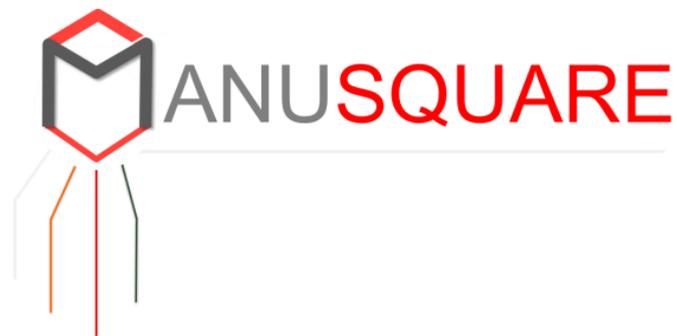


Horizon 2020 – The EU Framework Programme for Research and Innovation  
 Project Co-funded by the European Commission  
 Contract number: 761145  
 Call identifier: NMBP-22-2017  
 Project Start Date: 1<sup>st</sup> January 2018



**MANU**facturing eco**S**ystem of **QUA**lified **R**esources **E**xchange

---

D1.3

Business processes and early validation scenarios

---

Dissemination Level	Public
Partners	SINTEF, INESC, I-HUB, JPM, TRUDEL, I-COTTON, CSEM, SUPSI
Authors	Emrah Arica, Manuel Oliveira, Vasco Alves, Henrique Diogo Silva
Planned date of delivery	M8 – August 2018
Date of issue	19 <sup>th</sup> November 2018
Document version	Final 1.0

## DOCUMENT HISTORY

Version	Issue date	Content and changes	Partner
0.1	28.06.2018	Structure and outlines of the report	SINTEF
0.2	15.08.2018	Manufacturing technologies industry demo scenarios written	SINTEF, INESC, JPM
0.3	14.09.2018	Draft of the textile & cosmetics industry demo scenarios	SINTEF, I-HUB
0.4	09.10.2018	Draft of the report	SINTEF, I-HUB, INESC, JPM
0.5	05.11.2018	Improved presentation of the report	SINTEF, INESC, JPM
0.6	09.11.2018	Intermediate version is completed	SINTEF, INESC, JPM, SUPSI
0.7	16.11.2018	Final revision and completion of the report	SINTEF, INESC, JPM, I-HUB, TRUDEL, I-COTTON, SUPSI
1.0	19.11.2018	Quality assurance	SUPSI

Role	Partner	Person
Reviewer 1	JPM	Vasco Alves
Reviewer 2	I-HUB	Ilaria Donelli
Quality assurance	SUPSI	Andrea Bettoni

**TABLE OF CONTENTS**

Document history ..... 2

Table of contents..... 3

List of abbreviations ..... 5

1 Executive summary ..... 6

2 Introduction..... 7

    2.1 Aim and scope of the task ..... 8

    2.2 Relationships of Task 1.3 with other tasks ..... 8

    2.3 Outline ..... 9

3 Methodology..... 10

4 Manufacturing Technologies Industry demonstration scenarios..... 11

    4.1 The case company and the manufacturing technologies industry ..... 11

    4.2 Business context and characteristics..... 11

    4.3 Business maturity and relations ..... 11

    4.4 Business needs and challenges ..... 12

    4.5 Demonstration scenario 1 – New product development: development of a turnkey AGV solution ..... 12

        4.5.1 AS-IS description of the new product development process ..... 12

        4.5.2 TO-BE situation with the contribution of the MANU-SQUARE platform ..... 19

        4.5.3 Success criteria for validation of the demonstration scenario 1..... 24

    4.6 Demonstration scenario 2 – Market coverage extension: retrofitting business..... 24

        4.6.1 AS-IS description of the retrofitting / refurbishing process ..... 25

        4.6.2 TO-BE situation with the contribution of the MANU-SQUARE platform ..... 28

        4.6.3 Success criteria for validation of the demonstration scenario 2..... 32

5 Textile & Cosmetics Industry demonstration scenarios ..... 33

    5.1 The case companies and the textile& cosmetics industry ..... 33

    5.2 Business context and characteristics..... 33

        5.2.1 TRUDEL ..... 33

        5.2.2 I-COTTON ..... 33

    5.3 Business maturity and relations ..... 34

        5.3.1 TRUDEL ..... 34

        5.3.2 I-COTTON ..... 34

    5.4 Business needs and challenges ..... 36

        5.4.1 TRUDEL ..... 36

        5.4.2 I-COTTON ..... 36

    5.5 Cross-sectorial demonstration scenario – New product development and waste utilization..... 36

        5.5.1 Description of the cross-sectorial demonstration scenario ..... 36

D1.3 – Business processes and early validation scenarios

5.5.2	TO-BE situation with the contribution of the MANU-SQUARE platform .....	38
5.5.3	Success criteria for validation of the cross-sectorial demonstration scenario .....	42
6	Conclusion.....	44

## LIST OF ABBREVIATIONS

Acronym	Description
AGV	Automated Guided Vehicle
BPMN	Business Process Modelling Notation
DoA	Description of Action
MANU-SQUARE	MANUfacturing ecoSystem of QUALified Resource Exchange
MG	MANU-SQUARE Goal
NDA	Non Disclosure Agreement
RFI	Request for Information
RFQ	Request for Quotation
SME	Small and Medium Enterprise
WP	Work Package

## 1 EXECUTIVE SUMMARY

This report addresses the early description of the demonstration scenarios for the MANU-SQUARE (MANUFACTURING ecoSystem of QUALified Resource Exchange) platform that acts as a virtual marketplace bringing the available production capacity, as well as other virtual and physical assets, closer to the production demand to obtain the optimal matching. The description of the demonstration scenarios includes identification of the processes of interest in the pilot case companies, the AS-IS situation of the processes, the expected TO-BE situation where MANU-SQUARE provides its contribution, and the success criteria for evaluating the impact obtained through the project. The outcome of this report will provide a foundational background for the follow-up tasks towards building the reference model and architecture of the platform. This document addresses demonstration scenarios for the MANU-SQUARE platform in two sectors:

- **Traditional manufacturing industry**, that includes a new product development case (development of an AGV solution), and a market coverage expansion case (expanding to the retrofitting market) for the pilot company (JPM).
- **Textile & cosmetics industry**, embedded to each other, where one of the pilot companies (TRUDEL) provides its by-product as a raw material (sericin) to the other pilot company (I-COTTON) for the development of a new product (wet wipes), involving an innovation manager (I-HUB) that can design and manage the innovation process.

The results of the study indicate the following outcomes:

- For the **new product development** case in the manufacturing technologies industry, the following objectives were identified for the contribution of MANU-SQUARE:
  - providing a larger supplier base and matchmaking;
  - supporting the request for quotation;
  - supporting the evaluation and negotiation with suppliers.
- For the **market coverage expansion** case in the manufacturing technologies industry, the following objectives were identified for the contribution of MANU-SQUARE:
  - supporting and enlarging the sales prospects;
  - supporting the new partner assessments.
- For the **by-product utilization and new product development case** in the textile & cosmetics industry, the following objectives were identified for the contribution of MANU-SQUARE:
  - supporting the design and management of the innovation process
  - supporting the communication between the involved companies (TRUDEL and I-COTTON), innovation manager (I-HUB), and required technical service providers.
  - searching and matchmaking of technical service providers and contributors for relevant stages of the process such as the stabilization of sericin and the assembly of sericin with wipes.

## 2 INTRODUCTION

The MANU-SQUARE project creates an ecosystem that acts as a virtual marketplace bringing the available production capacity, as well as other virtual and physical assets, closer to the production demand to obtain the optimal matching (See Figure 1). This has two main advantages:

- the rapid and efficient creation of local distributed value networks for innovative providers of product services;
- the reintroduction and optimization in the loop of unused capacity and potential that would otherwise be lost.

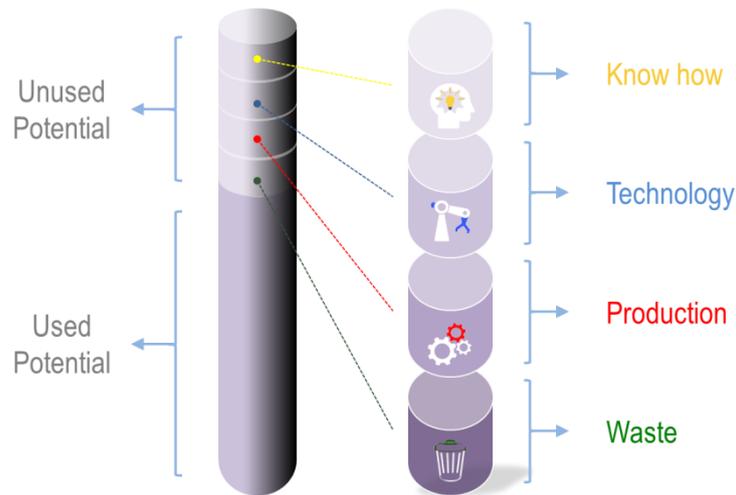


Figure 1 Composition of the unused potential

MANU-SQUARE establishes an ecosystem that is organized to match the needs of buyers with the availability of sellers in terms of know-how, technology, manufacturing capacity and waste. The associated MANU-SQUARE platform uses blockchain technology to ensure transparency and to provide security, thereby fostering the building of trust amongst the different stakeholders of the platform. A manufacturer may have a role of a supplier (seller) or a customer (buyer). In the case of the latter, a manufacturing company uses the platform each time it requires to engage with the MANU-SQUARE ecosystem to fulfil a need, such as additional production capabilities. The platform performs the search for the optimal matching on a wide number of possible candidates from the MANU-SQUARE ecosystem, using a sophisticated criterion that ensures high level of quality, reliability of suppliers, reduction of costs and short time to close the business transaction. The generated ecosystem allows optimal matches also for offering resources other than production hours or tangible assets with the aim to identify and exploit unexpected synergies between participants and to promote the mutual interaction of diverse industries, also within different value networks, for beneficial reuse of competences and flows. The main objectives of the project are:

- To make European unused manufacturing capacity emerge towards its reintegration in the loop and the creation of local efficient value networks.
- To support innovative SMEs and start-ups in finding the optimal suppliers to transform their business ideas into new product-services.
- To seamlessly involve actors all along the entire value network including consumers for cross-fertilization of product-service solutions and underlying technologies.
- To coordinate the whole MANU-SQUARE ecosystem towards a better use of resources and a more sustainable European manufacturing.

## 2.1 Aim and scope of the task

The aim of Task 1.3 is to analyse the requirements of the industrial partners and to specify an overall framework for demonstration and validation of the envisioned MANU-SQUARE functionalities through the identified business processes of the partners. The rationale behind this task is twofold:

- to maximize the applicability of the MANU-SQUARE platform through addressing the actual needs and requirements of the industrial partners;
- to customize the use cases in line with the project objectives for maximum coverage of the envisioned MANU-SQUARE results in the demonstration scenarios.

To achieve this, Task 1.3 has the following objectives and scope:

- to develop a conceptual framework for the definition of the business processes and demonstration scenarios;
- to identify the business processes for demonstration in the use case companies from the traditional manufacturing technologies, and silk & cosmetics industries;
- to analyse and describe the AS-IS situation of the identified business processes;
- to describe the TO-BE situation of the identified business processes with the implementation and contribution of the MANU-SQUARE platform;
- to identify the success criteria for evaluation of the demonstration scenarios, that will illustrate the gains after the implementation of the MANU-SQUARE platform.

## 2.2 Relationships of Task 1.3 with other tasks

Task 1.3 establishes the foundation for the validation of the project through demonstration pilots. The outcome of this task will be aligned with other tasks in WP1, in particular Task 1.4, and further impact WP6 directly, as well as impacting WP2, WP3, WP4 and WP5. The relationships of Task 1.3 are depicted in Figure 2 and explained below.

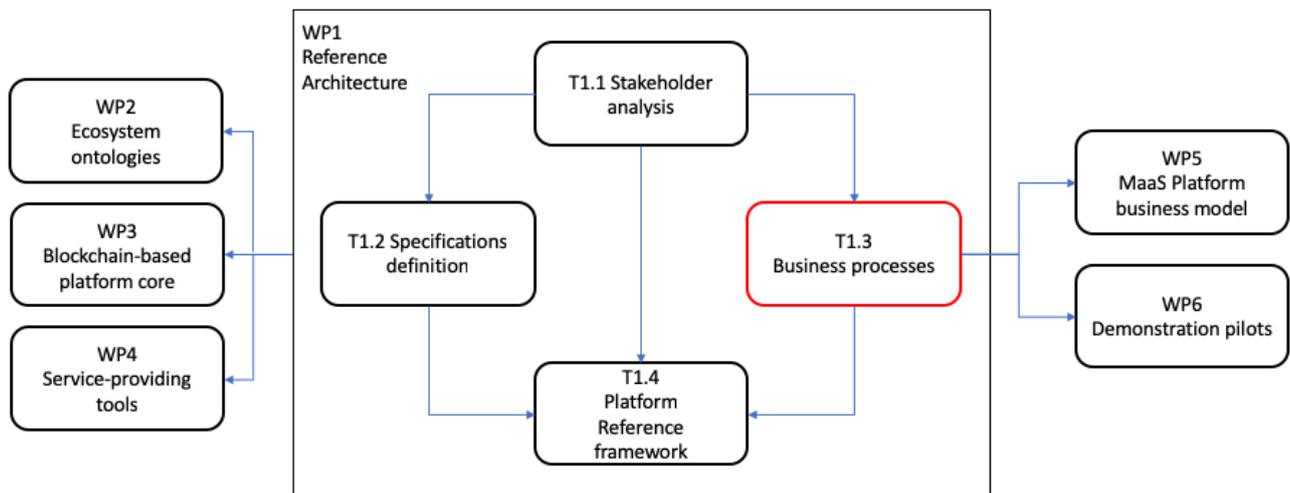


Figure 2 Relationships of Task 1.3 with other tasks and work packages

The interdependencies within WP1:

- Task 1.1: the purpose of the task has been to identify the interests and requirements of the potential stakeholders of the MANU-SQUARE platform. The outcome of this task provided reference information for the development of the relevant business processes and demonstration scenarios, regarding general needs and expectations of the industrial companies.
- Task 1.4: The purpose of the task is to define the platform reference framework, that addresses and harmonises the outcomes of Task 1.1, Task 1.2 and Task 1.3. In particular, Task 1.3, together with Task 1.2,

provides key information about the expected system behaviour of the MANU-SQUARE platform, which guides the reference architecture in Task 1.4.

The interdependencies with other WPs:

- WP2: the overall objective of this WP is to construct the semantic representation of the MANU-SQUARE ecosystem. Task 1.3 provides the overall framework and plan for implementation of the demonstration scenarios, helping to define the building blocks (e.g. actors, production capacities, available resources), and interactions of the domain-specific ontologies for the industrial sectors in Task 2.2.
- WP3: the main objective of this WP is to design and implement the MANU-SQUARE platform infrastructure for data storage and exchange, adopting a blockchain approach. The demonstration scenarios from Task 1.3 contribute to identifying the required connectivity of the IoT devices to the blockchain services from use cases (Task 3.1), and the privacy and security requirements of the companies (Task 3.2).
- WP4: this WP aims at developing the tools that provide the added-value services needed by the ecosystem members to implement the new business models. The results of this WP will be deployed and validated by the end users in WP6. Task 1.3 builds up the overall framework and plan for WP6, as such setting up the initial link between WP4 and WP6.
- WP5: this WP aims to characterize the MANU-SQUARE services and business model. As Task 1.3 ensures a closer, more in-depth understanding of the implementation scenarios of the MANU-SQUARE use cases, the discussions and information gathered throughout Task 1.3 will also be of interest to WP5 and the development of the business model.
- WP6: this WP deals with the actual demonstration of the MANU-SQUARE platform and business model potential. Task 1.3 can be regarded as a preparation stage for WP6, where the demonstration scenarios are executed and evaluated in detail based on the framework and initial plan resulting from Task 1.3.

