出國報告（出國類別：業務洽談，開會）

2024 ECSITE Annual Conference and Site Visits of European Science Centres

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Summary

The National Museum of Natural Science in Taichung, Taiwan is currently undertaking multi-year planning to renew its content and experiential spaces, which includes its museum, science centre, and theaters. Additionally, NMNS aims to grow its international profile through fostering relationships with peer institutions and museum/ STEM leaders, as a means of promoting Taiwan's excellence in science education, technology development, and climate and sustainability action. This report highlights the outcomes of site visits to science centres in Europe; the institutions included in the travel were selected based on their similarity in physical size and staffing resources to NMNS's existing science center, to serve as analogs for comparison. The travel concluded with NMNS' first attendance at the 2024 annual conference of ECSITE, the European Network of Science Centres and Museums, where a workshop on artificial intelligence was led by an NMNS representative.

Key Words: science communication, museum, informal science education, public engagement

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Report

I. Aims

Between May 26 and June 11, 2024, Curatorial Assistant Dr. Audrey Chang, representing the National Museum of Natural Science (hereafter NMNS) in Taichung, Taiwan traveled to Amsterdam, Netherlands; Helsinki, Finland; Warsaw, Poland; and Ljubjana, Slovenia with the following aims:

- In preparation for the renovation and update of NMNS' public engagement spaces, visit and meet with leaders representing science centers that have recently (within the last 5-7 years) updated and/ or recurated exhibitions to address the relationship between humans, nature and science.
- Visit science centers and museums that have successfully hosted exhibitions on health, public health, artificial intelligence, and the future with the goal of establishing future collaborations on related subjects.
- Meet with representatives of Europe-based design-build companies that have extensive experience with museums and science centers in Asia.
- Host an interactive workshop on AI x Organizational Development at the ECSITE Annual Conference, in collaboration with international professionals in the fields of art, technology, and human resources, focusing on AI initiatives in museums.

II. Background

European science centers are deeply rooted in traditional museums – these museums began incorporating scientific exhibits in the 19th and early 20th centuries. Institutions like the Science Museum in London (founded in 1857) and the Deutsches Museum in Munich (opened in 1903) are early examples of museums that focused on science and technology, rather than on the collections-centric (in the manner of cabinets of curiosities, for example) presentations that are typically associated with natural history and culture museums.

After World War II, interactivity in science learning, the "hands-on" approach, became popular in informal science education. The 1960s and 1970s saw rapid growth in both Europe and North America in this interactive engagement learning methodology. The Exploratorium in San Francisco, founded in 1969, was a pioneer in this field and influenced the development of science centers globally, including in Europe.
The first dedicated science centers began to appear in Europe in the 1970s and 1980s. Heureka opened to the public in 1989 in Vantaa, Finland.

The European Network of Science Centres and Museums (ECSITE) was founded in 1989, fostering collaboration and sharing best practices among institutions. ECSITE has over 350 members representing more than 50 countries, in both Europe and beyond. These members include a wide range of institutions such as science centers, museums, natural history museums, universities, and research organizations. ECSITE serves as a professional network and platform for its members, promoting the role of science engagement in society, cultivating professional growth and development, advocating for scientific literacy, diversity and inclusion, and motivating resource sharing and innovation. The Network achieves these goals through its annual conference, directors forum, and various network projects and initiatives.

ECSITE and its member organizations have increasingly focused on addressing global challenges such as climate change, biodiversity, and public health. Science centers and museums have increasingly investigated digital technologies, creating virtual exhibits and online educational resources to scalably serve more diverse audiences. This evolution reflects broader cultural and educational trends, highlighting the growing importance of science communication and public understanding of science in the modern world.

