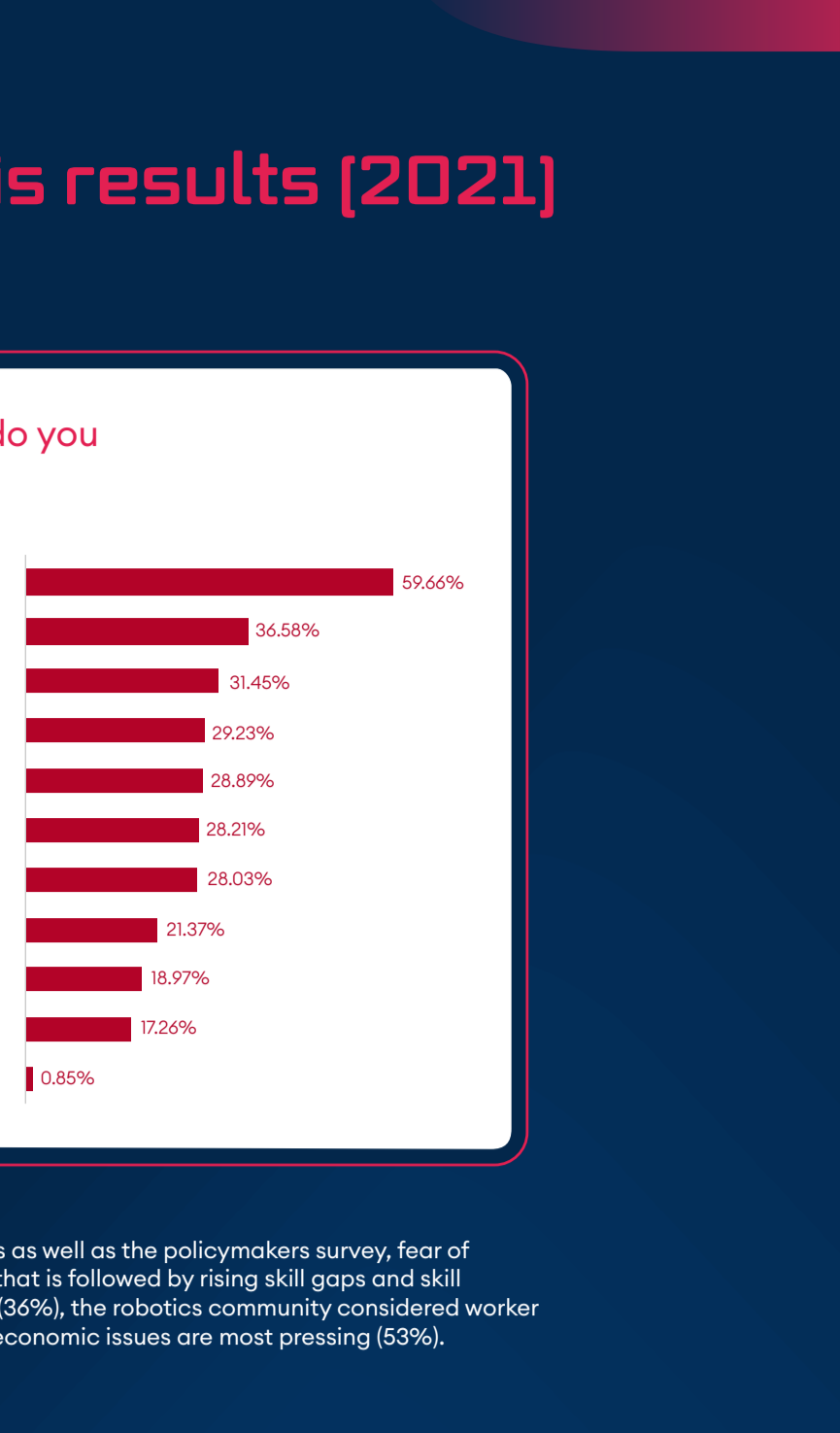


Factsheet #8

The Socio-Economic Dimension of Responsible Robotics

This document introduces the findings on socio-economic issues and solutions gathered as a part of Robotics4EU project activities in 2021-2023 in support of understanding how to support the more widespread adoption of robots in households and workplaces.

Disclaimer
This factsheet is based on research conducted by the Robotics4EU, as well as second-hand data collected by the project team from desktop research.