### 2.3 Outline

The report consists of the following chapters:

- § 2 introduces the MANU-SQUARE project, the aim of the Task 1.3, and the relations of this task with other tasks in the project;
- § 3 describes the applied methodology for eliciting and analysing the business processes of the involved industrial partners;
- § 4 describes the MANU-SQUARE demonstration scenarios at the industrial partner (JPM) from the manufacturing technologies industry;
- § 5 describes the cross-sectorial MANU-SQUARE demonstration scenario, involving the industrial partners (I-COTTON and TRUDEL) from the textile & cosmetics industry;
- § 6 concludes the report and provides highlights of the achieved results as well as of the next steps in this project line.

### 3 METHODOLOGY

A crucial criterion for all innovations is that they provide real value to the relevant users. With the aim of creating an ecosystem that works as a virtual marketplace across business sectors in Europe, the success of MANU-SQUARE highly relies on wide and active participation from the actors involved. To ensure that the desired value is delivered to these actors, two context specific demonstration pilots will be conducted as part of the project phase. Task 1.3 plays an important role in this process, specifying the overall framework for the validation of the project as well as the definition of the success criteria. The devised research methodology is illustrated in Figure 3 and consists of the following steps:

- workshops took place at the pilot companies where several participants from relevant departments, and participants from project partners were involved. In these workshops, business processes were mapped.
  - meeting with JPM in Porto, initial mapping of their relevant business processes with participants from SINTEF, INESC, and JPM;
  - meeting with TRUDEL and I-COTTON in Milano, initial mapping of their relevant business processes with participants from SINTEF, I-HUB, CSEM, SUPSI, I-COTTON, and TRUDEL;
- initial sketching of the business process that will be focused in the demonstration scenarios;
- validation of the business processes by I-HUB, INESC, and pilot companies;
- translation of the modified and validated processes into Business Process Modelling Notation (BPMN).

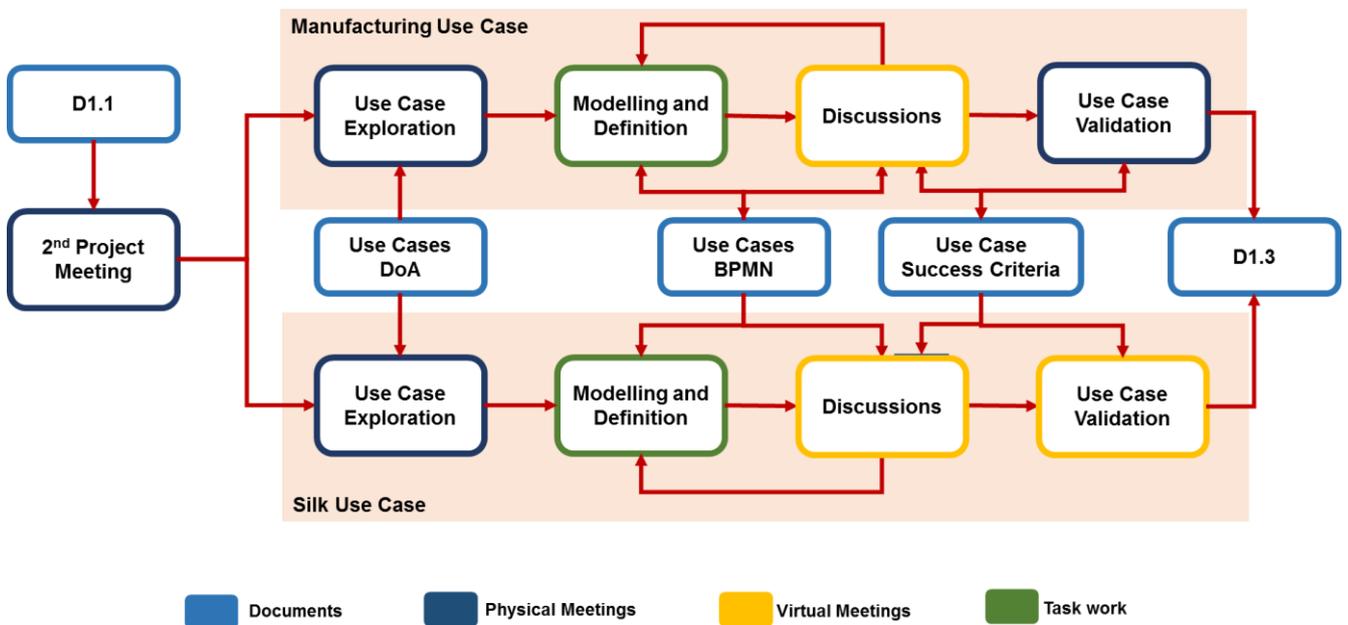


Figure 3 Methodology of conducting Task 1.3

## 4 MANUFACTURING TECHNOLOGIES INDUSTRY DEMONSTRATION SCENARIOS

This chapter presents the identified demonstration scenarios for the pilot industrial partner from the manufacturing technologies industry.

### 4.1 The case company and the manufacturing technologies industry

JPM is a technologically advanced company that carries out its activities primarily in the fields of Industrial Automation and Mechanical Engineering. Throughout its journey, JPM has specialized in the design, production, installation, maintenance and retrofitting of industrial equipment, development and implementation of intralogistics solutions and industrial plants design and installation.

JPM Industry is a worldwide player in the intralogistics sector, that provides engineering solutions for all the internal logistics of its costumers (from various market segments). Being at its core an engineering company, it develops from scratch most of its solutions, recurring to its internal development capabilities, supported by a team of 25 engineers in various fields (industrial layouts, mechanical design, automation design and PLC programming), that are part of the Engineering department.

Following the development phase, the projects are manufactured and assembled in-house, recurring mostly to the existing internal manufacturing capabilities, from laser cutting, to bending, welding, assembly and testing. The company also has installation and maintenance services that complement its value proposal to the market, that are fulfilled with its own teams that have track record of installation and maintenance of equipment and solutions across the globe. JPM's market segment is composed by highly skilled and specialized manufacturing and logistics companies, mostly with a worldwide operation and with a large-scale structure.

The main markets for JPM are Food & Beverage, Chemical, Pharmaceutical and Post & Parcel. In these markets JPM can provide a full range of intralogistics solutions, including conveyors (unit / box / bulk packaging / pallet / etc.), robotic systems (pick & place / palletizing / etc.), automation systems (PLC / HMI / control cabinets / etc.), software (Supervision software / SCADA's / HMI's / etc.), Industrial Equipment (various applications & custom-made design) and Turnkey projects (whole factories, including industrial project design, equipment and utilities). JPM Industry is part of JPM group, which is composed by 4 companies:

- JPM Industry - Intralogistics solutions;
- JPM Renovaveis - Renewable energy solutions;
- Jointsteel Process Technologies - Industrial process equipment & solutions;
- Novafabril Angola - JPM branch for Angola and Sub-Saharan Africa.

### 4.2 Business context and characteristics

Currently JPM Industry team is composed by more than 125 collaborators. It operates across the world, with exports to more than 40 countries, representing these exports in 2017, 76% of the total turnover for the year. The turnover for 2017 was 11,7 million Euros.

JPM operates in its headquarters that are located in Portugal and were concluded and inaugurated in 2013, with a total covered area of more than 15.000 square metres (manufacturing & offices), in which it carries out most of its activity (engineering, manufacturing, assembly, test, maintenance, etc., plus all the support activities to its operation).

### 4.3 Business maturity and relations

JPM works in a partnership approach both with its customers and main suppliers. It has structured and developed departments to manage customer & supplier relationships (Sales & Marketing and Supply Chain departments) that develop the relationship with customers and suppliers according to the company strategy. Most of the customers and suppliers of the company have been so for many years, which represents a high maturity in the relations established.

Regarding market position, being a worldwide player in the intralogistics sector, JPM competes with companies from across the world, having established itself as a reference in the industry that it operates in.

### 4.4 Business needs and challenges

Most of JPM projects are derived from its customers investment plans, which can bring some degree of variability to the company's activity during the business year. This means that, in some occasions, JPM might experience shortages in its capacity, that can be located in the engineering area or in the manufacturing process. Also, the opposite might occur - having a specific installed capacity, JPM might experience a surplus of unused capacity in its engineering or manufacturing areas, that is of great interest to utilize. Being a relatively capital-intensive company, this becomes of great importance.

Although the company has a broad and structured supplier base, the procurement activities would benefit greatly with the possibility to use of a platform like MANU-SQUARE, in the search for new potential suppliers / partners. The sales & marketing activities would also benefit from the access to the platform, in some areas of business of the company - being renovation & retrofitting one example. Currently, the retrofitting activities of JPM are more concentrated in a closer market - South Europe, but with the access to the platform this could be expanded to other geographical regions, with the match of demand and supply (capacity).

Engineering activities would also be supported by the platform, since the innovation process can be more interactive and supported by external entities - MANU-SQUARE could be of great usefulness in the matching of the capabilities that these entities offer with the demand from JPM, when applicable.

### 4.5 Demonstration scenario 1 – New product development: development of a turnkey AGV solution

The first demonstration scenario sees JPM as a customer in the MANU-SQUARE platform. From this point of view, the organization intends to develop a new automated guided vehicle (AGV) for the food processing industry, that should ultimately be delivered to clients as a turnkey solution.

For the customer perspective, the development of a new product was the chosen scenario as it encompasses all the core functionalities of the resources finding and sharing services of the MANU-SQUARE: capability matching, whether they are production, know-how or technological, through the matchmaking algorithm, RFQ management and communication support through the services marketplace and player profiling and reputation management through the user profiler tool.

With this scenario JPM will be able not only to evaluate MANU-SQUARE's impact throughout its entire product development process but also to gather important data as to how a global provider of industrial equipment conducts this entire process and what it deems crucial for its success. The fine-tuning required for the successful adoption of tools like the matchmaking algorithm and the reputation mechanism will rely heavily on the output from this demonstration scenario.

#### 4.5.1 AS-IS description of the new product development process

R&D projects for product development at JPM are divided into 3 main types, according to their scope and deadlines:

- Projects with an expected lifetime of no more than 3 months are considered short term. These projects are developed using mostly internal resources, and are frequently derivative from technologies and / or techniques that JPM already has implemented in its engineering and production departments, and are, for the most part, driven by a need of the market.
- From 3 to 12 months range, projects are considered medium term. Still market driven, the fundamental difference lies in the fact that these projects, while led by JPM itself, usually involves the participation of different partners like scientific institutions. Due to this elongated time frame (when compared to short term projects) and the more prevalent involvement of different partners, these kinds of projects start to cross the

barrier between one-off product development projects and projects with more structural importance to the company.

- Long term projects exceed the 12-month mark and JPM may share the leadership of the project with other entities. These projects frequently involve partnerships, usually with scientific institutions, and, most notably, are driven by an identified need to innovate, gathering new knowledge or develop a new technology / functionality. It is important to note that these projects can be escalated, given the necessity for further development.

The need for an RFQ to find a supplier depends on the existence of the internal capacity and capability in terms of the technology and know-how required. Figure 4 illustrates the scenarios that generate the need for acquiring a supplier to a new project.

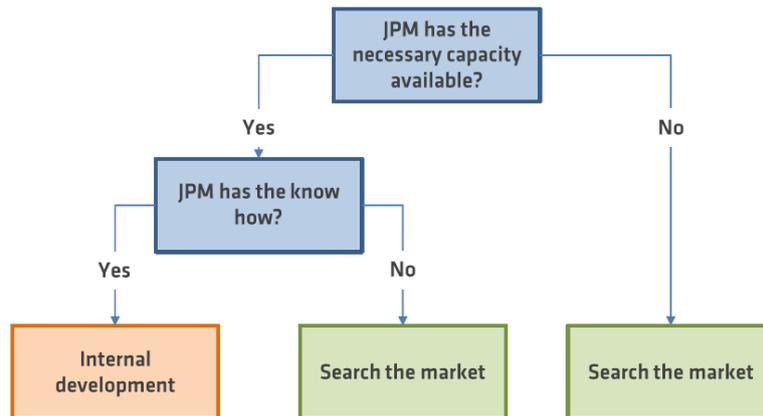


Figure 4 Scenarios for identifying the need for acquiring new suppliers / partners

- When JPM has the technology to develop a certain project but lacks the available capacity to implement it, it may choose not to develop this capacity in-house. For these projects, which fit the small to medium timespan, it becomes more cost-effective to search for suppliers to find the required capacity. Associated with long-term strategic projects are those in which JPM does not currently have the technology nor the know-how. Consequently, these projects always imply work in determining the state-of-the-art, both in terms of existing studies and/or patents as well as with current suppliers and scientific institutions, where partnerships can be beneficial.
- Cases in which JPM has the necessary technology for a project, the required know-how exists and there is capacity available to develop it are usually solved internally. If, however, the engineering capacity is lacking and the deadline is tight enough, partners and suppliers are integrated into the process. This scenario mostly applies to medium term projects and, as such, can encompass projects with a strategic value to the company. In these critical cases, the integration of third-party supplier goes through the same level of scrutiny of the Procurement for RFQ process, and can go up to the board level for approval.

Independently of the time frame, the AS-IS process for searching and acquiring new suppliers is illustrated in Figure 6 and explained step by step below. The main steps of this BPMN (Business Process Model Notation) are extracted in Figure 5 for easier understanding. The process starts with the Procurement for RFQ process. In here JPM compiles an initial list of suppliers that will be involved in the development process. All the suppliers that work with JPM need to go through a thorough evaluation process so, if a supplier is new to the JPM supply chain, the Supplier Evaluation activity is triggered. This process, repeated for every needed supplier, starts with a request for the supplier to fill a Request for Information (RFI) document, moves to an optional test order, to evaluate lead times and product quality, and finishes with a visit to the supplier site (when necessary) and a final decision. With a list of selected suppliers, the RFQ process begins, and the received quotations are evaluated. If the product is a standard one, the Procurement department is able to do this evaluation without input from other departments. If this is not the case, both the engineering and production departments are involved in the process. This activity is also a complex one, given that JPM may need to again search

the market if it doesn't have the required know-how to carry out internally the project. When the evaluation process is completed, JPM engages directly with suppliers to receive offers which will in turn trigger negotiations leading to a final deal.

