ACROBA

connect & produce through agile production

# D8.5 Sustainability plan – Part B

## WP8

Robocoast EDIH

20230517

Dissemination Level: Confidential

Version V2.0

ROBOCOAST EDIH Digital Innovation HUB

The ACROBA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017284.

## Approval Status

| | Name and Surname | Role in the Project | Partner(s) |
|---|---|---|---|
| Author(s) | Juha-Pekka Alanen<br>Tiina Savolainen<br>Kai Salmela | WP8 Leader<br>Innovation advisor<br>Advisor | ROB |
| Reviewed by | Lucie Soulard<br><br><br>José A. Dieste | WP7 Leader<br>European Projects Manager<br>Advanced Process Manager | Pôle EMC2<br><br><br>AITIIP |
| Approved by | Norman U. Baier | Project Coordinator | BFH |

## History of Changes

| Version | Date | Description of Changes | By |
|---|---|---|---|
| 0.1<br>1.0 | 2022.09.05<br>2022.09.26 | First Draft<br>Final Version | Juha-Pekka Alanen<br>Juha-Pekka Alanen |
| 2.0 (resubmission) | 2022.05.17 | Added sections:<br>3.5 European Digital Innovation Hubs (page 16).<br>4.2.1 New Venture business CANVAS (page 18).<br>4.7 Consortium wide sustainability plan (page 23). | Juha-Pekka Alanen |

The ACROBA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017284.

| | | | |
|---|---|---|---|
| | | 5. Target sectors (page 25).<br>Page 7 – text added.<br>Page 18 – text added. | |

The ACROBA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017284.

***Disclaimer:***

The work described in this document has been conducted within the ACROBA project. This document reflects only the ACROBA consortium view, and the European Union is not responsible for any use that may be made of the information it contains.

This document and its content are the property of the ACROBA Consortium. All rights relevant to this document are determined by the applicable laws. Access to this document does not grant any right or license on the document or its contents. This document or its contents are not to be used or treated in any manner inconsistent with the rights or interests of the ACROBA consortium or the Partners detriment and are not to be disclosed externally without prior written consent from the ACROBA Partners.

Each ACROBA Partner may use this document in conformity with the ACROBA Consortium Agreement (CA) and Grant Agreement (GA) provisions

The ACROBA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017284.

# Table of Contents



The ACROBA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017284.

## Executive Summary

This is a revision of the Deliverable 8.5 Part B v1.0. In this document the following parts have been updated: New section 3.5 EDIH's, New section 4.2.1 Business CANVAS's of three joint venture partners, new section 4.7 Consortium wide sustainability plan and new section 5 Target markets.

Projects have a start and an end. ACROBA, a Horizon 2020 funded project is no exception. Planning is needed in order to ensure that the product created in this innovation action has longevity and sustainability. The EC's grant will allow the short-term achievements of the project's goals. The 5 Pilot Lines developed as part of the project (WP4 and WP5) will demonstrate that the ACROBA solution is adaptable to multiple industrial settings. The ACROBA modular reference architecture not only makes it simple to integrate the platform into actual production lines but also allows adding new types of modules to the solution, increasing the platform's potential for further uses. ACROBA is destined to have a future as a product and a knowledge transfer in the education field.

The ACROBA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017284.

The political and economic situation has been unstable since the COVID-19 crisis, followed by a global supply chain disruption, and the war in Ukraine, which all have contributed to the inflation. This makes planning and price predictions somewhat difficult. Despite this unstable context, this Sustainability plan tries to open some of the curtain of the future of ACROBA and presents the different options that ACROBA is considering to effectively exploit the outcome of the project and ensure the sustainability of the ACROBA solution in the long term.

This Part B of the report includes all confidential parts that were removed from the Part A due to it Public dissemination level.

# 1 Introduction

There's still one year of development left before the Pilot Use case testings can start. The SWOT -analysis performed at M18 showed (results published in D8.1 Exploitation plan) that, since the project is in an early stage, commercialisation and the creation of a joint-venture is still at the pre-planning phase. However, in the coming months, there will be round table discussions about the future exploitation of the project. To ensure project exploitation potential, calculations have been made to forecast the cost savings of the use of ACROBA solution in the use cases. The replication potential of ACROBA will be improved through a focused campaign of industrial trials through targeted Hackathons and ACROBA On-Site Labs (AOSLs) for manufacturing SMEs (see D7.5 Updated Dissemination and Communication Plan and D8.7 Exploitable Results in Agile Manufacturing). The results and insight generated by the Pilot Use Cases and the AOSL's will be used to promote the true capabilities of ACROBA.

# 2 IPR Management

Intellectual property (IP) and knowledge assets needs to be seen as strategic business assets to capitalize their value. Effective IP management can result in business advantages and further funding opportunities. It is important to evaluate different strategies for improving the return on investment of IP generated in ACROBA- project.

The ACROBA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017284.

IP protection is essential if the aim is to maximize the return on investment. By protecting the IP, a more secure revenue can be ensured in a situation, where competition exists. Protected IP can prevent competition from entering the same market and strengthen the market value of the company. On the other hand, it needs to be evaluated, what is the cost of protection against the expected return on investment. For example, in fast evolving industries it might be more effective to apply for a utility patent instead of a patent. Securing the return on investment by protecting the IP also encourages future financing of research and development activities.

In a joint study Intellectual property rights and firm performance in the European Union (2021) carried out by the European Patent Office and the European Union Intellectual Property Office, a strong association between ownership of IPRs and improved economic performance has been found. According to the analysis, SMEs that own IPRs, have 68% higher revenue per employee, than SMEs that do not own IPRs at all.[1] In the light of the study, an effective IP strategy can bring significant competitive advantages.

