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Ministero dell'Università e della Ricerca
Direzione generale dell'internazionalizzazione e della comunicazione

Avviso per la *"Concessione di finanziamenti destinati alla realizzazione o ammodernamento di Infrastrutture Tecnologiche di Innovazione"* da finanziare nell'ambito del PNRR

Piano Nazionale di Ripresa e Resilienza, Missione 4, *"Istruzione e Ricerca"* - Componente 2, *"Dalla ricerca all'impresa"* - Linea di investimento 3.1, *"Fondo per la realizzazione di un sistema integrato di infrastrutture di ricerca e innovazione"*, finanziato dall'Unione europea - NextGenerationEU

Proposta definitiva

Intervention field 6: Investment in digital capacities and deployment of advanced technologies
DESI dimension 4: Integration of digital technologies + ad hoc data collections
055 - Other types of ICT infrastructure(including large - scale computer resources / equipment, data centres, sensors and other wireless equipment)

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Spett.le
Ministero dell'università e della ricerca
Direzione Generale dell'internazionalizzazione e della comunicazione
Via Michele Carcani, 61 – 00153 ROMA

OGGETTO: Proposta definitiva in esito alla fase negoziale per l'accesso alle agevolazioni previste dall'Avviso per la concessione di finanziamenti destinati alla realizzazione o ammodernamento di Infrastrutture Tecnologiche di Innovazione, da finanziare nell'ambito del PNRR – Progetto identificato con il codice 5AB7FB85 – NGHC

Il sottoscritto Ferruccio Resta, nato a BERGAMO il 29/08/1968, nella sua qualità di legale rappresentante (ovvero, procuratore speciale, in forza di idonea e adeguata procura speciale) del Soggetto Proponente Politecnico di Milano, con sede legale in MILANO, alla via Piazza Leonardo da Vinci , 32,

DICHIARA

- che la proposta definitiva è coerente con gli esiti della fase negoziale espletata a norma dell'art. 11 dell'Avviso in parola;

DICHIARA, altresì

- di confermare tutto quanto già dichiarato in sede di presentazione della Domanda recante Codice 5AB7FB85
- di essere consapevole che, in caso di dichiarazioni mendaci, ovunque rilasciate nel contesto della presente proposta e nei documenti ad essa allegati, potrà incorrere nelle sanzioni penali richiamate dall'art. 76 del D.P.R. 445/2000, oltre alla decadenza dai benefici, come previsto dall'art. 75 del D.P.R. in parola, conseguenti il provvedimento emanato in base alle dichiarazioni non veritiere;
- di consentire al trattamento dei dati personali per le finalità e con le modalità di cui al decreto legislativo 30 giugno 2003, n. 196, e successive modifiche ed integrazioni.

PRESENTA

la proposta progettuale identificata nella piattaforma GEA con il codice ITEC0000008, di cui alla presente. Costituiscono parte integrante e sostanziale della proposta tutti gli allegati indicati nella Sezione Allegati, che si intendono sottoscritti in uno alla presente, nonché gli Allegati trasmessi in sede di presentazione della domanda, come modificati in questa sede.

Firmato digitalmente

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Proposta definitiva

Avviso per la "Concessione di finanziamenti destinati alla realizzazione o ammodernamento di Infrastrutture Tecnologiche di Innovazione" da finanziare nell'ambito del PNRR – Proposta progettuale definitiva in esito alla fase negoziale – Codice 5AB7FB85

Soggetto proponente

- **Anagrafica Soggetto Proponente**
  - Denominazione: Politecnico di Milano
  - Codice CAR: F179040D
  - CF: 80057930150
  - Pec: pecateneo@cert.polimi.it
  - Tipologia soggetto: Università e Scuole Superiori a Ordinamento Speciale
  - Sede legale:
    - CAP: 20133
    - Via/Piazza: Piazza Leonardo da Vinci
    - Civico: 32
    - Comune: MILANO
    - Provincia: MILANO
    - Regione: Lombardia
- **Anagrafica Rappresentante Legale**
  - Nome: Ferruccio
  - Cognome: Resta
  - Codice fiscale: RSTFRC68M29A794Y
  - E-mail: ricerca@polimi.it
  - Data di nascita: 29/08/1968
  - Comune di nascita: BERGAMO
  - Sesso: Maschio
- **Anagrafica Referente del progetto**
  - Nome: Federico
  - Cognome: Colombo
  - Telefono: 0223993923
  - Cellulare: 3804799103
  - E-mail: ricerca@polimi.it

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Dati di sintesi della proposta progettuale

Titolo del Progetto: Next Generation Healthcare Center

Acronimo del Progetto: NGHC

Settori e ambiti prevalenti dell'iniziativa:

- Salute:

  - Tecnologie farmaceutiche e farmacologiche
  - Tecnologie per la salute

- Cultura umanistica, creatività, trasformazioni sociali, società dell'inclusione:

  - Trasformazioni sociali e società dell'inclusione

- Sicurezza per i sistemi sociali:

  - Cybersecurity

- Digitale, industria, aerospazio:

  - Transizione digitale
  - High performance computing e big data
  - Intelligenza artificiale
  - Robotica

- Clima, energia, mobilità sostenibile:

  - Transizione energetica ambientale

Keywords:

Digital health; digital medicine; AI; medical robotics; telemedicine; extended reality; health data; hospital planning; HC infrastructures;

Livelli di maturità tecnologica prevalente (TLR): 4; 5; 6; 7; 8;

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Data di avvio del progetto: 01/07/2022

Durata del progetto (in mesi): 36

Costo complessivo del progetto: 35.134.000,00 €

Tipologia intervento: Realizzazione/Creazione

Localizzazione

Infrastruttura distribuita: No

Numero sedi: 1

Sede 1

- CAP: 20157
- Via/Piazza: Via Cristina Belgioioso
- Civico: 171
- Comune: MILANO
- Provincia: MILANO
- Regione: Lombardia

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Piano economico

Costi complessivi di progetto

Spese ammissibili	Costi (€) (1)	IVA (€) (2)	Totale (€) (1+2)
a) Spese Manager Infrastruttura ed altre figure manageriali	1.000.000,00	0,00	1.000.000,00
b) Strumentazione scientifica, apparecchiature e macchinari	13.500.000,00	2.970.000,00	16.470.000,00
c) Impianti tecnici generici	6.200.000,00	1.364.000,00	7.564.000,00
d) Licenze software e brevetti	250.000,00	55.000,00	305.000,00
e) Fabbricati e terreni	2.000.000,00	440.000,00	2.440.000,00
f) Recupero, ristrutturazione, riqualificazione e ampliamento immobili	3.850.000,00	385.000,00	4.235.000,00
g) Spese per progettazione e altre spese tecniche	1.000.000,00	220.000,00	1.220.000,00
h) Costi indiretti	1.900.000,00	0,00	1.900.000,00
Totale (€)	29.700.000,00	5.434.000,00	35.134.000,00

Cronoprogramma di attuazione

Obiettivi intermedi: una sintesi

Codice identificativo	Mese di avvio (dalla data di avvio progetto)	Durata (in mesi)	Stima dei costi (€)
1	01/07/2022	7	10.000,00
2	01/09/2022	4	10.000,00
3	01/12/2022	31	1.000.000,00
4	01/12/2022	31	100.000,00
5	01/12/2022	31	80.000,00
6	01/12/2022	7	1.220.000,00
7	01/03/2023	13	6.675.000,00
8	01/03/2023	16	7.564.000,00
9	01/06/2023	25	16.470.000,00
10	01/07/2022	36	305.000,00
11	01/12/2022	31	100.000,00
12	01/12/2022	10	100.000,00
13	01/03/2023	10	350.000,00
14	01/06/2023	25	1.150.000,00
		Totale (€)	35.134.000,00

Obiettivo intermedo: 1

• Descrizione

1.1 A call for expressions of interest will be opened at M1 and closed at the end of M2 to recruit private partners who will contribute to fund, design, build and run the NGHC. Public and private partners will work together to identify the best legal form ensuring transparency, capacity and flexibility to the PPP for setting-up and running the infrastructure on time and on budget. Calls for tenders to build and equip the infrastructure while promoting downstream TT will be prepared in compliance with EU and national legislation, and contracts for both sponsors and clients will be finalized.

• Mese di Avvio

1

• Durata in Mesi

7

• Deliverables

MS1.1: PPP Legal Entity registered

Obiettivo intermedo: 2

• Descrizione

1.2 The partners of the PPP will nominate the representatives for the NGHC Board and for its Advisory and Scientific Boards. The Scientific Board will oversee the scientific objectives, the definition and prioritization of Use Cases and will include both academic and clinicians. Every year, the Scientific Board will confirm activated UCs and evaluate possible new UCs. The Advisory Board (including both policy makers and patient organization representatives) will define and supervise the interaction with regional, national and international institutional bodies. The NGHC Board will appoint an Infrastructure Manager to be recruited within M6 through an international recruitment process.

• Mese di Avvio

3

• Durata in Mesi

4

• Deliverables

MS1.2: Recruitment of the Infrastructure Manager - MS1.3: Completion of the Infrastructure Boards

Obiettivo intermedo: 3

• Descrizione

2.1 Once appointed by the NGHC Board, the Infrastructure Manager (IM) will recruit and coordinate the Infrastructure Management Team (IM Team) composed by professionals with technical, management and/or communication tasks. IM Team will implement all recruitment tasks related to the implementation of the UCs (see Obj2.2).

• Mese di Avvio

6

• Durata in Mesi

31

• Deliverables

MS2.1: Definition of the Advisory Board - MS2.2: Definition of the Scientific Board - MS2.3: Recruitment of the Infrastructure Manager Staff

Obiettivo intermedo: 4

• Descrizione

2.2 The PPP Board will identify 6 Use Cases (UCs) that will be developed using part of the initial funding made available by NGHC private partners. Two sets of UCs are envisaged, UC_SET1, starting earlier, aims at integrating and validating technologies at high TRLs (>5). UC_SET2, activated later, aims at implementing large pre-competitive projects with middle to long-term goals (from TRL 3). A Principal Investigator (PI) and co-PI for each UC will manage the activities (see WP5).

• Mese di Avvio

6

• Durata in Mesi

31

• Deliverables

MS2.4: Nomination of the PIs and of the co-PIs of the UC_SET1 - MS2.5: Nomination of the PIs and of the co-PIs of the UC_SET2

Obiettivo intermedo: 5

• Descrizione

2.3 This Task will be under the direct responsibility of the IM and IM Team and will include
Dissemination and rules of access: the IM Team will, and PPP Board will review and finetune the NGHC access policy and IP framework, in order to publish on the NGHC website all the required information according to EU best practice (see Annex 5)
Advanced networking through promotion of the infrastructure among potential stakeholders (including advocacy) and clients: the IM Team will work to constantly increase the NGHC attractiveness and reach, ensuring new contracts and grants based on activities described in WP4.
Societal engagement through outreach activities to the general public, patient associations, low- and high-school students, and participation to public events (women in research day, night of researchers, universities open days etc.)

• Mese di Avvio

6

• Durata in Mesi

31

• Deliverables

D2.1 Annual report on dissemination and communication (M12 - M24 - M36)

Obiettivo intermedo: 6

• Descrizione

3.1 NGHC's preliminary layout will undergo an iterative process of design revision and optimization to collect the infrastructural needs of the different stakeholders as well as the spatial, technical and regulatory requirements and constraints according to the specific setting that will be provided. The design will be developed from concept to construction merging different technical competences and with a growing level of detail in terms of bill of quantity and materials needed. Each design phase will be completed with the graphical and technical documentation required by the current regulatory framework, building codes, UNI EN, guidelines. From final design onward BIM methodologies will support the facility management and maintenance and the technological devices implementation. All necessary authorizations will be collected.