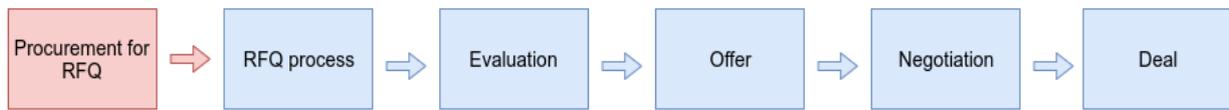


Figure 5 New supplier procurement process

**Demonstration Scenario 1 - Development of a Turnkey AGV Solution: AS-IS Situation**

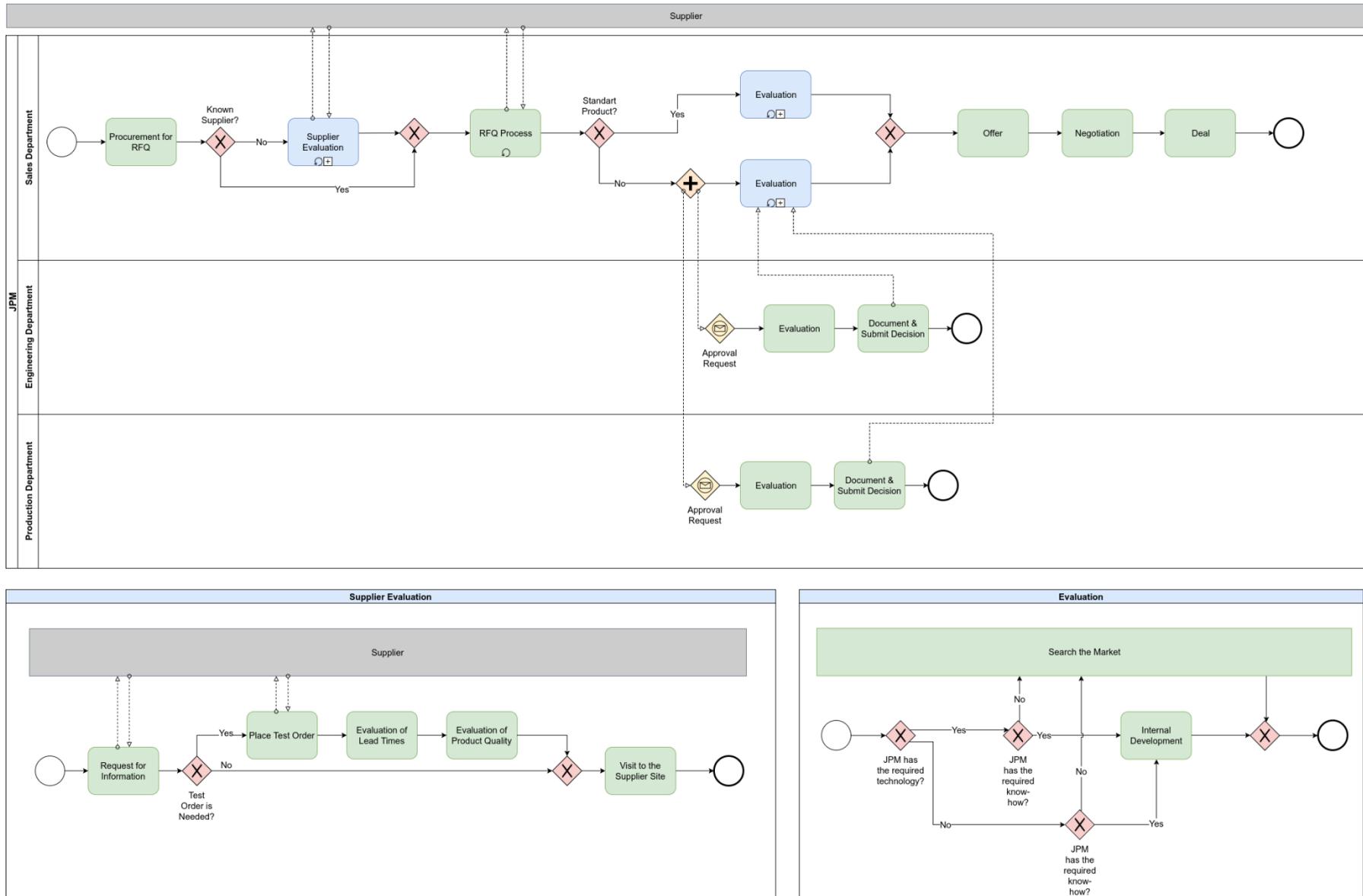


Figure 6 BPMN of AS-IS demonstration scenario 1: new product development

1. Procurement for RFQ: The first step in the supplier procurement process is a purely internal one.

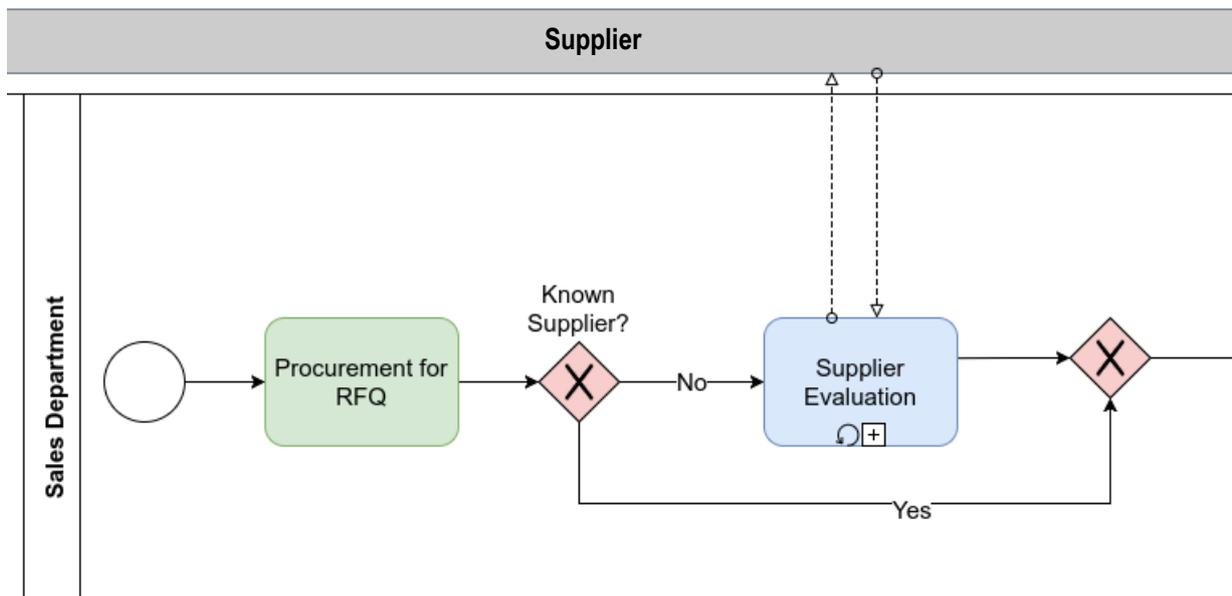


Figure 7 BPMN detail of Procurement for RFQ in the AS-IS situation

The procurement for the request for quotation (RFQ) is a pre-selection of suppliers that will potentially be involved in the subsequent project. The criteria used for this selection process is based on, and varies, according to the type of product / service to be supplied:

- for **suppliers of services**, the quality of services (given previous experiences), capabilities of the supplier, price, location, technical capabilities, and the contract situation of the supplier with its employees (companies who subcontract employees are not used for IP protection reasons) are the most relevant factors, amongst others;
- for **suppliers of equipment**, manufacturing processes, quality standards, technical skills, price and lead times, are taken into account as the main factors of decision;
- for **engineering suppliers** trust takes the centre stage, given the need to share sensitive intellectual property materials, on top of other factors such as technical and engineering knowledge and skills, development processes used, location, etc.

These criteria get formalized in a two-step verification processes used by JPM that every supplier must go through in order to be included in the supply chain.

1. The supplier characterizes its capacities, skills, equipment, staff, track record, standard certifications, business ethics and financial situation in what JPM calls a Request for Information.
2. This document is then analysed and validated with visits to the supplier site(s) and audit of the relevant components. In cases in which it is applicable, a test request is placed in order to evaluate lead times and work quality.

2. Request for quotation (RFQ): The next step of the process is the RFQ, fueled by the results of the previous evaluation. The way in which this process is conducted is supplier- and process-dependent and, despite the use of communication technologies to facilitate this process, for some suppliers this process is still an analogue one, relying on email, phone, and on-site evaluations.

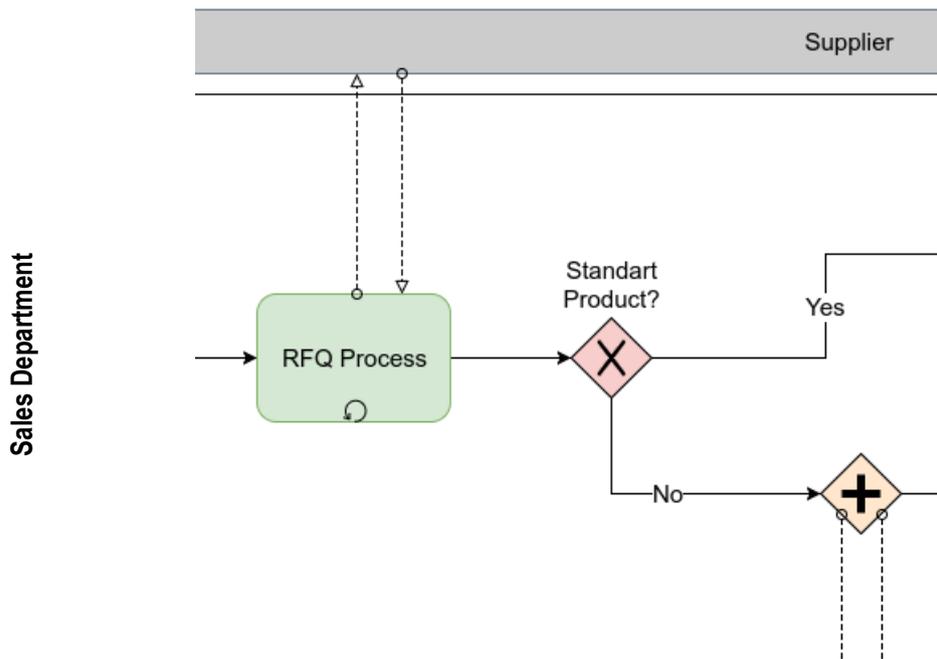


Figure 8 BPMN detail of Request for Quotation in the AS-IS situation

The exchange of information is a crucial part of this step. Although dependent of project and customer, the usual documentation exchanged during the RFQ process includes:

- non-disclosure agreements (unilateral or bilateral);
- quotation tools and templates (Excel files, with cost breakdown structures, other quoting tools, etc.);
- project, equipment and manufacturing drawings (2D and 3D);
- certificates of standards relevant for the process (ISO 9001 / 14001 / 18001 / Welding, etc.);
- other specific documentation, such as requests for information (RFI) (assessment to companies capabilities and skills, process installed, etc.), financial information enquiries, etc.;

The lead time is also very subjective and dependent on the complexity and type of project to be quoted. For a standard project, from RFQ start until quote submission, this can vary from 1 to 3 weeks.

**3. Evaluation:** The evaluation phase is the second internal phase. Here the main responsibility falls under the Supply Chain department, solely if the process involves a standard product. In a project where non-standard products are involved both the engineering and production departments may need to be involved.

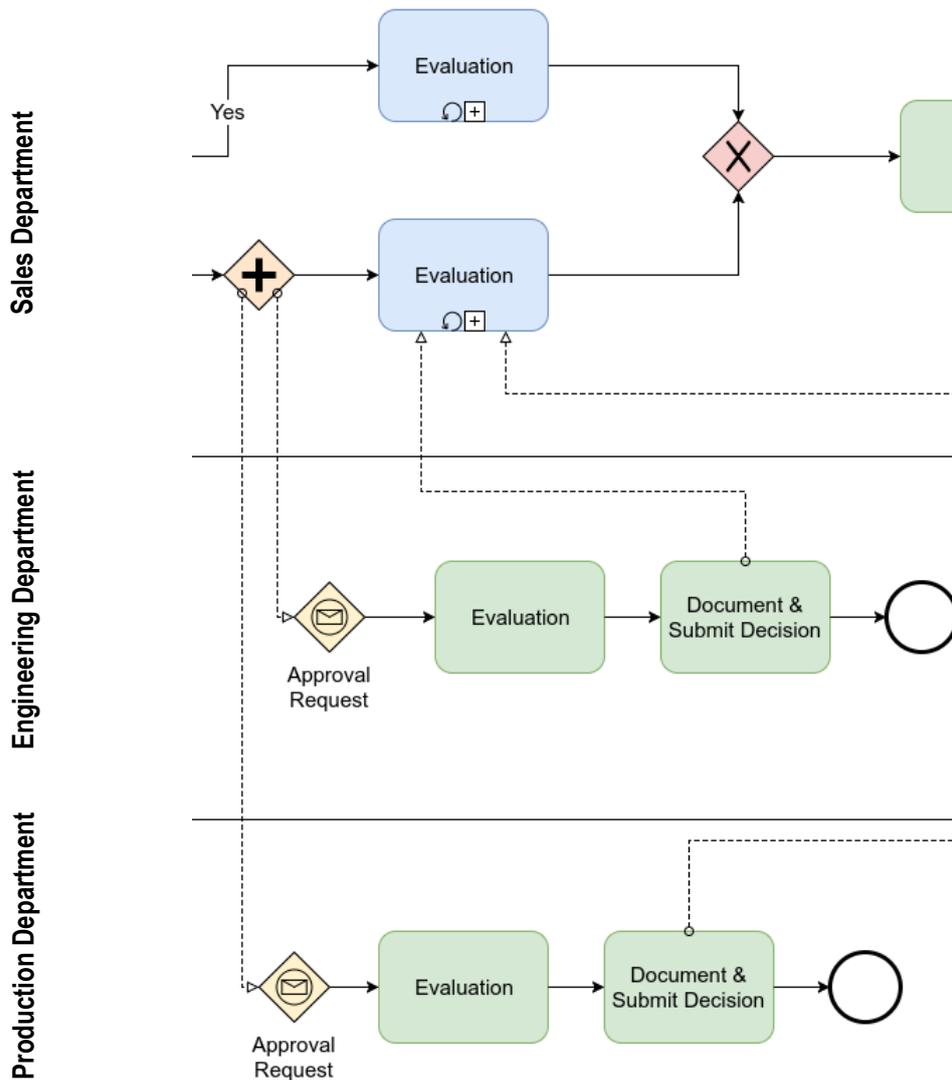


Figure 9 BPMN detail of Evaluation in the AS-IS situation

4. Offer, Negotiation, and Deal: With all the requirement gathered in the previous steps, the Supply Chain department, working closely with engineering and production departments receives an offer from the selected supplier, that includes factors such as price and delivery times and conditions. If the concept is not applicable or achievable by the terms of the first offer, JPM, through the Supply Chain department, can negotiate an alternative concept/solution with the supplier, negotiating at various stages (e.g. design, production, etc).

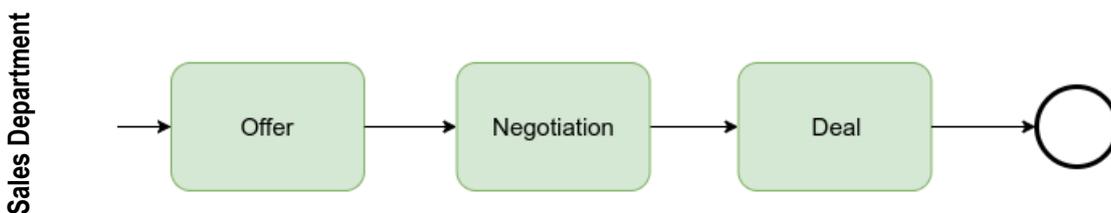


Figure 10 BPMN detail of Offer, Negotiation and Deal in the AS-IS situation

#### **4.5.2 TO-BE situation with the contribution of the MANU-SQUARE platform**

In this demonstration scenario, JPM acts as customer and accesses MANU-SQUARE to identify adequate and available capability and capacity of technology providers (companies and research centers) and suppliers in order to set up an adaptive extended product-service business model, covering the value chain for the development and production of a new industrial AGV. Figure 11 illustrates the BPMN of the TO-BE situation of the business process with the utilization of the MANU-SQUARE platform.

The TO-BE process starts with JPM relying on the MANU-SQUARE platform for the Procurement for RFQ process, utilizing the Blockchain based infrastructure for trust and privacy concerns of the information sharing. With the relevant data received, the platform conducts the matchmaking process and provides a supplier list to JPM. These suppliers, if unknown, go through an internal evaluation phase, that also relies on the MANU-SQUARE platform to speed up the process with its reputation mechanism. With a list of chosen suppliers, JPM goes back to the platform to start the RFQ process. When this activity, conducted between suppliers and the platform, is concluded, a notification is sent to JPM which can then perform the internal evaluation processes. Upon conclusion of the evaluation phase, the process proceeds with offer, negotiation and deal. These last activities are now conducted through MANU-SQUARE the platform, making the entire process structured, accountable, and trustworthy. The specific challenges in this business process as well as how the MANU-SQUARE platform will address these challenges are described after Figure 11.