Robotics4EU needs' analysis results (2021)

Among the socio-economic issues listed below, what do you think are the 3 most impactful?

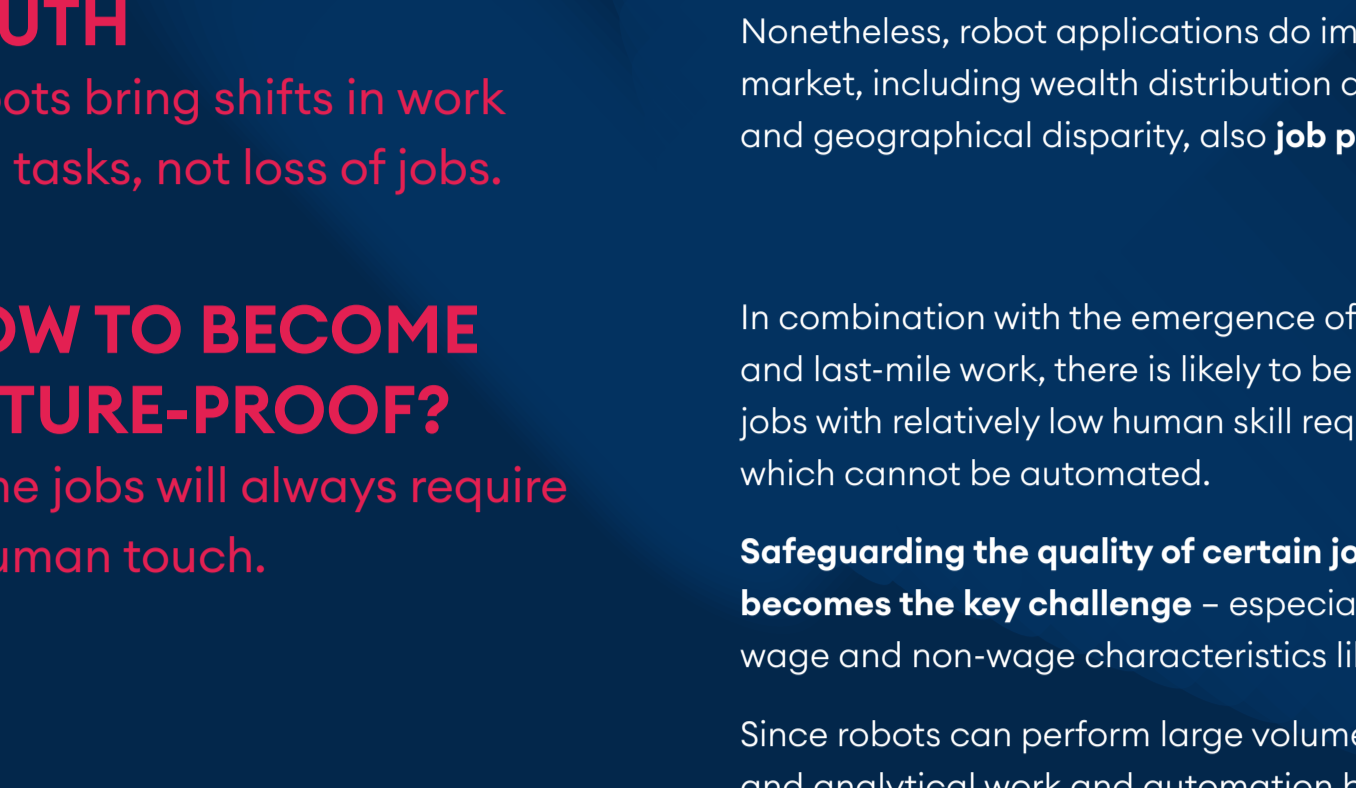


Figure 1. Socio-Economic issues identified by responders. According to the needs analysis as well as the policymakers survey, fear of technological unemployment is seen as the most impactful socio-economic issue (59%) that is followed by rising skill gaps and skill depreciation (32%). While policymakers marked policy as the third most important issue (26%), the robotics community considered worker autonomy as more relevant. Policymakers referred to agri-food as the field where socio-economic issues are most pressing (53%).

A COMMON WORRY

Will robots increasingly compete for jobs against humans?

The main socio-economic concern for the future of work is that we are heading towards **mass technological unemployment** by embracing robotic solutions.