The first Freedom to operate (FTO) analysis was made based on the input from the ACROBA development. The findings have been documented in D8.11 IPR Report. ROB has emphasized in several workshops the importance to protect the results of the project. To assist in the IPR management, Innovation Management Committee will actively meet with the Work packages leaders and module development teams to collect data for ACROBA IPR Database. See Deliverable 8.1 Exploitation plan v.2.0.

# 3 Business Plan, Ecosystem, and Inflation

There are two main routes that the business models for the commercialization of the ACROBA results addresses:

- First, there are commercial end users who will use the ACROBA Platform to automate their manufacturing procedures and quickly program their robotic systems. They will profit from the Platform's characteristics, which make it simple and affordable for them to cope with flexible production environments.

The ACROBA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017284.

- Second, there will be the business models related to the partners in charge of the future ACROBA platform exploitation as well as their side technology developments (i.e cognitive modules, dummy tools, etc).

Inflation has been steadily on the rise since 2020 when it hit a low point of -0.1%. This means that prices were falling across the board rather than rising.

However, in 2021 the inflation rate began to climb again, and it climbed steadily until June 2022 when it reached 8.6% in the euro area. This means that prices may rise to 9.6% from the previous year in the EU, according to Eurostat.[2]

This is just the beginning of a long-term trend. The inflation rate is expected to climb in the future, and this will have an **impact on the ACROBA project pilot line's forecasts and industrial investment forecasts**. In June 2022 the inflation rate varies from 6.1 (Malta) to 22% (Estonia), which makes it difficult to predict exactly the selling prices that the ACROBA project can deliver as a product. We should see the monetary values as an example in the business plan and pilot line estimations in tables 13 and 14. (GA pdf page192 / Page 42 of 127 Part B)

In contrast, ACROBA's forecast of the percentual savings is still valid when looking for the future platform adopters in Table 12 (GA pdf page 191 / Page 41 of 127 Part B) and Table 15 (GA pdf page 193 / Page 43 of 127 Part B), as this matter was discussed with the project members during July and August 2022. This should be the main attraction to early adopters when the actual price is depending on the chosen component-, energy- and work-price variance by the country at the forthcoming time.

The industry may be less likely to invest in new technology as a result of rising expenses, but it may also be prompted to use new robotics and intelligent systems to contain costs. This could serve as a signal for ACROBA to concentrate on attracting early adopters by spreading the word about the ACROBA platform, finding interested companies with the help of Digital Innovation Hubs (DIH) as well as making contracts with the appropriate industrial integrator companies in every country.

The ACROBA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017284.

The original figures in the Grant Agreement were reviewed, and the calculation for the pilot use cases remains the same. Only the business plan for external companies was slightly altered to meet today's inflation levels.

Here are the unaltered tables from the GA:

On the following table, sales are expected for the two possible scenarios, considering the following pricing strategy:

*Table1 - ACROBA solution expected cost savings vs conventional*

| Tasks | ACROBA solution cost savings expected vs conventional automation (%) | Weight of each task over the total | |
|---|---|---|---|
| | | Case 1 (%) | Case 2 (%) |
| Hardware/equipment | 10% | 72.96% | 46.55% |
| Management | 20% | 3.01% | 5.95% |
| Hardware engineering | 10% | 5.11% | 10.10% |
| Software engineering | 50% | 6.45% | 12.75% |
| Installation | 10% | 6.45% | 12.75% |
| Commissioning | 50% | 6.02% | 11.90% |
| **Average savings (taking into account the weight of each task)** | | **15.29%** | **20.46%** |

- Case I: Automate a manual process with high load of hardware/equipment required: Unit selling Price: 258,466 €. Unit cost: 232,620 € (Sales margin: 10%)
- Case II Automate a manual process with not much hardware/equipment required. Unit selling Price: 130,688 €. Unit cost: 117,620€ (Sales margin: 10%).

*Table2 - Collaborative Manufacturing PL's Forecasts*

| Year | Case I. High load of hardware/equipment | | | Case II. Low load of hardware/equipment | | |
|---|---|---|---|---|---|---|
| | Units sold | Sales (€) | Costs (€) | Units sold | Sales (€) | Costs (€) |
| 2025 | 5 | 1,292,333 | 1,163,100 | 5 | 653,444 | 588,100 |
| 2026 | 10 | 2,584,667 | 2,326,200 | 10 | 1,306,889 | 1,176,200 |
| 2027 | 20 | 5,169,333 | 4,652,400 | 20 | 2,613,778 | 2,352,400 |
| 2028 | 20 | 5,169,333 | 4,652,400 | 20 | 2,613,778 | 2,352,400 |
| 2029 | 20 | 5,169,333 | 4,652,400 | 20 | 2,613,778 | 2,352,400 |
| | **75** | **19,385,000** | **17,446,500** | **75** | **9,801,667** | **8,821,500** |

The ACROBA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017284.

This scenario has been calculated considering that presently, NUTAI produces in Spain and markets its products throughout Europe, specifically in the automotive industry sector. NUTAI sells special machinery focused on the industrial automation in the automotive sector. Their main customers (top 5) are: Ford, Seat, Volkswagen, Mitsubishi, Nissan and Renault. NUTAI's target market will also be expanded to new customers in the automotive sector, where NUTAI is not yet a supplier: Mercedes, BMW and Jaguar. The target market is worldwide commercialization, not limited to the Automotive sector, NUTAI's core business, but to access new sectors such as Food and Beverage, Pharmaceutical industry and Healthcare.

