TECHTOMED

Strategic report

DIGITAL AND TECHNOLOGICAL INNOVATION STRATEGIES OF THE PHARMACEUTICAL INDUSTRY

A global picture of key Pharma partnerships for innovation

UPDATED VERSION - 2023

OCTOBER 2023

contact@techtomed.com

Methodology

DISCLAIMER: This strategic report presents the main collaborations but is not exhaustive due to the significant number of advances, new technologies, programmes or partnerships in the field of digital health. Also, the collaborations presented are recent or ongoing. Other collaborations were excluded. All information are gathered and consolidated from public reports and publications. They are available online.

The methodology is based on desk research

Websites from institutions and private companies
Press releases
Financial reports
Specialized journals and newsletters
Books and publications

Used keywords: partnerships, artificial intelligence, data science, big data, digital twin, programmes, communication, incubators, call for projects, pharmaceutical companies

Research period: October – December 2022 / July – October 2023

Language: English

Number of pages: around 170

Editorial : Why a dedicated report ?

Over the last 5 years, Pharma industry has multiplied and accelerated technological partnerships to enhance its whole value chain.

In this report of around 170 pages, you will find examples of partnerships and digital innovations in the pharmaceutical industry: from collaborations to strategic alliances aimed at building technological innovation strategies.

From the use of AI or data science to the several existing incubators, you will find all means used by the pharmaceutical industry to improve research, discover new targets, accelerate the development of new drugs, access the market and finally reach patients.

Health is constantly evolving with new technologies, digital and data. The pharmaceutical industry adapts its research & development department to meet the new requirements and enabling future success.

Chemistry and biology have only allowed to identify a small part of the therapeutic possibilities. The arrival of data and AI has opened a whole new field of approaches.

Algorithms will contribute to tomorrow's health through more efficient medical practices, better analysis of active ingredients and lower costs. It also allows a rapid synthesis of empirical medical knowledge and represents a support to medical decision and diagnosis. Moreover, technologies contribute to more personalized responses, the development of screening tools, and the prevention and prediction of disease.

The discovery of new drugs is one of the most important issues in the coming years. Indeed, pathogenic bacteria are becoming more and more resistant to antibiotics and the question of treatment remains. AI is able to process huge amounts of data and can simplify the human work

How to read this report ? SCORE CARD example

Principal category

Sub category

Actors:

xxx

Logos of the key actors

When needed, more information and explanation on the partnership

Objectives:

Objectives of the collaboration

Infography to present the main aspects of the collaboration

Key data:

Key data available on the collaboration: start date, fundings…

Source with the direct link to the document (mainly press releases)

Source:

Value chain of pharmaceutical industries

VALUE CHAIN

RESEARCH	DEVELOPMENT	MARKET ACCESS	GO-TO-MARKET	FOLLOW-UP (LIFECYCLE MANAGEMENT)
Needs: Find innovative entities to meet new health challenges Personalize therapeutics...	**Needs**: Accelerate evidence and clinical trials Recruiting faster Dealing with the lack of patients (e.g. rare diseases)...	**Needs**: Bringing more medico-economic value to innovations with more real-world evidence	**Needs**: Developing scientific knowledge Interact with health professionals and patients...	**Needs**: Enrich patient journey Monitor patients remotely Generate real-world data Ensuring proper use...
Strategic issues				
Increasing prevalence of chronic diseases Rare diseases, pan-diseases... Ageing of the population Growing demand for care	Ethical and regulatory (patient rights) Time to market access Addressing the lack of identifiable patients	Pricing pressure from ever more demanding public health policies Preparing for 'the real world' by anticipating the evidence plan	Information and training in the age of digital speed Addressing constraints on access to health professionals Addressing patients' digital practices	Supporting and monitoring therapies Proper usage Pharmacovigilance

Summary

1. RESEARCH, DRUG DISCOVERY

- AI and data science
- Digital twin

2. DRUG DEVELOPMENT

- AI and data science
- Digital twin

3. MARKET ACCESS

- RWE

4. POST APPROVAL

- CRM and Customer Data Management
- Medical content & HCP engagement
- Patient engagement
- Apps, software & DTx
- Programmes, call for projects ...