To benchmark NMNS' planned capital projects against European peer institutions, the following institutions were selected:

- NEMO (Amsterdam, Netherlands): The largest science center in the Netherlands, NEMO offers interactive exhibits and activities that explore science and technology. The exhibition *Humania* was recently opened as a permanent installation; various other galleries are currently undergoing revitalization and revision.
- Naturalis Biodiversity Center (Leiden, Netherlands): Naturalis is one of the largest natural history museums Europe, renowned for its extensive collection of fossils, minerals, and biodiversity specimens and its narrative-driven presentation. The museum combines research and public education, highlighting biodiversity and the importance of conservation.
- Heureka (Vantaa, Finland): Heureka, the Finnish Science Centre, is renowned for its innovative approach to science communication. Heureka features exhibits and exhibitions that encourage exploration and curiosity about the natural world, technology, and, increasingly, science and society. Heureka recently upgraded their planetarium to a 10k dome presentation.
- Copernicus Science Centre (Warsaw, Poland): The Copernicus is one of the leading science museums in Central Europe and the host of 2025's ECSITE annual conference. The Copernicus is currently revising its public spaces to meet the needs of its changing visitor demographics (notably converting Russian-language text to Ukrainian), better foster dialogue with student visitors, and address technological advances (with its new exhibition on AI and the future of humanity).

- Geological Museum (Warsaw, Poland): Located at the Polish Geological Institute, the museum features extensive collections of minerals, fossils, and rock samples, showcasing the geological history of Poland and the wider world.
- National Museum of Ethnography (Warsaw, Poland): The National Museum of Ethnography in Warsaw comprises an extensive collection which includes artifacts, textiles, and artworks that highlight the cultural heritage and practices of various communities, offering visitors insights into local and global ethnography. Importantly, its temporary exhibitions frequently feature art and artists from Poland.
- The Kerniskova Institute (Ljubljana, Slovenia): Located in the Gallery of Contemporary Investigative Art, the Kerniskova brings together transdisciplinary practitioners in scientific research, technology, and fine arts to investigate biotechnologies, mechatronics and bionics.

Entrance to NEMO Science Museum, housed in a Lorenzo Piano-designed building in Amsterdam, Netherlands.

III. Process

Date(s)	Location	Activities
5-27-2024	Amsterdam, Netherlands	Arrival in Amsterdam Meeting with Bruns/ Kossmanndejong
5-28-2024	Amsterdam, Netherlands	Visit Naturalis Biodiversity Center
5-29-2024	Helsinki, Finland	Arrival in Helsinki
5-30-2024	Helsinki, Finland	Meeting with Heureka team
5-31-2024	Warsaw, Poland	Arrival in Warsaw
6-1-2024	Warsaw, Poland	Visit The Geological Museum
6-2-2024	Warsaw, Poland	Visit the National Museum of Ethnography
6-3-2024	Warsaw, Poland	Meeting with the Copernicus Science Centre team, Hüttinger
6-4-2024 to 6-9-2024	Ljubljana, Slovenia	Attendance at ECSITE 2024 Speaker at: ● 6/7 Workshop on AI ● 6/7 Traveling Exhibitions session Visit the Kerniskova Institute
6-10-2024	Amsterdam, Netherlands	Arrival in Amsterdam Visit NEMO

IV. Outcomes

A. Science Centre Presentation Styles

Evident at the science centres visited, and in formal and informal debate during ECSITE, exhibitions are undergoing a transition from phenomenological presentation to narrative-driven experiences. In each of the science centres, for example, both styles of presentation are on view: phenomenological presentations typically use single stations focused on a specific topic (such as gravity, vacuums, light, etc.) while narrative exhibitions stress experience and connectivity, relying more on scenography and storytelling. The latter experience is thought to be more immersive but also requires more financial resources to bring to the exhibition floor.

A creative conference session on the same topic was hosted by colleagues from Vilvite, the Bergen Science Centre; Heureka, Technorama, the Swiss Science Centre; phaeno; the California Academy of Sciences, the Glasgow Science Centre; and designers Kossmanndejong. Titled "On Trial: Storytelling Through Scenography in Science Centres," the participants debated whether or not scenography is an effective mechanism for learning or whether it is a "waste of time and money."

In natural history museums, this transition toward narrative and storytelling has largely occurred in exhibition design. Interestingly, exhibition halls addressing geological content seem to be the exception (see The Geological Museum in Warsaw below, the Gems and Minerals Hall at the American Museum of Natural History, the minerals hall at The Perot, and many other examples), possibly because the specimens are already so unique and captivating. A strong contrast here is the Hall of Fossils at the Smithsonian's National Museum of Natural History, which leverages a narrative on earth's history to motivate the action for the future of the planet.

The Geological Museum in Warsaw, Poland houses several large fossils and a comprehensive collection of gems and minerals from the country.