The following table shows a summary of the business plan analysis which depicts the costs savings coming from the exploitation of the Pilot Lines up to five years after the end of the project. This analysis will consider the costs that the Industrial partners will have to run for upgrading the production lines in their respective use cases, the Internal Rate of Return (IRR), and the expected Return of Investment (ROI). The results shown are based on a conservative scenario.

The ACROBA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017284.

*Table 3 - Business Plan for the ACROBA Industrial partners (Pilot Lines)*

| | | Forecasts (€) | | | | |
|---|---|---|---|---|---|---|
| | **Investment** | **2025** | **2026** | **2027** | **2028** | **2029** |
| **ACROBA Costs Savings** | | **370,147** | **786,168** | **1,548,868** | **1,572,335** | **1,572,335** |
| **Lights Out Manufacturing PL** | | **78,062** | **201,998** | **380,528** | **403,995** | **403,995** |
| **Collaborative Assembly PL** | | **292,085** | **584,170** | **1,168,340** | **1,168,340** | **1,168,340** |
| *Case 1: with high load of equipment* | | 174,465 | 348,930 | 697,860 | 697,860 | 697,860 |
| *Case 2: with not much equipment* | | 117,620 | 235,240 | 470,480 | 470,480 | 470,480 |
| **ACROBA Investment** | | | | | | |
| **Upgrading Costs** | **2,505,618** | | | | | |
| *Lights Out Manufacturing PL(MOSES+STER+CABKA)* | 1,614,848 | | | | | |
| *Collaborative Assembly PL (ICPE+IKOR)* | 890,771 | | | | | |
| **Proportional funding** | **1,753,933** | | | | | |
| **NET CASH FLOW** | **-751,686** | **370,147** | **786,168** | **1,548,868** | **1,572,335** | **1,572,335** |
| Accumulated Cash Flow (with funding) | -751,686 | -381,539 | 404,628 | 1,953,496 | 3,525,831 | 5,098,166 |
| Accumulated Cash Flow (without funding) | -2,505,618 | -2,135,472 | -1,349,304 | 199,563 | 1,771,898 | 3,344,233 |

**With funding:**

| | |
|---|---|
| **NPV (Net Present Value)** | **3,922,787** |
| **Cost of capital** | **6.620%** |
| **IRR (Internal Rate of Return)** | **97%** |
| **ROI (Return On Investment)** | **778%** |

**Without funding:**

| | |
|---|---|
| **NPV (Net Present Value)** | **2,168,855** |
| **Cost of capital** | **6.620%** |
| **IRR (Internal Rate of Return)** | **29%** |
| **ROI (Return On Investment)** | **233%** |

## 3.1 - Business Plan for External Company

Some calculations have been made to assist future adopters to calculate the ROI value and costs savings expected vs conventional automation and the cost required to automate manual process with high load of hardware/equipment required (Case I):

*Table4 - ACROBA Cost Savings for Future Platform Adopters*

| Description of Tasks | Cost required | Weight over the total (%) | ACROBA cost savings vs conventional automation (%) | ACROBA solution cost saving (€) |
|---|---|---|---|---|
| Hardware/Equipment | 169,740.00 € | 72.97 | 10% | 16,974.00 € |
| Management | 7,000.00 € | 3.01 | 20% | 1,400.00 € |
| Hardware Engineering | 11,880.00 € | 5.11 | 10% | 1,188.00 € |
| Software Engineering | 15,000.00 € | 6.45 | 50% | 7,500.00 € |
| Installation | 15,000.00 € | 6.45 | 10% | 1,500.00 € |
| Commissioning | 14,000.00 € | 6.02 | 50% | 7,000.00 € |
| TOTAL | 232,620.00 € | 100.00 | 15.29% | 35,562.00 € |

The ACROBA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017284.

Next, the following table is a slightly updated version of the one released in GA due to the inflation. It shows a business plan analysis for a company outside the consortium once the project ends. This business plan depicts the costs savings detailed above up to five years after the automation, the costs required to automate manual process, the Internal Rate of Return (IRR), and the expected Return of Investment (ROI). The results shown are based on the Case 1 of the Collaborative Assembly.

*Table 5 - ACROBA business plan for future Platform adopters*

| | | Forecasts (€) | | | | |
|---|---|---|---|---|---|---|
| | Investment | 2025 | 2026 | 2027 | 2028 | 2029 |
| Collaborative Assemble Case 1 Costs Savings | | 38.957 | 81.809 | 134.985 | 222.726 | 222.726 |
| Investment required | 266.568 | | | | | |
| NET CASH FLOW | -266.568 | 38.957 | 81.809 | 134.985 | 222.726 | 222.726 |
| Accumulated Cash Flow | -266.568 | -227.611 | -145.802 | -10.817 | 211.909 | 434.635 |

| | |
|---|---|
| NPV (Net Present Value) | 287.304 |
| Cost of capital | 6,620% |
| IRR (Internal Rate of Return) | 32% |
| ROI (Return On Investment) | 263% |

## 3.2 Joint-Venture

Three project partners, MrNec, NUTAI and AITIIP, are considering to create a joint-venture to r. As negotiations are just about to start, there are only limited

## 3.3 - Costs Evaluations Tools of Creation of a Digital Twin

Digital Twin (DT) is a digital replica of a system, a machine, a production line, or an entire factory. DT is a key factor to exploit ACROBA at a production site. Our observation in Finland has revealed, that in the SME sector, Digital Twins are almost non-existent. Hence, Robocoast is studying the costs of creating of a Digital Twin for SME in Finland, and steps SME's need to take to deploy a DT. Currently we have some insight of the costs of a basic setup of the digital replica of the environment. These figures will be updated later with the knowledge gained during the AOSL, where one focus will be what kind of DT is needed in order to benefit of

The ACROBA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017284.