D1.3 – Business processes and early validation scenarios

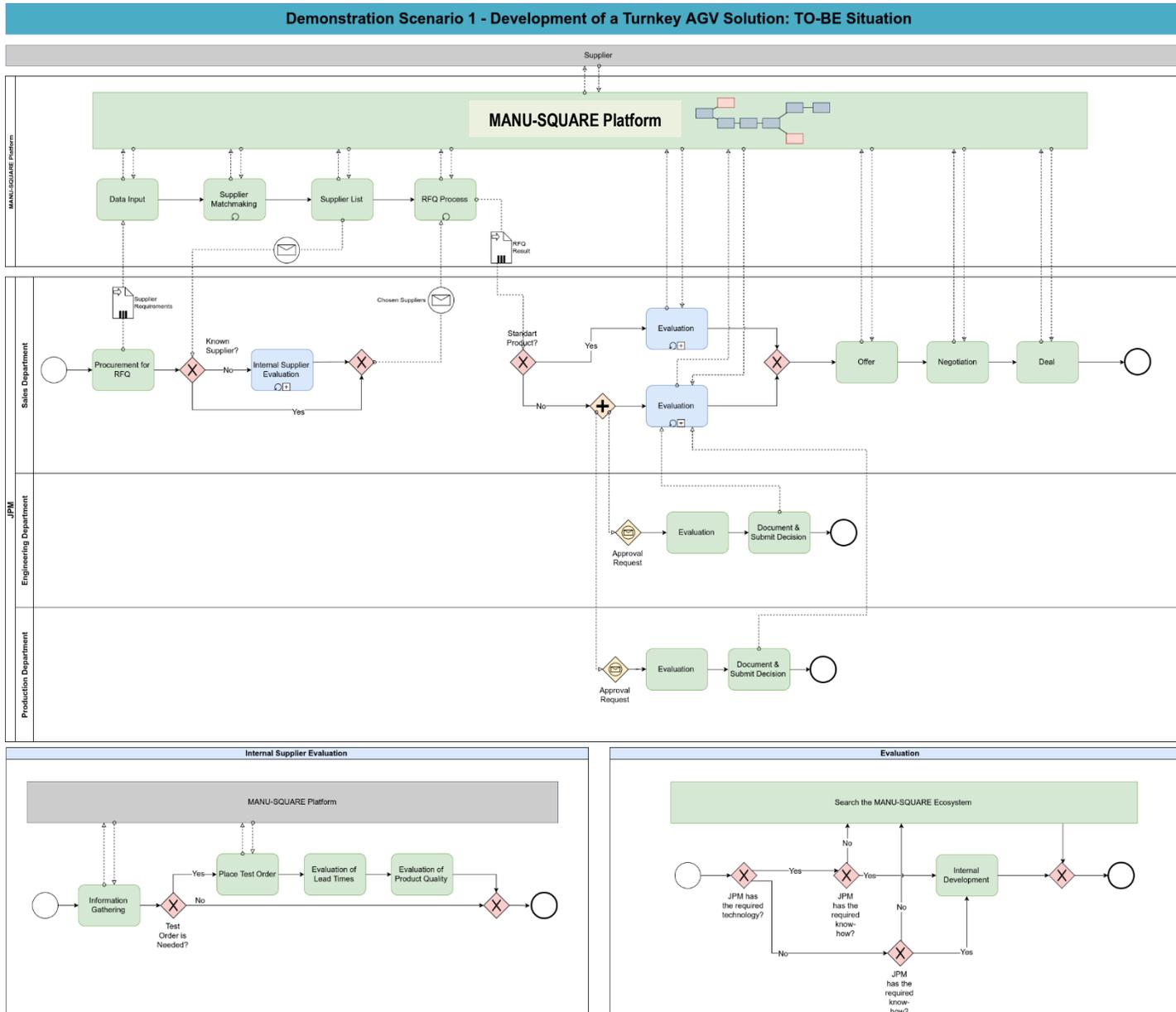


Figure 11 BPMN of the TO-BE demonstration scenario 1: new product development

**Process step:** Procurement for RFQ

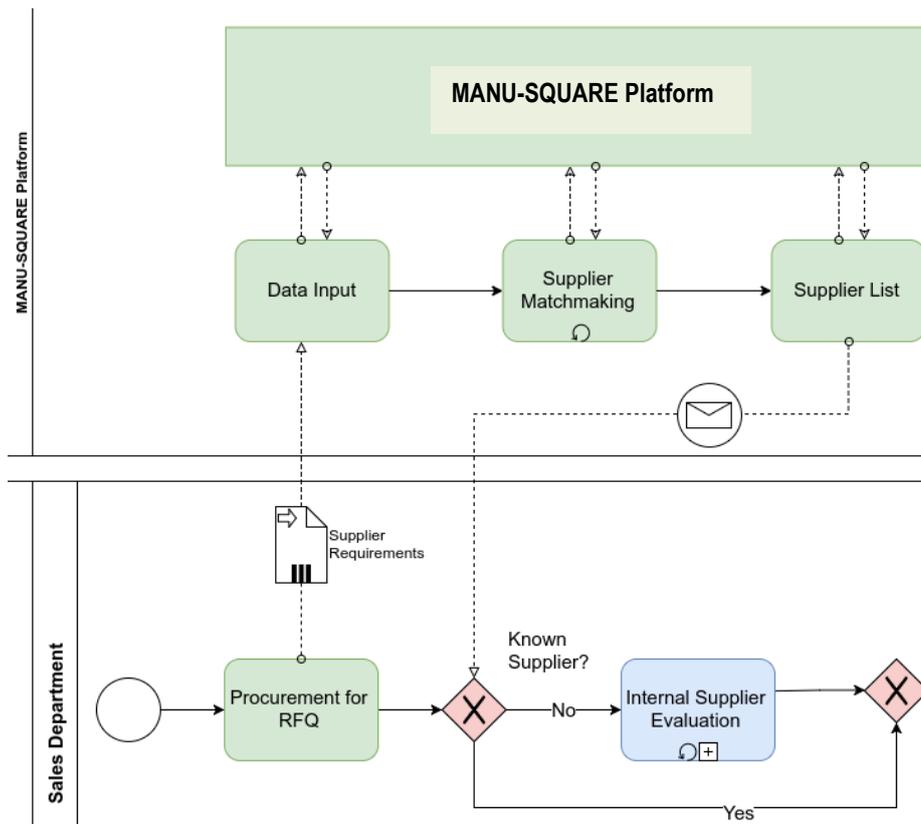


Figure 12 BPMN detail of Procurement for RFQ in the TO-BE situation

**Challenges:** The main drawback of how this phase is currently managed is the amount of time needed to manually go through all the steps of finding and verifying a supplier: market research, reference gathering and validation, verifying certifications, financial information, and reputation with other players of the market. This is an expensive process as it is time-consuming, can lead to unreliable decisions, and is very much dependent on how much accessible information about a supplier is available. The supplier search in the market is dependent on the company knowledge of the market, networking knowledge and is, in some occasions, limited to a certain geographic area (in which JPM has more knowledge of potential suppliers).

**MANU-SQUARE Solution:** Matching demand with supply is one of the main functionalities of the MANU-SQUARE platform and, for this matching function to be of any use, trust between parties must be assured. This trust building need is the reason why an evaluation step precedes the RFQ in the current JPM business processes. MANU-SQUARE employs various mechanisms to foster trust between businesses and the platform itself. The most relevant mechanisms to this process are the companies' profiles and the reputation score. Being designed from the ground up with the notion of company profiles, most of the information requested by JPM in the request for information forms can be made available in these profiles by the companies themselves. The trustworthiness of the information in these profiles will then be reflected in each company's reputation score, and with systematic use of the platform and the strengthening of the reputation algorithm with enough data points, it will be also possible for the complete track record process to be automated.

**Addressed MANU-SQUARE Functionalities** (from D1.2): Production capacity matching, Know-how capabilities matching, Transactions management, Reputation management, Certifications management, Suppliers assessment, Information security and privacy, Communication support, User Profile management

**Process step:** Request for Quotation (RFQ) process

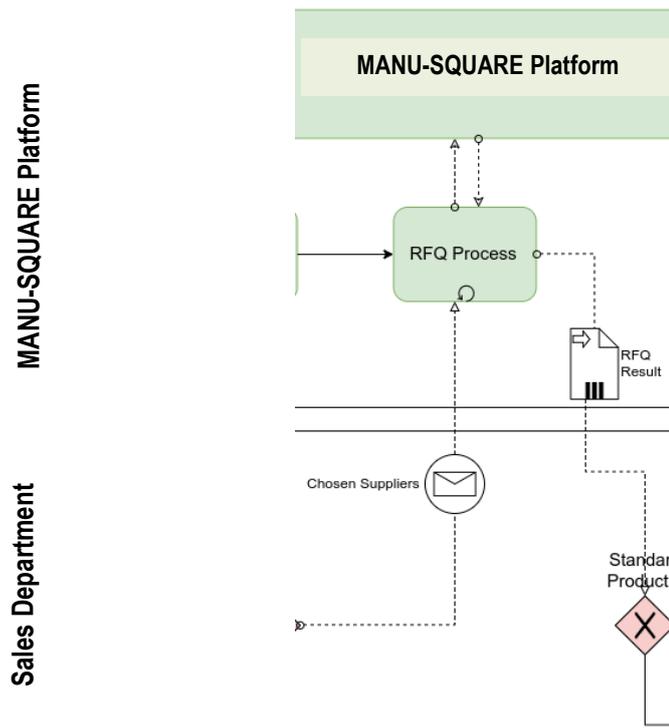


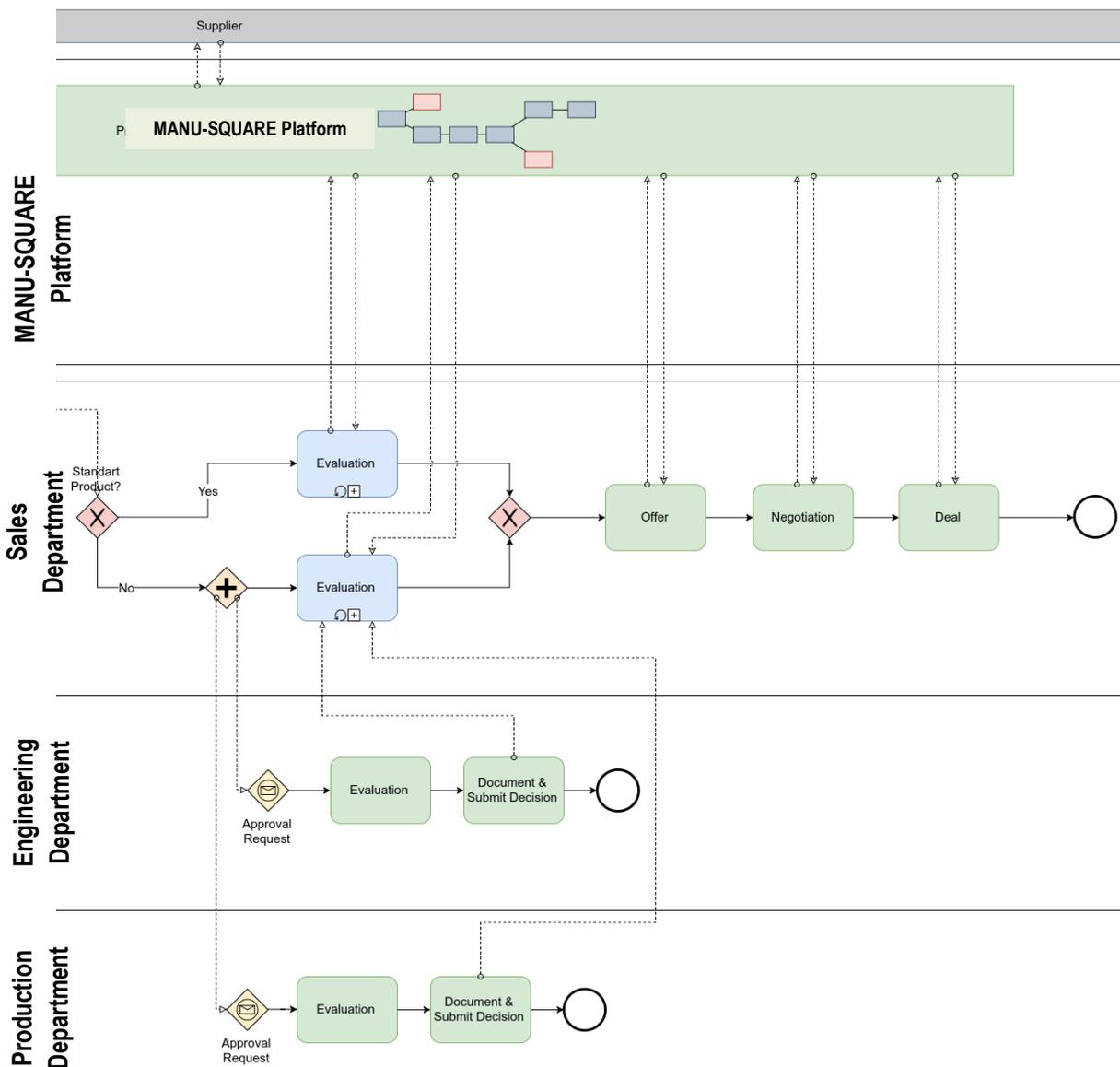
Figure 13 BPMN detail of Request for Quotation in the TO-BE situation

**Challenges:** The main problem facing the request for quotation process is the high volume and various typologies of used documents. In complex quotation processes, there might be various documentation being filled and exchanged by the parties. It can become difficult to manage the documentation and its various versions, and the control due dates of documentation delivery by the RFQ contenders. Another major issue is how this information travels from point-to-point. This is not only due to the inherited security risks of common email protocols, the main channel of communication in use, but also to the fact that email doesn't lend itself to the dissemination of information among multiple stakeholders, where all of these have equal access to updated information. Very often a change in a quote for a particular supplier affects other quotes. Using email to disseminate a change like this across a supply chain is an error-prone, manual task which lacks in terms of traceability and control. Traceability and accountability are the main pain points of this process. The ubiquitousness of email has allowed it to become a standard means of official communication between companies. However, as the need for more structured, secure and traceable forms of communication arise, this simplicity becomes a burden to get around.

**MANU-SQUARE Solution:** The MANU-SQUARE platform leverages the use of new technologies in combination with true and tested concepts. The use of decentralized ledger technologies in conjunction with a central digital platform service allows for the platform to remain ubiquitous in terms of access and distribution in all the relevant B2B interactions. This duality allows for the management of templates, bids and the updated management of the tender process for all stakeholders, from the server-side perspective, while providing the traceability and accountability for the entire duration of the communication process throughout the decentralization mechanism. The platform could also improve the communication between companies with the standardization of a NDAs for all forms of communication.

**Addressed MANU-SQUARE Functionalities** (from D1.2): RFQ management, Transactions management, Reputation management, Certifications management, Suppliers assessment, Information security and privacy, Communication support, User Profile management

**Process step:** Evaluation, Negotiation, and Deal



**Figure 14** BPMN detail of Request for Evaluation, Negotiation and Deal in the TO-BE situation

**Challenges:** JPM's main challenges for the evaluation and negotiation phase relate to the lack of precise information on suppliers' capabilities, trustworthiness, reputation in the market, quality standards and ability to deliver, that are relevant to a project and to the limited pool of suppliers. Given that most information about a supplier, that does not come from the supplier itself but is gathered from either market research or other trusted suppliers and networking sessions, this is a subjective, error-prone, and time-consuming process. In-site inspections and test orders can serve to alleviate some of these challenges but they accentuate even further the cost factor with travel and personnel expenses. All this translates into difficulty in finding suppliers for specific procurement processes.

**MANU-SQUARE Solution:** The ecosystem that is to be created around the MANU-SQUARE platform is the biggest advantage for the particular problems that JPM faces in this stage. With a larger pool of potential suppliers, more information about each of them and the matchmaking mechanism, this process should become easier to accomplish.