B. Global Issues through Exhibition Collaboration

Related to (A) above, science centre and museum exhibitions are focusing on social and society issues that impact humans, communities and the environment. Outstanding examples of this work are:

- *Humania* at NEMO, which asks the question of "what does it mean to be human?" and explores evolution, gender, sex and other human-centric issues.
- *Death* at Naturalis, examining why (or why not) death occurs in the natural world.
- *Dress Code* at Heureka, an exhibition on sustainability and consumption as it relates to fashion.
- *Our Journey in Space* at Heureka, which discusses not only the science of space travel but the human decision-making processes and systems that enable future space colonization.
- *Autonomy* at The National Museum of Ethnography, a sociological exhibition on how children and childhood, from post-World War II to today.
- *Artificial Intelligence* at the Copernicus Science Centre, surfacing the opportunities and tensions with emerging technologies.

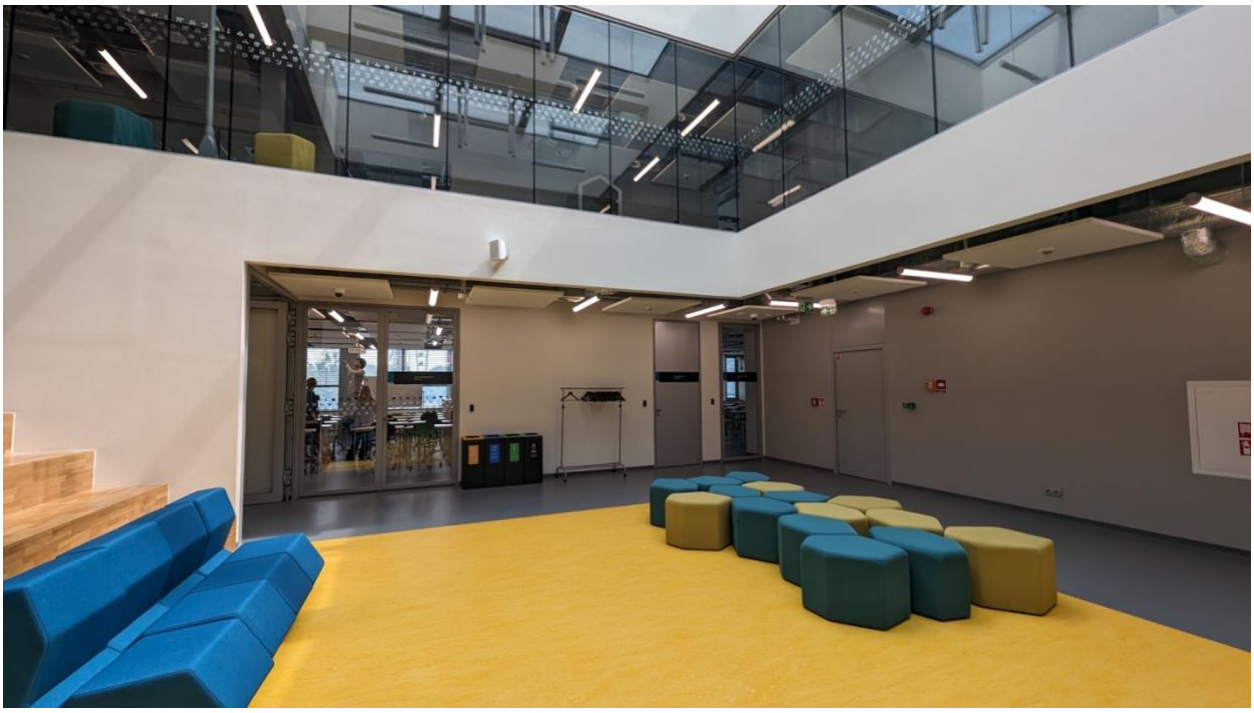
Entry to *Death*, an exhibition at Naturalis Center for Biodiversity in Leiden, Netherlands.

Humania at NEMO features a large sculptural installation; the exhibitions questions what, who, and where humans are in their histories and societies.