ACROBA platform, and how to reach the TRL level 5 to be able to obtain ACROBA. The following cost estimates do not cover the functionality of a production line in Digital Twin, but just the creation of the environment.

### 3.3.1 Scenarios

The following three Scenarios are possible examples for the creation of a Digital Twin of a production line.

1) Scenario Small: one machine, area 20 m2
2) Scenario Medium: One line of machines, area: 100 m2
3) Scenario Large: Several lines of machines, area: 500 m2

#### *3.3.1.1 Data capture*

Several different methods to capture the As-Built situation can be used. We are considering three of them.

1) Mobile Scanning
2) Terrestrial Scanning
3) Photogrammetry

Mobile Scanning: The scanning happens on-the-fly by moving through the area of interest.
Pro: Easy and fast to deploy, little preparation or post treatment, medium costs
Con: Medium resolution and accuracy

Terrestrial Scanning: Scanning is done on several fixed positions.
Pro: High resolution and accuracy
Con: Time consuming, good planning necessary, high costs

Photogrammetry: 3D data is computed based on picture data
Pro: Easy to deploy, easily scalable, low cost
Con: Low accuracy

The ACROBA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017284.

### *3.3.1.2 3D Model Type*

In order to use the 3D data in a digital environment it is necessary to convert it to a format which can be read by the used interface. We consider two basic types here.

1) Surface Models
2) Primitives Models

Surface Model: The 3D model consists of a surface mapped onto a point cloud. Depending on the point cloud data and the method used for the mapping the result of the surface model can vary drastically. The used exchange format plays a role in the available features of the model.

Primitives Model: The 3D model is a collection of 3D primitive bodies which represents and fits the As-Built situation the best considering the level of detail. The level of detail is the most important factor in describing the specification for this 3D Model.

### *3.3.1.3 Example Cases*

**Scenario Small, Photogrammetry, Surface Model**

The data acquisition can be done by a series of high-resolution photographs and should not take more than one hour. The computing and post treatment of the model can be done within a couple of hours.

Estimated costs: 400 – 800 €

**Scenario Medium, Mobile Scanning, Surface Mode**

The data acquisition is done with a mobile scanner and should be estimated with one day. Post processing of the scan data and point cloud should also be estimated at one to two days.

Estimated costs: 2500 – 4000€

**Scenario Large, Terrestrial Scanning, Primitives Model**

The ACROBA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017284.

The data acquisition should be estimated at three to five days with a one-to-two-man team, depending on the conditions. Post processing of the scan data and point cloud should be estimated at two to three days. Creating the 3D Primitives Model with a low level of detail should be estimated with one week of design work.

Estimated costs: 7000 – 13000€

#### *3.3.1.4 Next steps in Digital Twin study*

In the following months and during the AOSL testing we will gather more real numbers about the costs of a creation of a Digital Twin for ACROBA. These figures will help a potential customer to prepare for becoming an ACROBA user and making the Digital Leap to the world of Agile Manufacturing.

## 3.4 - Co-operation with European & Other platforms

A discussion with European platforms such as DIH2, TRINITY and Better Factory have been started for easier access to the markets. Some of them offer marketplace visibility, others have timely open calls to provide funding for testing. These opportunities will be utilized when ACROBA is ready for testing. These opportunities will be utilized when ACROBA is ready for testing. In addition, the members of the consortium belong to platforms that can transversally expand the potential market of the solution, as is the case of EFFRA at European level, the Vanguard Initiative in a cross regional approach, and several national and regional platforms. A funding opportunity monitoring will be made to pave the way of TRL and MRL increase at the project end.

Preliminary discussions have been held with the United Nation's ITU AI for Good program, which is a gateway to offer innovative solutions to global markets. If this turns out to be a viable option to access markets outside Europe, further deeper cooperation will be initiated.

### 3.4.1 DIH-Squared

DIH² is a network of European Digital Innovation Hubs in the field of manufacturing industry. Occasionally they have arranged open calls to support manufacturing SME's to test new

The ACROBA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017284.

innovations. Currently they are planning a marketplace for innovations, give an access to VC's, and offer visibility to their networks which ACROBA could use to promote the end product. BFH, EMC2, IMR and ROB are members of DIH².

### 3.4.2 Trinity

The main objective of TRINITY is to create a network of multidisciplinary and synergistic local digital innovation hubs (DIHs) composed of research centers, companies, and university groups that cover a wide range of topics that can contribute to agile production. The result will be a one-stop shop for methods and tools to achieve highly intelligent, agile, and reconfigurable production, which will ensure Europe's welfare in the future.

There are two rounds of open calls for application experiments, where companies with agile production needs and sound business plans will be supported by TRINITY DIHs to advance their manufacturing processes.

### 3.4.3 Better Factory

There is an open call is now open until mid-November. Robocoast is studying could this open call benefit ACROBA objectives and is talking with potential companies who are already interested in ACROBA solution. This open call could be used to boost AOSL's impact.

## 3.5 European Digital Innovation Hubs

Three of the ACROBA partners are coordinating a regional EDIH in their countries. These will provide ACROBA project the basic network to reach out their respective partnering EDIH's. Also, DIH² provides access to more than 100 manufacturing industries DIH's.