• Mese di Avvio

6

• Durata in Mesi

7

• Deliverables

D3.1: concept design validation and basic design - D3.2: final design - D3.3: construction design

Obiettivo intermedo: 7

• Descrizione

3.2 Starting from the construction design phase, the realization will take place in the agreed area and following the specific prescriptions defined in the previous planning phases. Particular attention will be paid to the use of advanced techniques, prefabricated building elements, industrialized systems to guarantee a high level of safety and security, environmental sustainability, clear construction costs and optimization of building site timing. The specific care settings that will be installed and the high level of technology required will be the starting point for implementing solutions able to boost flexibility, technological redundancy and adaptability to multiple uses. The regular construction management team will be supported by a temporary panel of scientific and technical advisors to guarantee that the innovative design solutions are correctly implemented.

• Mese di Avvio

9

• Durata in Mesi

13

• Deliverables

D3.4: state of advancement of works - preparatory works and structure (25%) - D3.6: state of advancement of works - structure, building and technology (50%) - D3.11: state of advancement of works - building, technology and finishing (75%) - D3.12: state of advancement of works - technology, finishing and validation (100%)

Obiettivo intermedo: 8

• Descrizione

3.3 Although the design phase output will already incorporate an abacus of possible layout settings, throughout the construction phase a detailed design of each specific mock-up care setting will be provided along with the details of each space. According to the needs of different stakeholders and the private partners of each specific project, the single setting might vary in terms of devices, layout or furniture. A flexible infrastructure with various redundant installations and system terminals will allow setting up multiple rooms on a modular grid. The results of this phase will be regularly verified by a Board composed by at least 2 members of the Design Advisory Board, 1 member from the Joint Research Platform Healthcare Infrastructure, 2 members of the industry partners, 1 hospital facility manager, 1 expert of each specialty/setting considered.

• Mese di Avvio

9

• Durata in Mesi

16

• Deliverables

D3.5: validation and review of an abacus of possible setting - D3.7: selection of setting and measurement devices to incorporate - D3.10: detailed design of each selected setting and creation of the digital twin - MS3.1: realization of each selected setting and validation through digital-physical iteration

Obiettivo intermedo: 9

• Descrizione

3.4 The objective of this phase is to equip NGHC with the most advanced technology and devices to pursue research and development activities with high TRL. In particular, the acquisition and procurement process will follow criteria of efficiency and transparency and will target the rapid installation of different devices. Some devices can be provided by the private partners of each specific project/use cases while others might not be already present in the market. One key feature of each device will be interoperability with multiple systems and networks while identification of short and long-term strategy for device replacement in a 360° circular economy process will be considered.

• Mese di Avvio

12

• Durata in Mesi

25

• Deliverables

D3.8: List of devices and relative key features - D3.9: Rules and modalities of procurement - MS3.2: Living Labs and Orbital Technological Labs equipment acquisition - MS3.3: Living Labs and Orbital Technological Labs equipment installation - MS3.4: UCs dedicated equipment acquisition and installation

Obiettivo intermedo: 10

• Descrizione

4.1 NGHC will start immediately to work for the implementation of its core exploitation strategy according to the following commercial pathways to innovation:
Pre-competitive collaboration:
Sponsored projects and contract research:
IP management and valorization.
TT and business creation

• Mese di Avvio

1

• Durata in Mesi

36

• Deliverables

D4.1 Exploitation plan on an annual basis including IP valorisation, enterprise creation, contract research and sponsorships - MS4.3 Activation of at least two contracts with Industrial partners - MS4.4 Activation of at least two additional contracts with Industrial partners

Obiettivo intermedo: 11

• Descrizione

4.2 The function of the Grant Office, linked to analogous functions of the two Universities, will be a crucial asset of NGHC for:
- detection of opportunities relating to Regional, National, EU and International funding programs;
- support throughout the project lifecycle, both in the pre-award and in the post-award phase of grant applications.

• Mese di Avvio

6

• Durata in Mesi

31

• Deliverables

MS4.1 Preparation of proposal for ETF at EU calls - MS4.2 Participation to at least 4 proposals to public (international, national, regional) calls - M4.5 Participation to at least 6 proposals to public (international, national, regional) calls -

Obiettivo intermedo: 12

• Descrizione

5.1 The activities of each UC will be run under the supervision of the UC PI and co-PI nominated at the UC start by the NGHC Board. They will propose to the NGHC Board the Experts panels. The UC Exploitation Panel consisting of representatives nominated by PPP private members involved in the UC and by academic representatives, will define the actions to be undertaken within the UC and the expected results. The UC Scientific Panel, composed by the UC PI and co-PIs (see Task 2.3), one representative of the PPP private members and 2 healthcare professionals from Clinical Research Centers, will be in charge for supervising and monitoring periodically the activities. The UC Advisory Panel will consist of 10 members from the relevant medical areas for the UC and will support the scientific panel with the main focus on effective clinical translation.

• Mese di Avvio

6

• Durata in Mesi

10

• Deliverables

MS5.1 Nomination of the UC Exploitation Panels, UC Scientific Panels, UC Advisory Panels for all UC_SET1 - MS5.4 Nomination of the UC Exploitation Panels, UC Scientific Panels, UC Advisory Panels for all UC_SET2

Obiettivo intermedo: 13

• Descrizione

5.2 The Scientific Boards of the UC in the first month after the appointment will prepare a workplan of the UC, organized as a coordinated cluster of projects. A young researcher (YR) will be appointed for each project and a team of PhD students and post-doc will be assigned to the YR for the execution of the project. The recruitment of the YRs, leaders of the project, will be performed through international public calls at M10 for UC_SET 1 and at M16 for UC_SET 2. The YRs' profiles will be proposed by the UC PI/co-PI upon approval of the UC Scientific Board and will be brought to the attention of the international community through the standard channels used for university recruitment, private company recruitment, headhunters. The YRs will be recruited with a 3-years non-tenured contract. The team for each Project will be recruited after the YRs with internationally visible procedures.

• Mese di Avvio

9

• Durata in Mesi

10

• Deliverables

MS5.2 Activation of the recruitment procedure for YRs for UC-SET1 - MS5.3 Recruitment of YRs for UC_SET1 - MS5.5 Activation of the recruitment procedure for YRs for UC-SET2 - MS5.6 Recruitment of YRs for UC_SET2

Obiettivo intermedo: 14

• Descrizione

5.3 Each Project reports on a bimonthly base to the UC PI, who manages a 6-month review for the whole UC presented to the participating PPP members. UCs implementation starts at M6 for the UC_SET1 and at Month 12 for the UC_SET2. They will both run until M36. Intermediate results will be evaluated, and major deviations will be submitted to the NGHC Board for approval.

• Mese di Avvio

12

• Durata in Mesi

25

• Deliverables

D5.1: definition of the relevant equipment and identification of the working teams for UC_SET1 - MS5.7procurement of the dedicated equipment completed for UC_SET1 - D5.2: definition of the relevant equipment and identification of the working teams for UC_SET2 - MS5.8 procurement of the dedicated equipment completed for UC_SET2 - D5.3: release of the Project deliverables for all UCs

Allegati

Allegato 1 - Proposal template

Allegato 1: ***Proposal template***

Ministero dell'Università e della Ricerca
Direzione generale dell'internazionalizzazione e della comunicazione

Avviso per la *"Concessione di finanziamenti destinati alla realizzazione o ammodernamento di Infrastrutture Tecnologiche di Innovazione"* da finanziare nell'ambito del PNRR

Missione 4, "*Istruzione e Ricerca*" - Componente 2, "*Dalla ricerca all'impresa*" -
Linea di investimento 3.1, "*Fondo per la realizzazione di un sistema integrato di infrastrutture di ricerca e innovazione",* finanziato dall'Unione europea - NextGenerationEU

REFORMS AND INVESTMENTS UNDER THE RECOVERY AND RESILIENCE PLAN

NextGenerationEU

Call for proposals

Intervention field 6: Investment in digital capacities and deployment of advanced technologies
DESI dimension 4: Integration of digital technologies + ad hoc data collections
055 - Other types of ICT infrastructure (including large-scale computer resources/equipment, data centres, sensors and other wireless equipment)

Mission 4 – "Education and Research"
Component 2: from research to business
Investment 3.1: "Fund for the realisation of an integrated system of research and innovation infrastructures

Annex 1 (technical annex)

Proposal template, pursuant to Article 8 of the call for proposals

(To be provided in English only)

DISCLAIMER: This document is aimed at informing potential applicants for call-PNRR funding. It serves only as an example. The actual Web forms and templates, provided in the online proposal submission system underthe online proposal submission system, might differ from this example. Proposals must be prepared and submitted only via the online proposal submission system.

Part A – Strategic framework of the initiative

A.1. Objectives of the initiative

The Next Generation Healthcare Centre (NGHC) aims to be an innovation hub, connecting research institutes, clinical centers, companies, financial, advocacy and public institutions (Fig. 1A). It will harness the potential of the digital revolution in the settings of care by accelerating the transition to more effective, efficient, safe, and sustainable **technological, architectural and organizational solutions** throughout the entire healthcare chain, from the acute care hospital to the patient's home and territorial healthcare system.

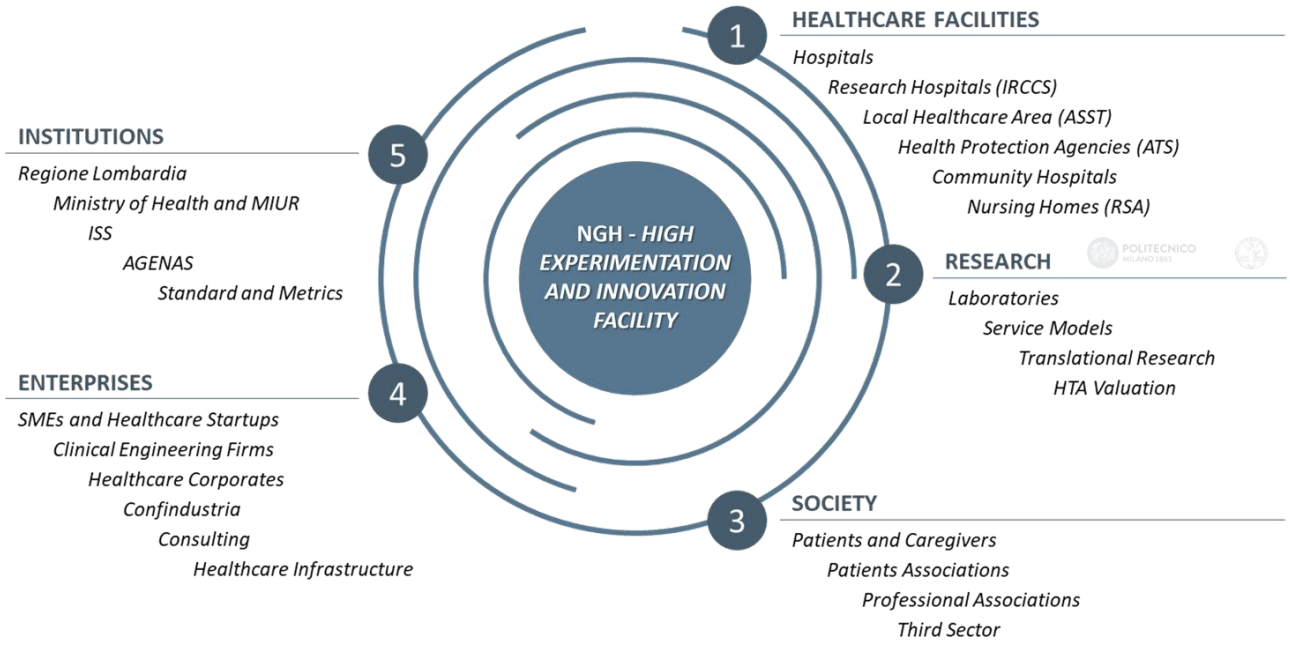


Figure 1A NGHC Ecosystem

NGHC's ambition is to be a groundbreaking infrastructure pursuing 5 key missions:

