Please Follow Me to the Next Stop: A Case Study of Planning, Deploying and Researching a Robot-Guided Tour in a Museum in the UK

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ABSTRACT

Robots are increasingly being used in public spaces in the UK. Museums and galleries are a noteworthy setting for exploring robot adoption, such as for providing guided tours or enabling remote visits. Although robots have been deployed in museums in the past, there is arguably little information about what is involved in the process of both deploying and researching them. In this case study paper, we present our experiences and lessons learnt from conducting a research study of a robot-guided tour in a museum in the UK. We describe the process and stakeholders, and discuss the challenges and opportunities that emerged throughout. We provide recommendations for Human-Robot Interaction researchers hoping to move their investigations out of the lab and into the real world.

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CCS CONCEPTS

• **Human-centered computing → Empirical studies in collaborative and social computing**; *Participatory design*; • **Social and professional topics** → *Implementation management*.

KEYWORDS

robot guided tour, museums and galleries, robot deployment, co-creation, stakeholder involvement

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1 INTRODUCTION

Robots are increasingly visible outside of domestic and industrial settings, appearing now in public spaces as tools, companions, and assistants, and as HCI researchers we are keen to understand what a deployment, in terms of logistics and user experience, entails.

In places like airports and shops, robots are greeting visitors and offering their services [7, 14, 25]. In museums, social robots can serve as tour guides and telepresence robots can give people the opportunity to explore an exhibition remotely [15, 26]. As a community interested in the socio-technical organisation of technology, we wish to understand, not just how the interaction between the robot and the visitor unfolds, but the broader processes involved in getting the technology to that point and what is involved in ensuring sustainable use [e.g., 4, 18, 20].

The literature contains ample studies of robots in public spaces. Starship robots traverse the outdoors to deliver food in cities and university campuses [19, 23]; Servi waits tables in bustling restaurants [11, 16]; and robots such as Pepper [12] are being deployed as tour guides, remote access tools, entertainment providers, and educators in museums [9, 22]. Whilst these studies provide valuable insights into how users might respond to robots in such spaces, there is little discussion as to what is involved in deploying and maintaining such robots in use [3]. We have little information about the process involved in robot deployments "in the wild" and beyond the scope of research. Likewise, there is little guidance on the setting up process prior to the deployment, i.e. all the work with museums in terms of developing the contacts, building the relationships, understanding context, and engendering trust. In order to support organisations in making effective use of robotic technology, we need to understand what obstacles they might be facing and what resources are needed to carry out such a project.

Responding to this knowledge gap, we report on our experience deploying a robotic museum tour guide, throughout the discovery, design, development, testing, and deployment phases [1], and reflect on the lessons learnt. We describe the work involved in engaging with the museum, coordinating with the relevant stakeholders, helping the curators in creating the robotic tour and in handling the ethics of deploying a robot in a public space. As this was a research project, we draw implications relating to a deployment in and of itself, but also relating to the study of such as a deployment. In presenting this case study, we wish to highlight the importance of investigating robots in situ for revealing the broader social complexities of robot use in the real-world. We also wish to encourage work in this field to be more comprehensive and transparent on the implications of technology within the settings it is being deployed in and the practical challenges it engenders.

2 PROJECT OVERVIEW

The deployment presented in this case study took place between 16-21 July, at the Lakeside Arts Gallery and Museum of the University of Nottingham. This was during an exhibition on the history of a health and beauty retailer and pharmacy chain, presenting products, promotional materials and other artefacts from the company's archives. During the deployment, a Temi robot [24] (see figure 1) provided visitors with an optional, free, 15-minute guided tour of part of the exhibition.

3 THE STAKEHOLDERS

The project was initiated by our research team in conjunction with researchers from other universities, as part of a one-year Trustworthy Autonomous Systems Hub grant [10], for the purpose of studying telepresence robots in public spaces, including but not limited to museums. The stakeholders involved were:

The museum and gallery management. Our two primary contacts were in charge of managing access to the gallery space, arranging exhibitions and promoting the robot experience to the public.