EDIH partners of ACROBA:

- **EMC2** – DIVA EDIH
- **IMR** – FxC EDIH
- **ROB** – Robocoast EDIH, around 50% of Finnish exporting companies in the region

The ACROBA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017284.

The EDIH network will be used to do market research within their manufacturing industry network and automation and robot integrator sector. DIH Tours in WP7 are purposed to make visits in different EDIH's and use it to trust building, marketing, market research and dissemination.

### 3.6 National funding opportunities

A list of National funding options will be created to assist SME's to find viable options for deploying ACROBA and update their systems to reach TRL 5, including a Digital Twin.

### 3.7 European Fast-track scheme

The current funding bodies that are implementing the Fast Track are Knowledge and Innovation Communities (KICs) of the European Institute of Innovation and Technology (EIT) for selected funding schemes and EISMEA for EIC Pathfinder and Transition projects. The EIC Accelerator supports individual Small and Medium Enterprises (SMEs), in particular Startups and spinout companies to develop and scaleup game-changing innovations. In some cases small mid-caps (up to 500 employees) are supported.

These funding schemes can become convenient for a joint-venture creation, and to assists third parties to find proper funding schemes.

## 4 Project Spin-offs and Exploitation

### 4.1 Extensions of Use Case pilots

Most of the Pilot Use Case partners have expressed their willingness to expand the use of ACROBA in other parts of their production lines, or copy the pilot line to their other, similar factories. Steripack is thinking to use ACROBA, not just for light-out processes, but also for collaborative environments.

### 4.2 Joint Venture

The ACROBA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017284.

A joint venture will be created to offer ACROBA with Platform as a Service (PaaS) concept and turnkey solution services. The turnkey solution can be a robotic cell built on ACROBA Platform. Joint venture is essential not just for the founding partners, but licensees within the project. Also, expansions of current Use case pilots require a running business.

Some preliminary discussions of creating a joint venture have been held in the project meetings. MrNec, AITIIP and NUTAI have expressed their interest to be part of the joint venture, and several partners are considering the option to join in the joint venture.

### 4.2.1 New Venture Business CANVAS

As negotiations to create a joint venture are just about to start, each of the three partners have created a Business Canvas to outline their individual business plan and strategy. In further discussions these three templates will be unified to a single business plan.

The ACROBA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017284.

## NUTAI BUSINESS CANVAS

<table>
<tr><th>Key partners</th><th>Key Activities</th><th>Value Proposition</th><th>Customer Segments</th></tr>
<tr><td rowspan="2">Universal Robots<br><br>Sigma?<br><br>OEMs<br><br>ACROBA Developer's Team</td><td>- Turnkey project, within the following areas and programmed with the ACROBA framework:<br>• Electrical and mechanical engineering.<br>• Mechanical and electrical installation.<br>• Software: programming and development<br>• Installation and commissioning<br>Technical training</td><td rowspan="2">NUTAI stands out for applying a management strategy based on total quality in the services/products it offers.<br>• Turnkey project<br>• Energy efficiency<br>• Own creations<br><br>It stands out for its R+D+i studies, through the development and implementation of solutions within the collaborative robot industry.</td><td rowspan="2">- Plastic industry<br>- Medical devices<br>- Electric motors<br>- Electronic elements<br>- Other industrial sectors</td></tr>
<tr><td>Key Resources<br><br>Physical: Physical installations, website, social networks, trade fairs.<br><br>Intellectual: Own creations Software CobotVNC, MADController, tidyPal.<br><br>Human: Sales team, IT, HR, engineers, administrative staff, and directors.<br>Economic:</td></tr>
<tr><td></td><td></td><td>Channels<br><br>NUTAI has both offline and online channels to reach customers.<br><br>OFFLINE<br>• Sales team; where a complete follow-up of the sales process is carried out, providing an information, sales and after-sales service.<br>• Trade fairs; through these we make contacts for future clients.<br>ONLINE<br>• Web Site (www.nutai.com)<br>• Social Media<br>• email<br>• UR page integration<br>• CRM HubSpot</td><td>Customer Relationships<br><br>NUTAI stands out by having a personal and exclusive assistance to each client, by means of a follow-up from the first contact, at the same time also taking into account all the suggestions and contributions of the clients in order to satisfy their needs.</td></tr>
<tr><td colspan="2">Cost Structure<br><br>- Fixed costs (salaries, rents, overheads, materials)<br>- Maintenance cost of PL<br>- IPR protection</td><td colspan="2">Revenue Streams<br><br>- ACROBA services<br>- Selling products<br>- Installations, services such as technical support or maintenance<br>- Teaching courses</td></tr>
</table>

The ACROBA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017284.