D. Flexible Spaces

To better serve communities and staff, museums and science centres have begun to intentionally build flexible spaces that can be converted into work, engagement, and entertainment venues as required by programmatic and revenue needs. For example, NEMO includes a studio space for adult programming and rentals, as well as a maker space that can also be converted for public programs, as it includes movable bleacher-style seating and an overhead truss for lighting and sound. Adjacent is an R&D space as well as a meet-a-scientist space for additional engagement and evaluation/ prototyping opportunities. The Copernicus Science Centre includes a recent

annex to allow more school group learning and onboarding to take place away from the frequently noisy main building. It additionally has added collaborative work space for conference calls and staff collaboration (both pictured below).



E. Art-Science to Engage New Audiences

Museums and science centres are employing art, design and technology to serve more audiences. While “art-science” as a concept has been in frequent use for at least two decades now, it has typically been prevalent in spaces dedicated to its practice such as the galleries of the international network Science Gallery or ArtScience in Singapore.

At the National Museum of Ethnography, the Kwiaty Polski” (“Polish Flowers”) exhibition provided an excellent example of interactive art-science exhibition. Through design, scenography and artistic representations, this exhibition showcased the relevance of native plants in Poland, highlighting the roles that plants play in social activities such as health and healing, rituals (e.g., communions, weddings, etc.), symbolism across diverse Polish communities. The exhibition also contained content on plant biology, anatomy and ecology. Most impressively, this exhibition was both highly interactive and completely analog.

An interactive and analog game in the *Polish Flowers* exhibition at The National Museum of Ethnography in Warsaw, Poland.

A contrasting example was on view at The Geological Museum: Upon entry, visitors are greeted with the winning entries to a juried “space art” exhibition. The competition invited practicing and amateur artists to submit artworks that adhered to the theme of space. Another wing of the museum hosted an exhibition on design and fashion, imagining and realizing the dress and style of Polish-French scientist Marie Curie.

In Ljubjana, the Kerniskova Institute dedicates its space specifically for art-science and transdisciplinary collaborations. Provocative examples on view included sound sculptures, a

biosymbiosis spacesuit, and kerosene robots that modelled biological (fungal) and cyber interactions.

Phonos, a sound installation by artist Marc Vilanova, part of the Creative Collisions exhibition on view at the Kerniskova Institute. The installation uses a computer and recycled speakers to create a sense of a living organism that breathes and "exists" in a world filled with pollutants.

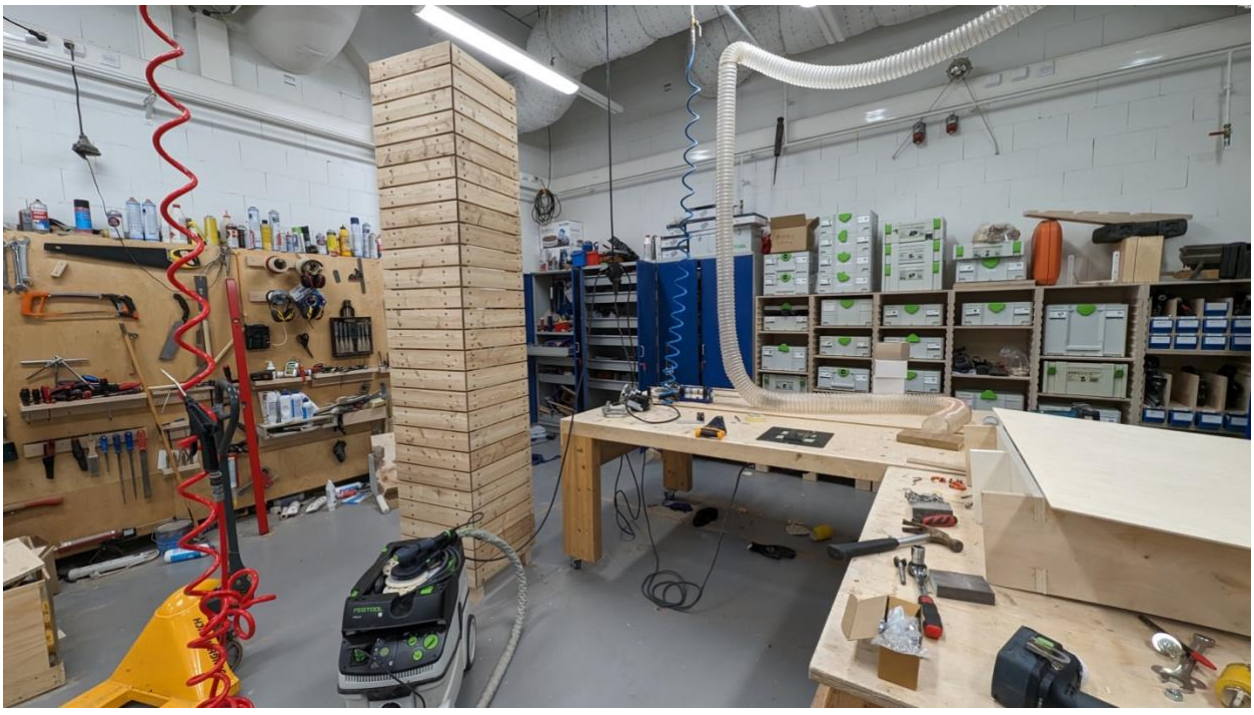
F. In House vs Design-Build Collaborations