Gallery staff and invigilators. These were people who worked at the gallery during the exhibition, answering the visitors questions and ensuring that visitors behaved appropriately around the exhibits. They also supported the project during scoping and setup stages.

Robotics provider. We worked with a Community Interest Company that provides robotics technology and the relevant consultancy, implementation and technical support to enable organisations to adopt robot-based solutions.

Exhibition provider. The exhibition that was being hosted during our deployment displayed items from the archive of a company, who are historically linked to the local area. Many of the visitors to the exhibition were current or previous employees.

Exhibition curators. The exhibition was designed by two curators (the exhibition provider's archivist and a local historian). They have expertise on the subject matter, as well as access and familiarity with the contents of the archive. They are also skilled in creating educational experiences for the public, and were often at the venue throughout the exhibition giving in-person group tours. We worked with them to design a curated tour that would be provided by the robot, which contained additional information on the exhibition than what was already available at the gallery.

Research team and robot lab. Researchers with backgrounds and expertise in Human-Computer and Human-Robot Interaction, Human Factors, Public Engagement, IT Law, and Social Sciences. The Cobot Maker Space [6] is a bespoke research and engagement facility for collaborative robotics located in our university.

4 THE SPACE

The robot deployment took place in Lakeside Arts, the University of Nottingham's museum and arts centre. Specifically, in the Djanogly Gallery space (from here on, referred to as 'the gallery'), which hosts a year-round programme of twentieth-century and contemporary exhibitions. A number of them are related directly to research conducted at the University [2]. The gallery consists of three, wheelchair accessible, interconnected rooms of different sizes. The rooms feature high ceilings and open-floor layouts, allowing for configurable exhibitions. The exhibitions are commonly on display for a few months. In the course of our one-year project (from initial engagement with museum management to robot deployment), three different exhibitions were featured at the gallery space; the deployment was conducted during the third one.

5 THE ROBOT

As mentioned before, the initial interest of our research project was investigating the potential adoption of telepresence robots in museums. As such, the robot we were seeking to deploy was the Double 3, a two-wheeled teleconferencing robot which features a screen, obstacle avoidance and autonomous driving capabilities [21]. As part of the discovery phase and in line with stakeholder

Figure 1: Temi robot providing the guided tour in the museum space

engagement principles of Responsible Research and Innovation [13], we sought to co-define with museum stakeholders the specific uses of the robot so that it not only fulfilled our research interests but would also benefit and provide value to the museum. Thus, we did not have a specific or pre-defined use case, instead we proposed and discussed ideas emerging from past work on telepresence robots in museums such as enabling remote visitors to access the gallery and having an expert or curator remotely providing a tour [3, 5, 17].

Throughout the process, we discussed the suitability of the Double 3 robot given concerns about the remote user's ability to drive the robot safely, particularly around crowded spaces and unconventional exhibits (e.g. artworks hanging from the walls and not touching the floor, as displayed in the second exhibition visited by the research team). Although this robot has built-in functionality to try to avoid problems of this nature, we cannot control what the remote users do. We decided to use instead the Temi 3 robot [24] for the initial feasibility session held at the gallery (see section 6), as this model allowed us to place more clear restrictions on its movement, by mapping the space and create virtual walls to protect certain areas. It also offers built-in functionality for tours without the need for remote operation, which broadened the scope of the project, from only telepresence to guided tours. At the time, however, our robot lab had not acquired a Temi 3 yet and some of the research team were unfamiliar with it. The robotics provider, who was one of the project partners, provided the initial robot unit until our lab purchased one, and provided technical support and training to the research team throughout.

6 THE PROCESS

The entire process of this project took about a year, as shown in the timeline below. We note that some delays are due to the nature of academic research (members occupied by other projects, ethics applications etc).

