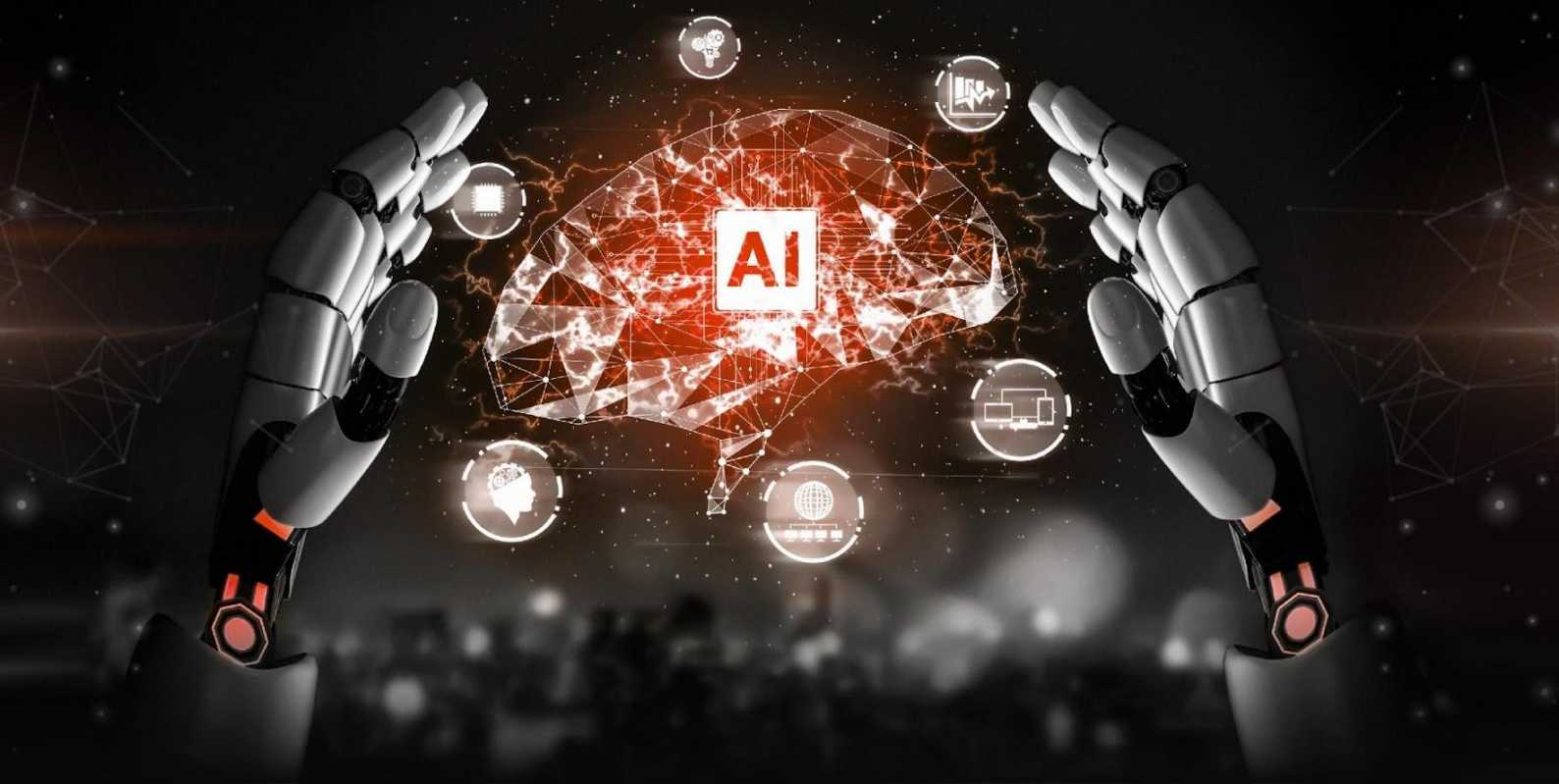


# Interview Guide



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## Interview guide

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## AGIMUS in a nutshell

AGIMUS aims to deliver open-source breakthrough innovation in AI-powered agile production, introducing solutions that push the limits of perception, planning, and control in robotics, enabling general-purpose robots to be quick to set up, autonomous and easily adaptable to changes in the manufacturing process.