## AITIIP Business CANVAS

<table>
<tr><th>Key partners</th><th>Key Activities</th><th>Key Resources</th><th>Channels</th></tr>
<tr>
<td>AITIIP as technology developer and tester. Technology partners in ACROBA WP1,2 and 3, in order to integrate the ACROBA approach in the dummy tool tracking. (architecture, skills, planner....)<br><br>Robot manufacturers. To use their brand in the solution. (Plug ins for the robots, potential ROS)<br><br>Software developers, to build a consistent unified software for the solution.<br><br>Customers. The application of the value proposition in one customer with grants will open the market for further implementations.<br><br>Potential exploitation through Spin off (AITIIP, NUTAI, MrNEC)</td>
<td>Final software development. (Skills, primitives....)<br><br>Main partner compromise in the business model.<br><br>Joint participation in fairs and showrooms, to profit from their commercial network.<br><br>Value Proposition<br><br>Lightweight dummy tools and processes for creating human guided processing paths. Including AV tracker, robot, controller,<br><br>software and dummy tools.<br><br>Services using the above-mentioned process for different task for the defined customer segments.<br><br>No available solution in the market. Some early approaches, but less accurate or small size. Based in inaccurate monitoring sensors. Some research projects trying to develop the solutions. Robot manufacturers interested in the solution. HR collaboration reducing the gap between technology and operators.</td>
<td>Technology. AV camera swarm. Hardware, camera calibration tool, Dummy tools based on fiducial markers. ACROBA skills,<br><br>and architecture Engineering resources for dummy tools design and AM.<br><br>Software developers for customization.<br><br>Technical team for support.<br><br>Customer Segments<br><br>Company<br>- producing large accurate assembled products.<br>- producing large scale welded structures or products<br><br>Companies<br>- providing solutions for metrology, software and automation<br>- providing metrology services for large parts.<br>- with manual unsafe and unhealth manufacturing processes that could be automated<br>- requiring full customization of the production.<br>- with current manual hazardous manipulations or tasks</td>
<td>Customer type 3, direct demonstration of capabilities. Showroom.<br><br>Rest of customers, dedicated sectorial fairs. Commercial visit and demonstration in site.<br><br>Social media<br><br>Webpage<br>ACROBA SEP<br><br>Customer Relationships<br><br>Partners in the development and centralize the exploitation, by licencing.<br><br>Rest will buy the solution, will require training and support.</td>
</tr>
<tr><th colspan="2">Cost Structure</th><th colspan="2">Revenue Streams</th></tr>
<tr><td colspan="2">TBD.</td><td colspan="2">Services, dummy tool manufacturing (AITIIP), Robot programming services. Monitoring facilities integration. Training. Dummy tool robotic cell replication. Customization of the dummy tool concept for other tasks or activities. Easy programming robots in automotive, aerospace...</td></tr>
</table>

The ACROBA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017284.

MRNec CANVAS

<table>
<tr><th>Key partners</th><th>Key Activities</th><th>Value Proposition</th><th>Customer Segments</th></tr>
<tr><td rowspan="2">Automation industry: Siemens<br><br>Manufacturing industries: Automative, etc.</td><td>Innovation planning<br><br>Partnering with process automation networks active in robotics and related industries<br><br>Keeping trade secrets by controlling disclosure and use of tool</td><td rowspan="2">Automating and optimising performance of manufacturing processes in sectors as medical device production. Using functional programming languages to generate reward and perception guided action control functions that allow to train, validate and test DRL agent that in turn can be embedded, embodied and deployed as an artificial neural networks in work-cell or shop floor to carry out rapidly delicate tasks with(out) interaction with human operators in a safe manner.</td><td rowspan="2">Automation industry: Siemens<br><br>Manufacturing industries: Automative, etc.</td></tr>
<tr><td>Key Resources<br><br>Scientific program developers<br><br>Process automation and robotic engineers with experience in (e.g., automotive, aircraft, ship, ...) manufacturing<br><br>AI cloud infrastructure services</td></tr>
<tr><td></td><td></td><td>Channels<br><br>Long-term ( Interact with the customer on a recurring basis)<br><br>Personal assistance (Provide customer service support through emails or call centre)</td><td>Customer Relationships<br><br>Partners channels / indirect (e.g., through partners websites/social, through partners network); Owned channels /direct (e.g., in-house sales team, company resources ...); Hybrid channels (both owned and partners channels/resources to increase reach)</td></tr>
<tr><th colspan="2">Cost Structure</th><th colspan="2">Revenue Streams</th></tr>
<tr><td colspan="2">- Operational costs (platinum, gold, silver, bronze, standard: 3000, 2500, 2000, 1500, 1000 EURO) for running IT services 24/7 customised and optimised robot agent reward and action control generation services on premise or in cloud.<br>- Staff costs (salary rate at 150 K EURO/y) - total of all expenditures associated with service customisation in ramp up, deployment or upgrade phase.<br>- Overhead costs (10 K EURO/y) .<br>- Capital costs (25K EURO/y) - investments for upgrading existing per process specific licence and extending service portfolio.</td><td colspan="2">Annual license of core (DIY) robot agent reward and action control generation tool (500 euro).<br><br>Monthly license of add-on customised robot agent reward and action control generation tool and services for update and upgrade (1000 euro).<br><br>Monthly license for add-on customised and optimised robot agent reward and action control generation services of different SLAs / skills performance levels (platinum, gold, silver, bronze: 10.000, 7.500, 5.000, 2.500 euro).</td></tr>
</table>

A joint venture may be a new corporation, a partnership, or a simple contractual agreement. When dealing with an ACROBA scale of a project where there's a need to agree with many IP owners, a stand-alone corporation, to be owned equally (or in whatever proportions you choose) by the joint venture partners, could be feasible. The joint venture may need its own identity, officers, and employees, although there may be significant overlap with the original companies. A joint venture agreement needs to be made and it becomes a partnership agreement that will define how the partners will share liabilities and responsibilities.

The ACROBA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017284.

## 4.3 Single Entry Point (SEP)

The intention of SEP is to make the most promising developments of ACROBA last over time, after the conclusion of the project. It aims to be a window to the world and at the same time trying to keep the consortium alive and operational. The SEP will be a point of contact for potential future services that may be developed by the ACROBA partners, as well as potentially being a point of sale for any of the planned KERs. SEP will be materialized in a website that will be available at the end of the project.

## 4.4 Licensing

Some partners of the ACROBA project are expecting to generate revenue streams by offering software licenses to their customers. Part of them will be offered as a Software as a Service (SaaS) model concept, some will offer turnkey solutions while others are looking to update current manufacturing systems.