- **June 2023: Initial contact**
- **November 2023: Researchers visit to the gallery**
- **December 2023: Museum staff visit to our lab for robot demo**.
- **February 2024: Feasibility robot trial at the gallery without visitors**
- **March-April 2024: Planning**
- **April 2024: First ethics application submission**
- **May 2024: Visiting the new exhibition and meeting the curator**
- **June 2024: Mapping the gallery**
- **July 2024: Brainstorming session with the curators and tour creation**
- **July 2024: Ethical approval granted**
- **July 2024 (16th-21st): Deployment. Robot tour available to the public**

6.1 Initial conversations

Our initial connection with the museum and gallery management begun in June of 2023, when we (the research team) hosted a workshop, introducing robotic technologies to the representatives of several local museums. After discussions about the robots needing certain types of spaces to operate (e.g. open floors, no stairs), a management member suggested their gallery which fit the criteria.

Members of our team then visited the gallery in November 2023. During this visit, we were introduced to our main contact from the gallery, in charge of managing the exhibitions. The purpose of this visit was for us to understand whether the gallery could be a viable space for a robot deployment study, and open a dialogue towards planning such a deployment in a way that would be mutually beneficial. Although initially hesitant, by the end of the visit, the museum and gallery management were open to letting us use their space. Their hesitation stemmed from a difficulty in understanding the purpose of a telepresence robot, as well as from not understanding our motivation for wanting to explore such a project, as we had not defined a specific use case (given that we sought to co-explore this with them). However, they felt that a robot could bring good publicity to the gallery and attract visitors. Together, we realised that a robot that could roam the gallery offering information or tours would be more valuable to the museum and its visitors than a telepresence robot. As such, this early touchpoint with the museum and gallery management generated conversations that proved to be a vital initial step to our co-design of the final deployment.

Another big part of engaging with the museum and gallery management during that visit involved explaining to them how the robot worked. We showed them videos of the robot (both from our past projects and from the manufacturers) and provided an explanation of its functionality. Still, they had some concerns over how it moved and whether it could safely avoid people and objects in the exhibition space. As such, we invited them to come and see the robot in our robot lab before deciding whether it was safe for us to bring to their gallery. Following up on that visit, they both then visited our lab a month later (December 2023). During their visit, we gave them a demonstration of a Double 3 robot going around a mock "museum room" and discussed some potential uses (e.g., giving access to visitors or allowing curators and artists to give tours remotely). As a result of this visit, they decided that we could bring the robot to their gallery in a couple of months, when a new exhibition had been set up. This had to happen on a day when the exhibition space is closed to the public. Before making this visit, we submitted an ethics application so that we could video and audio record our use of the robot and conversations or contextual interviews with staff. This was submitted in mid-December and was approved in late January; given the gallery was used when closed to the public, the risks involved in the research were considered minimal.

6.2 Feasibility session

As described before, we switched to the Temi 3 robot and involved the robotics provider to facilitate this process (see 5). The Temi expanded the possible use cases from telepresence modality to also offer a pre-set tour as a main feature, which was the museum and gallery management's first interest. The research team and a representative of the robotics provider visited the gallery for a full day in February 2024. An invigilator was present at the gallery at all times and was invited to engage in discussions around practical and conceptual elements of the planned deployment. One of the managers and another staff member also dropped by during the day to check in on progress and join in discussions. The main purpose of this session was to explore the technical feasibility and constraints of using the robot in the gallery. We first explored the space and exhibition without the robot, marking areas of potential risk or challenge (e.g. Can the robot avoid the item even if this is not touching the floor? Can a remote person, using the telepresence mode, see the paintings on the wall?). The robotics provider representative had pre-prepared information about the exhibition found online, including photos, text and video for three main exhibit items. Once at the gallery, he mapped the rooms. This is done simply by selecting the Temi's mapping mode and leading the robot around every part and corner of the room using the 'follow' function (i.e. the robot detects a body and follows it around) until the map is completed. The map includes the objects in the space as obstacles so that the robot can avoid them later on. Mapping must be conducted without people coming across the robot, otherwise the robot detects them as obstacles and includes them in the map too. The research team and invigilator observed the mapping process in action. The robotics provider created a quick three-stop tour, using the previously prepared resources; it was demonstrated to the research team, the invigilator and management. The telepresence mode was demonstrated too. These demonstrations facilitated more grounded discussions of practical uses of the robot in the gallery. One of our key lessons learnt from this session, was that when the invigilator present on the day was asked whether she trusted the robot, she expressed she did because she was there when the mapping occurred, and she witnessed our testing and was able to ask questions about the robot functionality in the moment. The main outcome from the visit was that the managers agreed for us to have the robot deployment during the last part of a new exhibition, running May-July 2024. It could be argued that this session was key to support the level of technical understanding needed by the management and invigilators to act as 'competent' stakeholders [8] able to exercise judgement adequately for the project.