To achieve such agile production, AGIMUS leverages cutting-edge technologies and goes beyond the state-of-the-art to equip current mobile manipulators with a combination of (i) an advanced task and motion planner that can learn from online available video demonstrations; (ii) optimal control policies obtained from advances in reinforcement learning based on efficient differentiable physics simulations of the manufacturing process; as well as (iii) advanced perception algorithms able to handle objects and situations unseen during initial training. Along the way, optimising energy efficiency and using 5G technology will support further pushing the limits of autonomy.

The AGIMUS solutions and their impact will be demonstrated and thoroughly stress tested in 3 testing zones, as well as 3 industrial pilots in Europe, under numerous diverse real-world case studies and scenarios (different tools, environments, processes, etc.). In every step, and from the very beginning, AGIMUS will go beyond current norms and involve a wide range of stakeholders, starting from the production line itself, to identify the essential ethical-by-design principles and guidelines that can maximise acceptance and impact.

## Scope of the analysis

Based on the ongoing desk research, a deep dive into the versatile robotics for agile production paradigm, understanding in more detail the needs, challenges & requirements of manufacturing lines that have adopted or need such principles was endeavoured.

Our aim is to shed light on (i) agile production as a new trend, (ii) its industrial needs and challenges, (iii) available or forthcoming technological solutions such as versatile robotics, (iv) key actors (industry, policy and research arena), (v) openly available resources for extending research activities, uncover barriers and drivers across key framework conditions which may influence uptake in the shop floor (e.g. culture, access to properly skilled human capital, regulations, policy support, etc.).

To gain the necessary knowledge more effectively, semi-structured interviews will be performed with key experts in AI, Data, Robotics, and Manufacturing from AGIMUS industrial partners and external stakeholders. The workforce from the AGIMUS industrial pilots and external key stakeholders will be actively involved towards better understanding their needs, concerns and acceptance barriers. Potential interviewees will also include people involved in the shop floors, following recent research insights that suggest that active workforce involvement during the design phase (i.e., drawing on the workers' knowledge) can lead to not only better productivity results, as they have the required knowledge for the details, but also higher acceptance rates for production robotics.

## The objective of the interviews

The main target of the interviewing activities is to offer profound insights to AGIMUS, allowing a more accurate and high-performance design of the envisioned autonomous robotic solution, but also to introduce major long-term impact to the shop floor such as an increase in productivity, reduction in deficits and waste of materials and high acceptance rates.

By actively involving key stakeholders across the “AI, data and Robotics” supply chain through interviews (and surveys later on), a concrete foundation will be created on the actual needs and potential of improved perception and understanding of an agile production line that uses versatile robots, while working safely at the same shopfloor with workers, without or with limited supervision.

These findings will support implementation through a shopfloor-driven, user-centred approach, ensure increased autonomy and an arsenal of augmented capabilities for safe and efficient manufacturing processes.

During the interviews, any openly available platforms, databases, datasets, etc., that can bring value during the implementation phase will be documented. The valuable feedback of the interviewees will enable us to identify any dimensions not previously envisaged and fuel the development of a questionnaire to be administered to a broader group of experts, including the employees of AGIMUS’ 3 industrial pilots. This questionnaire will cross-reference findings and reveal disparity points that may require further investigation.

Ultimately, interviews will help us define certain requirements that will be transformed into specific functional and non-functional (social, privacy, etc.) technical requirements of AGIMUS system architecture.

To summarise, the interviews’ objectives are:

1. Extract insights to validate, complete or even correct the ongoing desk research and literature review (iterative process);
2. Enhance the knowledge provided by key stakeholders across the “AI, data and Robotics” supply chain to support the design of the questionnaire survey that will follow later, giving insights on the topics that should be covered by it and people that should be reached;
3. Elucidate issues that may arise in AGIMUS industrial pilot cases, take them into account and potentially prevent them;
4. Shed light on various aspects of robotic-driven agile production, such as business, economics, technology, management and ethics, from the viewpoint of all involved stakeholders, i.e., workers, managers/experts, and decision takers;
5. Inform the main aspects and parameters that should be considered for AGIMUS system requirements and architecture;