1. **Improve the state of health and care and the quality of life of citizens thanks to a unique national infrastructure**
   a. where the new treatment paths and space criticalities are analyzed and simulated in the continuum of care
   b. for the validation of resilient, secure, and robust solutions for the analysis of shared health big data, using Trustworthy Statistical & Machine Learning methods for
      i. data management through the patient journey
      ii. in silico validation of new solutions (patient digital twin)
      iii. studies for secondary uses of resilient data
   c. by supporting resilience tests of care models and spaces (adaptable to emergencies and different needs).
2. **Foster the competitiveness of the Italian Health industry by becoming a global reference center**
   a. promoting innovative layouts, spatial and organizational solutions with one-to-one scale functional settings and physical setting models (BIM-based virtual reality and digital twins)
   b. where large companies, SMEs and start-ups accelerate time-to-market by
      i. speeding-up the certification pathway by a high-level systematization of pre- and post-market validation (MDR 745/2017)

ii. finding possible synergies in an open science interdisciplinary co-design framework toward a human-centered innovation approach
iii. benefiting of a single-entry point with clinicians from different specialties and with the support of multi-disciplinary teams of researchers
iv. bringing together all the competencies and technology needed to unlock the potential of emerging specializations (e.g., digital therapeutics)

3. **Accelerate digital transformation through a transdisciplinary training playground**
   a. where professionals are introduced to new technologies, spatial and organizational models
   b. where the empowerment of patients and final end-users is backpropagated through the whole technology development cycle for an effective, participative co-decision process
4. **Enhance health-outcomes and cost-effectiveness leveraging an extraordinary innovation ecosystem**
   a. promoting the integration of technologies as well as the operational efficiency of healthcare infrastructures and measuring the impact of innovative spaces and services (Evidence-Based and Performance-Based Design, Health Technology Assessment and Value-Based Healthcare)
   b. where regulators and policymakers can assess the impact of mainstreaming new technologies, layouts, spatial and organizational solutions in the national health system
   c. promoting the definition of interoperability standards, accelerating the scalability of local care solutions through agile accreditation systems
5. **Develop new organizational, technological, spatial and structural models for the smart hospital and the territorial and home care systems** to:
   a. create benchmarking systems for healthcare structures to redesign processes and procedures
   b. develop resilient models of environments and use of spaces (modularity and adaptability)
   c. design the integration of telemedicine infrastructures as the backbone of territorial healthcare systems
   d. develop and test sustainability models for energy-intensive healthcare facilities, as well as safety standards (safe and sustainable hospital) and novel sanification technologies.

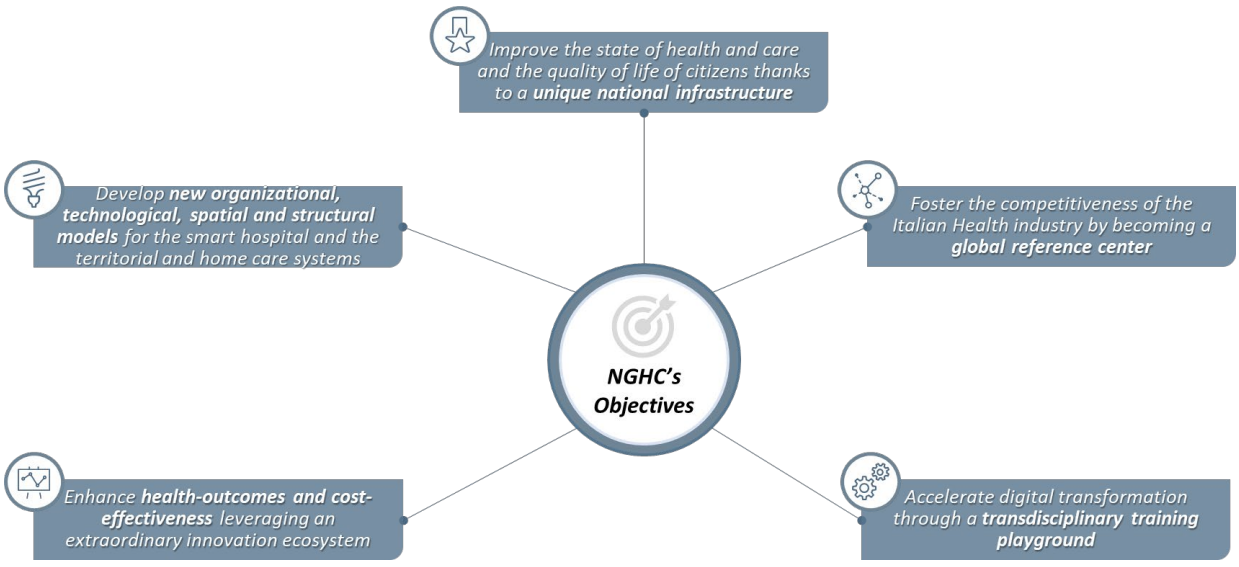


Figure 2A NGHC Objectives

A.2. Geographical area of interest

Lombardy region, Italy, Europe

A.3. Sectors/domains

Details are contained within the final project proposal.

A.4. Keywords

Details are contained within the final project proposal.

A.5. Prevailing levels of TRLs

Details are contained within the final project proposal.

A.6. Coherence with the priorities set in the European, National and Regional strategic agendas

NGHC is aligned with the EU Commission working document on Technology Infrastructures, tackling the challenges raised by the 2017 Communications "Investing in a smart, innovative and sustainable Industry" and "Strengthening Innovation in Europe's Regions: Strategies for resilient, inclusive and sustainable growth", as well as by the 2018 Communication "A renewed European agenda for research and innovation", which identify the lack of scale-up and technology diffusion due to insufficient investment in infrastructures and new technologies as a key barrier to EU competitiveness.

NGHC also responds to the priority of the Italian National Plan for Research Infrastructures 2021–2027, i.e. tightening the relationship between industry and research infrastructures, across different Italian infrastructures and with EU centers. Indeed, NGHC is already connected through its academic partners with all the key EU Research Infrastructures in the health domain.

NGHC is also strongly coordinated to the Lombardy proposal under the EU Digital Innovation Hub (EDIH) call, coordinated by UNIMI and now under evaluation. POLIMI is core partner of the EDIH Robotics in Healthcare.

NGHC is fully aligned with the EU4Health, the Horizon Europe programme and the European objectives of the digital and pharmaceutical strategy of the National Research Plan 2015-2020. It responds to the Italy 2025 Strategy proposing the creation of a digital infrastructure to facilitate the collection, harmonization, sharing and analysis of data from different sources, to accelerate the transition to the 4P medicine paradigm, in line with the Lombardy region smart specialization strategy.

Beyond the synergies across mission 4 (see A.7), NGHC is complementary with Mission 6 initiatives such as M6C1-1 "Community houses", M6C1-2 "Territorial operational center", M6C2-1.2 "Safe and sustainable hospital" and M6C2-1.3 "Community hospital" as well as with the PNRR Complementary Plan for the creation of Innovative health ecosystems.

A.7. Synergies with other initiatives envisaged within Mission 4 ("Education and research"), Component 2 ("From research to enterprise"), with particular, but not exclusive, referenceto Investment 3.1 ("Fund for the creation of an integrated system of research and innovation infrastructures")

NGHC has been designed to be synergistic to the activities of the Lombardy Ecosystem proposal coordinated by the University of Milano Bicocca with the participation of POLIMI and UNIMI. Research activities carried out by the Life Sciences spoke (led by UNIMI) and by the DeepTech spoke (led by POLIMI) are designed with the idea that the NGHC will provide the ideal testing and acceleration environment.

NGHC will also act synergistically with the Lombardy spoke of the Innovation Center on High performance simulations, computation, and data analysis led by POLIMI, the EBRAINS Research Infrastructure (where POLIMI and UNIMI are partners) and the Lombardy spoke of the Innovation Center on Development of gene therapy and drugs with RNA technology led by UNIMI. The NGHC is also a natural partner for the Extended Partnership on Artificial Intelligence, Precision Medicine, Cybersecurity, Aging, Neurosciences and Space for all those spokes dedicated to health-related activities.

A.8. International profile and reach of potential users (with particular reference to SMEs)

Proponent institutions international profile

POLIMI is one of the most outstanding technical universities in the world, ranked 1st in Italy and 142nd in the world by the QS World University Ranking 2022. It will contribute to NGHC with its 50+ laboratories operating on technologies related to human health, with its vocation towards entrepreneurship and its worldwide recognized excellence in the design of infrastructures. POLIMI has specific bachelor, master, and PhD programs in Biomedical Engineering plus specific tracks on healthcare in other disciplines (Management Engineering, Information Technology, Architecture, etc). POLIMI patent portfolio consists of 1101 innovations, of which 962 are patent families. Since 2012, POLIMI has filled 743 innovations, 8% of which are in the field of medical devices, systems for drug delivery and technologies for modelling biological systems in vitro. 49% were commercialized through licensing or assignment agreements, 15% by companies operating in the biotech field, 13 by university spin-offs. 97 Spin-offs were created since 2000, 16 in the Healthcare sector. POLIMI accelerator, PoliHub, is rated among the 5 best university incubators in the world. 45 Observatories on digital innovation run at POLIMI.

While POLIMI is the coordinator (*soggetto proponente*), NGHC has been conceived in collaboration with UNIMI which will join the PPP in case of a successful proposal (see B2.2).

UNIMI is the largest general university in Lombardy. NGHC wise, it complements POLIMI especially with its School of Medicine and Pharmacology. It is a top performer in Health & wellbeing, environmental sustainability, and 1° in Life Sciences in national QS ranking, 36° in world ranking in Pharmacy & Pharmacology and 83° in Life Science & Medicine (QS World University Ranking 2020). Since 2012, UNIMI filled 125 patents, over 40% of which in the field of pharmacology and medical sciences. More than 46 spin-offs were created since 2003.

Reach of potential users (with emphasis on SME)

A detailed user engagement strategy and support letters are included in Annex 5. Users' reach is ensured by both the extensive industrial networks of POLIMI and UNIMI and by the community of the emerging Milan Innovation District (MIND), where NGHC will be located (Fig4A). MIND used to be the area of EXPO2015 and now hosts the Galeazzi research hospital, the Human Technopole - a global research infrastructure dedicated to structural biology, genomics and bio-informatics -, and UNIMI scientific campus. In 2022 the first tenants will settle: Astrazeneca, Illumina, Rold, Esselunga and Bio4Dreams.