NEMO, the Copernicus Science Centre, and Heureka all serve as appropriate analogs for NMNS' science centre, as they share similar missions for public science dissemination, as well as comparable physical footprints. Like NMNS, these science centres also produce their own temporary exhibitions and, in the case of Heureka, serve the greater science centre and museum communities through a traveling exhibitions program.

These three institutions represent differing degrees of investment in in-house capabilities for exhibition design and production (fabrication). Heureka's exhibitions department designs and fabricates almost the entirety of their temporary and traveling exhibitions in-house; their staff include fabricators for exhibitry as well as technologists who design and develop their digital interactives. Copernicus, like Heureka, have a fabrication shop on site and produce some of the scenic elements and casework for their exhibition. However, Copernicus have increasingly been outsourcing their fabrication work for cost and human resource efficiencies. NEMO primarily work with design-build companies such as Bruns and Kossmandejong for their temporary and permanent exhibitions; the projects are managed by the two exhibition developers on staff. While cost-effective, unifying a "look and feel" and designing a consistent narrative style across

the physical space can be challenging in this instance. These three cases demonstrate the trade-offs facing most contemporary museums and science centres between cost, space, and experience.

The machine shop for Copernicus Science Centre's exhibitions team.



The wood shop for Heureka's exhibitions team.

G. AI in Informal Science Education

As part of this year's participation at ECSITE, Dr. Chang led a workshop in collaboration with representatives from The Exploratorium, BLR World, St. Jude's Children's Hospital, and an independent curator. The workshop was titled "AI for Career Growth: It's Not Just Your CTO's Problem Anymore." Designed as an interactive show-and-tell, this session aimed to identify the barriers and pathways to enabling AI and other emerging technologies in museums and science centres engaged in science communication.

Questions addressed during the workshop included the following:

- How much technical knowledge (e.g., on supervised vs unsupervised machine learning) must museum professionals have to leverage AI?
- How do I communicate and influence decisions on technology preparedness to my peers and supervisors?
- What skills should I anticipate needing to be hired/ promoted in 3/ 5/ 10 years?
- What gaps can AI fill? What processes can be improved or supported by AI?
- What do institutions need to prepare to deploy AI for visitor experience, governance, security, fundraising and other areas of museum/ science centre operations?

Session attendees included institutional directors, education managers, exhibition developers and designers from science centres and design companies. Data gathered during the session indicated that the majority of museums and science centres do not currently have either a) an AI governance or ethics policy or b) any professional development and training opportunities for their staff, despite the desire of their staff to better understand the technology and its implications for their work. Critically, most attendees indicated that they are already using AI in some capacity or another in their day-to-day task and activities but are doing so without guidance or support from their institutions.

Teams working on assignments in the ECSITE AI workshop.