**Addressed MANU-SQUARE Functionalities** (from D1.2): Ecosystem optimization, Transactions management, Suppliers assessment, Information security and privacy, Communication support

**4.5.3 Success criteria for validation of the demonstration scenario 1**

The success criteria for validation will focus on the overall improvement of the product time to market metric, and, given the main pain points of JPM’s product development process, the pre-validation for the RFQ process (Procurement for RFQ), the RFQ process itself and the communication between business partners are the most relevant bottlenecks. As such, the success criteria in Table 1 are defined to be evaluated. This demonstration scenario will contribute to the achievement of the following MANU-SQUARE target impacts listed in the DoA:

- Increasing responsiveness of collaborative value networks, through effective mechanisms for demand-supply matching. This impact targets the following measurable goal: “-30% time-to-market for new product-service thanks to the acceleration and the implementation of first-time-right solutions promoted by the platform” [MG2.2 in the DoA].
- Reducing the time-to-market, through reducing the time spent for the RFQ process steps and procurement lead time. This impact targets the following measurable goal: “+10% new product-service concepts brought to the market thanks to the platform support provided from conception to production” [MG2.1 in the DoA].

Success criteria	Description	Target	Approach to assess
Increasing accuracy of the matchmaking functionality	This criterion targets improvement of the results obtained from the procurement for RFQ process. Due to the incomplete information about the suppliers, and the variability of skills and needs from JPM, the acquirement of new suppliers is a task that is time- and resource-consuming.	90% accuracy of the supplier validation	Based on the simulations of the match-making algorithm accuracy
Making the steps of the RFQ process platform-driven	This criterion targets maximizing the usage of the MANU-SQUARE platform for performing the RFQ process steps, including the document sharing management.	The entire RFQ process	Utilization of the MANU-SQUARE RFQ management functionality for performing the complete RFQ process
Reducing the procurement process lead time	This criterion targets reducing the procurement process lead time, shortening the time spent for acquirement of a new supplier to the JPM network. The acquirement process includes searching and finding capable suppliers, managing the RFQ process, and validating the certifications, reputation, and financial status of the information.	Less than 2 weeks to go through the steps for validating and integrating the supplier (from current 3-4 weeks)	Lead time from the launch of an RFQ (request for supplier with the matchmaking algorithm) in MANU-SQUARE until a deal is reached

Table 1 Success criteria for testing and validation of the demonstration scenario 1

**4.6 Demonstration scenario 2 – Market coverage extension: retrofitting business**

In the second scenario, JPM is meant to become one of the companies populating the database of MANU-SQUARE, thus offering their services and available production capacity for retrofitting activities of already installed manufacturing equipment around Europe.

Retrofitting services provided by JPM have been limited to the South Europe area. The expansion of these services to other locations in Europe would allow JPM to increase their capacity utilization up to 15%, but the extension of these services to other markets requires dedicated resources and a financial exposition that the company is not willing to take without any proven interest by target markets.

This demonstration scenario tries to bridge this gap by focusing on new equipment retrofitting and refurbishing projects, which will provide another point of view as to how JPM establish connections with its customer and suppliers and how the platform can become attractive to businesses who have available unused capacity.

#### 4.6.1 AS-IS description of the retrofitting / refurbishing process

The AS-IS process for acquiring retrofitting / refurbishing projects is illustrated in BPMN in Figure 16, and explained step by step below. The main steps of this BPMN is extracted in Figure 15 for easier understanding. This scenario is triggered by an inquiry from a customer, to perform a retrofitting/refurbishing activity. This prompts an initial internal assessment by both the sales and the engineering departments which serves as the first checkpoint for the continuation of the process. If this first checkpoint is cleared JPM moves to a local (to the customer) assessment of the work as the second checkpoint. If the project is taken, JPM engages with the customer in the quotation and negotiation activities, leading to a final deal and start of the work.

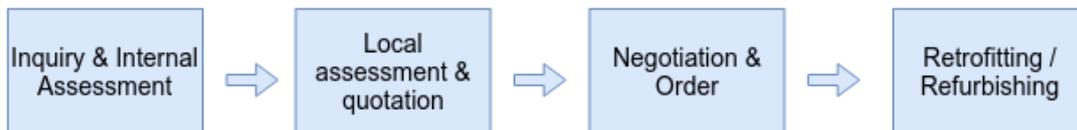


Figure 15 The overall process of acquiring retrofitting and refurbishing projects

## Demonstration Scenario 2 – Market Coverage Extension: AS-IS Situation

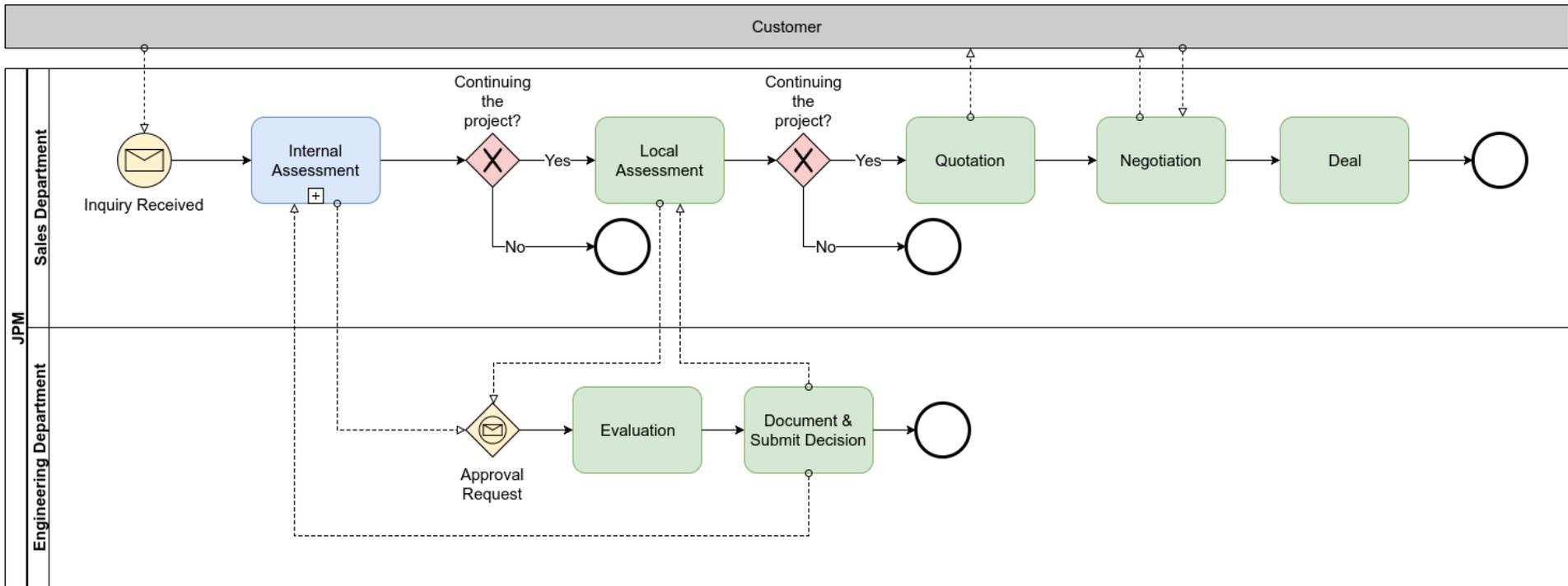


Figure 16 BPMN of the AS-IS demonstration scenario 2: acquiring retrofitting / refurbishing projects

1. Inquiry and internal assessment: The retrofitting / refurbishing process usually starts with an inquiry that comes directly from the customer who wants his equipment to be retrofitted or refurbished. Before going to the facility for a local assessment, JPM goes through a checklist which aims to understand the scope (mechanical, automation, robotics), time expectations, and physical location of the project, as well as a rough cost estimation. This checklist is highly dependent on the scope of the project and varies for each one.

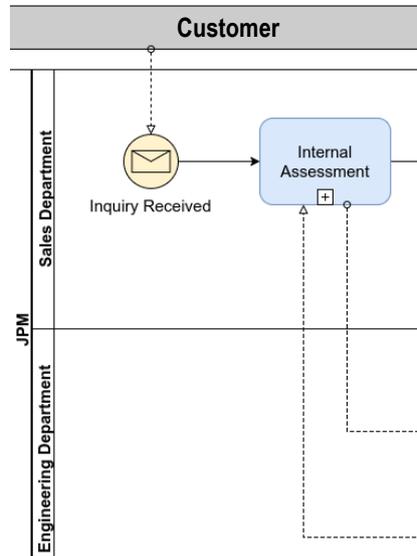


Figure 17 BPMN detail of Inquiry and internal assessment in the AS-IS situation

For retrofitting / refurbishing services, the physical location of the equipment is a decisive factor in taking in new projects. Projects in which equipment is located in the southern Europe region can have a smaller scale or be of a one-off nature. Projects in which equipment is located in other regions of the world need to have, however, a different, larger scale to offset the inherited costs. This first remote assessment can usually take between one and two weeks.

2. Local assessment and quotation: The second phase in the retrofitting / refurbishing process is a visit to the facility where the equipment is located for a local evaluation of the required work by the JPM team. This local assessment is an important requirement given that the customer doesn't usually have the expertise to do the full evaluation.

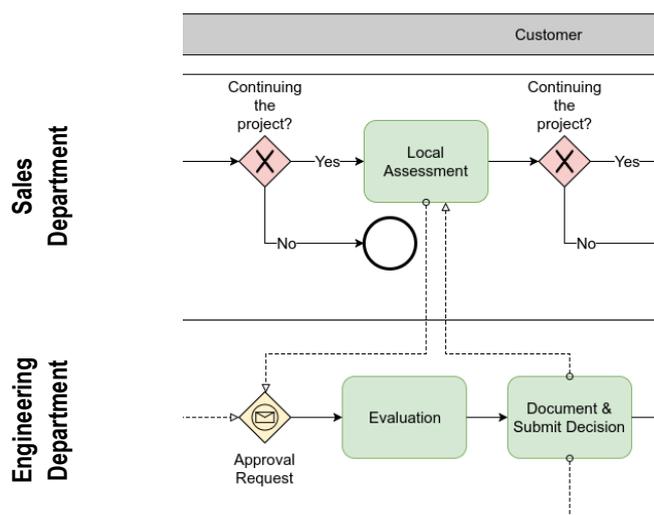


Figure 18 BPMN detail of Local assessment and quotation in the AS-IS situation

JPM estimates that between 90% to 95% of assessments are made in the customer's facilities. However, when an ongoing partnership exist, the equipment may be sent to JPM facilities for this assessment. The Engineering department

and the Production department are responsible for the technical assessment, but other departments can be involved if deemed necessary from the initial remote evaluation. Due to the specificity of some retrofitting projects (e.g. application of new technologies, materials), JPM might not have pre-established relations with the necessary suppliers. This triggers the process described in the previous demonstration scenario with the additional constraint imposed by the need to close the quotation process. Adding to this issue, the already limited supplier base, unclear information about specific processes and competences and the fact that, especially for small scale works, potential suppliers also see distance as a constraint, it can become challenging to find suppliers. This assessment process can range from one to two weeks and culminates with an estimation from the sales department of the project that is being passed to the customer. This estimation includes not only the engineering, mechanical, and material costs, but also all costs related to logistical and legal issues.

**3. Negotiation and Order:** The negotiation and order phases vary highly from project to project. During these bilateral discussions between the customer and JPM, time, cost, and scope of the project are subject to change and the negotiations may also require the involvement of third-party suppliers.

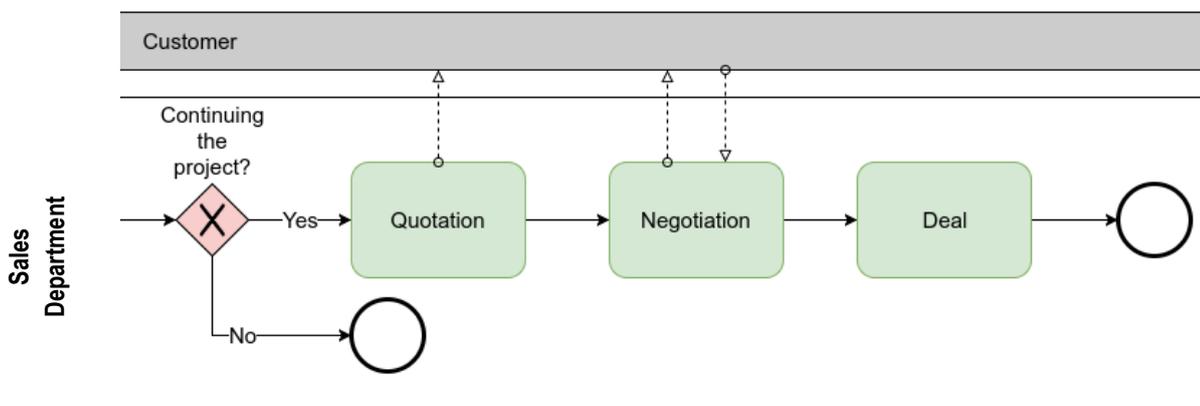


Figure 19 BPMN detail of Negotiation and order in the AS-IS situation

#### 4.6.2 TO-BE situation with the contribution of the MANU-SQUARE platform

Figure 20 illustrates the BPMN of the TO-BE situation of the business process with the utilization of the MANU-SQUARE platform. The TO-BE process begins with JPM being included in the supplier matchmaking of a customer, through the trustworthy MANU-SQUARE platform that relies on to the Blockchain based infrastructure. The customer sends JPM an inquiry about the work to be performed that will go through the internal assessment as described in the AS-IS process: first assessment by the sales and engineering departments and later a local assessment. If the process gets an internal green light, JPM gives the project a quotation and engages in the negotiation process, which, if successful, will turn into a deal and an order. The specific challenges in this business process as well as how the MANU-SQUARE platform will address these challenges are described after Figure 20.