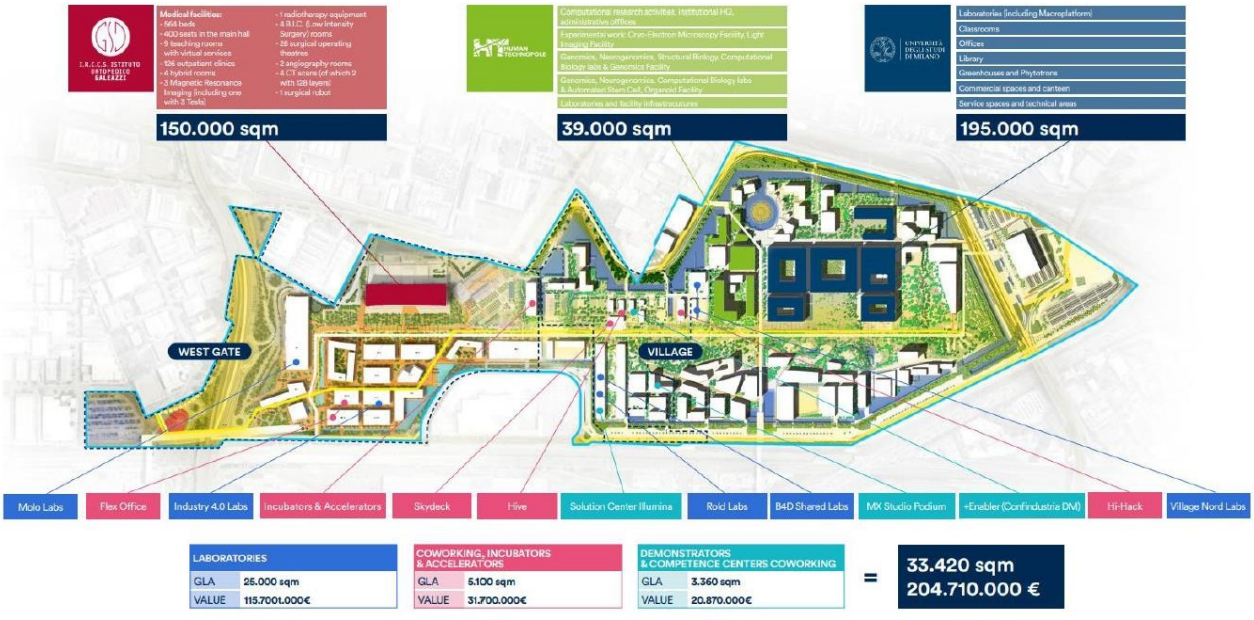


Figure 4A – Research Infrastructure at the Milano Innovation District

We expect around 50% of the capacity of the NGHC to be absorbed by its academic and industrial partners. External users, including SMEs and start-ups will be reached through dedicated activities, as well as through collaboration with:

- **Federated Innovation @MIND**: the industrial network set-up by MIND private developer LendLease to accelerate tech-transfer and innovation in the life sciences and smart city domains. The network, powered by 36 large companies, can rely on a community of 300 SMEs and start-ups, and has launched over 100 projects, collecting around 20M in grant funding for R&D projects.
- Industrial associations such as **Assolombarda** and **Confindustria Dispositivi Medici**.

A.9. Start date of the initiative

Details are contained within the final project proposal.

A.10. Please choose one of the following options below:

Details are contained within the final project proposal.

Part B – Initiative features

B.1. Activities

DESCRIPTION OF THE INITIATIVE

NGHC is an IT infrastructure fully compliant with constraint 055 (Annex VII of Reg. (EU) 2021/241) and based on two interconnected layers: Living Labs that reproduce the different settings of care delivery and Orbital Technological Labs focused on innovative solutions (Fig. 1B). Living Labs replicate specific settings of care and allow for the testing of innovative solutions in a simulated environment, as well as the understanding of how to better embed new technologies in the health system chain in an integrated way all along the patient journey. In the technological Labs, the technologies to be deployed in the Living labs are designed, built, and tested.

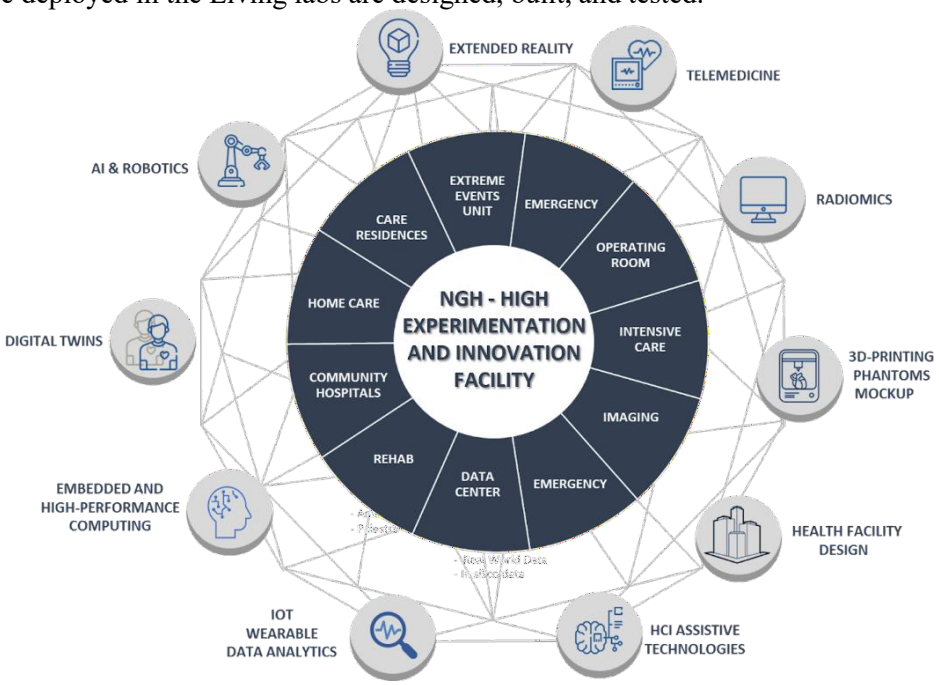
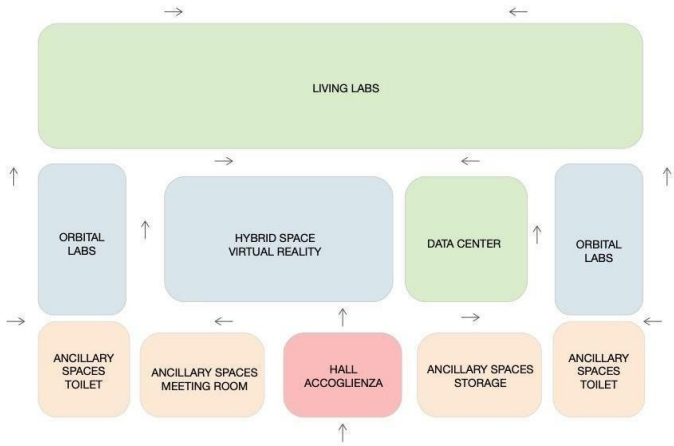


Figure 1B – Organization of the NGHC.
The Center includes Living Labs reproducing the various settings of care delivery (central circle) and technological Orbital Labs providing technologies and support to the setting Lab.



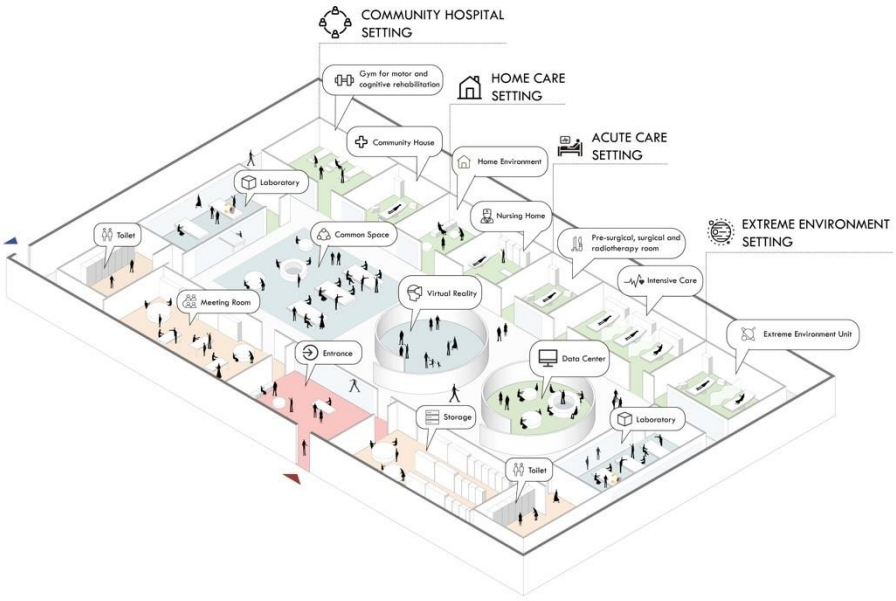


Figure 2B – Layout concept of the NGHC

NGHC will include diverse **Living Labs** according to a modular and flexible approach.

ACUTE CARE SETTING

- **The pre-surgical, surgical and radiotherapy room** is equipped with different technologies (imaging, monitoring and therapeutic) to simulate surgical interventions, radiotherapy treatments and their preparation phases. A flexible and modular interoperable concept will be implemented to be adapted according to changing RDI needs.
- **The intensive care room** simulates the intensive care environment to evaluate the integration of the different technologies needed for cardiac, respiratory, and metabolic monitoring and for effective data collection and timely intervention.
- **The emergency and urgency station** is equipped to re-create the typical dynamics occurring in the Emergency Unit, from the intervention of emergency vehicles to patient access for triage. The space will allow to design and test the most innovative techniques for the management of field stabilization, interventions, Machine Learning and Natural Language Processing for triage, risk prediction, queue management and organization of activities.

COMMUNITY HOSPITAL SETTING

- **The gym for motor and cognitive rehabilitation** hosts an environment suitable for experimenting new technologies for motor and/or cognitive rehabilitation at multiple level of surveillance and autonomy.
- **The ward** is a flexible hospitalization station adaptable to different therapeutic scenarios with state-of-the-art robotic and digital technologies for the management of post-acute hospitalization.
- **The Community House** includes the General Practitioner's office and specialist diagnostic laboratories.

HOME SETTING

- **The nursing home** simulates a protected and organized home environment for people who are not totally autonomous.

- **The home place of care for the chronic patient** allows the development of integrated services that can be used at home (remote monitoring, active or passive data collection, tele-rehabilitation) and the design and testing of technologies and services for monitoring the patient after discharge, for the validation and dissemination of digital therapies and for the development of technologies and services to support the prevention and promotion of healthy lifestyles.

EXTREME ENVIRONMENT SETTING

The extreme environment unit is a stand-alone unit to simulate mobile structures for emergency medicine to be used in extreme or hostile environments (e.g. war sites, Mars landing).

DATA CENTER

The Data Center integrates digital technologies related to medical records, data computing, data storage, communication, data security and privacy, data analysis, simulation, augmented and mixed reality (Fig.B).

Figure 3B- The Data Center is both a setting lab and a technical lab where all data from all the other living labs converge

NGHC is completed with **Orbital Technology Laboratories** providing the needed digital technologies to the Living Labs. They are aimed at the co-design, co-development, and preliminary testing of new technologies together with companies, clinicians and patients. They include:

- **Extended Reality laboratory** for the development of augmented, mixed and virtual reality systems for training, surgical planning, remote proctoring and rehabilitation activities
- **Telemedicine laboratory** for the development of advanced tele-operated medical services
- **Radiomics laboratory** for the development of image analysis and image fusion
- **Healthcare facility design laboratory** for the development of new physical-spatial, architectural and infrastructural solutions for the design of hospital and socio-sanitary environments based on the most recent scientific evidence and on dedicated physical/virtual simulations
- **3D printing and 3D phantom laboratory** for the development of phantoms for patient simulation and the creation of prototype solutions
- **Human Brain Interface laboratory** for the development of hardware and software digital interfaces between devices and the human brain

- **IoT and wearable systems laboratory** for the management of distributed sensor systems for patients' remote monitoring
- **Embedded and High-Performance Computing laboratory** as IT infrastructure serving all laboratories and the Data Center
- **Digital Twin laboratory** for the development of software simulators capable of reproducing specific organ, tissue, device, infrastructure functions
- **AI laboratory** for the development of AI and XAI applications throughout the care supply chain, and for the statistical analysis of data
- **Robotics laboratory** for the development and use of robotic systems for patient care, rehabilitation, and assistance and for logistic and surveillance.

