

# Bioindustry 4.0 Stakeholder Information



What can digitalisation bring to industrial biotechnology?  
What can it do for the people working in industrial biotechnology?

## What is Bioindustry 4.0?

Bioindustry 4.0 is an EU project spearheaded by [6 leading European research infrastructures](#) (and 25 participating organisations), that will develop new services enabling the smart design and operation of advanced biomanufacturing processes. The services draw upon advanced process sensor prototypes and computational methods, including artificial intelligence and federated learning, to create design support systems and digital twins that will underpin next generation bioprocess design and control, making biotech processes faster, cheaper, and more sustainable.

Considering that both cutting-edge computational sciences and biotech are advancing at a similar, exciting pace, the integration of these technologies in the biomanufacturing sector has not yet been achieved. Therefore, the ambition of Bioindustry 4.0 is to accelerate this integration. To succeed, we believe it is vital to involve a variety of stakeholders, including those working either in the industrial biotechnology sector or in digital sciences. Moreover, we are keen to reach out to policymakers and industry regulators.

## Working with stakeholders throughout the project lifetime

Our project places strong focus on potential future users and stakeholders, either from academia or industry. We believe that this will ensure that the services and tools developed within Bioindustry 4.0 are of use to you, irrespective of whether you represent large or small entities operating in the bioindustry environment. Therefore, we want to involve our stakeholders from the beginning, gaining their interest and confidence so that they will remain with us until the end of the project. To meet and engage stakeholders, we will conduct a series of [interviews](#) and organize [focus group](#) meetings. For engaged stakeholders, we intend to organise [co-design workshops](#) aimed at establishing [a user wish-list for future Bioindustry 4.0 related services](#). These workshops will be an opportunity for all involved to identify opportunities and express concerns.

Whatever your present level of awareness is, we guarantee that as a stakeholder you will gain new knowledge about the cutting-edge technologies that are set to make a difference in your field of interest.

## Cutting-edge research and new services

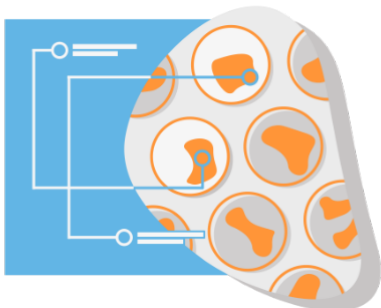
During the duration of Bioindustry 4.0 we intend to devise [5 new services](#) that will be offered by European research infrastructures. These services will support the needs of both academia and industry, providing them with access to some of the most advanced technologies available. These services include:



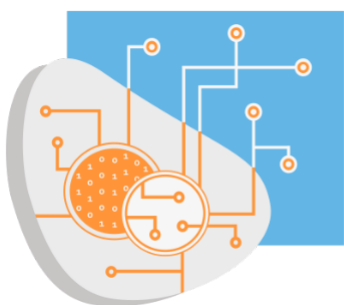
**Data fabric** – a platform that helps users to structure and manage their datasets in a manner that is compliant with international standards and suitable for use in algorithm training. The data fabric will ensure that high quality datasets are available for AI learning, for example using federated approaches. This is crucial for users that wish to source data from different locations and also for user consortia that wish to engage in trusted data networks to co-develop AI powered methodologies, such as digital twins.



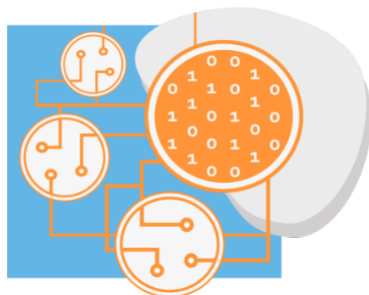
**Advanced process analytical technology (PAT) devices** – these are cutting-edge sensor devices that will offer novel in-line bioprocess monitoring capabilities. These devices will provide users with the ability to perform real-time bioprocess monitoring and open the way to automated real-time bioprocess control.



**Strain discovery tool and decision support system** – these novel tools will enable searching and analysing standardized microbial strain data on a large scale. The first one will reform querying of microbial accession databases by bringing a standardized format to microbial data and joining the data resources of multiple culture collections. This will provide users with unprecedented querying power. The second tool will use the rich knowledge gathered in the strain discovery database to support bioindustry users in finding the optimal strain for their application and enhancing strain engineering processes.



**Digital shadows for bioprocess design** – using physical and biological models, and a wealth of legacy and bespoke datasets, bioreactor digital shadows will be designed and trained. As advanced digital tools, Bioindustry 4.0 digital shadows will provide R&D specialists with new capabilities to explore bioreactor behaviour and generate new knowledge.



**Digital twins for bioprocess control** – using robust bioreactor models, digital twins suitable for real-time process control will be developed. This involves the use of model reduction methods (e.g., use of neural networks), necessary to produce computationally agile systems suitable for coupling to in-line PAT devices. Ultimately, these digital twins will provide the basis for autonomous bioprocess control systems and quality-by-design biomanufacturing.

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We hope that you will join us on our industry 4.0 journey, learning with us and contributing to tomorrow's bioindustry.