The take-up of automated solutions is feared to increase the **gap in skills, wealth, and earnings**, and to cause numerous **issues regarding policy, employees' rights, and the environment**.

THE LESS ACKNOWLEDGED TRUTH

Robots bring shifts in work and tasks, not loss of jobs.

Despite widespread workplace automation, there is **no empirical proof to support the fear** of jobs being eliminated.¹

Nonetheless, robot applications do impact the job market, including **wealth distribution and regional and geographical disparity**, also **job polarisation**.²

HOW TO BECOME FUTURE-PROOF?

Some jobs will always require a human touch.

In combination with the emergence of new wealth and last-mile work, there is likely to be a fraction of jobs with relatively low human skill requirements, which cannot be automated.

Safeguarding the quality of certain jobs therefore becomes the key challenge – especially in terms of wage and non-wage characteristics like autonomy.

Since robots can perform large volumes of manual and analytical work and automation becomes more and more sophisticated, humans will take on certain tasks instead of robots – contractors will come and go according to organisational needs while robots continue making day-to-day decisions.

THE EFFECTS OF URBANISATION

A variety of skills are necessary in all regions, not just urban areas.

A large body of research shows that high-skilled workers have increasingly moved to more densely populated areas over the last 35 years. With urbanisation, some areas have become more abundant in high-skilled jobs while the availability of middle-skill work has declined.³

This can lead to a digital divide on local, regional, and even international level. Digitalisation thereby also causes shifts in production that lead to the **reallocation of work across and within borders**.⁴

NEW FORMS OF WORK ARE HERE

An effective workforce is hybrid – connecting robots with people.

As workforces are automatized, fewer **on-site employees will be needed on a consistent basis, forming a hybrid workforce that includes both robots and humans**.

Increasing emphasis on automation and the role of interactive robots will therefore influence the long-term economic prospects of the EU as these **new forms of work** differ from the traditionally large groups of full-time workers with permanent contracts.

COLLABORATIVE WORK CALLS FOR NEW LAWS

All employees need social benefits, regardless of their working arrangements.

Temporary workers should be able to enjoy the same institutional and social protections as provided through full-time employment contracts, including but not limited to minimum hourly wage, paid holiday leave, parental leave, paid sick days and more.

The **gig-economy specific worker protection rights** are an important issue to address, even more as type of work is on the rise amongst women and minorities.⁵

BUSINESSES NEED TO WEIGH IN ON SDG

Authorities can lead, or force, the way to sustainability on every level.

Public authorities can support ethical technological developments by making it compulsory to consider the overall societal impact of automation and to integrate Sustainable Development Goals (SDG) in all businesses with the help of **voluntary policy measures and complementary regulation**. Maximum societal value creation could be secured for the society at large by **accounting for the social, environmental, ethical, and consumer concerns and human rights**.⁶

Agri-food projects tend to focus on **socio-economic issues** that are closer to **environmental impact**. Solutions are created to prevent harm and improve energy savings, to address safety and security at the workplace, to educate employees when using robotics solutions. This could become the general practice across fields.

TACKLE THE FEARS WITH KNOWLEDGE

Citizens must see and experience the benefits of using robots.

The fear of robots taking away people's jobs can be addressed by **showcasing how robots are advantageous for work**. Citizens must get used to seeing robots so that they would have a **realistic understanding** of the current robot technologies and how they are used.

- Mokyr, J. et al. "The History of Technological Anxiety and the Future of Economic Growth: Is This Time Different?" Journal of Economic Perspectives, 29 (2015): 31
- VoxEU, Sense and nonsense in the public discussion of the future of work. <https://voxeu.org/content/sense-and-nonsense-public-discussion-future-work>
- Autor, D.H., and Salomons, A. "New Frontiers: The Evolving Content and Geography of New Work in the 20th Century." (2019), Working Paper
- From INBOTS White Paper on Interactive Robots: http://inbots.eu/wp-content/uploads/2019/07/Attachment_01.pdf
- Katz, L.F., and Krueger, A.B. "The Rise and Nature of Alternative Work Arrangements in the United States, 1995-2015." Industrial & Labour Relations Review 72 (2019): 382-416
- From INBOTS White Paper on Interactive Robots: http://inbots.eu/wp-content/uploads/2019/07/Attachment_01.pdf

Suggestions from the Responsible Robotics Compass

This section is based on the recommendations given in a societal maturity assessment tool developed by the Robotics4EU team in 2023.