Figure 4B – Visualization of Living Labs, hardware and software Technological Labs

INTERNATIONAL BENCHMARKING

An international benchmarking has been performed to identify similar infrastructures and evaluate the novelty of this proposal. To this purpose, five features have been identified for comparison's purposes, namely:

1) the focus of the center (whether on specific diseases/technologies or on the entire care supply chain)
2) the structural connection with universities, focusing on universities with a technological vocation
3) healthcare training activities
4) the inclusion of Labs and digital twins for simulation/design/development/training activities
5) the collaboration with companies in the Life Sciences and Healthcare sector.

Fifteen facilities, including exemplary experiences of the SESAM network were analyzed, either in Italy or abroad, that share some activities with those planned for NGHC. Their profiles are summarized in Fig 5B. Most of the Centers are based in large hospitals and aim at training healthcare professionals on innovative technologies.

	Key features of Next Generation Healthcare Center and international benchmarking	Healthcare supply chain completeness	c/o technical university (ENG/DES/ARC)	Healthcare personnel training	Physical simulation and environment layout study	Design and R&D support firms
SE	Chalmers University Center for Healthcare Improvement e Center for Healthcare Architecture	NA	✓	✗	✓	✗
USA	Penn Medicine Center for Health Care Innovation	✓	✗	✓	✓	✗
USA	Clemson University – Center for Health Facilities Design and Testing	✓	(✓)only ARC	✗	✓	✗
USA	Jefferson University – Health design lab	✗	(✓)only DES	✓	✓	✗
ES	Los Madronos Madrid - Eurobench	✗	✗	✓	✗	✓
FIN	Helsinki University Hospitals	✓	✗	✓	✗	✓
USA	Houston Methodist Institute for Technology, Innovation & Education – MITIE	NA	✗	✓	✓	✗
IT	Laboratorio Smart Health di Ospedale San Raffaele e Huawei	NA	✗	✓	✗	✗
IT	NeuroSIM Besta *	✗	✗	✓	✗	✗
IT	Simulation Center Humanitas*	✗	✗	✓	✗	✗
IT	Simulation Center UniCampus	NA	(✓)only ING	✓	✗	NA
NL	Techmed Simulation Centre, University of Twente	✓	✗	✓	✗	✗
ES	Instituto de Investigación Sanitaria Aragón	NA	✗	✓	✓	✗
ES	IMIM - Hospital del Mar Medical Research Institute	✓	✗	✓	✗	✗

* Simulation centers in Milano area, they are representatives of the SESAM network, including 100+ Sim Center in Europe, all mainly devoted to interdisciplinary Training of healthcare professionals and mostly linked with School of Medicines

Fig. 5B Benchmarking table. A selection of international facilities, possible models/competitors of the NGHC, are analyzed according to the key features of the NGHC.

NGHC significantly differs from already existing centers and offers an original answer to many unmet needs of the healthcare ecosystem: it sums up multidisciplinary skills in research, digital technology, clinical engineering, management and organizational processes across multiple health settings. It has an independent and central role with respect to the multiple clinical players (which allows intermediated access to patients) present in the Milan metropolitan area, and transversal skills across the entire patient journey (from prevention to chronicity), extensive industrial relations and a consolidated and internationally recognized competence in technology transfer. NGHC has the prerequisites to become an interdisciplinary training school for both professionals in the health sector with a high technological content and for patient empowerment thanks to its connection with both the Technical Schools of POLIMI and the Medical Schools of UNIMI.

B.2. Governance model

B.2.1. Infrastructure and operational management

In the **design, engineering** and **construction** phase (hypothetically from mid-2022 to mid-2025), NGHC's operations will be focused on the creation and operative set up of the facility. In this phase, the project coordinator and UNIMI will work together to finalize the recruitment of private members of the PPP and to set-up the legal entity which will allow the PPP to start operations by M6 of the project. The NGHC managing board, bringing together the two universities and the private members of the PPP, as well as the NGHC Advisory boards, ensuring operational connections with both the policy making and clinical worlds, will also be set-up in this phase. The NGHC governance model is summarized in Fig. 6B.

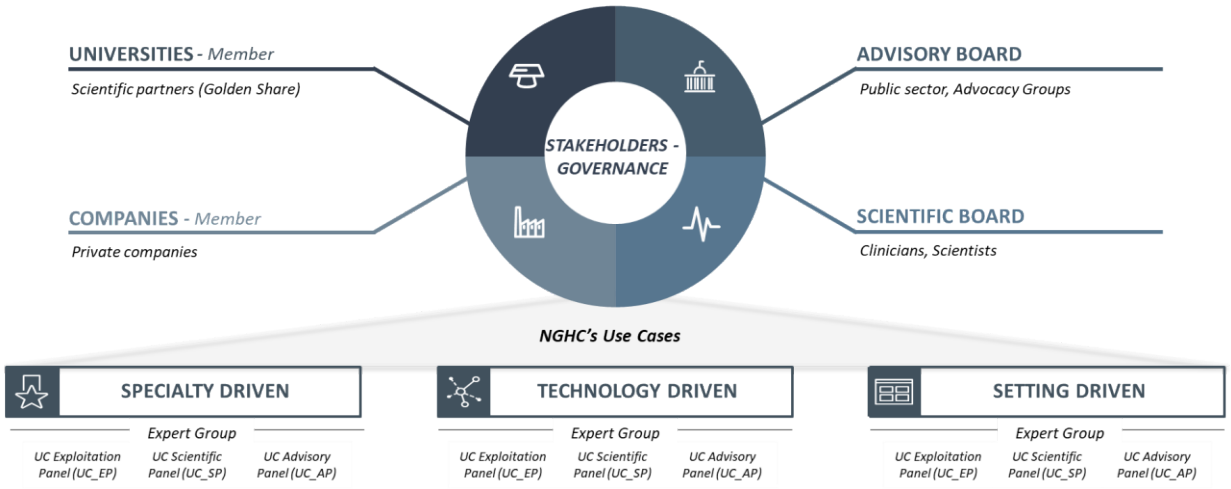


Fig 6B The governance model of the NGHC

The infrastructure manager will also be hired by the end of M6, through an international recruitment process, and will initially supervise the construction of the Centre, reporting to the Board and guaranteeing the meeting of milestones and pre-defined objectives. The IM will also oversee both internal and external relations with perspective clients and stakeholders, supporting the Board in the process of identifying and kickstarting Use Cases, i.e. strategic innovation areas selected by the infrastructure's public and private partners, and reviewing and finetuning both the NGHC access policy – including data policy - and its IP framework. In this phase, the IM will also proceed to hire the Infrastructure Management Team, that will consist in:

- An administrative executive with a legal background, in charge of managing the general and administrative tasks occurring throughout the facility construction, including tendering processes. The executive will also act as a reference point for administrative and contractual matters during the first operative phase;
- 4 technicians (IT manager, data scientist, hardware and electronic specialist, architecture specialist), who will oversee the completion of living labs and laboratories and act as points of reference for these spaces, also during the first operative phase;
- A fundraising manager, in charge of managing and pursuing grant and contract research opportunities.

During the design, engineering and construction phase, partners will be mainly acting as providers of state-of-the-art technologies, designs, software, focusing on shared problems and solutions, thus maximizing technology and capabilities transfer. Partners will also have the opportunity to contribute to the design and execution of joint R&D projects, cooperative programs, training and exchange programs.

During the **full capacity** phase (from 2026 onwards), the IM will be mainly in charge of business development activities, including international partnerships, and will keep managing internal and external relations, while also presiding hiring processes and monitoring NGHC performances.

The IM team will be fully devoted to the day-by-day running of the Centre, and will be complemented by around 45 privately funded team workers:

- key scientific opinion leaders (+10), with a research or clinical background, able to act as a point of reference in case of particular events related to the Centre (part-time commitment).
- 4 people devoted to the daily management of the Centre, with a particular focus on IP valorisation, start-up creation, fundraising (grant and contract research), dissemination (full-time commitment and TT background)
- beyond researchers devoted to specific technologies and use cases, additional researchers (+5), will collaborate with the Centre for projects coordination, either for internal/external companies, or associated to public grants;
- +10 assistants supporting, managing and implementing NGHC's daily activities.

During this phase, the experimental facilities and data will be used not only by internal public and private partners, but also by external actors:

- Public partners will be able to benefit from an annual time (25% of overall days per year, i.e., 250) allocated specifically to open research; paying an amount equal only to the coverage of the operative expenditures needed to sustain the research spaces used.
- Private partners will be able to test, validate, and eventually certificate innovative developments and technologies within a series of different healthcare settings equipped to capture, refine and measure innovations' performances and to sustain direct translation to clinical trials and patients/healthcare system adoption. To do so, private partners will have an annual time allocated equal to 25%, at a price equal to the operative expenditures associated to the usage of the spaces. Access to spaces for training and exchange programs at a discounted tariff is also foreseen to improve knowledge and adoption of innovative technologies and equipment.
- 30% of the time will be allocated to external actors, who will be able to access the services provided by NGHC (see Annex 5 for a first list, to be finetuned and published on the NGHC website). External actors will be charged to pay at market price, as detailed in the next paragraphs, but for sponsors who will have a discount.

B.2.2. PPP operation

The PPP on which the NGHC grounds will involve public and private actors differently. Public partners, i.e. POLIMI in its role of coordinator, implementer and beneficiary of the public funds, and UNIMI, will establish a joint venture, which will converge in a *NewCo* including also the private partners who will co-fund and co-manage the NGHC. Public partners, which will initially hold the 49% of the new vehicle, will have a golden share with veto power on key Board decisions such as the appointment of the IM, the approval of use-cases and of new investments (including equipment), and the admission of new members. Private partners will be represented in the board based on their financial contribution and will initially hold the 51% of the new vehicle. Private partners will be allowed to exit from the NewCo starting from 2026, when new members will also be allowed to join. Private companies can become members of the NGHC by providing a funding ticket of either €2M or €1M, in both cases distributable in maximum three years. Private companies providing a €2M ticket will access a *"Platinum Membership"* thereby becoming **full members**, while private companies providing a €1M ticket (*"Gold Membership")* will be **commonly represented** by one or more representatives within the NGHC's Board.

Both Platinum and Gold Members will:

1. Enjoy priority access to NGHC's facilities and services at cost price;
2. Actively participate to the identification of UCs to be implemented, both to set-up long-term precompetitive multi-partner industrial RDI programs and industrial RDI projects;
3. Suggest experts /clinicians in the boards;
4. Participate in international/EU partnership agreements;
5. Shape training programs for medical staff, accessing the NGHC's knowledge-intensive contents at a discounted price;
6. Gain partial real estate propriety on NGHC, since the center will perform capital investments in building, machineries and related furniture. Moreover, the infrastructure is expected to constantly modernize by leveraging on a yearly financial reserve (as a percentage of profits), thereby auto sustaining any further investment needed after reaching break-even;
7. Access IP royalties, as the result of the public and private partners' joint innovation capabilities;
8. Gain visibility everywhere, by leveraging the extended network on which the center grounds, and the brand of its academic partners.

A third scenario for companies entails becoming NGHC **sponsors**, with no access, however, to the NGHC board and governance. Sponsors are companies allocating a minimum ticket of €300,000 (€100,000 per year in the first

three years, with the possibility to guarantee up to 20% of the ticket in-kind). Sponsors can:
1. access the NGHC facility and services at privileged conditions (i.e., at a lower than market price);
2. access long-term precompetitive multi-partner UCs launched by NGHC's members
3. access up-to-date information about NGHC's calls for tenders, programs and events
4. be consulted by NGHC members about strategic programming on a biannual basis
5. gain visibility everywhere as sponsors.

The sponsorship model is facilitated for SMEs and start-ups by leveraging consortium schemes.