## QUESTIONNAIRE

### General information of the interviewee

	INTERVIEWEE'S PROFILE		
<b>Demographics</b>	<b>Age range</b>	<b>Gender</b>	<b>Education</b>
	50-60	Male	<i>Master in SW engineering</i>
<b>Organisation type</b>	<i>SME</i>		
<b>Positioning in the organisation</b>	Founder - CTO		
<b>Level of expertise in robotics</b>	<b>HIGH</b>		
<b>Level of experience in production (agile or otherwise)</b>	<b>INTERMEDIATE</b>		
<b>Country</b>	Spain		

The interviewees may be experts, executive officers, managers or workers. The questions that will be posed may differ slightly according to the respective target group. All notes may be kept in the area that is foreseen after each question below. If need be, the transcripts should be translated into English before being delivered to Q-PLAN.

## Questions

No	Interview's topics/questions	Notes for interviewers (to activate/trigger the dialogue, or give some hints, explanations, or examples)
1	<p><b>What is the definition you would give on agile production?</b></p>	<p>Guide the interviewee if his/her definition is ambiguous.</p> <p>Indicative definition:</p> <p><i>“Agile production is a term applied to an organisation that has created the processes, tools, and training to enable it to respond quickly to customer needs and market changes while still controlling costs and quality. It is seen as the next step after lean manufacturing in the evolution of production methodology.”</i></p>
2	<p><b>How do you envision versatile robotics could address the agile production line needs?</b></p>	<p>Indicative definition:</p> <p><i>“Versatile robotics are robotic systems able to quickly adjust and adapt to many different functions, activities or changes, causing minimum interruption to the production process.”</i></p>
3	<p><b>Are you aware of any versatile robotics solutions for agile production?</b></p>	<p>Goal: to find out about the competition</p> <p>e.g., advanced perception algorithms, Task-And-Motion</p>

No	Interview's topics/questions	Notes for interviewers <i>(to activate/trigger the dialogue, or give some hints, explanations, or examples)</i>
	<p><b>Are you aware of any available or forthcoming technological solutions for agile production?</b></p> <p>In traditional robotics there are "Motion Planners" algorithms, they are preconceived movements with predefined data of the product to be produced and of its environment for optimization and movement safety. Ex. A palletizer that handles boxes and places them on a pallet, informing the system of how the boxes should go, the robot will execute the necessary movements to place the boxes in the correct way with movements generated by the robot itself.</p> <p>In mobile robotics, the robot moves through the environment with the constant "Feedback" of what is around it. For this reason, it is a highly rapid system to change its environment for optimal displacements.</p> <p>In agile production (applying versatile robotics is part of this), there are also several technologies available, especially in the field of communications and computing, such as a CRM, the ERP where staff can optimise management in an optimal way.</p>	<p>Planner, Cloud systems and Internet of Things</p>
4	<p><b>Which are the 5 most important needs of agile production lines in your opinion? Why? Does the use of versatile robotics create more/different needs? Why?</b></p> <p>There are several needs, but some would be:</p> <ul style="list-style-type: none"> <li>- The selection and identification of repetitive and recurring tasks.</li> <li>- The digitization of processes and products, to improve the effectiveness of the company in the changes.</li> <li>- The adaptation of technological equipment.</li> <li>- The qualification of personnel and continuous training within the company for learning</li> <li>- We can say that versatile robotics creates the same needs, learning, adaptation to understand the technology and adaptation of the equipment for proper functioning.</li> </ul>	-
5	<p><b>What kind of technologies were you using instead of robotics? When did you first use robotic systems? What kind of robotics did you use?</b></p> <p>Before robotics, I could say that computing was and is a technological tool for agile manufacturing. The first computer I had cancelled my typewriter, with which I could be more agile doing work in the studios.</p> <p>Some 22 years ago, I understood that robotics is a tool where it provides a lot of versatility and flexibility (in fact, a robot can do various tasks depending on the tool that we assemble on it); In addition, a robot has several degrees of freedom that can generate movement and move to different points in space with great precision and repeatability. That gives flexibility and precision.</p>	-