## Demonstration Scenario 2 – Market Coverage Extension: TO-BE Situation

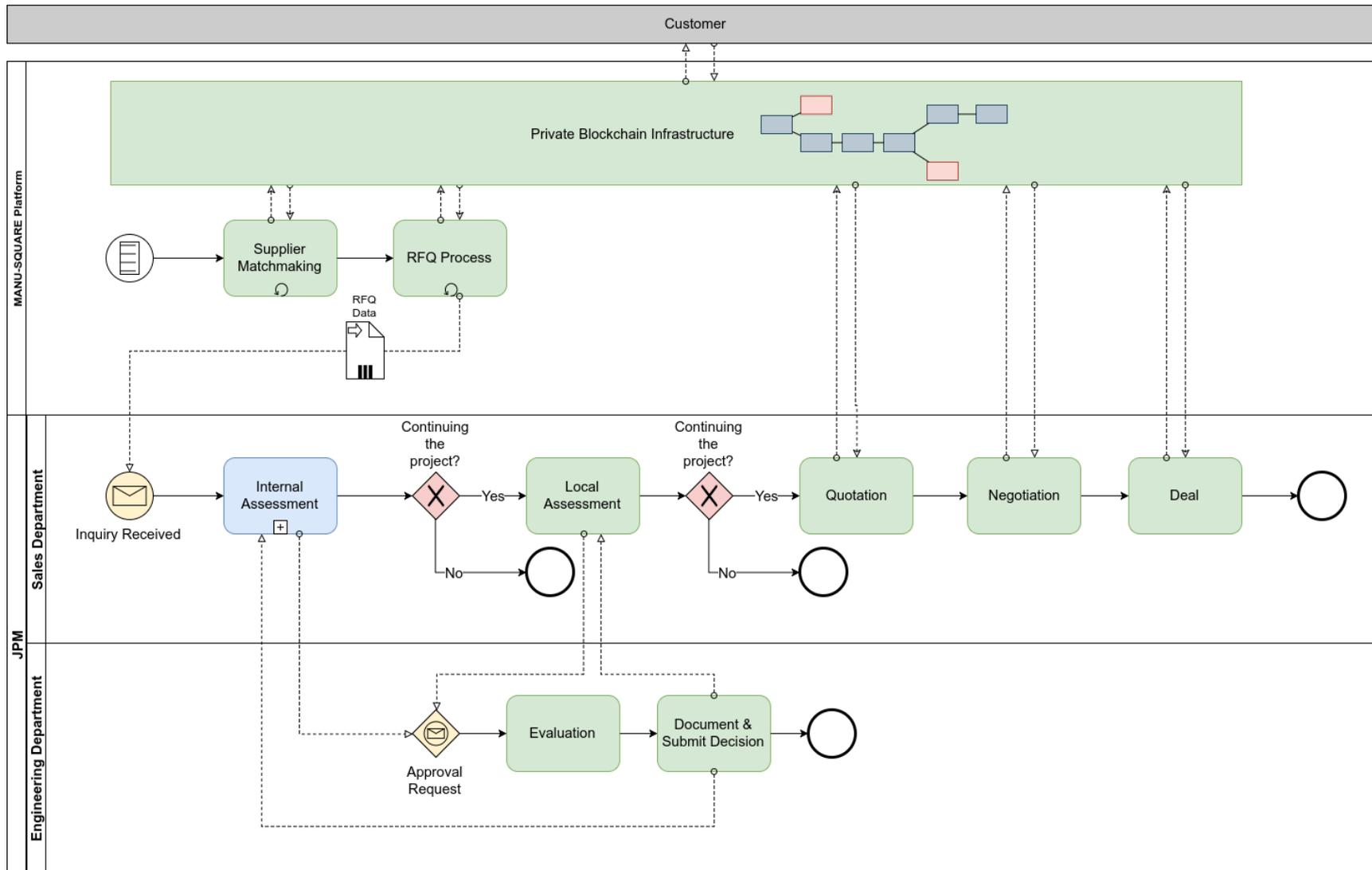


Figure 20 BPMN of the TO-BE demonstration scenario 2: acquiring retrofitting / refurbishing projects

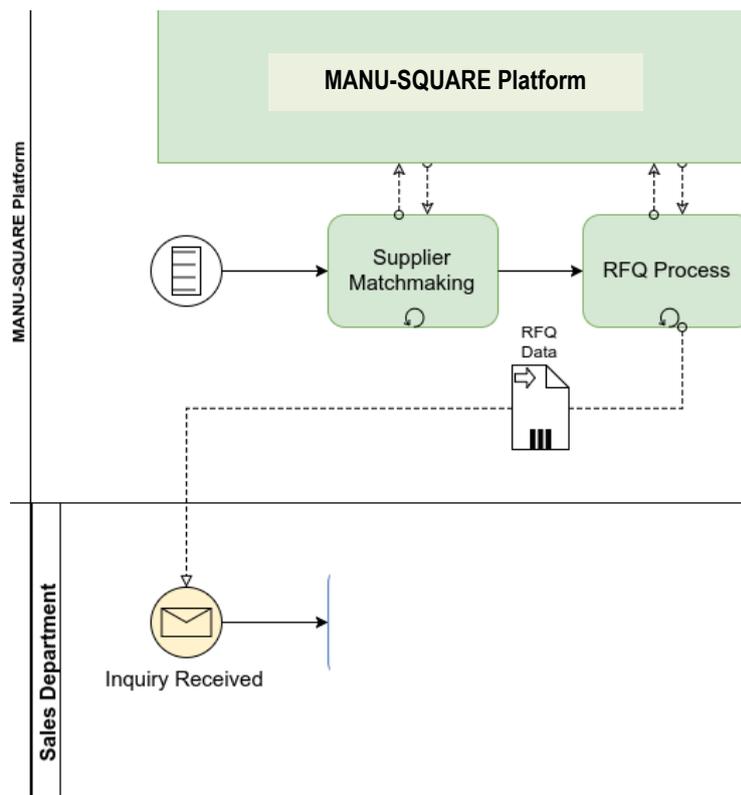
**Process step:** Inquiry receiving - Sales prospecting

Figure 21 BPMN detail of Inquiry receiving - Sales prospecting in the TO-BE situation

**Challenges:** For JPM, sales prospecting is one of the main interesting points of this scenario. Some of JPM's retrofitting / refurbishing capacity, which includes physical space, can experience variability in its occupation. This variable nature of retrofitting / refurbishing processes can be partially attributed to the difficulty of sales prospecting. Due to all the inherited constraints of these processes, trust and geography are key factors to clients that look for these kinds of services. The technical specificity of each project means that clients favor the use of known, geographically close partners in order to reduce risk and costs. This is highlighted by the fact that most of the retrofitting / refurbishing work now conducted by JPM is requested by established clients through standing contracts and partnerships. The challenges described in the Offer, negotiation and deal step of the demonstration scenario 1, crop up here, from the opposite point-of-view: better mechanisms are required for JPM to provide information about its capabilities, trustworthiness and reputation in the market. Allying this with the fact that sales prospecting is an expensive process all by itself, makes this one of the business processes where MANU-SQUARE can make a real impact.

**MANU-SQUARE Solution:** Going back to the core functionalities of the platform, the matchmaking tool together with the reputation mechanism can make a real impact. By taking into account all the previous described requirements imposed by JPM's into matching its available unused capacity with organizations that can, to a reasonable degree, be trusted based on the reputation mechanism, the system can improve the companies market opportunities and reduce the resources needed for sales prospecting.

**Addressed MANU-SQUARE Functionalities** (from D1.2): Production capacity matching, Know-how capabilities matching, RFQ management, Transactions management, Reputation management, Information security and privacy, User Profile management

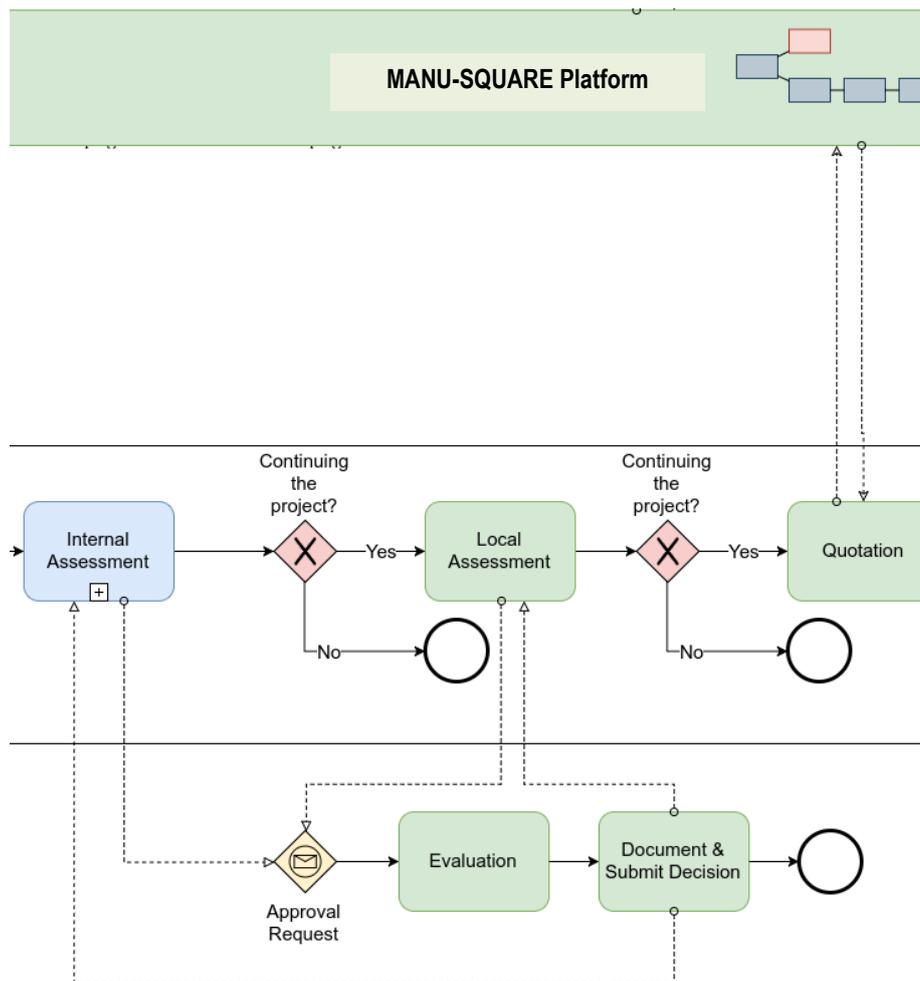
**Process step:** Inquiry assessment

Figure 22 BPMN detail of Inquiry assessment in the TO-BE situation

**Challenges:** The inquiry, internal and local assessment phases draw many of the problems observed in the procurement for RFQ stage of the first demonstration scenario. Dealing with new partners can be a time-consuming process, especially when there are disconnections between business processes requirements by both parties. Problems such as misaligned information, access to up-to-date documentation and its management, and lack of established communication channels resurface in this demonstration scenario as well.

**MANU-SQUARE Solution:** From this perspective, a mechanism where stakeholders can define custom templates to feed specific information needs can greatly speed up initial contacts and decision-making processes. For information already made available by companies in their individual profiles, this step can be done automatically and behave as another means of accessing information in the format or typology that each business requires for integration with other systems. The management of individual parts should also be managed by the platform and is already covered in early platform data models. This not only will reduce the back and forth required by processes, when additional parts are required, but can also feed into the matching algorithm for future resource availability and by-product matching.

**Addressed MANU-SQUARE Functionalities** (from D1.2): RFQ management, Transactions management, Reputation management, Information security and privacy, User Profile management, Certifications management, Suppliers assessment

**4.6.3 Success criteria for validation of the demonstration scenario 2**

This second demonstrator is expected to show how the MANU-SQUARE platform, is able to support JPM in satisfying complex customized high-value manufacturing orders in a short time by making it able to identify adequate available capability and consequently set up an adaptive extended product-service business model, covering the whole value-chain. As such, the success criteria in Table 2 are defined to be evaluated. This demonstration scenario will contribute to achievement of the following MANU-SQUARE target impacts listed in the DoA:

- increasing the number of innovative business solutions, through expanding the market opportunities and business inquiries. This impact targets the following measurable goal: “+10% new product-service concepts brought to the market thanks to the platform support provided from conception to production” [MG2.1 in the DoA].
- increasing capacity utilization [MG1.2], through addressing the unused capacity for retrofitting resources (e.g. machines, space). This impact targets the following measurable goal: “+20% reuse of unused manufacturing capacity achieved through the trade opportunity granted by the platform” [MG1.2 in the DoA]
- reducing time-to-market, through reducing the time spent for the RFQ process steps. This impact targets the following measurable goal: “-30% time needed for the RFQ process thanks to the characterised information availability allowing to pre-screen the offer factually” [MG1.1 in the DoA]

Success criteria	Description	Target	Approach to assess
Making the steps of the RFQ process platform-driven	This criterion targets maximizing the usage of the MANU-SQUARE platform for performing the RFQ process steps, including the document sharing management.	The entire RFQ process	Utilization of the MANU-SQUARE RFQ management functionality for performing the complete RFQ process
Increasing the number of business queries	This criterion targets increasing the number of business queries from the customers for retrofitting and refurbishing business.	15% increase in number of business queries from the market.	Percentage increase of the business queries thanks to the use of the MANU-SQUARE platform.

Table 2 Success criteria for testing and validation of the demonstration scenario 2

## 5 TEXTILE & COSMETICS INDUSTRY DEMONSTRATION SCENARIOS

This chapter presents the identified demonstration scenarios for the textile and cosmetics industry.

### 5.1 The case companies and the textile& cosmetics industry

Textile market includes the companies that are manufacturing products identified as "nonwoven materials". "Nonwoven materials" are produced by different technologies:

- Spun bonded
- Spun laced
- Melt bonded

Certainly, the most advanced products are obtained with spun lace technologies. They are used in many different sectors, for cosmetic and/or medical applications.

I-COTTON produce 100% cotton - spun lace materials by water entanglement technologies. These manufactures are used in the cosmetic sector as wet wipes, make-up remover, sheet musk for every part of the body, shower sheet, exfoliating facial scrubber and facial cleaning pad.

The cosmetic sector uses "nonwoven material" as support for body cleaning or for the release of active ingredients. For examples: moisture agent, cleaning, rehydration, antiaging, anti-elastase, antioxidant and more over. These ingredients include many natural molecules, as silk protein.

Silk material and silk transformation processes (from raw materials to yarns and fabrics) are the core business of TRUDEL Silk. Silk sericin, one of the silk protein removed during the transformation process, is an important by product for TRUDEL Silk business. The company has developed technologies to recover sericin silk protein in native and natural conformation. Native form silk sericin can be used for wet wipes production useful for face cleaning, anti-age treatment, anti-acne treatment and rehydration application for skin sensitive people.

### 5.2 Business context and characteristics

#### 5.2.1 TRUDEL

- Number of TRUDEL Group employees: ~ 20-25 (12 FTE's)
- Consolidated TRUDEL Turnover: ~ CHF 30-35m
- Offices in Zürich, Como, Hong Kong & Huzhou
- Main geographic markets: Europe, China & US
- Main products & services:
  - Solution provider on along the full value chain ranging from supply chain management, logistics, procurement, silk innovation
  - Raw silk & yarn trading
  - Silk Fabrics trading
  - Innovations in the field of e.g. organic silk, silk paddings, anti-bacterial yarns, counterfeit protection, sericin & fibroin solutions for cosmetics

#### 5.2.2 I-COTTON

- Number of employees: 200
- Turnover for the year 2017: 18 million 500 thousand.
- There are 2 production plants in Latvia, and 1 plant in Poland. Total of 600 employees.
- Main markets: Eastern Europe, Western Europe, Russia, Ukraine, CIS, China etc.
- Main customers: Maxima, Rimi, Aldi, Biedronka, Ashan, etc

- Main products and services: Non-woven material used as substrates of wipes, cotton pad and for a large varieties of cosmetic and health care products

### 5.3 Business maturity and relations

#### 5.3.1 TRUDEL

TRUDEL is a leading player in the silk market with a fully vertically integrated business model with over 100-year-old history in the business. The company is one of the key leaders in the market with 2-3 larger players globally. TRUDEL has regular collaborations and joint ventures with leading luxury consumer groups and several agreements with suppliers on different continents. The organization chart of the TRUDEL group is illustrated in Figure 23.

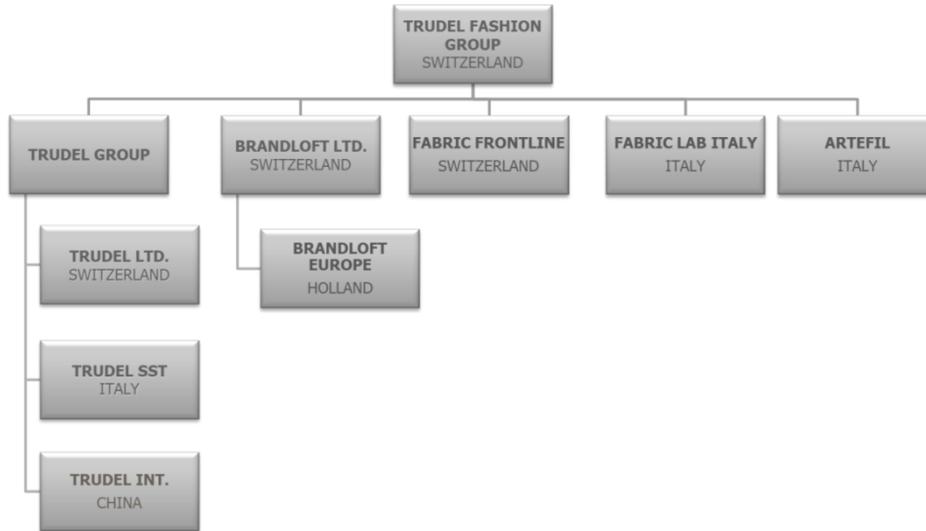


Figure 23 Organizational chart of TRUDEL

#### 5.3.2 I-COTTON

I-COTTON has been established as Italian-Russian joint venture from Liepaja (Latvia) producing the wide range of products including wet wipes, baby products, household goods and household chemicals. The company has distribution network in many countries, including Ukraine, Belarus, Kazakhstan, Moldova, Tajikistan, Uzbekistan, Baltic countries and Poland. Dedicated organizational structure is illustrated below in Figure 24.