Finally, NGHC will be connected to key stakeholders through two dedicated boards, which will be set-up by M6 and consulted on a biannual basis. The **Advisory Board** includes both public sector representatives (i.e., public administrations such as municipalities, regions, ministries, regulatory bodies etc.), and Advocacy Groups (i.e. patient associations, consumer organisations, third sector etc). The **Scientific Board** includes clinicians (see support letters in Annex 4) and star scientists.
Importantly, **expert groups** will also be set-up for each UC (see WP5).

B.3. Budget plan

Details are contained within the final project proposal.

B.4. Project time schedule

Implementation activities consist of 5 work packages (WP). WP1 starts once PNRR funding is awarded (M1) and lasts six months. It aims to establish the PPP together with all the legal and contractual frameworks necessary to start-up the infrastructure, nominate the Infrastructure Boards and appoint the Infrastructure Manager. As soon as the PPP has been set-up (M6), WP2 ensures a smooth management of the infrastructure; it is run by the infrastructure board and management team. It aims to provide efficient project management, including networking and communication internally between partners and externally with institutions, research centers, hospitals, and prospect users. WP2 also manages which Use Cases (UCs) will be activated and supervises the UC PIs and research team selection process. In parallel with WP2, WP3 aims at the design and realization of the overall infrastructure and physical laboratories, including the acquisition and installation of equipment and instrumentation. WP4 is devoted to exploitation and sustainability and concerns all the activities needed to foster the long-term sustainability of the center. A grant office will allow addressing relevant national and international calls, working closely with the NGHC IP and TT functions. WP5 deals with the implementation of the UCs. The whole living labs and orbital technological laboratories system is activated to implement concrete projects in the UCs areas, bringing together industry, academia, and relevant stakeholders from the clinical, policymaking, and civil society sectors. UCs can be driven by:

- **Medical specialties** (e.g., cardiology) with the engagement of multiple living labs and a focus on the patient journey across different settings, including through data monitoring.
- **Technological challenges** (e.g., cybersecurity, -omics…) encompassing multimodal data throughout multiple labs/settings for holistic and reliable information on the patient status and developing trustworthy algorithms to support clinical decisions.
- **Physical settings** (e.g., community hospital) where a specific setting of care will be studied under different perspectives (technology's integration, distribution of spaces, operational procedures, connections to the rest of the chain such as community hospital or extreme environment healthcare.

WP 1 - PPP LEGAL ENTITY ESTABLISHMENT (M1-M6)

WP1 pursues the recruitment of private partners and set-up of the PPP in charge of funding, designing, and running the NGHC. This means establishing a legal entity and taking care of contractual and legal aspects, from the JV between the two universities who will enter the PPP to the tender procedures which will ensure a smooth and transparent process behind the realization of the infrastructure.

Obj 1.1 PRIVATE PARTNERS TENDERING PROCEDURES AND PPP FINALIZATION (M1-6)

A call for expressions of interest will be opened at M1 and closed at the end of M2 to recruit private partners who will contribute to fund, design, build and run the NGHC. Public and private partners will work together to identify the best legal form ensuring transparency, capacity and flexibility to the PPP for setting-up and running the infrastructure on time and on budget. Calls for tenders to build and equip the infrastructure while promoting downstream TT will be prepared in compliance with EU and national legislation, and contracts for both sponsors and clients will be finalized.

Obj 1.2 NOMINATION OF THE BOARDS OF THE PPP AND RECRUITMENT OF THE IM (M3-6)

The partners of the PPP will nominate the representatives for the NGHC Board and for its Advisory and Scientific Boards. The Scientific Board will oversee the scientific objectives, the definition and prioritization of Use Cases and will include both academic and clinicians. Every year, the Scientific Board will confirm activated UCs and evaluate possible new UCs. The Advisory Board (including both policy makers and patient organization representatives) will define and supervise the interaction with regional, national and international institutional bodies. The NGHC Board will appoint an Infrastructure Manager to be recruited within M6 through an international recruitment process.

WP1 OBJECTIVES	SMART KPIS TYPE: MILESTONE (MS); DELIVERABLE (D); DUE DATE (M)
Obj 1.1 PRIVATE PARTNERS TENDERING PROCEDURES AND PPP FINALIZATION	MS1.1: PPP Legal Entity registered (M6, 10/2022)
Obj 1.2 NOMINATION OF THE BOARDS OF THE PPP AND RECRUITMENT OF THE IM	MS1.2: Completion of the Infrastructure Boards (M4, 10/2022) MS1.3: Recruitment of the Infrastructure Manager (M6, 12/2022)

WP 2 - INFRASTRUCTURE MANAGEMENT (M6-M36)

The infrastructure management activities will ensure smooth operations within the center.

Obj 2.1 PROJECT MANAGEMENT AND MONITORING (M6-M36)

Once appointed by the NGHC Board, the Infrastructure Manager (IM) will recruit and coordinate the Infrastructure Management Team (IM Team) composed by professionals with technical, management and/or communication tasks. IM Team will implement all recruitment tasks related to the implementation of the UCs (see Obj2.2) (Fig 7B).

Obj 2.2 USE CASES DEFINITION, PRIORITIZATION AND SUPERVISION (M6-M36)

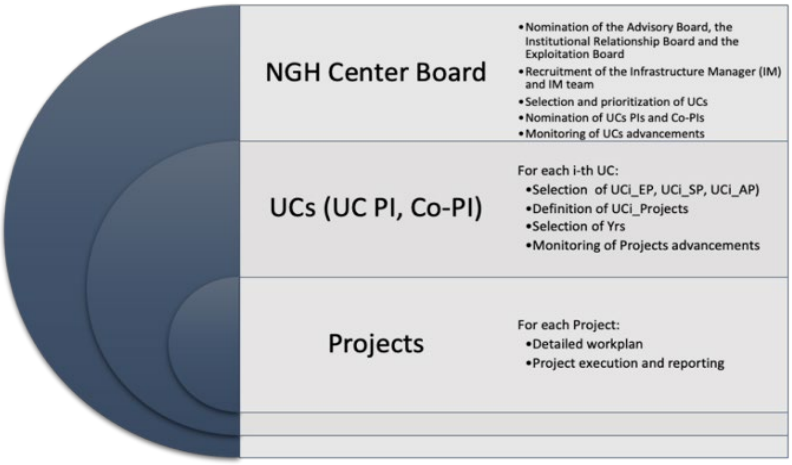


Fig 7B The nested implementation strategy of the NGHC

The PPP Board will identify 6 Use Cases (UCs) that will be developed using part of the initial funding made available by NGHC private partners. Two sets of UCs are envisaged, UC_SET1, starting earlier, aims at integrating and validating technologies at high TRLs (>5). UC_SET2, activated later, aims at implementing large pre-competitive projects with middle to long-term goals (from TRL 3). A Principal Investigator (PI) and co-PI for each UC will manage the activities (see WP5).

Obj 2.3 NETWORKING AND COMMUNICATION (M6-36)

This Task will be under the direct responsibility of the IM and IM Team and will include

- **Dissemination and rules of access** (web site creation, socials, dissemination material design, realization and diffusion): the IM Team will and PPP Board will review and finetune the NGHC access policy and IP framework, in order to publish on the NGHC website all the required information according to EU best practice (see Annex 5)
- **Advanced networking** through promotion of the infrastructure among potential stakeholders (including advocacy) and clients: the IM Team will work to constantly increase the NGHC attractiveness and reach, ensuring new contracts and grants based on activities described in WP4.
- **Societal engagement** through outreach activities to the general public, patient associations, low- and high-school students, and participation to public events (women in research day, night of researchers, universities open days etc.)

WP2 OBJECTIVE	SMART KPIS TYPE: MILESTONE (MS); DELIVERABLE (D); DUE DATE (M)
Obj 2.1 PROJECT MANAGEMENT AND MONITORING	MS2.1: Definition of the Advisory Board (M6, 12/2022) MS2.2: Definition of the Scientific Board (M6, 12/2022) MS2.3: Recruitment of the Infrastructure Manager Staff (M18, 12/2023)
Obj. 2.2 NOMINATION OF THE USE CASES' PRINCIPAL INVESTIGATORS	MS2.4: Nomination of the PIs and of the co-PIs of the UC_SET1 (M6, 12/2022) MS2.5: Nomination of the PIs and of the co-PIs of the UC_SET2 (M12, 06/2023)
Obj. 2.3 NETWORKING AND COMMUNICATION	D2.1; D2.2; D2.3 Annual report on dissemination and communication (M12; M24; M36)

WP 3 - INFRASTRUCTURE CONSTRUCTION (M6-M36)

WP3 presides the NGHC design, engineering and construction phases. The design process will be supported by a Design Advisory Board composed by 1 expert in infrastructure for innovation design, 1 expert in healthcare facility design at national level and 1 at international level, 1 expert in infrastructure for innovation construction.

Obj 3.1 INFRASTRUCTURE DESIGN (M6-M12)

NGHC's preliminary layout will undergo an iterative process of design revision and optimization to collect the infrastructural needs of the different stakeholders as well as the spatial, technical and regulatory requirements and constraints according to the specific setting that will be provided. The design will be developed from concept to construction merging different technical competences and with a growing level of detail in terms of bill of quantity and materials needed.

Each design phase will be completed with the graphical and technical documentation required by the current regulatory framework, building codes, UNI EN, guidelines. From final design onward BIM methodologies will support the facility management and maintenance and the technological devices implementation. All necessary authorizations will be collected.

Obj 3.2 INFRASTRUCTURE REALIZATION (M9-M21)

Starting from the construction design phase, the realization will take place in the agreed area and following the specific prescriptions defined in the previous planning phases. Particular attention will be paid to the use of advanced techniques, prefabricated building elements, industrialized systems to guarantee a high level of safety and security, environmental sustainability, clear construction costs and optimization of building site timing. The specific care settings that will be installed and the high level of technology required will be the starting point for implementing solutions able to boost flexibility, technological redundancy and adaptability to multiple uses. The regular construction management team will be supported by a temporary panel of scientific and technical advisors to guarantee that the innovative design solutions are correctly implemented.

Obj 3.3 SETTING LAYOUT DESIGN (M9-M24)

Although the design phase output will already incorporate an abacus of possible layout settings, throughout the construction phase a detailed design of each specific mock-up care setting will be provided along with the details of each space (both living labs and technological orbital labs). According to the needs of different stakeholders and the private partners of each specific project, the single setting might vary in terms of devices, layout or furniture. A flexible infrastructure with various redundant installations and system terminals will allow setting up multiple rooms on a modular grid. The results of this phase will be regularly verified by a Board composed by at least 2 members of the Design Advisory Board, 1 member from the Joint Research Platform Healthcare Infrastructure, 2 members of the industry partners, 1 hospital facility manager, 1 expert of each specialty/setting considered.

Obj 3.4 EQUIPMENT ACQUISITION AND INSTALLATION (M12-M36)
The objective of this phase is to equip NGHC with the most advanced technology and devices to pursue research and development activities with high TRL. In particular, the acquisition and procurement process will follow criteria of efficiency and transparency and will target the rapid installation of different devices. Some devices can be provided by the private partners of each specific project/use cases while others might not be already present in the market. One key feature of each device will be interoperability with multiple systems and networks while identification of short and long-term strategy for device replacement in a 360° circular economy process will be considered.