Use and test the free-of-charge compass here:
<https://robocompass.aiod.eu>



Development Economics

- Consider the well-being of all workers and people whose lives will be impacted by the robot.
- Avoid worker isolation or inhumane working schedules.
- Consult internationally recognised NGOs to ensure worker protection measures that apply both in the country of design and manufacturing.
- Assess the robot's impact on jobs. List jobs destroyed and created, and describe the impact on different economic areas.

Labour Market

- Workers, whose jobs are automated, should be involved in designing the solution to ease the transition to operating the robot with minimal training.
- Customers should be informed about the impact that the automated solution(s) will have on productivity and how this can impact their chain of supply.
- Local solutions for robot maintenance should be provided for all economic areas where the robot is sold, e.g., enabling basic in-house maintenance, and verifying local companies (that enforce ethical job practices) to work with the robot.

Equality

- If the robot operates around regular citizens, test the algorithms for the needs and safety of all people, including minorities.
- Involve diverse test groups in the validation of the human-robot interface. Aim for different profiles in terms of sex, race, socio-economic status, and (dis)abilities.
- Any data used for human recognition or detection algorithms should be controlled for bias. See an example list of biases here: <https://towardsdatascience.com/bias-what-it-means-in-the-big-data-world-6e64893e92a1>.
- Follow the development of standardised data quality measures in ISO / IEC JTC 1 / SC 42 / WG 2: <https://www.iso.org/committee/6794475.html>.
- Avoid economic discrimination and the concentration of power by enabling companies to rent or buy second-hand robots.
- Support equal access to robotics' education, scientific research, and professional training by giving back to the community – share your robot with schools and universities in disadvantaged areas, give lectures in local universities, participate in science fairs, etc.
- Publish a declaration of interests, stating the sources of your funding to encourage the practice of transparency, integrity and building trust.

Insights from co-creation workshops

The following information reflects the opinions and experiences of a variety of stakeholders that participated in the Robotics4EU co-creation workshops in 2021-2023. More information on these events and results can be found on [D4.3 Co-Creation Workshops to Test Robotics Applications](#).

AgriFood

While it is difficult to talk about the general socio-economic impact of new robotic technologies, the consequences for the individual worker – or in this case, the farmer – are a more tangible talking point. Stakeholders from the agriFood sector are most concerned about the changes in workers' status and living.

Would the robot bring about significant changes in the job market?

Developers say yes. Many tasks in agriFood are unattractive due to the specific working conditions that come along with farm work. Automating repetitive, physically demanding and/or undesirable tasks within the sector means that workers can focus on more meaningful tasks and take higher-paid jobs. For the most part, this is seen as a positive development for workers within the agri-food area.

What kind of financial implications will automation bring?

Potentially, the gap between the rich and the poor in society can increase. Small and/or local businesses can also be put at a considerable disadvantage because they might not be able to invest in robotic solutions, thereby affecting the agriFood communities. To improve this, robot companies could be supported in ensuring a sustainable demand for the automated solutions and small/local farms could be provided specific grants that enable them to onboard robotic solutions.

Healthcare

How can a healthcare-targeted robot change the job market?

The automation of jobs is **already happening** and is helping to **reduce the workload** of personnel while also addressing the **severe understaffing** issue in numerous areas within the healthcare industry. While the role of many workers will undoubtedly be different, the lives of healthcare workers will be made easier as they are relieved from several burdens common to the walk in life.

The robotic solutions presented at the workshop were all believed to help **alleviate physically strenuous and stressful healthcare work** at a much larger scale and **free up time** for taking care of more important tasks that are directly related to patients. Human-robot collaboration also creates new job opportunities, pushing workers to be upskilled and take on other roles.

How to create a good transition of the robot into the workplace?

Access to information and relevant education is crucial for building trust in robots. More specifically, the successful integration of new technologies requires extensive training, which is regularly reinforced and extended to individuals who closely collaborate with the robots. Furthermore, **involving workers in the robot's design process** and allowing them to express their opinion on **unwanted tasks**, can lead to increased acceptance of the robot. Such an approach can address the concerns that many have about robots taking their jobs.

Production, Inspection & Maintenance

What technological advancements can we expect to realise by 2040?