V. Recommendations

A. Opportunities for NMNS "Traveling" Exhibitions

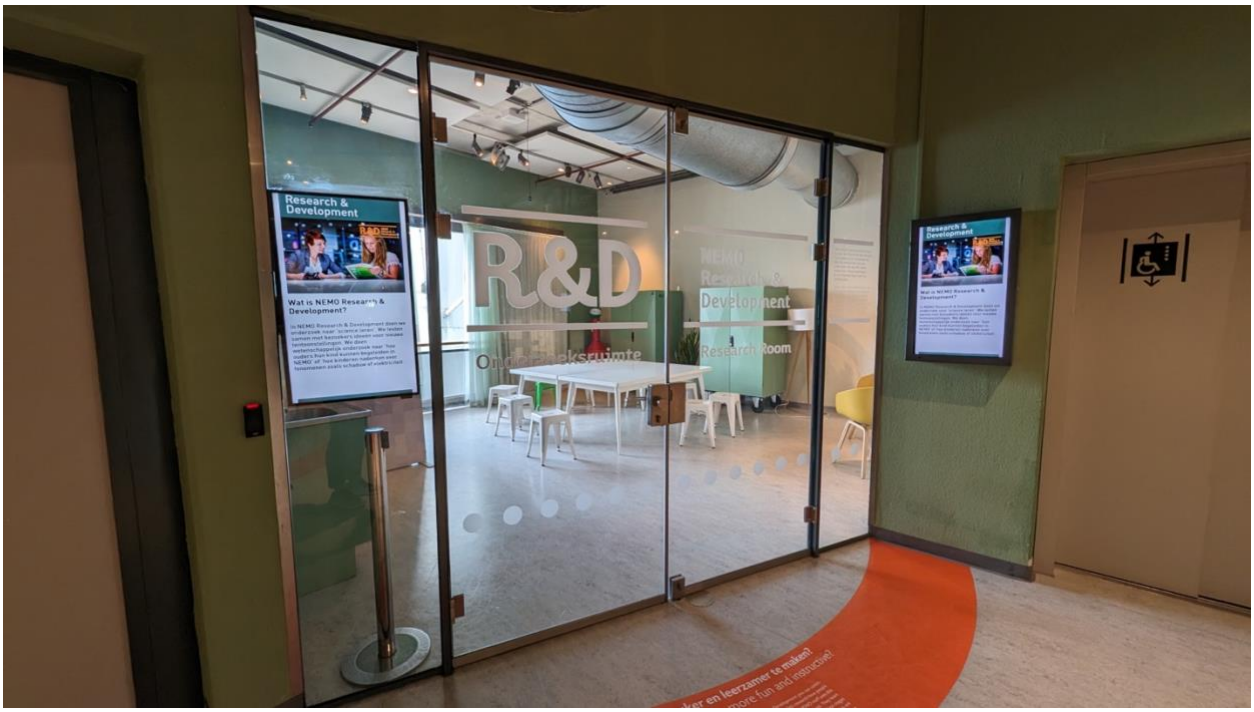
NMNS is positioned to leverage the dynamic science exhibition landscape through the following:

- Collaborating with select exhibition production partners to create new models for touring exhibitions, prioritizing cost efficiency and environmental sustainability while bringing new content to Taiwanese audiences. NMNS can serve as a regional anchor in Asia Pacific, for example, by partnering with European and/ or North American museums and science centres that already have a mature traveling exhibitions program.
- Producing content to pilot an international traveling exhibitions program. Several exhibitions currently in development by NMNS have global appeal and can be designed and fabricated for travel with an international partner. As NMNS currently does not have in-house capacity to manage the sales, licensing and operations of a traveling exhibitions program itself, NMNS can work with a well-established travel-as-a-service organization to distribute its scientific research and communication content in Asia Pacific and beyond.

B. Creating a World-Class Science Centre

The planned renovation of NMNS' science centre offers an unique opportunity to reimagine science education in Taiwan. With emerging trends in narrative-focused presentation, visitor

experience strategy planning, and new fundraising initiatives and opportunities, NMNS is poised to engage international design-build companies to partner on a capital project to better serve its 2.5 million annual visitors, whose needs and expectations are very different in 2024 (and will be even more so in 2030) than when the science centre and museum were first open to the Taiwanese public in the mid-1980s. The science centre investment could take into consideration the balance between exhibition and facilitated learning spaces, technology-driven vs scenographic exhibitry, interactive vs observational education, and other such methodologies. Ideally, the science centre renovation project will coincide with a larger museum campus planning project, resulting in a Central Taichung facility that is a beacon for informal science education in Asia.