WP 3 OBJECTIVES	SMART KPIS TYPE: MILESTONE (MS); DELIVERABLE (D); DUE DATE (M)
Obj 3.1 INFRASTRUCTURE DESIGN	D3.1: Concept design validation and basic design (M6, 12/2022) D3.2: Final design (M8, 02/2023) D3.3: Construction design (M12, 06/2023)
Obj 3.2 INFRASTRUCTURE REALIZATION	D3.4: State of advancement of works - preparatory works and structure (25%) (M12, 06/2023) D3.6: State of advancement of works - structure, building and technology (50%) (M15, 09/2023) D3.11: State of advancement of works - building, technology and finishing (75%) (M18, 12/2023) D3.12: State of advancement of works - technology, finishing and validation (100%) (M21, 03/2024)
Obj 3.3 SETTING LAYOUT DESIGN	D3.5: Validation and review of an abacus of possible setting (M12, 06/2023) D3.7: Selection of setting and measurement devices to incorporate (M15, 09/2023) D3.10: Detailed design of each selected setting and creation of the digital twin (M18, 12/2023) MS3.1: Realization of each selected setting and validation through digital-physical iteration (M21, 03/2024)
Obj 3.4 EQUIPMENT ACQUISITION AND INSTALLATION	D3.8: List of devices and relative key features (M15, 09/2023) D3.9: Rules and modalities of procurement (M15, 09/2023) MS3.2: Living Labs and Orbital Technological Labs equipment acquisition (M18, 12/2023) MS3.3: Living Labs and Orbital Technological Labs equipment installation (M24, 06/2024) MS3.4: UCs dedicated equipment acquisition and installation (M36, 06/2025) (see also WP5)

WP 4 – SUSTAINABILITY AND EXPLOITATION
The framework of a robust exploitation strategy will be based on the structural cooperation between the PPP partners, who will commit to bring to the center their immaterial assets consisting of knowledge, know-how and proprietary technologies to build the infrastructure as well as the UCs and create the conditions to successfully develop valuable innovative products and services. NGHC will benefit from the Universities' track records and capabilities in generating innovative tools and technologies and related IPRs, as well as the corporate partners' operational expertise and their effectiveness in delivering innovation across the functions from R&D to manufacturing, to marketing. At the same time, NGHC will be opened to a broader cooperative scheme towards the innovation and business community (Open Innovation). According to specific project needs, NGHC will also perform technological scouting and assessment of already existing technologies in the market to identify possible third parties' IP bundling with the PPP members' assets and enabling or ensuring the implementation of the projects.

Obj 4.1 BUSINESS MODEL IMPLEMENTATION (M1-M36)
NGHC will start immediately to work for the implementation of its core exploitation strategy according to the following commercial pathways to innovation:

- **Pre-competitive collaboration**: PPP members (and, as appropriate, third parties), mostly organized as a consortium and possibly backed by public funds, will work together to produce an innovative outcome as a result of the convergence of enabling technologies, R&D results, new designs aimed at the development of standards and tools; generation and aggregation of data; knowledge creation and product development. The downstream value of this collaboration will be transformed into marketable innovation and become the pillar of a commercialization strategy set up by either a partner of the consortium or an external party. NGHC will arrange a licensing scheme,

by identifying the best candidate for a license, setting the deal and enabling the licensee to the commercialization phase.

- **Sponsored projects and contract research:** the activities will be sponsored by a member or a third party, that leverages on the critical mass of knowledge, technologies and material assets shared by the founders within the PPP to enable and accelerate the achievement of certain innovation objectives. In this type of collaboration, the IPRs will be clearly transferred to the sponsor/client, based on assignment or license agreements.
- **IP management and valorization:** within the IP policy described in Annex 4, NGHC will arrange the IP framework before starting the activities of a specific use case, during the project design and related planning, and adjust it from time to time during the implementation, as a result of sourcing and integrating different knowledge and IP. NGHC will coordinate the services offered by the TTOs and IP Management of the members, from technology assessment to IP protection strategy definition and will deliver the project-related exploitation plan, with the valorization scheme and specific terms of the license/assignment agreements and execute negotiation and contracts finalization processes.
- **TT and business creation:** TT activities will be fostered according to the upstream model during the design & construction phase, and the downstream model within the UCs (ESFRI 2020). Strategic partnerships will be activated with the Universities' Incubators, according to which the Centre will leverage on their capabilities of supporting the definition of new business models originating by the use-cases spillovers or the results of exploratory research projects. The collaboration with the Incubators will also activate networking activities with both startup and the venture capital community.

Obj 4.2 GRANT OFFICE OPERATIONS (M6-M36)

The function of the Grant Office, linked to analogous functions of the two Universities, will be a crucial asset of NGHC for:

- detection of opportunities relating to Regional, National, EU and International funding programs;
- support throughout the project lifecycle, both in the pre-award and in the post-award phase of grant applications.

WP4 OBJECTIVES	SMART KPIS TYPE: MILESTONE (MS); DELIVERABLE (D); DUE DATE (M)
Obj 4.1 BUSINESS MODEL IMPLEMENTATION	D4.1 Exploitation plan on an annual basis including IP valorization, enterprise creation, contract research and sponsorships (M12-M24-M36) MS4.3 Activation of at least two contracts with Industrial partners (M24, 06/2024) MS4.4 Activation of at least two additional contracts with Industrial partners (M30, 12/2024)
Obj 4.2 GRANT OFFICE OPERATIONS	MS4.1 Preparation of proposal for ETF at EU calls (M12, 06/2023) MS4.2 Participation to at least 4 proposals to public (international, national, regional) calls (M18, 12/2023) MS4.5 Participation to at least 6 proposals to public (international, national, regional) calls (M30, 12/2024)

WP5 – USE CASES

Six innovation Use Cases will be activated aimed at demonstrating the operational capacity of the center and its ability to collect interest from a wide range of stakeholders as well as to host the development of innovative and cutting-edge projects.

Obj 5.1 DEFINITION OF THE USE CASES' PANELS (M6-15)

The activities of each UC will be run under the supervision of the UC PI and co-PI nominated at the UC start by the NGHC Board (M6 for UC_Set1 and M12 for UC_Set2). They will propose to the NGHC Board the Experts panels. The **UC Exploitation Panel** (UC_EP) consisting of representatives nominated by PPP private members involved in the UC and by academic representatives, will define the actions to be undertaken within the UC and the expected results.

The **UC Scientific Panel** (UC_SP), composed by the UC PI and co-PIs (see Task 2.3), one representative of the PPP private members and 2 healthcare professionals from Clinical Research Centers, will be in charge for supervising and monitoring periodically the activities. The **UC Advisory Panel** (UC_AP), will consist of 10 members from the relevant medical areas for the UC and will support the scientific panel with the main focus on effective clinical translation. Panels will be nominated by M9 for UC_SET1 and by M15 for UC_SET2.

Obj 5.2 UC PROJECTS DEFINITION AND YOUNG RESEARCHER'S RECRUITMENT (M9-18)

The Scientific Boards of the UC in the first month after the appointment will prepare a workplan of the UC, organized as a coordinated cluster of projects. Each project will have clear deliverables, milestones, and a team. A young researcher (YR) will be appointed for each project and a team of PhD students and post-doc will be assigned to the YR for the execution of the project.

The recruitment of the YRs, leaders of the project, will be performed through international public calls at month 10 for UC_SET 1 and at month 16 for UC_SET 2. The YRs' profiles will be proposed by the UC PI/co-PI upon approval of the UC Scientific Board and will be brought to the attention of the international community through the standard channels used for university recruitment, private company recruitment, headhunters. The YRs will be recruited with a 3-years non-tenured contract. The team (PhD students and post-docs) for each Project will be recruited after the YRs with internationally visible procedures.

Obj 5.3 UC PROJECTS DEVELOPMENT (M12-36)

Each Project reports on a bimonthly base to the UC PI, who manages a 6-month review for the whole UC presented to the participating PPP members. UCs implementation starts at M6 for the UC_SET1 and at Month 12 for the UC_SET2. They will both run until M36. Intermediate results will be evaluated, and major deviations will be submitted to the NGHC Board for approval.

WP5 OBJECTIVES	SMART KPIS TYPE: MILESTONE (MS); DELIVERABLE (D); DUE DATE (M)
Obj 5.1 DEFINITION OF THE USE CASES' PANELS	MS5.1 Nomination of the UC Exploitation Panels, UC Scientific Panels, UC Advisory Panels for all UC_SET1 (M9, 03/2023) MS5.4 Nomination of the UC Exploitation Panels, UC Scientific Panels, UC Advisory Panels for all UC_SET2 (M15, 09/2023)
Obj 5.2 MANAGEMENT OF YR'S RECRUITMENT PUBLIC CALLS	MS5.2 Activation of the recruitment procedure for YRs for UC-SET1 (M10, 04/2023) MS5.3 Recruitment of YRs for UC_SET1 (M12, 06/2023) MS5.5 Activation of the recruitment procedure for YRs for UC-SET2 (M16, 10/2023) MS5.6 Recruitment of YRs for UC_SET2 (M18, 12/2023)
Obj 5.3 UC PROJECTS DEVELOPMENT	D5.1: Definition of the relevant equipment and identification of the working teams for UC_SET1 (M12, 06/2023; M18, 12/2023) MS5.7 Procurement of the dedicated equipment completed for UC_SET1 (M24, 06/2024) D5.2: Definition of the relevant equipment and identification of the working teams for UC_SET2 (M18, 12/2023, M24, 06/2024) MS5.8 Procurement of the dedicated equipment completed for UC_SET2 (M36, 06/2025) D5.3: Release of the Project deliverables for all UCs (M24-M30-M36)

Candidate strategic USE CASES

Following the interests of the POLIMI and UNIMI, those collected by the stakeholders interviewed during the proposal preparation and according to the discussion with potential industrial partners who have expressed interest in the NGHC (see Annex 5), a set of candidate Use Cases has been identified as reported in Fig. 8B. **Actual UCs will be confirmed upon NGHC Infrastructure approval and private members' investments.**

UC Name	UC_SET	Objectives	Settings	Technologies	Medical Specialties (Clinical partners)	Potential interested companies
CARDIOLOGY	1	- Explore new concepts of spatial organization of the surgical theatre to make it compliant to the novel digital technologies and new operational models for improving and monitoring hygiene, comfort, ergonomics, energy consumption, infection control and operational efficiency - Provide new solutions in the area of cybersecurity, (data curing, transparency, etc) and cyberintelligence (patient journey surveillance, image and signal processing, digital m-therapeutics, real world data collection/interrogation)	- All settings	- Artificial Intelligence - Telemedicine - Cybersecurity - Extended Reality - Digital Twins - Wearable and IoT - Robotics - Radiomics - Health facility design	- CMR, - Percutaneous interventions cardiovascular diseases (Rete IRCCS Cardiologia)	- Cy4gate - Operamed - Eurocolumbus - Vodafone - GE Healthcare - Polygon - Lend Lease
REAL-WORLD DATA EVIDENCE	1	- Promote interoperability standards across different devices and across different hospitals on retrospective and prospective data. - Develop Statistical/Machine Learning trustworthy and interpretable algorithms for resilient integrated data robustness gained by Real-world data	- All settings	- Artificial Intelligence - Telemedicine - Cybersecurity - Augmented Reality	All specialties starting from - Orthopedics (Galeazzi IRCCS) - Lung Cancer (INT IRCCS)	- Cy4gate - Vodafone
3D PRINTING OF MEDICINES	1	- Make available medicines that are currently too expensive to be produced (e.g. orphan drugs). - Speed up preclinical and clinical studies by easing the formulation development step. - Prototype/validate innovative drug delivery devices	- Hospital pharmacy	- 3D printing - Digital Twins	- All specialties	- Angelini
HEALTH SECURE METAVERSE	2	- Improve training, planning, intraoperative and rehabilitation practices; - integrate virtual healthcare interaction with non fungible token and blockchain technology, and cryptocurrency solutions; - Develop, validate, sandbox trustworthy learning algorithms of integrated clinical data	- All settings	- Extended Reality - Cybersecurity - Telemedicine - Wearables and IoT - Robotics	All specialties, starting from - Rehab Med (Villa Beretta- Valduce) - Pediatric Neuropsychiatric (La Nostra Famiglia)	- Operamed - Eurocolumbus - Vodafone - GE Healthcare - Cy4gate
TERRITORY PATIENT JOURNEY	2	- Build evaluation and optimization models of Community Hospital settings with the attention on the key requirements: being a multi-purpose, multi-specialist structures, integrated into the data flow both with the hospital and with chronic care till the home telemonitoring and telerehabilitation.	- Community Hospitals - Community House	- Health facility design - Digital Twins	All specialties starting from • Frailty and Chronicity (with ASST Lecco)	- Operamed - Vodafone - Polygon - Lend Lease
HEALTH IN SPACE & IN EXTRATERRESTRIAL HABITATS	2	- Monitor and support human health, performance and safety in extreme environment (isolation, different gravity level, contamination risk, radiation exposure, etc...) - Design new settings and process to improve healthcare sustainability in isolated environment	- Extreme event units	- Unobtrusive monitoring - Wearables and IoT - Robotics - Health facility design - Telemedicine - 3D printing - Virtual reality	All specialties	- Cy4gate - Operamed - Vodafone - GE Healthcare - Polygon

Fig. 8B Candidate UCs: objectives, involved NGHC living labs and orbital labs, medical specialties and potential industrial partners who have expressed interest in the NGHC.