In 2016, I-COTTON has invested EUR 8 million in a new production line co-financed by EU funds and backed by LIAA (Investment and Development Agency of Latvia). Currently the company operates state-of-the-art manufacturing equipment launched between 2012-2016. Production site of over 15 000 m<sup>2</sup>. Annuals production capacity of I-COTTON amounts to 5400 tons of wet wipes, 1500 tons of cotton pads and 620 tons of cotton buds.

D1.3 – Business processes and early validation scenarios

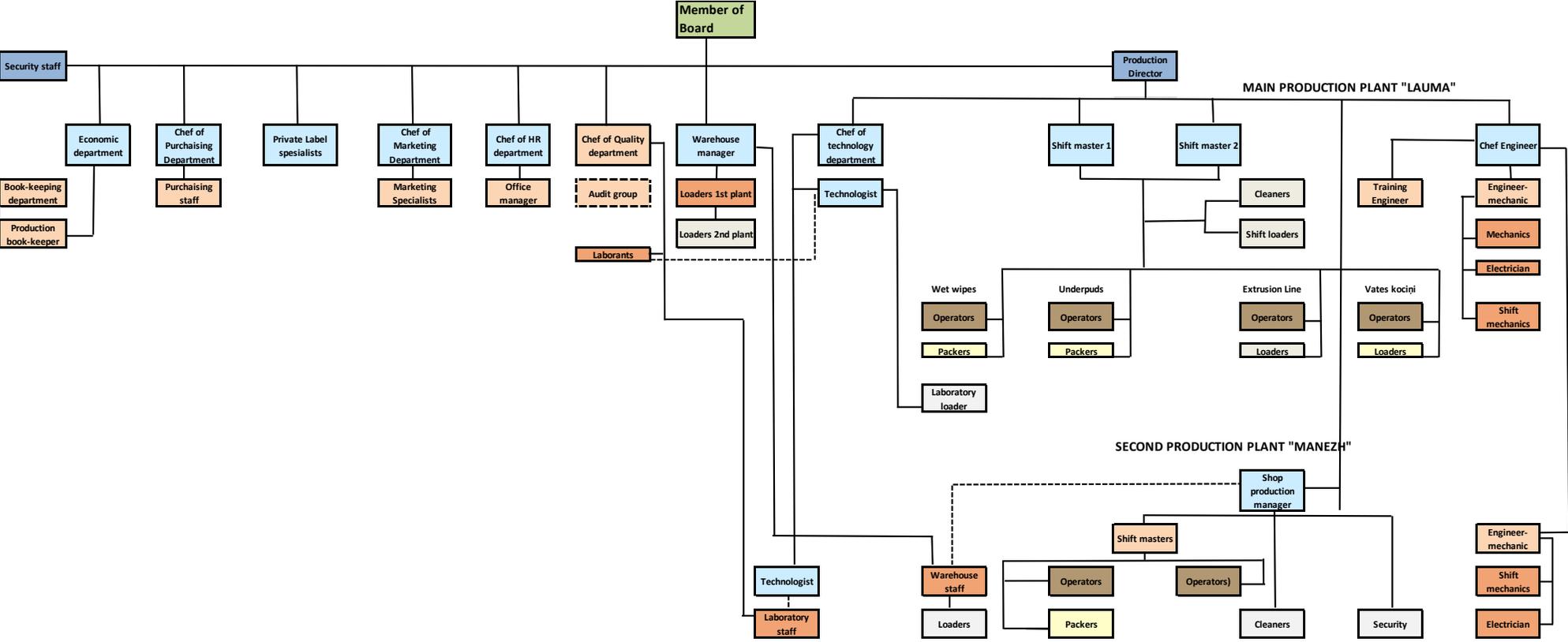


Figure 24 Organizational chart of I-COTTON

## 5.4 Business needs and challenges

### 5.4.1 TRUDEL

Capacity and inventory management remains at the core of the business and continues to be one of the key challenges for all players in the industry. With its longstanding know-how, TRUDEL understands the value chain in silk from the mulberry tree through to the branded silk scarf. Hence it is perfectly positioned to contribute with its know-how to the MANU-SQUARE platform along the entire supply chain including innovation elements as described above.

On the other hand, TRUDEL would be interested to benefit from a platform as is the case with MANU-SQUARE. More specifically, it would be of interest to have fully integrated platform at hand to manage TRUDEL's capacity and inventory more efficiently with the aid of MANU-SQUARE and to be able to identify suitable innovation partners both on the supply but mainly on the offtake side. At the same time, it will be critical to be able to manage confidential business data in the right way as part of the MANU-SQUARE project.

### 5.4.2 I-COTTON

I-COTTON is currently running at full production capacity. The company is mainly interested in developing new products and processes, and in studying new solutions and new materials based on customer requirements, generating higher product qualities and better profit margins. Furthermore, the company is interested to find potential partners with whom they can build new business ventures for developing and commercializing new products, establishing new production facilities, and finding new market opportunities.

## 5.5 Cross-sectorial demonstration scenario – New product development and waste utilization

The demonstration scenarios in textile & cosmetics industry are embedded to each other and concerns both companies, TRUDEL and I-COTTON, in a multi-sectorial way. I-COTTON currently produces cleansing wipes distributed through large retailers all around Europe. The company has already implemented a differentiation strategy starting from its foundation: no synthetic fibres but just cotton-based products in order to assure a better environmental and safety profile than low-cost competitors. In the last few years two phenomena further changed the market context: on one side economic downturn facilitated the diffusion of low-cost (synthetic) products, and, on the other, Far-East manufacturers started producing also cotton-based cleansing wipes (with lower costs than their European competitors). Today economy starts to bounce back from the crisis, and European customers are increasingly interested in safer, healthier, greener and more functionalized products.

I-COTTON aims at developing a new product addressing the above-mentioned market emerging needs, thus supporting further differentiation potential from low-cost (also cotton-made) solutions. Initial investigations performed off-line allowed to identify a potential innovation manager (I-HUB) providing the knowledge for product and process (re-)design and a provider of an interesting bio-compatible and green material (sericin, coming from silk yarns processing) able to functionalize I-COTTON non-woven fabrics. sericin is a by-product / waste of production processes of TRUDEL. In this respect, this case also demonstrates a waste utilization scenario for TRUDEL.

### 5.5.1 Description of the cross-sectorial demonstration scenario

This cross-sectorial business process is mainly concerned with ideation and innovation processes of the companies. Currently, this process is unstructured. The actors of the value chain, their roles, and the process steps are not clearly defined yet. As such, BPMN is not provided for the AS-IS situation. MANU-SQUARE project will contribute to design, structure, and manage the innovation process, as suggested in Figure 14, the BPMN of the envisioned TO-BE situation. Following description illustrates the possible flow of the activities in the process, when it becomes more established.

The process starts with TRUDEL producing sericin as by-product, which is then stabilized by a technical service provider and certified. I-COTTON's cotton pad products are then assembled with sericin for development of a new product, usually involving another subcontractor called SANITARS for the required capacity and technological capability. The innovation manager (I-HUB) supports the whole process in designing it, building the contacts, supervising, and providing the required knowhow. Figure 25 depicts the process, which is followed by the descriptions of each step.

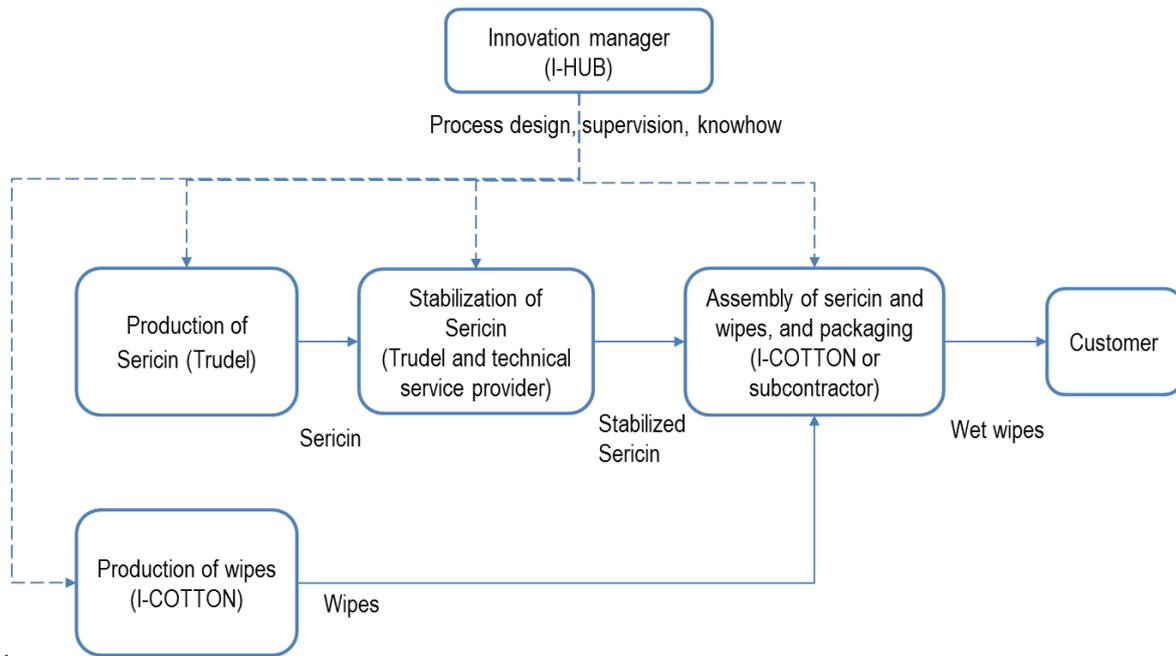


Figure 25 The business process of developing the new product utilizing the by-product (sericin)

**1. Innovation manager provides the required know-how (I-HUB):** The contribution of the innovation manager (I-HUB) to the project is mainly related to a proper flow of technology transfer and exchange between partners involved in textile and cosmetics industry. I-HUB has developed the extraction and filtration process of sericin and is involved in this topic to extend the advanced applications of the silk proteins. The sericin project was focused to design a new process of extraction using subsequent water cycle under pressure, defining a precise temperature process line, and avoiding any chemical matter. The extracted protein, in a form of water suspension, is treated in a dedicated machinery, based on the tangential filtration technology, and able to recover sericin as concentrated hydrogel. This material requires a further hydrolysing process to equalize the molecular weight of the protein. In this precise form, sericin can be adopted for advanced purposes including cosmetic and health care products. The sericin is a biomaterial and its properties for skin care are well known. Several kinds of raw sericin are available on the market, but all of them are obtained by expensive, dedicated processes, based on a chemical extraction.

**2. Production of sericin (TRUDEL):** TRUDEL supplies natural raw silk and semi-processed yarns and fabrics. The raw silk thread preserves fibroin filaments coated and protected by sericin, that cover the structure completely, and make raw silk suitable for the subsequent mechanical processes of doubling and twisting. This basic material is then doubled, one or more times, and twisted producing a large range of derived yarns that differ in shapes and sizes. These raw yarns still maintain the sericin in the outer layer, and it is removed, before dyeing, by a degumming process. The result consists of finished silk yarns placed on the market and used for dyeing and weaving. The degumming process extracts sericin that represent 25% in weight of the raw silk weight and is completely recovered by the ultrafiltration technology. Sericin is recovered in its hydrated form, easily sterilized or chemically preserved, avoiding the drying and its huge cost in terms of energy consumption. The wet condition allows also to avoid the several, and not controllable, oxidation processes that occur at high temperature.

**3. Stabilization of sericin (TRUDEL or subcontractor):** The recovered hydrogel of sericin is not completely stable, due to the high molecular weight of its proteins, and requires a specific process to solve this problem. TRUDEL has developed the stabilizing process, in cooperation with I-HUB and a technical service provider. The final product consists of a stable hydrogel, sterilized, with a homogeneous distribution of molecular weight, suitable for advanced applications such as wetting and skin protection.

**4. Production of wipes (I-COTTON):** I-COTTON produces non-woven material used as substrates of wipes, cotton pad and for a large variety of cosmetic and health care products. The production lines are structured and designed adopting

one the most interesting spun-lace technology, based on water entanglement process. The water process for non-woven production avoids the use of chemical binder or synthetic melting material, giving a pure cotton pad suitable for a new generation of valuable skin care products. The starting material, processed in the I-COTTON lines consists of cotton linters, considered a by-product, because the length of the fibers is too short for the yarn production and used for low value applications.

5. Foaming, assembly, and packaging (I-COTTON or subcontractor): The combination of two by-products, sericin and cotton linters, both natural, both biopolymers, is the guiding idea to set up a recycling process, for high value products, starting from low value materials, considered wastes. Sericin can be combined with cotton substrates in several forms, all of them derived from the stabilized material supplied by TRUDEL. Sericin can be delivered onto cotton pads as stabilized solution or in different forms like microsphere, emulsion with oil, co-dispersed with other protein, in blend with hyaluronic acid or in combination with anti-age factors (polyphenols, stilbens, catechols, etc.). The assembling of the wipes, or other wet material, activate with sericin, requires a specific machinery that start form cotton pads, add the sericin by spray, wetting or foaming devices, and finish with the packaging. A specific assembling line is required. The assembling can be carried out in the I-COTTON facilities or by the subcontractor (SANITARS). However, an external subcontractor with more specialized equipment can be required to process sericin in its different forms.

### **5.5.2 TO-BE situation with the contribution of the MANU-SQUARE platform**

This section describes how MANU-SQUARE will contribute to this change in the business process. Figure 26 illustrates the BPMN of the TO-BE situation of the cross-sectorial demonstration scenario with the utilization of the MANU-SQUARE platform. The TO-BE process begins with description of the existing products at I-COTTON and production of sericin in TRUDEL. The innovation manager (I-HUB and / or CSEM) guides both companies in potential product improvements and application areas, respectively, through utilization of the MANU-SQUARE platform. Once this ideation process generates ideas for innovations and new applications, the innovation manager designs the innovation process, helps companies in specification of their products, and in describing the required value chain actors, through the platform again. Identified and selected external partners are then involved to fulfill the requirements of the value chain, which results in the final assembly where the products of I-COTTON and TRUDEL are assembled into a new product. It should be noted that I-COTTON and TRUDEL may also work with other companies in this innovation process. Further description of the challenges and potential MANU-SQUARE contributions are provided after the Figure 26.

