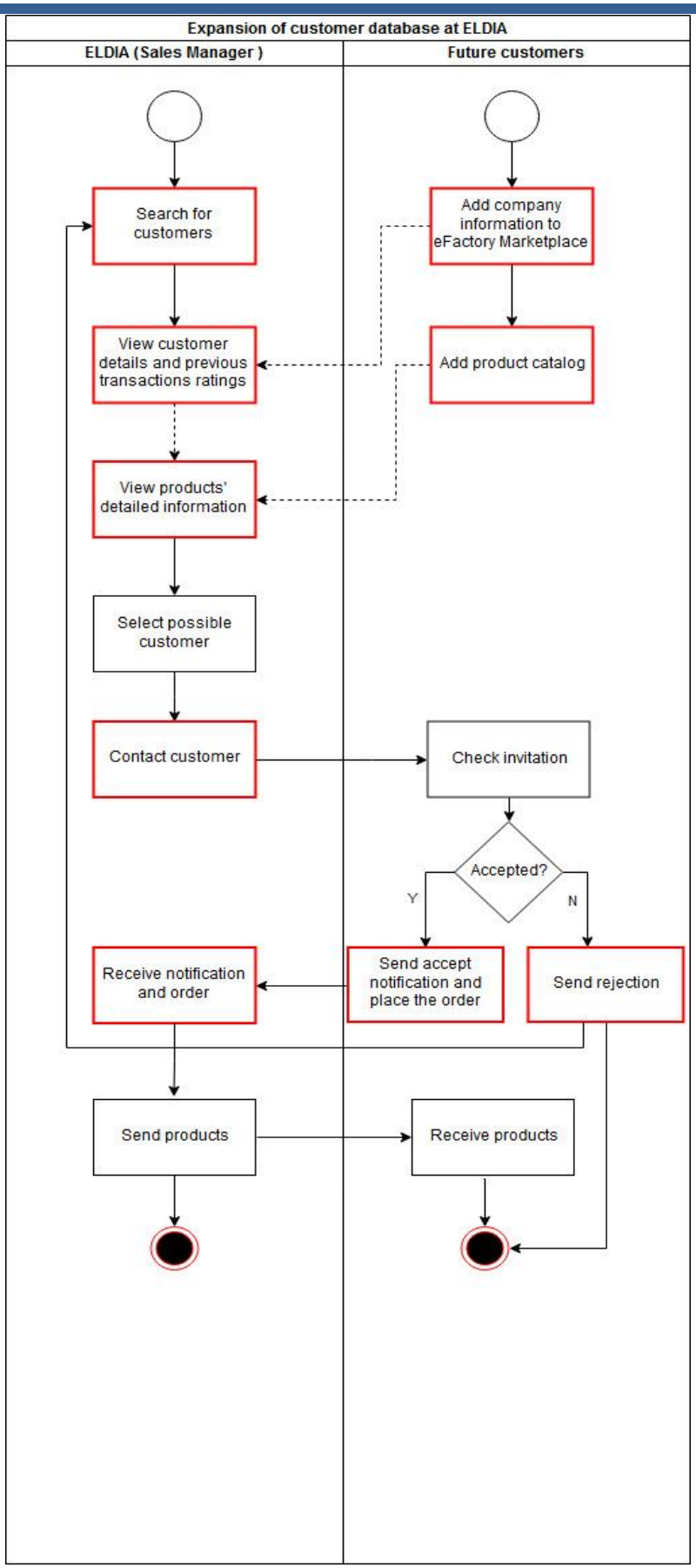


Figure 30: Activity diagram of market research for specialised product customers

4.4.4 User story: Browse, contact and negotiate with suppliers

As a Purchasing manager, I want to negotiate prices and contracts so that I can obtain high-quality energy services at reasonable prices

Acceptance criteria:

- A repository of customers
- A history of relationships established with these customers through the platform, such as negotiations, information requests, etc.