For the **Industrial Robotics Company**, the next 20 years are expected to clarify what role AI will play in the future of their robot. Once a sufficiently large dataset is available, an automated program can be created to make the robot accurately correspond to the information received after scanning a component or part, **linking the need for manual programming** in certain contexts.

In this context, the main **challenges** **elimit data collection**. It can be difficult to convince companies and workers that their data is collected **only** to make robotic solutions better, in general. It is also not entirely clear which areas of work should be automated, how to offer and finance employees' re-training or upskilling and where automation is strategically significant to create long-term value.

Can a robot cause social inequality?

Based on the discussion with **SINTEF** while high-skilled workers' impact remains relatively unaffected, although studies show that low-skilled workers remain employed in robotized workplaces, more effort could be directed towards **elevating the professional baggage of low-skilled workers**. The distinction between low-skill and high-skill workers, however, is often **contingent upon the local context** (e.g., the educational level within a country), which assumes different strategies for guiding employees towards a more diverse skill set.

How to bring robots into its operational environments more smoothly?

The creators of **SenseGlove** highlight the need to make guidelines and FAQs available for all users. One possible barrier in taking that approach might be the difficulty to pre-define all particular use cases of a solution. For example, SenseGlove's grabbable scripts and material scripts are used for various interactions, the robot just adapts by adjusting thresholds and positions.

How can robots alter the job market in production and maintenance?

According to the experience of **Panza Robotics**, robots are unlikely to replace human workers or lead to a significant reduction of jobs. Instead, it diversifies the job market by removing the need for people to handle difficult or dangerous jobs. As robots are often better suited for these kinds of assignments, they free up employees' time for doing other meaningful or more advanced tasks. People's work experience and the possibility to create a good synergy with other employees is enhanced. However, the readiness of employees to be upskilled for other tasks needs to be well assessed – not everyone might want to move away from certain tasks.

What is necessary to facilitate a smooth transition to a robotized and digitalised workplace?

Employees need to be equipped with skills that help them to successfully conform to the anticipated changes in their work life. The broader strategy could involve incorporating robotics into educational systems and creating a political blueprint that outlines the ethical, social, and economic implications of widespread robotic integration. This includes an investigation into how education systems can proactively prepare for the future, ensuring that individuals are well-prepared for the changing demands of the workforce influenced by robotics and automation.

Selected references

- The REELER project** - responsiblerobotics.eu
An interdisciplinary Horizon2020 project funded by the European Commission (grant no. 731726) in support of the European Commission's effort in moving towards RRI-SSH integration and exploring alternative perspectives on societal issues related to technology-driven innovation.
Their homepage includes a toolbox for awareness raising activities (e.g., a board game and a mini-training), policy recommendations, literature reviews, research guides and so on.
- The NewHorizon project** - newhorizon.eu
This Horizon2020 project (grant no. 741402) focused on bridging gaps between science, research and innovation and society at large by calling for inclusive, anticipatory, open and responsive R&I systems. Its results – that are free to use by anyone – include a MOOC course, publications and manuals on responsible research and innovation.
The project website also holds a practical thinking tool for researchers working with innovative solutions that helps to assess the maturity of their work. The user can clarify the conditions in which the activities are done and investigate the key areas which need to be addressed to follow the principles of Responsible Research and Innovation.
- SINTEF** - www.sintef.no
One of Europe's largest research institutes and independent foundations working in the intersections between technology, natural sciences and social sciences. SINTEF holds laboratory and test facilities and supports the creation of innovation with businesses and the public sector at home and abroad.
With experts in a wide range of topics from digital inclusion to system safety, they participate in and promote a good variety of events that address the future of automation, digitalisation and robotics.
- PRISMA** - www.rii-prisma.eu/rii-toolkit
Funded by the Commission (Horizon2020 grant no. 710059), PRISMA collected good practices to help SMEs integrate responsible research and innovation (RRI) in their businesses, considering genuine societal needs as well as environmental and economic sustainability. The toolkit includes stakeholder engagement guidelines, a **sustainability method selection tool**, and an **online course** on RRI.
- Responsible Innovation Compass** - <https://innovation-compass.eu/method-kit/>
A self-check system to make smarter choices in innovative projects. They provide a "method-kit" on their website, which includes a training section for learning to co-create innovation, guidance on building responsible action plans and running an innovation lab.
- IDEAS RePec database** - ideas.repec.org
A bibliographic database for more than 4 million research papers in economics that are available for download at full length.