### D1.3 – Business processes and early validation scenarios

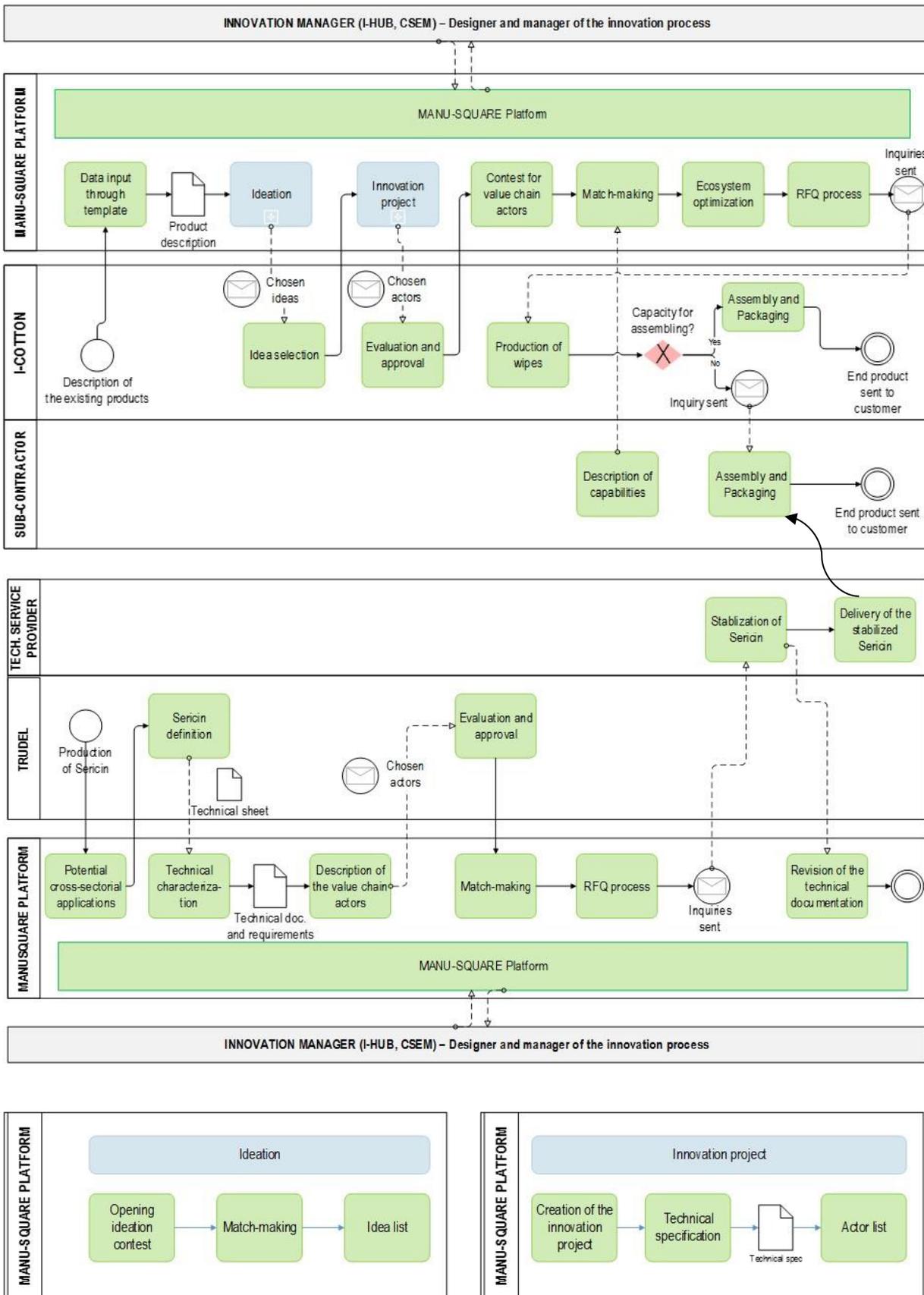


Figure 26 BPMN of the TO-BE cross-sectorial demonstration scenario in the silk & cosmetics industry

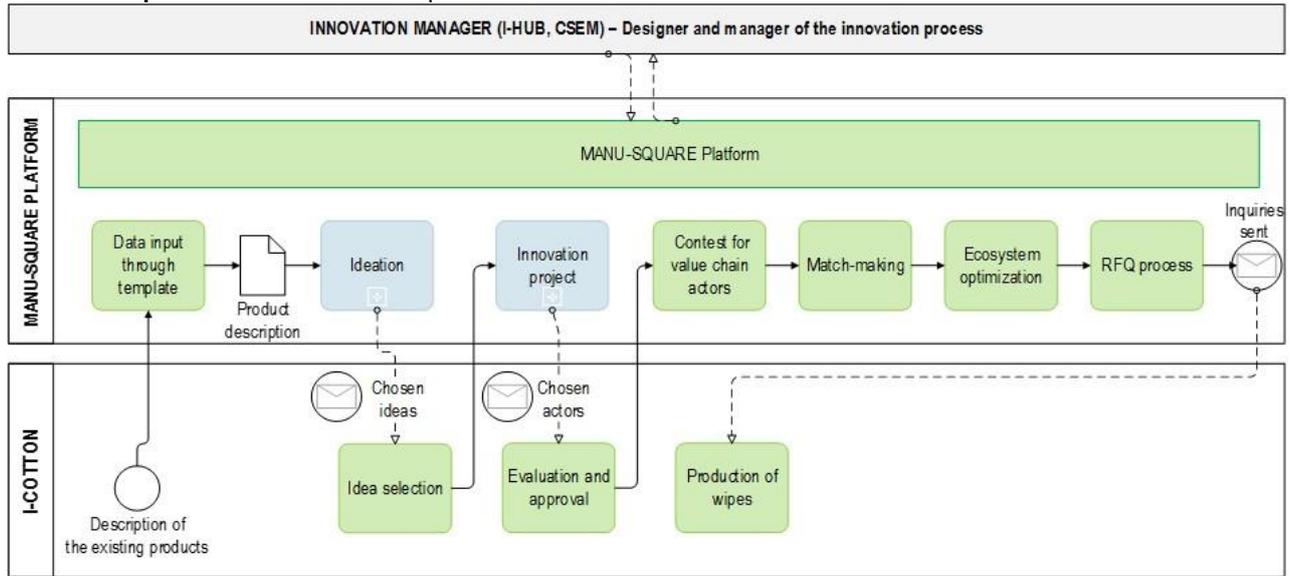
**Process step:** Ideation and innovation process for I-COTTON

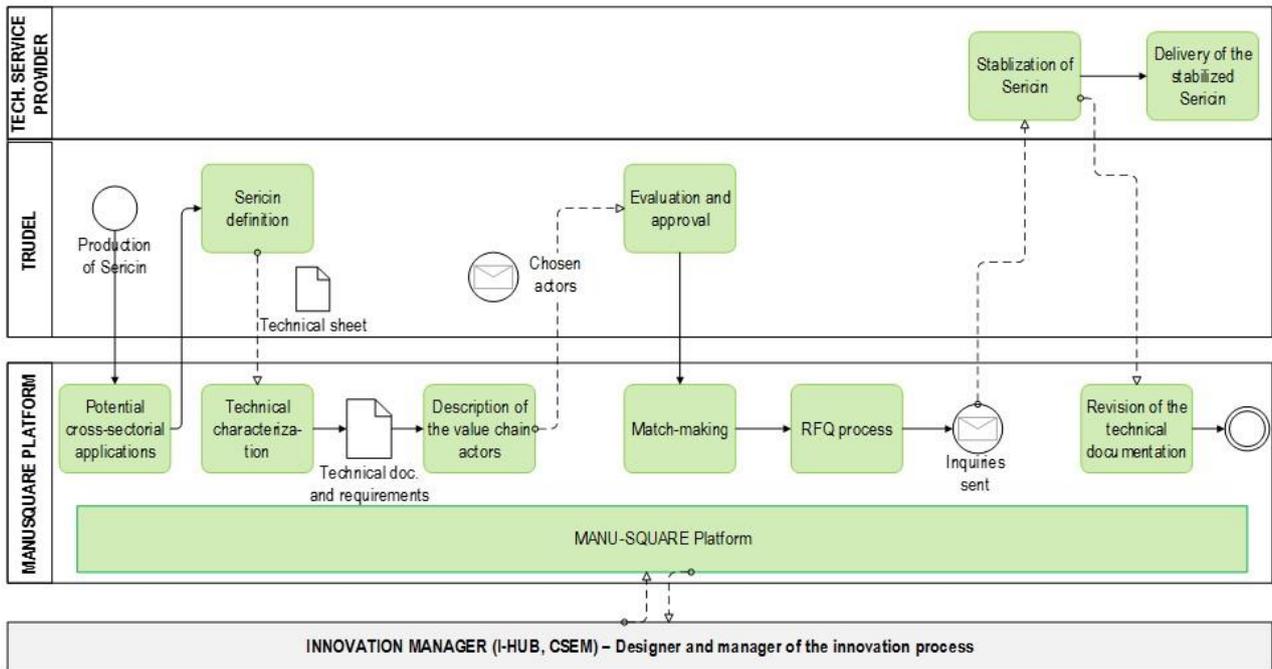
Figure 27 BPMN detail of Ideation and innovation process for I-COTTON in the TO-BE situation

**Challenges:** The main challenge for I-COTTON is to trigger the ideation and innovation process for identifying new opportunities for new products. In this context, I-COTTON needs support from Knowledge Providers (e.g. research centers) to identify potential innovations in their current product portfolio and to manage the innovation process aligned with actual market needs. Steps such as the translation of I-COTTON's needs to technical requirements, configuring and evaluating the potential value chain actors for new product development, and managing the acquirement of new actors should be addressed through the MANU-SQUARE platform.

**MANU-SQUARE Solution:** I-COTTON will access MANU-SQUARE and describe both its current products and the envisaged improvements. Such a description is performed using a pre-defined and standardized spreadsheet, based on a data structure developed during the project. The platform will also enable opening a contest in order to identify the best innovation manager able to assist I-COTTON during the new product development project. Several applications will be gathered (including ones from I-HUB and CSEM) and I-COTTON will select one or more applicants as consultants. The MANU-SQUARE platform functionalities will support I-COTTON decision making: profile comparisons, reputation mechanism, and matchmaking. Once the innovation consultants have been selected, a new “innovation project proposal” is created using the platform. Two actors are initially involved: the innovation consultant will interact with I-COTTON in order to deepen their requirements. A project proposal is shared among them and, once approved, a new “innovation project” instance is created within the platform. The innovation consultant will take charge of the project performing the following initializing tasks: I-COTTON requirements are translated in technical requirements and specifications using a dedicated template, and each actor / activity of the value-chain (covering all the tasks going from product prototyping to its end-of-life, if appropriate) is described in detail and allocated to connected actors. Once approved, a second contest is launched in order to identify interesting providers for each of the described actors. Using the match-making functionality, the MANU-SQUARE platform will send invitations for applications to select suppliers stored in the internal database. Further candidates will be directly seeking by the innovation manager and, finally, applications will be also collected from suppliers interested in joining the initiative also providing peculiar (unexpected) solutions to the identified problem. Once the contest is closed, the innovation manager and I-COTTON will use the MANU-SQUARE functionalities to compare the candidates, to put together aligned applications, to quantify the envisaged environmental and social impacts of alternative value-chain configurations, and to ask for quotations.

**Addressed MANU-SQUARE Functionalities** (from D1.2): Production capacity matching, Know-how capabilities matching, RFQ management, Transactions management, Reputation management, Information security and privacy, User Profile management, Ecosystem optimization, Suppliers assessment, Innovation management

**Process step:** Characterization and stabilization of sericin for TRUDEL



**Challenges:** To become ready for utilization in final product assembly when producing cosmetic wet wipes, sericin needs to be functionalized through a stabilization process and receive approval certification for usage. TRUDEL needs support in characterization and technical documentation of the sericin, and in finding a technical service provider that can both stabilize and certify the produced sericin.

**MANU-SQUARE Solution:** TRUDEL can cooperate with the platform for know-how and certification of the sericin material. Besides the stabilized sericin, the other forms of sericin, called “functionalized sericin”, can also be identified for improved value and extended potential applications. I-HUB can support this implementation, but also TRUDEL can give an important contribution involving the technical service provider for stabilizing sericin. More technical and scientific expertise and contributions for functionalized sericin can be found and included through the MANU-SQUARE platform, using the matchmaking functionality. A complete biochemical characterization of the silk protein must be provided by TRUDEL in a form of a technical sheet. This technical document will be defined with the scientific support of I-HUB. This document will be updated after the chemical stabilization of the sericin. The final sericin product will be tested under the current regulations adopted in a specific market.

**Addressed MANU-SQUARE Functionalities** (from D1.2): Production capacity matching, Know-how capabilities matching, RFQ management, Transactions management, Reputation management, Information security and privacy, User Profile management, Certification management, Suppliers assessment, Innovation management

### 5.5.3 Success criteria for validation of the cross-sectorial demonstration scenario

This demonstrator is expected to show how the MANU-SQUARE platform, is able to support I-COTTON and TRUDEL in generating innovation ideas for new product development, configuring the corresponding value chain, and acquiring the required value chain actors, at the same time integrating innovation managers (I-HUB and CSEM) into the process. As such, the success criteria in Table 3 are defined to be evaluated. This cross-sectorial demonstration scenario will contribute to achievement of the following MANU-SQUARE target impacts listed in the DoA:

- Increasing the number of new textile-cosmetics products designed, developed and prototyped within the MANU-SQUARE ecosystem. This impact targets the following measurable goal: “+10% new product-service concepts brought to the market thanks to the platform support provided from conception to production” [MG2.1 in the DoA].
- Increasing the number of new (external) manufacturers, distributors, suppliers involved in the new textile-cosmetics value networks. This impact targets the following measurable goal: “-30% time needed for the RFQ process thanks to the characterised information availability allowing to pre-screen the offer factually” [MG1.1 in the DoA].
- Reducing the time required to the innovation manager for establishing the novel value network. This impact targets the following measurable goal: “-30% time-to-market for new product-service thanks to the acceleration and the implementation of first-time-right solutions promoted by the platform” [MG2.2 in the DoA].

D1.3 – Business processes and early validation scenarios

Success criteria	Description	Target	Approach to assess		
			TRUDEL	I-COTTON	Innovation manager (I-HUB and CSEM)
Increasing the number of innovation opportunities targeting textile & cosmetics products	Increasing the number of innovation opportunities relating to the stabilization of the sericin, the design and development of new cosmetic complex, and the application to the wet wipes	Increase by 5% the received innovation opportunities	Number of innovation opportunities involving functionalized sericin in dry or liquid form	Number of new product opportunities that are pursuable	Number of delivered technical consultancies and analysis for innovative products
Facilitating the establishment of the innovation value chain	Defining and structuring the innovation value chain network, including the innovation manager, as well as increasing the number of potential value chain actors that can be accessed	At least 3 new value networks, involving TRUDEL and / or I-COTTON	Searching and finding new potential qualified sub-contractors / partners (stabilization) in a larger pool	- Searching, assessing, and acquiring new sub-contractors (assembly) - Opening new markets	Number of new innovation value chains designed
Increasing the effectiveness of the innovation process	Increasing the effectiveness of the innovation process in terms of success rate of the innovation opportunities	At least 2 innovation opportunities successfully developed from design to prototype	A percentage of the innovation opportunities are worth evaluating (50% is the goal)	- Number of new products with innovative functions - Profit margin increase - New business opportunities (new companies investing in new production facilities)	Number of successful innovations managed
Increasing number of generated innovative results	Creating new innovative results	Create at least one innovative result	Number of innovative results generated through the platform	Number of innovative results generated through the platform (patent at least related to cotton pads)	Number of innovative results supported through the platform, as well as the scientific and technical publications

Table 3 Success criteria for testing and validation of the cross-sectorial demonstration scenario

## 6 CONCLUSION

This report described, analysed and planned the validation of the demonstration scenarios for the MANU-SQUARE platform. The demonstration scenarios cover two industrial sectors; manufacturing technologies industry and textile & cosmetics industry. From the manufacturing technologies industry, a new product development case, and a market coverage expansion case were identified for being supported by MANU-SQUARE. From the textile & cosmetics industry, a combination of new product development with utilization of by-product was identified. The study involved the identification of the AS-IS situation of the analysed business processes for demonstration, the potential contribution of the MANU-SQUARE platform at different steps of the business processes, and the success criteria for testing, comparing, and validating the contribution of the MANU-SQUARE platform.

The outputs of this task will provide important foundations for the follow-up tasks, among others for the definition of the platform architecture of Task 1.4, for the definition of the services value and behaviour in WP5 and for the setting up of the demonstration pilots in WP6.

Having engaged the industrial partners from the foundations of WP1 and, in particular, during the business process modelling carried out in this task ensures that the platform developments are steered by the gathered specifications and objectives that are relevant to the project's references industries. Still attention will need to be paid in the further project steps so as to continue feeding this engagement and to enlarge the pool of companies that can have a say in portraying the expected platform behaviours towards a more general, all-encompassing design of the MANU-SQUARE business processes.