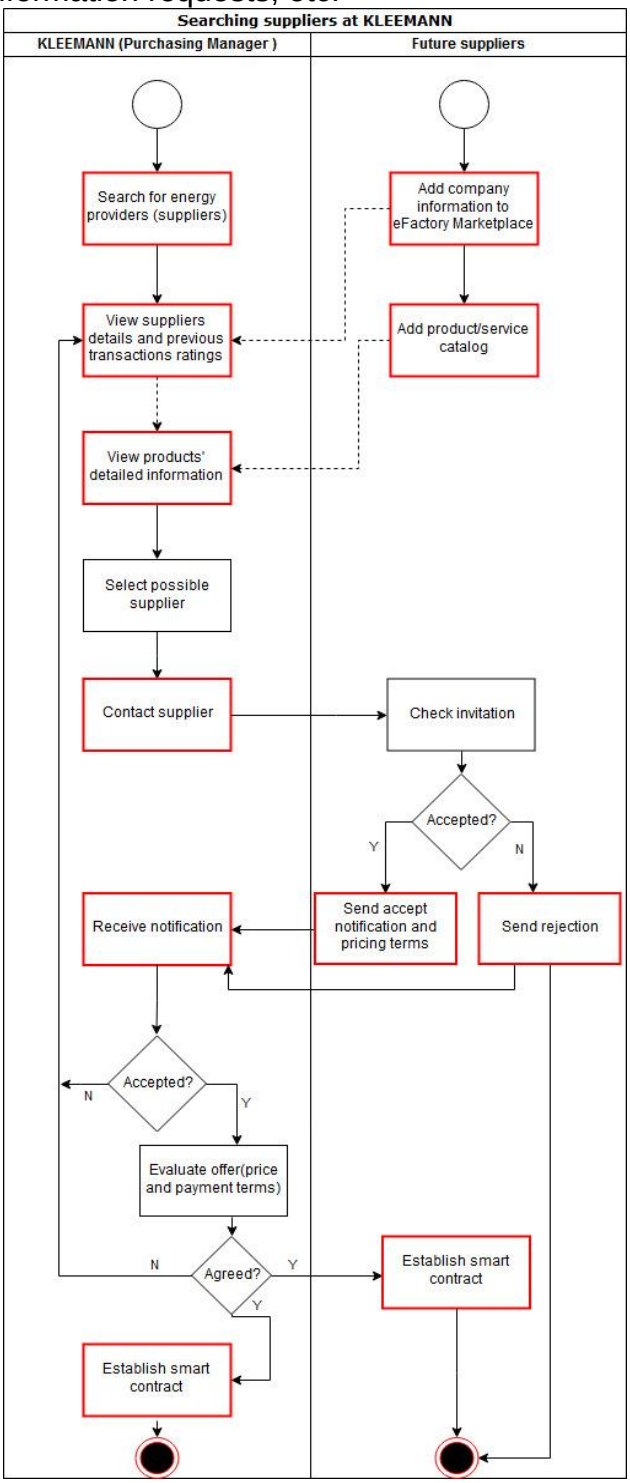


Figure 31: Activity diagram of browse, contact and negotiate with suppliers

5 Prioritisation of Requirements – MoSCoW

The MoSCoW base prioritisation of the gathered requirements from the three EFPF pilots is described in the following table:

Epic	Aerospace Pilot	MoSCoW
01	Place products and services in catalogue and offer them to a predefined user group	Must
01	Define a product / service catalogue	Should
01	Create product / service catalogues for customers and specify sales conditions	Should
01	Finding suppliers for specific products and services on an ad-hoc basis	Must
02	Place spare parts in a catalogue and offer them to a predefined user group	Should
03	Find partners for joint purchase of consumables	Must
03	Finding partners for joint purchase of (raw) materials and products with high MOQ	Must
	Finding skilled staff for interim support on an ad-hoc basis	Would
03	Place tender also for 1st suppliers and downwards	Would
Epic	**Furniture Pilot**	**MoSCoW**
04	Send and receive orders	Would
04	Search of products and services	Must
04	Request for quotation of customised product	Must
04	Exchange product catalogue	Must
04	Customer analytics	Should
05	Invitation to join collaboration platform	Must
05	Tender publication and tender bid assessment	Must
05	Product request	Must
06	Production optimisation	Could
06	Production process monitoring in a supply chain	Must
06	High-level production overview	Must
07	Delivery process monitoring	Must
07	Local reception of goods	Would
07	Delivery schedule	Should
07	Replace logistics provider to meet just-in-time delivery	Must
07	Set up logistics supplier in new country	Must

Epic	Circular Economy Pilot	MoSCoW
08	Bins' fill level monitoring	Should
08	Product processing and remote maintenance	Could
09	Request and receive possible suppliers' details	Must
09	Online bidding process for scraps	Must
09	Search for customers	Should
09	Search for suppliers	Should
10	Equipment selection and purchasing	Should
10	High level market opportunities overview	Should
10	Market research for specialised product customers	Must
10	Browse, contact and negotiate with suppliers	Must

6 Summary

The purpose of this EFPF deliverable D2.3 'Requirements of the Embedded Pilot Scenarios' is to gather and analyse the requirements concerning agile collaborations, lot-size-one manufacturing and other technology needs of the EFPF pilot partners. The analysis of the gathered requirements kicks off the relevant development and integration activities in the EFPF project. The requirements gathering and analysis activity takes into account the Description of Action (DoA), the requirements from the pilot domains captured from the pilot partners (i.e. manufacturing companies) based on their knowledge, expertise and more specifically needs in the particular domains. This document describes the user, requirements as user stories in order to present them in a familiar and easy to understand way to technical partners, ready to initiate development activities.

35 user stories in total were gathered and are explained in this deliverable. These user stories are grouped in 10 different Epics that present higher level of abstraction of the needed functionalities that EFPF will specifically target. Moreover, each user story is assigned a priority as per the MoSCoW prioritisation method which provides direction of where technical effort should be focused in the next steps of the project.

Finally, these requirements are considered a snapshot of the pilot partner' current view of their needs. The project foresees that they will evolve as is happens with any project of this kind. Nevertheless, EFPF has already established a procedure to manage the evolution of these requirements during the length of the project using [JIRA] tracking system, but this is already outside the scope of this deliverable. Further details will be presented in deliverable D2.4 EFPF Platform Requirements.

Annex A: History

Document History	
Versions	V1.0: • Final updates, quality check and packaging V0.9: • Updates based on internal review. Ready for submission V0.8: • Included updates to furniture and recycling pilots V0.7: • Review of the existing content, remarks as comments, V0.6: • Incorporated input from HAW • Full review to align all user stories and epics. Some epics were removed, others merged. V0.5: • Update in Section 5 based on contribution from CERTH and KLE V0.4: • Updates in Section 4 based on contribution from AID V0.3: • Updates in Section 1 and the pilot descriptions in Section 2 V0.2 • Addition of user stories from furniture and circular-economy pilots V0.1 • Base document structure established and populated with pilot introductions
Contributions	ICE: • Cesar Marin • Usman Wajid KLEEMANN: • Theofilos Mastos CERTH: • Alexandros Nizamis HAW: • Ingo Martens A-D: • Arnd Schirrmann AID: • Fernando Gigante

Annex B: References

[JIRA]: JIRA Issue Tracking System: https://www.atlassian.com/software/jira

European Factory Platform

www.efpf.org