Drug discovery

AI & Data science

Servier and Aqemia: a collaboration to use Aqemia's technology based on AI and quantum physics

Actors:

SERVIER moved by you AQEMIA

Objectives:

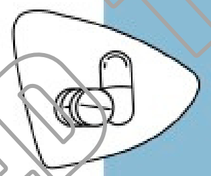
➔ Accelerate the discovery of small molecule therapeutic drug candidates in immuno-oncology,

➔ Exploit Aqemia's generative technology, whose physical free energy calculations will enable the design of optimal molecules according to multiple development criteria.

Key data:

- Start date: **2021**
- **Initial payment** as well as payments related to the achievement of early development and clinical milestones of the drug candidates resulting from this collaboration

The collaboration follows a pilot project initiated by Servier in early 2021 to blindly test Aqemia's unique AI, quantum physics and statistical physics-based technology.



OPTIMAL MOLECULE DESIGNS

A software that can predict the affinity between drug candidates and the therapeutic targets responsible for a disease. Through machine learning systems, it is able to make a prediction in minutes.

QUANTUM AND STATISTICAL PHYSICS-BASED CALCULATIONS

By generating its own data with quantum and statistical physics-based calculations, Aqemia is able to tackle the project from the earliest stage of the drug discovery.

Sources: Servier, MyPharma

Drug discovery

AI & Data science

Sanofi and Owkin: an investment in Owkin to advance Sanofi's oncology portfolio through AI and federated learning

Actors:

sanofi OWKIN

Objectives:

➔ Advance Sanofi's oncology portfolio through artificial intelligence and federated learning in non small cell lung cancer, triple negative breast cancer, mesothelioma and multiple myeloma,

➔ Build robust disease models while maintaining the confidentiality of large datasets from different research institutions and hospitals,

Build the largest database of cancer genomics from major cancer centers,

➔ Optimize the design of clinical trials and detect biomarkers that predict disease and therapeutic outcomes (treatment response from multimodal patient data).

Key data:

- Start date: **2021**
- **3-years agreement**
- Sanofi invests **$180 million** in Owkin
- Initial payment of **$90 million** over **three years** with additional milestones payments

A global research network based on federated learning

Applying artificial intelligence to patient data from partnerships with multiple university hospitals

Data scientists can securely connect to decentralize muti-party datasets

Data scientists can build AI models without data pooling

Researchers can apply these cutting-edge technology platforms to the development of drugs with potential to transform the lives of cancer patients around the world

OWKIN

sanofi

Sources: Sanofi

Drug discovery

Digital twin

Servier and Aitia (formerly GNS): a second partnership focusing on the use of AI and digital twins

Actors:

SERVIER moved by you AITIA

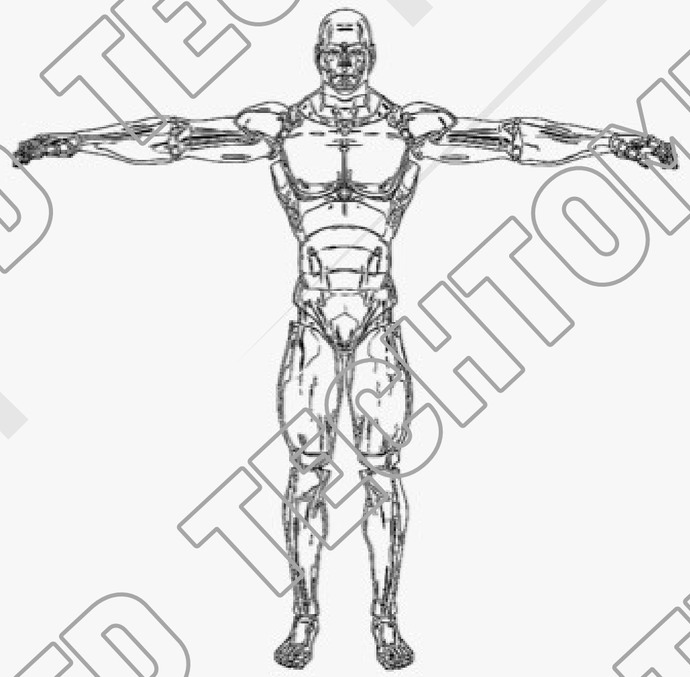
Objectives:

➔ Uncover genetic and molecula pathways linked to clinical outcomes in a specific disease (pancreatic cancer)

Key data:

- Start date: **2023**
- **Exclusive option** on candidates directed at "several" novel targets

This new project will focus on pancreatic cancer and builds on a collaboration in the blood cancer multiple myeloma that was started in 2022. (previous slide)



GEMINI

A digital twin platform that brings together **omics** and **patient data** into an AI-powered system used to uncover genetic and molecular pathways linked to clinical outcomes in a specific disease

MODELISATION

Of what happens when a gene or a protein is targeting

REVELATION

Of brand new drugs targets that can be validated in silico

SIMULATION

Of disease progression and the response to drug therapies

Claude Bertrand, head of R&D at Servier: the partnership will "make significant strides towards developing deeper biology of the disease and a better understanding of translational medicine questions, such as biomarkers, patient stratifications, or the discovery of drug targets"

Source: Servier, GNS

Post approval

DTx

Viatris and Ludocare: a partnership based on the JOE solution

Key actors:

VIATRIS

Ludocare

Objectives:

➔ Improve compliance and encourage the correct use of medication in children with **chronic asthma**

➔ Accelerate access to Joe, a digital therapeutic dedicated to this pathology

Key data:

- Start date: **2022**

AMBASSADOR PROGRAM

Doctors will initially be able to give 2 000 families access to this innovation

Viatris brings its expertise and knowledge of allergology and HCPs in this sector

JOE

A connected robot designed by Ludocare, co-constructed with caregivers and families

Available in France since 2019

Joe by Ludocare

A CLINICAL STUDY

Ludocare is running **a large-scale, multi-center clinical study in France** in conjunction with the ambassador program, involving both hospital and outpatient pediatric respirologists

--> It aims to demonstrate the efficacy, medical and economic benefits of the Joe solution

A GUIDANCE

Motivation and empowerment of children to take their daily medication

Therapeutic education tool for HCPs

Reassurance of patients and caregivers

Sources: Ludocare

Market access & treatment improvement

RWE

The EHDEN federated network: a consortium of 24 partners from across 12 countries to harmonise data in Europe

Key actors:

NOVARTIS, IMI innovative medicines initiative, efpia, NICE, abbvie, Lilly, EPF European Patients Forum, BAYER, Lundbeck, Pfizer, Boehringer Ingelheim

Objectives:

➔ Harmonize real-world and clinical data across Europe,

➔ Build a federated data network of allowing access to the data of 100 million EU citizens standardized to a common data mode,

➔ Impact the understanding of, and improvement of, clinical outcomes for patients within diverse healthcare systems in the EU,

➔ Establish a self-sustaining open science collaboration in Europe supporting health actors.