B.4.1. Intermediate objectives

Details are contained within the final project proposal.

B.4.2. Timeframe envisaged for the implementation of the procedure aimed at setting up a PPP

The PPP and NGHC Advisory and Scientific Boards will be set-up by M6 (see WP1). An international call for expression of interest to identify private members of the Centre in compliance with European and national regulations will be launched just after the communication of the result of the bid, if successful. During the bid-writing phase POLIMI and UNIMI, to taste market appetite for the NGHC, already collected several expressions of interest (see Annex 5) from perspective private partners and sponsors, including

- specialized RDI infrastructure developer and investor LendLease – who expressed its interest in co-funding the whole center in its start-up phase
- Clinical engineering companies Polygon, Eurocolumbus, Municipia and Operamed
- Medical devices companies GE, Philips, Emme Esse, Nippon Gases, Favero
- MedTech companies such as Illumina
- Pharma companies such as MS, BS and Angelini
- ICT companies such as Cy4Gate and Vodafone
- Greentech companies such as Siram Veolia
- Innovation service providers such as Deloitte.

We therefore believe that we will be successful in securing private funding and finalizing the PPP by M6 as planned.

B.5. Promotion of knowledge transfer and business creation activities

Building on EU best practice and as recommended by the European Strategy Forum on Research Infrastructures (ESFRI)[1], NGHC's TT activities will follow two main parallel paths: the upstream model for construction and equipment activities and the downstream model – with a mix of open and commercial innovation activities – for the running.

Concerning the upstream model, we expect both industrial partners and providers identified through calls for tenders to work closely together with academic partners in "co-solution mood", "addressing shared problems leading to equally-driven objectives and maximizing the exchange of technology and competence." (ESFRI 2020). Indeed, we expect that technologies and processes tested and used to set-up and equip the NGHC will then be integrated into new products or processes to be commercialized.

As for the downstream model, NGHC's IP Policy has already been defined (see Annex4) setting the principles that support the implementation of the business model (as described in WP4) and qualify the exploitation strategy, such as IP ownership definition and valorization processes among the parties. During the implementation phase, NGHC will elaborate all the contractual tools needed to govern multi-actor relationships (I Non-disclosure Agreement to Consortium Agreement, to IP License or Assignment templates. On an annual basis, the Centre will release an exploitation plan, supporting transversally all the business lines with the identification of:

- new corporate needs and/or targets for UCs activation;
- relevant milestones in on-going projects and possible synergies with other projects;
- opportunities for the valorization of the IP outcomes and new business creation based on the commercial exploitation of said outcomes.

This plan will include the activities that the Centre and each partner or stakeholder will be committed to carry out, how the project's results will be exploited, and ultimately used by principal beneficiaries and end-users.

Based on POLIMI and UNIMI track-records, and on the overall annual research revenues estimated for the NGHC, a baseline of 6 – 10 patents per year is foreseen. Partnerships with the Universities TTOs and incubators will also be established to foster the creation of spin-offs and start-ups.

Part C – Expected impact

C.1. Expected outcomes of the intervention

Scientific and Technological impacts.
NGHC will host Living Labs and Orbital Technological Labs combining different know-how thus promoting trans-interdisciplinary projects and fostering cross-fertilization between sectors by:

- Supporting knowledge creation and IP protection: multidisciplinary R&D activities will create high-quality new knowledge in a faster and more effective way than following a sectorial approach. We expect around 10 new patents and 1 spin-off per year at full capacity.
- Supporting innovation: activities integrating R&D between sectors will accelerate the creation of innovation by developing new solutions and by recombining existing technologies, promoting both disruptive and incremental innovation.
- Stimulating collaborative networks both at the Italian and European level, enhancing the competitive position of partners when looking for a collaborative advantage.

Economic impacts
NGHC will facilitate the transfer of research results to the market, by boosting new technology validation and deployment in the health supply chain. Economic advantages for different players are summarized in the table below:

STAKEHOLDERS	BENEFITS
Start-ups and SMEs	learning more about the market they are approaching and interact with large Corporations
Corporates	adapting quickly to market changes and monitor the emergence of new technologies, reducing costs of research and development and enhancing their competitiveness
Investors	will easily monitor the development and validation of new inventions, building better benchmarks and decreasing the risk of investments
Academia	will benefit from the validation and implementation of research results. Students at the involved Universities will be educated through field experience on the whole innovation path
Healthcare institutions	will benefit from a user-oriented approach in which technology is used to care for specific patients' needs, reducing costs and burden for healthcare and administrative staff and will have access to training and simulating facilities before adopting new technologies
Government	policy-makers will be supported in understanding the impact of deployment of new technologies, products, services and processes in the NHS

Social impacts
NGHC will contribute to improving the health standards of citizens, thanks to more effective prevention, a lower burden of diseases, the development of processes for a better patient care experience, better diagnosis and more effective therapies. The synergy between researchers, doctors and patients' associations will be key to address clinical needs and develop new digital innovation technologies to solve specific unmet needs. The development of new wearable and extended reality devices will allow and increase treatment and rehabilitation of patients remotely, increasing access and decreasing costs particularly for chronic patients. Training needs of healthcare workers will also be addressed.
In terms of **employment**, between 2022 and 2026, NGHC will manage about 45 professionals, out of which 50% will be women and 80% will be under 35 years old. Indirect creation of highly qualified jobs thanks to innovations developed by the NGHC will be monitored by the NGHC team.

C.2. Long-term sustainability profile

NGHC long-term sustainability profile has been evaluated throughout a time span of 17 years (2022 –2038), by defining the yearly ***inflows*** and ***outflows*** to compute fundamental financial metrics such as the *Net Present Value (NPV)* and the *Pay-Back-Period (PBP).*

Concerning inflows, NGHC expects to collect public and private funding from year 2022 to 2025. Public funding is estimated at €14.7M, while private funding at €15.3M (plus €1,1M allocated to privately funded employees and other indirect costs). While this funding cannot be properly considered as "revenues", it enters within the computation of NPV and PBP, being these KPIs built upon a cash-logic. NGHC starts generating **revenues** in 2026 and settles between **€9.0M** and **€9.8M** in the full capacity phase. Five key revenue streams have been identified:

1. *Research (about 20% of total revenues).* NGHC will pursue research opportunities, either commissioned by internal/external firms, or by leveraging on national and international grants. In both cases, NGHC will leverage on the research capacity of POLIMI and UNIMI. Face to private firms' requests and/or to implement publicly funded projects, public partners will provide research teams (key opinion leaders, senior researchers, junior researchers) to the center, which will hold a fee equal to 20% of the agreed price. Following this logic, and assuming i) a maximum number of researchers equal to 60; ii) a saturation of the spaces equal to 45% over a number of working days per year equal to 250 (cautionary logic); iii) a research team composed on average by 1 junior researcher, 0.25 senior researcher and 0.1 key opinion leader, revenues from research activities have been estimated at **€2,000,000 per year**.
2. *Infrastructure access (about 61% of total revenues)* a maximum of 30% of annual working days available will be offered to external actors. NGHC's spaces can be distinguished into living labs ("high-tech" spaces), laboratories ("mid-tech"), and co-working or exhibition units ("low-tech"); related pricing is as follows:
    a. External actors will pay a price which includes the depreciation of the assets associated to each space, the operating expenses and a mark-up of 50%, i.e. €2,680/day for high-tech, €1,130/day for mid-tech and €600/day for low-tech spaces.
    b. NGHC partners will pay a price which includes only the operating expenses associated to each space, i.e., €320/day for high-tech, €290/day for mid-tech, €180/day for low-tech spaces.

    The aforementioned prices only include access to spaces with own personnel; if researchers from POLIMI and UNIMI are needed, additional costs will be calculated (Point 1). Based on these assumptions, the infrastructure access is expected to generate **yearly revenues** close to **€6,000,000.**
3. *Open research (about 6% of total revenues).* 25% of annual time of high-tech and mid-tech spaces will specifically be allocated to open research (with the remaining 20% of annual time considered as "empty" in a cautionary logic). For open research, the same logic seen for NGHC partners applies, with only operating expenses needed to run the spaces required. Thus, **annual revenues of €560,000** are expected under this stream, again no research personnel is included.
4. *Learning activities (about 7% of total revenues).* Assuming a price per user of €300, 50 days per year, a 20% discounted tariff for private partners and a number of users per session equal to 50, learning activities are expected to generate around **€720,000 per year.**
5. *Intellectual Property's Management (about 6% of total revenues).* NGHC will benefit from the high innovation capabilities both of public and private partners. The development of patents is expected to generate revenues by means of a royalty-based logic, as better described in Annex 4, up to a value of **€510,000 in 2038**.

Concerning **outflows**, from 2022 to 2026 NGHC will sustain the capital and operative expenditures described in "B.3 Budget Plan", plus €1,1M allocated to privately funded employees and other indirect costs. From 2026 onwards, the PPP will mainly sustain the operating expenditures needed to run the Centre, estimated at around **€4M** and composed as follows (on a yearly basis):

Personnel	~€1,900,000
Direct Materials	~€20,000
Utilities and Facility's Cleaning	~€150,000
Connectivity	~€130,000
Marketing	~€100,000
Third-Party Services	~€150,000
Insurances	~€60,000
Licenses	~€3,500
Taxes	~€1,400,000

According to these previsions, NGHC can generate around **€5.5M net inflows** at full capacity. Two further considerations should be highlighted:

- considering the high-tech facet of the Centre, yearly **depreciation** of equipment, machineries and technologies settles around **€2.6M** (not considered in the aforementioned net inflows, which follow a cash logic);
- in the timespan under-evaluation (17 years), NGHC will necessarily sustain further capital expenditures. These **re-investments** have been estimated by considering the useful life of each asset acquired, assuming the purchase of a new asset once the old one's useful life expires. Hence, re-investments have been estimated close to **€20M** during the full capacity phase and will be entirely covered by a "financial reserve" that the Centre will progressively store from yearly net cashes.

The computation of yearly net cashes, cleared from the yearly re-investments needed, comes with **cumulative cash flows** from 2022 to 2038 close to **€50M (€69M** by including the terminal value of the investment).
Regarding the NPV of the investment, the following data have been considered as inputs:

- Yearly net cash flows, also including eventual re-investments needed.
- A Weighted Average Cost of Capital (WACC) equal to 8.51%. This value is the result of the average of the WACC of healthcare, education and pharma sectors in Europe at 2021 (Damodaran), plus a specific risk factor of 3% to take into account the innovativeness of the project and the inherent risk of delay for break-even results.

Based on these assumptions, NGHC's NPV can be estimated around **€29M.**
The Pay-Pack-Period has been computed by considering non-discounted cumulative cash flows, according to which PBP can be met within **5 years** from the investment.

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