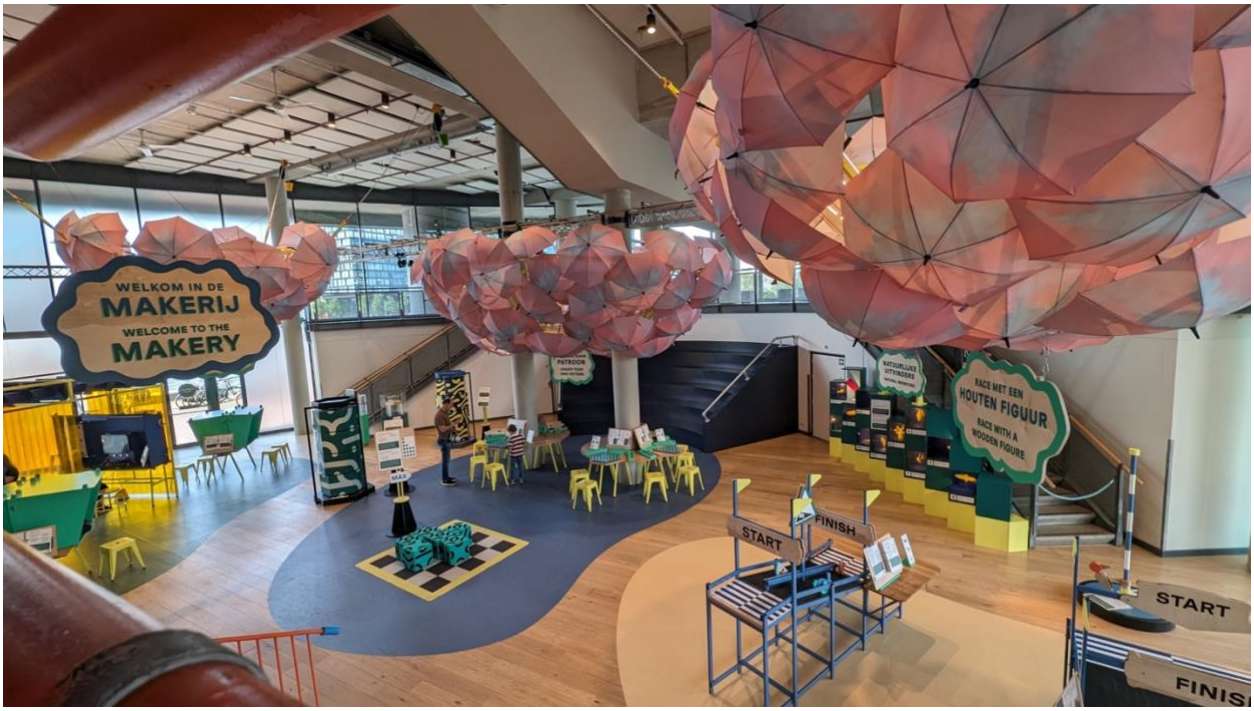


Bringing research, development and innovation to science education at NEMO in dedicated R&D space.

C. Engaging New Audiences through Art x Science

While NMNS has previously incorporated art-science into its exhibitions and programs, transdisciplinary collaboration could serve as a future focus area for the Museum. In addition to drawing new audiences, particularly those youth who do not identify as "scientists" or "technologists," art-science may create new international collaboration opportunities and funding sources (for example, through transdisciplinary research grants, new corporate and foundation sponsors, marketing partnerships). Art-science practices could also open new programmatic areas for NMNS: artist residencies could support science education at the Museum by seasonally increasing human resources while also providing alternative methods for science communication (e.g., through drama, theater, and dance); design and technology training programs could

simultaneously upskill NMNS staff and serve the professional development needs of university and post-graduate students as they embark on their career journeys.



Science centres and museums can serve many different engagement purposes, from art-science, to hands-on learning, to live events. A flex space at NEMO creates many opportunities.

D. Investing in AI

Taiwan is an international leader in science and technology. As such, Taiwan's premier science museum should exemplify the country's leading position in science and technology education. Internally, an AI taskforce at NMNS could pave the way for ethics training, AI governance and policy, and workflow solutions deployment. To serve the visitors, NMNS could host public events, arts exhibitions, and discussion seminars to help audiences evaluate the role of AI and other emerging technologies in personal, social and society decision-making processes. Central to these investments is staff training and upskilling.