Licensing can be a great option for a business plan for several of reasons. From the point of sustainability of a product, exploitation through licensing can have fast time to market, it requires less financing, involves fewer financial risks and licensing can provide faster returns. Through licensing a product can reach wider market sectors and geographical areas through different licensees in different technology areas. Licensing as a strategy can help to maximize the impact of results.

The licensee often has established markets and the business plan is to increment their own technology and fill in a specified gap in the market. This way the new product or service can reach wide markets in reasonable time and resources. The licensee also has already acquired the expertise to exploit the IP and generate profitable business with it. Licensing can be a great way to exploit the IP if the IP owner does not have enough resources or expertise to launch the product to market.

The ACROBA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017284.

## 4.5 Open-Source Software

Open source as a business plan can be utilized for example by building service infrastructure around the software, for example integration, training, and consultancy. Another strategy could be offering software as open source to support for example robots or specific hardware that a company produces to enhance sales.

When choosing the license, we must deliberate between permissive and copyleft licenses. Special attention must also be addressed to interoperability of different components and solutions. The decision to use open source as a business strategy must be justified in terms of the impact and business opportunities that the strategy has.

## 4.6 Standardisation

The benefits of standards for European industry are extensive. Standardisation activities are one of the key paths of the project exploitation to ensure the future adoption of the Platform. An extensive report D8.9 Standardisation Strategy of the ongoing work is published simultaneously with this Sustainability plan at M21.

## 4.7 Consortium wide sustainability plan

The partners have been asked about their plans around ACROBA and how are they going to be involved after the project ends. Some of the partners have very clear idea of the future exploitation of the project results, while others still consider their options. WP6 and WP8 are conducting a survey within the project, for which we have set the due date at the end of June. Hence the results are not complete yet, but here's the preliminary data, where the total number refers to the number of partners going to take part in the action described.

| ACTION | TECHNOLOGY POTENTIAL | BUSINESS INTEREST |
|---|---|---|
| | TOTAL | TOTAL |
| Maintain the general ACROBA architecture. | 4 | 0 |

The ACROBA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017284.

| | | |
|---|---|---|
| Update and upgrade the architecture after the project to new rel. | 3 | 1 |
| Update skills and primitives | 4 | 1 |
| Create new skills and primitives on demand | 5 | 1 |
| Generate tutorials and training for new primitives or skills | 3 | 0 |
| Update the current modules | 2 | 1 |
| Create new modules on demand | 3 | 1 |
| Create new tasks using the existing modules. | 7 | 2 |
| Maintain or update the task planner | 1 | 1 |
| Test new developments in your robotic cells | 8 | 5 |
| HR safety consultancy | 3 | 1 |
| Standardization consultancy | 2 | 0 |
| Upgrade existing robotic cells to Acroba | 6 | 2 |
| Develop on demand robotic cells using Acroba | 7 | 2 |
| Develop dummy tools on demand | 5 | 2 |
| Program robots on demand | 9 | 6 |
| Plug in for new robots or hardware | 5 | 1 |
| Develop interfaces for new devices | 3 | 0 |
| Develop academic material for lecturers | 6 | 3 |
| Investing in a Joint Venture | 2 | 1 |
| Participating in a Joint Venture | 5 | 5 |
| Selling the ACROBA results | 4 | 1 |
| Other services you consider, please describe. (education, courses) | 2 | 1 |

The ACROBA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017284.

# 5 Target Sectors

The European industrial robotics market has been experiencing significant growth in recent years, driven by factors such as the robust manufacturing industry in the region, increasing demand for automation in various industries, and the adoption of Industry 4.0 technologies. The market is expected to reach $20.08 billion by 2025, growing at a CAGR of 9.02% during the forecast period. The automotive industry accounts for the largest share of the market, while other industries such as electrical and electronics, metal and machinery, and food and beverage are also expected to contribute to the market's growth. Germany is the largest market for industrial robotics in Europe, accounting for more than 40% of the market share, followed by Italy, France, and the United Kingdom. The increasing adoption of collaborative robots or cobots is expected to create new opportunities for the market in the region. Material handling is expected to be the largest application segment of industrial robotics in Europe, followed by welding and soldering, assembly, painting and dispensing, and inspection and testing. Overall, the European industrial robotics market is expected to continue growing significantly in the coming years.

## 5.1 General Trends

The industrial robotics market in Europe is being driven by several factors, including the robust manufacturing industry, increasing demand for automation, and the adoption of Industry 4.0 technologies. Trends driving the market include the need for flexible manufacturing systems and a focus on workplace safety. Key players in the market include ABB, KUKA, and FANUC, with Universal Robots and Yaskawa Electric Corporation also making a significant impact. While the automotive industry is the largest end-user segment, other industries such as electrical and electronics, metal and machinery, and food and beverage offer growth opportunities. However, the market also faces challenges such as the high cost of industrial robots and a shortage of skilled workers to operate and maintain them. Investment in education and training programs is needed to prepare workers for the jobs of the future.

## 5.2 ROS WITHIN ROBOTICS

The ACROBA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017284.

ROS, or Robot Operating System, is an open-source framework for developing robotics software that provides a collection of libraries, tools, and drivers that can be used to build complex robotic systems. ROS is expected to continue to have a significant impact on the field of robotics due to its standardization, flexibility, innovation, accessibility, and collaboration. It provides a standardized platform for robotics development, making it more efficient and collaborative. ROS is designed to be flexible and modular, allowing for more efficient development and enabling developers to create custom robotic systems that are tailored to their specific needs. As an open-source platform, ROS allows for a high degree of innovation and experimentation, leading to the creation of new robotic systems and technologies. ROS is also accessible to a wide range of developers, from hobbyists to researchers to industry professionals, which can lead to a more diverse and inclusive robotics community. Finally, ROS has a large and active community of developers who collaborate on the development of the framework, leading to more rapid development and innovation, as well as a greater sharing of knowledge and resources.