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	Use industrial robotics for handling large loads and dangerous processes such as loading/unloading in high-temperature presses, where an operator would be in not very favourable conditions and the faces to be handled are very heavy.	
6	<p><b>Which were/are the most important drivers of implementing agile production in general and versatile robotics in particular? Why?</b></p> <p>As I understand it, customer requirements have been fundamental in the automotive industry for example. We all like to be able to select every detail of your product (in this case, the car, to be able to select options, from colour to customisable details); so if there are many customers you have to be quick to adapt the product to the customer's needs in order to be able to produce a car with many variants.</p> <p>On the other hand, the product infrastructure has also been a key point. In the aerospace industry, the construction and manufacture of very bulky/heavy products has made versatile robotics (in this case mobile) an almost 100% necessary technology. Think that handling ships/aircraft wings, beams, engines, etc... is not easy without mobile robots.</p>	e.g., Industry, customers' requirements, infrastructure, government policies, company interests, other
7	<p><b>How were technology changes in your production process seen by the employees? What allowed them to take place? What did perhaps decelerate/accelerate their progress or reduce/increase their acceptance?</b></p> <p>In our case of versatile robotics, there is still a debate as to whether a robot takes away jobs or creates them... so we are still in a phase of assimilating these changes and understanding that it is a benefit for everyone. Our mission is to show that it is a tool that helps you in your production process, in short, it is an improvement and a benefit for everyone.</p> <p>It speeds up the implementation a lot to make people see that a repetitive robot task is for a Robot, to make people see that we don't have to work LIKE robots, but WITH robots.</p>	-
8	<b>Do you have in mind any measurable changes depicting the impact of introducing agile production methods in general and the use of versatile robotics in particular?</b>	with respect to productivity, efficiency, quality, profit, other

No	Interview's topics/questions	Notes for interviewers <i>(to activate/trigger the dialogue, or give some hints, explanations, or examples)</i>
	<p>A measurable factor would be TIME, in terms of productivity; being more agile and faster. With regard to versatile robotics in particular, one change would be efficiency and safety. Moving goods on optimised trajectories makes it more efficient for the company and safer for people.</p>	
9	<p><b>Which are the 5 most important challenges that agile production lines face in your opinion? Why?</b></p> <p><b>Does the use of versatile robotics create more/different challenges? Why?</b></p> <p>In my opinion, the main challenges would be:</p> <ul style="list-style-type: none"> <li>- Adaptation of staff, because technological evolution evolves very quickly.</li> <li>- Continuous training, for a good adaptation.</li> <li>- Having qualified personnel who want to participate in the adaptation process.</li> <li>- In mobile robotics, good dissemination of its efficiency and safety.</li> </ul>	<p>e.g., culture, access to properly skilled human capital, technology, regulations, policy support</p> <p>e.g., excessive deployment time, maintenance, costs, any other particularity</p>
10	<p><b>To which extend are AI-powered solutions beneficial for the employees? Which employee category do you expect to oppose to the deployment of AI-powered solution?</b></p> <p>AI can help to unlock a task that a person may not be able to appreciate. In the case of Artificial Vision, it helps a lot to avoid human errors and therefore we get very high quality products.</p> <p>It also improves ergonomics in repetitive handling tasks, avoiding sick leave and muscular injuries to people.</p> <p>The employees who may oppose it, would be because of their age, as there is an older generation that is not ready to adapt to certain technologies. We see this in older people with the use of mobile phones, a technology that has evolved very quickly, but for a certain generation it is a serious problem. Hence my insistence on lifelong learning.</p>	<p>e.g., impact on the work life quality, specialized training and abilities may be needed in order to integrate robots in the production line and work with them, patiently teaching a robot how to carry out repetitive tasks may be required</p>