Key data:

- Start date: **2018**
- End date: **2024**
- IMI and EFPIA contributions: **€30 million**

Foundational pillars

Infrastructure

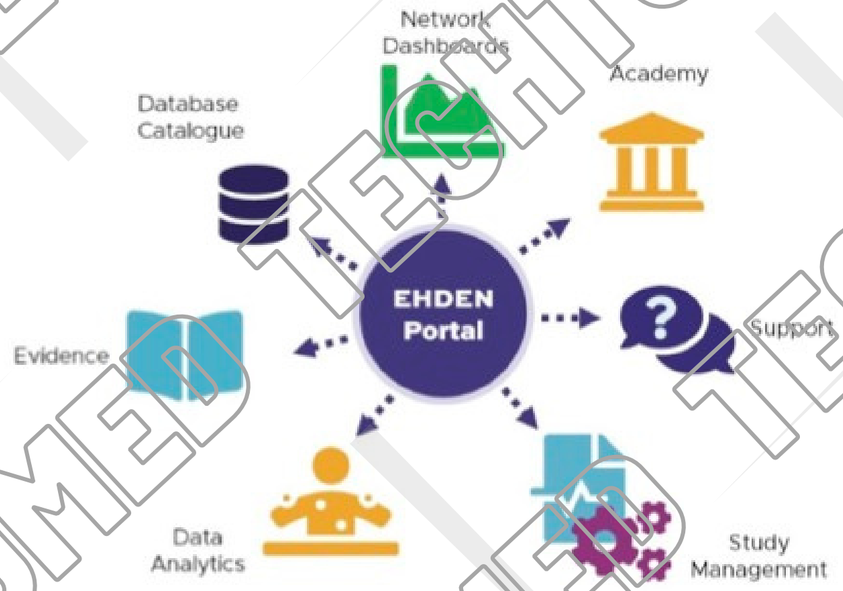
- Creation of an EU-wide federated architecture
- Privacy by design
- Data harmonisation to the OMOP common data model
- Training & certification of SMEs

Research & Outcomes

- Use cases to evaluate the EHDEN federated network
- Collaboration on consistent methodologies
- Collaboration with the global OHDSI research network
- Incorporation of the ICHOM health outcomes standards

Education & Community

- Establishment of an EHDEN Academy
- Expansion of the OHDSI network in Europe
- Collaboration on collective memory for research use cases



EHDEN is building the sociotechnical architecture to facilitate its European federated network and the research workflow from discovery to analysis within the Findable, Accessible, Interoperable and Reusable (FAIR) principles.

The EHDEN portal will be the main tool for Data Partners and Researchers with:

- Enrolment
- single sign off authentication
- Approval
- The understanding of who may be relevant and interested in the research query or protocol prior to engaging
- Contracting
- Seeking approvals
- Running rapid, network analysis, publication, etc., within the open science community wanting to generate high quality evidence.

Sources: EHDEN

Post approval

CRM

PHARMAS are all using Customer Relationship Management tools (CRM) to develop and pilot their customer experience

Key actors:

salesforce, Veeva, OCE, pipedrive, Microsoft Dynamics 365, HubSpot

Objectives:

➔ Manage customer experience through integrated 360° tools,

➔ Help sales forces to optimize interactions sequence and story flow,

➔ Manage commercial contents & channels,

➔ Enrich customer data.

Veeva integrate BI modules to provide experience suggestions

Key data:

- Veeva start date: **2007 (spin off sales force) – 80%** market share
- Veeva Turn Over > 1Billion€
- OCE : sales forces licence **2018**

Leading CRM Partner

Veeva, salesforce

Dec 2022 : Veeva said in a statement that its current contract with Salesforce expires in September 2025, and it does not plan to renew. Instead, it will be migrating the back-end cloud management of Veeva CRM onto its own, newer cloud platform and application suite it calls Veeva Vault.