## 5.3 SKILL BASED PROGRAMMING

This text explains the difference between two building blocks used in programming and controlling a robotic system: primitives and skills. A primitive is a basic action or behavior that a robot can perform, such as moving a joint or gripping an object. Primitives are often pre-defined and can be combined to create more complex behaviors. A skill, on the other hand, is a higher-level behavior that can be composed of multiple primitives, designed to perform more complex tasks, such as navigating a maze or assembling a product. The distinction between primitives and skills allows robotic systems to be programmed and controlled at different levels of abstraction, providing low-level control over individual actions and higher-level control over complex behaviors. By using a combination of primitives and skills, robotic systems can be programmed to perform a wide range of tasks. There are several advantages to using a skills and primitives based programming approach in robotics: Modularity, Abstraction, Reusability, Debugging, Customization. Moreover, the use of ROS in research and academic institutions is widespread in Europe. Many universities and research institutes use ROS as a platform for developing and testing robotic systems.

The ACROBA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017284.

## 5.4 POTENTIAL APPLICATIONS AND MARKETS

### BIN PICKING

Bin picking robot applications are being used in a variety of industrial sectors, where the picking and placing of objects is a common task. Some of the industrial sectors using bin picking robot applications include automotive, electronics, logistics, pharma and food industries. Overall, bin picking robot applications are being used in a variety of industrial sectors where the automation of picking and placing tasks can lead to increased efficiency, productivity, and accuracy.

### COMPLEX ASSEMBLY

Complex product robotic assembly involves using robots to automate the assembly of complex products such as cars, aircraft, and electronic devices. Some of the applications of complex product robotic assembly and the industrial sectors involved are: automotive, electronics, aerospace, medical devices, and consumer goods.

Human-robot collaborative assembly (HRC) is an area of robotics that focuses on the safe and efficient collaboration between humans and robots in assembly tasks. Some of the current trends in HRC assembly are: Safety, Flexibility, Artificial intelligence (AI), Integration and sustainability.

### PROGRAMMING BY DEMONSTRATION

Robotic programming by imitation using haptic tools is a field of research that aims to enable robots to learn tasks by imitating human movements through haptic feedback. One of the key trends in this area is the development of advanced sensing and feedback systems that capture the motion and force of human movements in real-time. Additionally, machine learning algorithms are increasingly being used to analyze and learn from human movement data, which helps to improve the accuracy and efficiency of robot movement.

Another important trend is the increasing focus on human-robot collaboration, which involves developing robots that can work alongside humans and adapt to their movements and preferences. This requires the development of interfaces and training programs that make it

The ACROBA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017284.

easier for humans to teach robots new tasks. Finally, virtual reality is being used to create more immersive and realistic training environments for users, allowing them to simulate the environment in which the robot will operate and provide a more intuitive interface for teaching the robot new tasks. Overall, these trends are helping to advance the field of robotic programming by imitation and pave the way for new applications in industries such as manufacturing, healthcare, and entertainment.

## 5.5 MANUFACTURING AS A SERVICE

Specific technological (or non-technological) enablers or solutions that need to be addressed by the research or innovation activities. In order to achieve a consistent approach to the industrial challenges, one or more of the following areas have to be addressed. Some of them are covered by ACROBA scope, and others should be worked in other potential environments.

ACROBA covered enablers:

- Autonomous reconfiguration and planning systems
- Market place
- Manufacturing service
- Definition of sustainable business models

### 5.5.1 ZERO-DEFECT MANUFACTURING – QUALITY ASSURANCE – SELF-LEARNING SYSTEMS

ACROBA covered enablers:

- Integrated machine, fixture, tool, workpiece
- integration of intelligent, autonomous, self–adaptive
- Process adaption by self-learning
- Robust automation
- New measurement and inspection
- Development and integration of in-line or in-process

The ACROBA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017284.

- Strategies for optimally combining and harmonising heterogeneous data such as images, geometry
- Plug-and-inspect data.

# 6 Conclusion

ACROBA is like a plant grown inside a green house. One day it will be strong enough to be located outside from the greenhouse to sustain in the real climate.

The EC's Grant makes it possible to develop this great tool for the EU's manufacturing industry. Although ACROBA is still in the development phase, planning is needed for the future. The pilot use cases, the AOSL and the Hackathons will provide plenty of evidence that ACROBA can deliver what it promises. Furthermore, the development of the SEP (Single entry point), in development will pave the way for the project sustainability plan, to show market reach evidence, and to be the future window show for the result, to engage industry, and specially SMEs to the innovations, to ensure the digital transformation of the European Industrial Community.

This first Sustainability plan presents the various possible ways for the product to live by its own. When it delivers what promises, it has already a merit of its own. To be viable on the markets, the project needs a strong IPR management, good business plans, marketing, and markets. These will be focused on WP8 in a daily basis along with WP6, the pilots use cases and development.

---

[1] Intellectual property rights and firm performance in the European Union, 2021, European Patent Office & the European Union Intellectual Property Office

[2] https://ec.europa.eu/eurostat/documents/2995521/14644638/2-19072022-AP-EN.pdf/fff35147-c9b3-a915-7bf0-b09202bbd130).

The ACROBA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017284.