No	Interview's topics/questions	Notes for interviewers (to activate/trigger the dialogue, or give some hints, explanations, or examples)
11	<p><b>What would you consider as sufficient guarantee regarding the responsibility and accountability of an AI-powered solution, before integrating it into the production line?</b></p> <p>Uff... we are too human to think that an AI will never make a mistake, but the truth is that there are many security algorithms around it. I would consider that if there are sufficient security elements to avoid (physical) damage, it can be introduced without problems, the AI learns as it works, and this also provides a guarantee.</p> <p>For example, in quality control processes in artificial vision, AI is undoubtedly used and is not questioned, although the "damage" if there is an error, is not physical, it could be economic when selling products with a defect.</p>	<p>e.g., performance metrics; safety guarantee about the behavior of the robot; explicability of the robot behavior (for example displayed on an external screen or leading to interpretable movements); safety measures in case of failure; time-to-reset metrics</p>
12	<p><b>How reliable do you consider AI-powered compared to classical engineering-based solutions? How reliable would you like an AI-powered solution to be in order to consider integrating it or replacing your current solution?</b></p> <p>In production, it is normally in a closed and controlled environment, as well as integrating security elements such as scanners, fencing, security gates, etc... makes it possible to implement it without any problems.</p>	<p>The interviewee should provide a quantitative metric (e.g., the success rate regarding a specific task) if possible</p>
13	<p><b>Have you considered the environmental &amp; energy cost of deploying AI-powered solutions to your company/organisation? If you are already using AI-powered solutions, have you considered using more efficient algorithms to reduce the environmental impact?</b></p>	<p>e.g., energy consumption, type of energy used by the data centres, hidden costs of cloud-based solutions</p>

No	Interview's topics/questions	Notes for interviewers (to activate/trigger the dialogue, or give some hints, explanations, or examples)
	<p>Yes, in the specific case of mobile robotics. We know that A helps to optimise certain trajectories, to make the best route, not to make unnecessary trajectories, so it leads to a reduction in the energy cost of autonomous equipment compared to equipment that can be driven by an employee. Controlled battery charging times when necessary, etc.</p>	
14	<p><b>There are concerns that AI-powered solutions, such as versatile autonomous robots, will replace workers. What is your point of view and which do you consider to be an ethical approach to this deployment?</b></p> <p>In fact, I have already been in a restaurant where autonomous robots act as waiters... Well, there is always the waiter who manipulates these robots and uses them for tasks in which they themselves consider that being with the customer is not necessary. Regarding ethics, there is always a human relationship between people, but between robots maybe that is what is lost, it is an interesting point to debate.</p> <p>But, perhaps restaurants are a service industry. In the agile manufacturing industry there is this concern, but for older people who have lived through another generation, I think there are a lot more people who accept autonomous robots than people who don't.</p>	-
15	<p><b>AGIMUS' framework results are expected to be the foundation of an open-source, international, robotics software consortium. What kind of benefits would your company/organisation expect to participate in it?</b></p> <p>I hope that this will serve to spread and create many products with this type of open source software. Since it is open source, it is most likely and certain that a solid community will be generated with continuous improvements in security and robustness over a very quick period of time.</p> <p>For us in particular, our benefit would be to be able to help pass on/disseminate and bring this technology to our technology product manufacturers.</p>	-
16	<p><b>What issues do you expect to arise with the broad use of cloud applications and 5G for online &amp; offline training of an AI-powered solution?</b></p> <p>With 5G we gain speed, so there could be some communication problems between equipment. For this we will also have to adapt equipment to these technologies and one problem could be the cost.</p>	-

No	Interview's topics/questions	Notes for interviewers <i>(to activate/trigger the dialogue, or give some hints, explanations, or examples)</i>
17	<p><b>From the 7 key requirements defined by the EU ethics guidelines for trustworthy AI, which do you consider to be the most important? Please elaborate how this could be applied in the case of versatile robotics for agile production.</b></p>	<p><u>EU ethics guidelines for trustworthy AI</u> key requirements:</p> <ol style="list-style-type: none"> <li>1. Human agency and oversight</li> <li>2. Technical robustness and safety</li> <li>3. Privacy and data governance</li> <li>4. Transparency</li> <li>5. Diversity, non-discrimination and fairness</li> <li>6. Societal and environmental wellbeing</li> <li>7. Accountability</li> </ol>
	<p>I consider technical robustness and safety to be among the most important. In the case of mobile robotics, if you transmit safety and robustness, there are no negative arguments for its implementation, it is a given.</p>	
18	<p><b>Would you consider any additional aspect of agile production &amp; implementation of versatile autonomous robotics that we did not manage to address?</b></p>	<p>Goal: to check the completeness of the questionnaire &amp; make adjustments; to receive feedback on aspects not covered</p>
	<p>In general I think we have discussed the most important points of both agile production and mobile robotics. Thank you for your invitation.</p>	