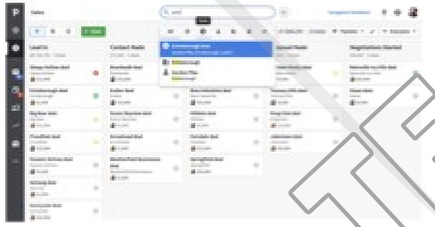
Other Pharma CRMs

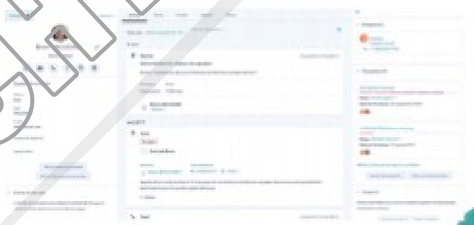
Microsoft Dynamics® 365

OCE, salesforce

pipedrive

HubSpot





Post approval

Patient engagement

Communication platforms for patients: the example of Merck with infertility

Key actor:

MERCK

Objectives:

➔ Promote the therapeutic areas of interest of the industry

➔ Establish trust with patients

➔ Improve the patient journey by supporting patients in the understanding of the disease and the observance

➔ Fight against the fake news

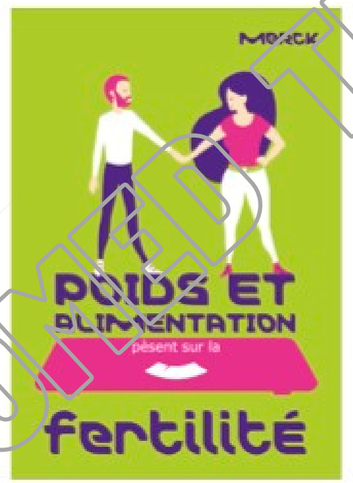
➔ Identify unmet patients needs

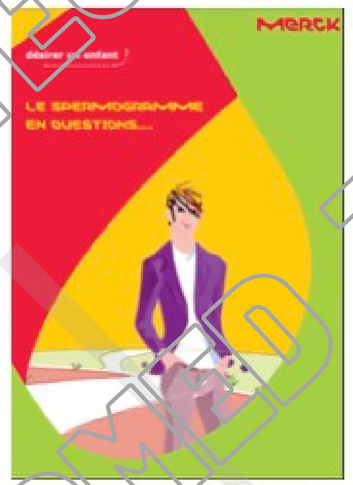
To guide patients through infertility, Merck established a wide range of information: essential information, the causes of infertility, existing solutions, the support process. The platform also includes web conferences and a map to find the nearest centre to the patient

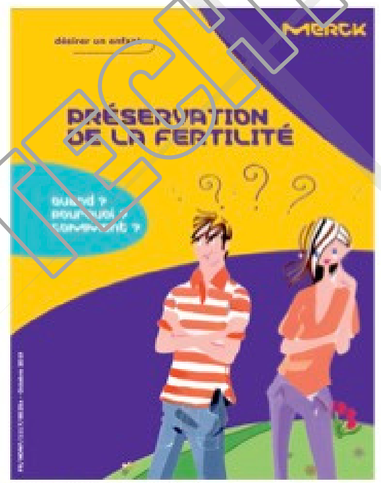
Webinar. Endocrine disruptors: what impact on my fertility?

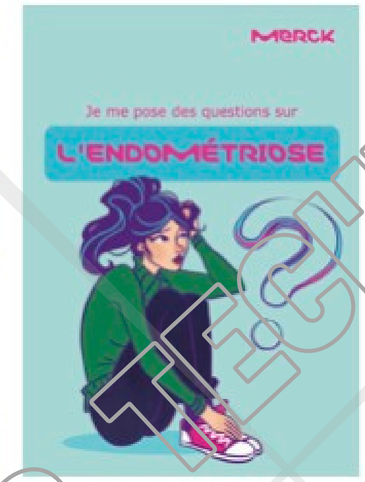
Article: Causes of female infertility

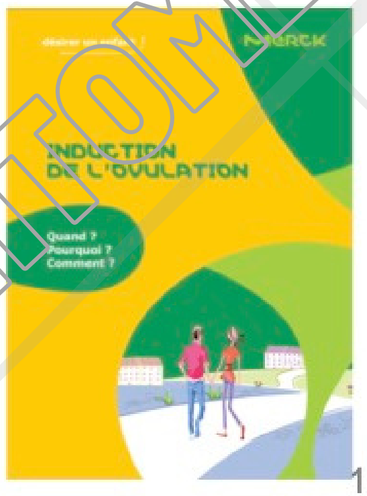
Webinar. Is infertility only for woman?











Sources: Merck

Post approval

Programmes

Amgen innovations : a fund for Science and Human

Key actors:

AMGEN

AMGEN INNOVATIONS LA SCIENCE & L'HUMAIN

Objectives:

➔ Support innovative initiatives to improve patients and caregivers' health, quality of life

➔ Ensure the attractiveness of the territory

➔ Bring together startups that use technology to reinvent the healthcare pathway, research teams working to discover the medicine of tomorrow and HCPs in the challenges of their professions

Key data:

- Start date: 2020
- Budget of **€600 000** in 2023

In 2023, the fund decided to go beyond oncology and hematology, opening up to **chronic inflammatory pathologies, cardiology/metabolism** and innovation in healthcare

AMGEN INNOVATIONS LA SCIENCE & L'HUMAIN

FINANCING RESEARCH PROJECTS

Contribution to the funding of applied and fundamental research projects

CALLS FOR PROJECTS 2023

Theme 1: Fundamental research
Theme 2: Innovation in healthcare. Data / AI / Digital technology

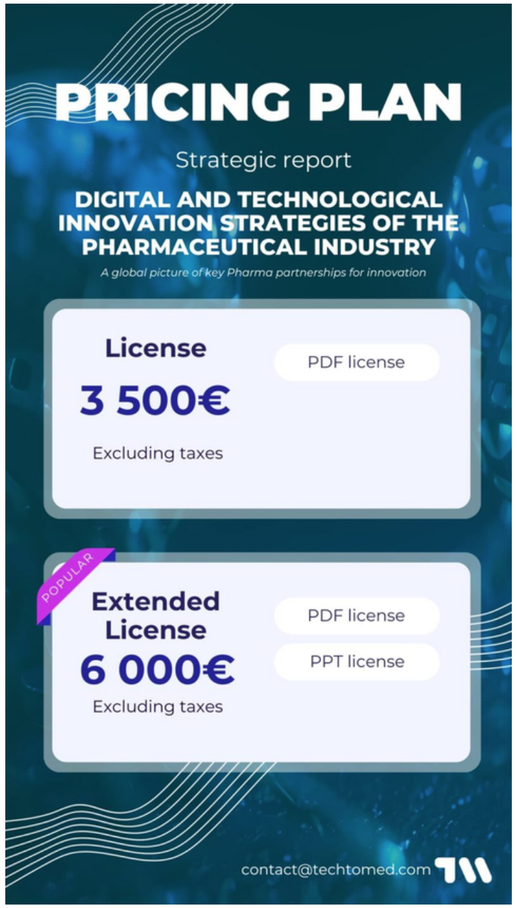
4TH CALL FOR PROJECTS

The overall budget for the fourth call for projects is **600 000€.** Each winning project will receive funding of up to **75 000€**

Sources: Amgen

Purchase order form

This report of 170 pages in English will be delivered to you online / by email within 24 hours of receipt of the completed and signed purchase order.
This purchase order form is to be returned completed to Techtomed (contact@techtomed.com)



USER INFORMATION

Company _____ Function _____ Contact name _____
Address _____ Zip code _____ City _____
Country _____ Email _____ Tel _____

☐ Option 1: A single license in a secured PDF

☐ Option 2: An extended* license with a PDF and a ppt

*For an entire company
These prices are exclusive of taxes, a VAT will be applied accordingly to the country of destination.

Are you going to issue your own company purchase order: ☐ YES ☐ NO
Billing Company _____ Billing address _____
_____ VAT Number _____
Zip code _____ City _____ Country _____

☐ I agree to receive TechToMed Newsletter

GOOD FOR AGREEMENT

You will receive an invoice and a report access after the PO validation Date : _____

Signature **Company stamp**