6.3 Research planning & ethics

Following the initial conversations and feasibility testing of the robot, we spent two months (March-April 2024) planning the deployment and the logistics of conducting a study around it. We wished to study the reality of how people interact with and behave around a robot that is incidentally encountered in a crowded, public space and capture the visitors' 'real-world', unprompted responses. This would be achieved through video recording of interactions between visitors and robot by the research team. Of course, this raised a lot of discussion on appropriate ways of tackling data collection in ethically compliant ways. We submitted the first application to our school's research ethics committee on 24 April 2024, and received our final approval on 14 July 2024, after 6 revisions to the application as well as a Data Protection Impact Assessment (DPIA) produced in collaboration with and approved by the University of Nottingham's Data Protection Officer (DPO). Ethical approval for studies involving more than minimal risk usually takes 1-2 months.

A core reason for the delay in ethical approval was the conversation evoked around the incidental collection of data from members of the public who did not opt to use the robot as direct study participants but were in the museum when recording was taking place (i.e., bystanders). This 'grey area' presented novel challenges around what might constitute as 'surveillance' and how to protect and respect the privacy of bystanders - particularly those deemed 'vulnerable' by law. We resolved this by placing posters throughout the space, providing clear warning that recording was taking place with additional information and our contact details, as well as by placing signs with the words 'Recording' on our camera devices whenever they were turned on. In addition, front-of-house gallery staff were asked to inform visitors at the entrance that the robot was in the gallery, and they might be caught on camera when recordings were happening, in particular those who could not visually access the information sheet (e.g. visually impaired visitors). In addition, we ensured that it was clear in the DPIA that the robot itself would not be collecting data from visitors or performing any kind of facial recognition on them.

Further, in the case of child visitors, we resolved to only use their data in the case of particularly relevant episodes of interaction. For this, we would seek informed consent from a parent or legal guardian, and fully anonymise any data, ensuring that the child is never recognisable. We made sure to always have at least one research staff member who is DBS checked during the sessions taking place at the gallery. In practice, we did not record episodes with school groups at all, even when they were present, and they did interact with the robot. Ethics reviewers also raised questions on the physical safety of the robot towards people and objects. In response, we ran a number of tests throughout the feasibility session to prove that the robot can only move where the map allows it, also configuring the robot settings so that when it senses an obstacle it cannot avoid, such as people, it stops before reaching them. We also solidified a protocol that there would always be a member of the research team observing the robot in use and ready to intervene in emergency scenarios.

7 CO-CREATING A ROBOT TOUR

During May-July 2024, we familiarised ourselves with the exhibition and then worked with the curators and robotics provider to create the robot tour. Initially, one researcher attended the exhibition, participated in a guided tour given by a museum volunteer; photographed the exhibited items, their arrangements and room layouts; and compiled preliminary fieldnotes from observations. As we were waiting for ethical approval, no personal data was collected.

We then met with one of the curators to introduce the project, the robot, and the planned deployment, using a video to showcase the robot in use. At this stage, we were keen on doing both modalities (telepresence visit and robot-guided tour). The curator (exhibition provider archivist) expressed interest in a tour via telepresence that could be livestreamed to the exhibition provider's employees.

In June 2024, the robot provider supported the mapping of the exhibition, which had to be conducted when the gallery was closed to the public, as the space needs to be empty for this purpose. We predefined a few locations as potential stops for the tour, including the angles of the screen and the direction the robot would face to deliver content (i.e. playing videos, showing photographs, narrating text-to-speech). In early July 2024 we held a session with both curators and the robot at the gallery. After demonstrating the robot, initial discussions led us to focus on continuing to create the robot tour for the visitors in the gallery, forgoing the telepresence modality due to time constraints. The curators spent some time looking around the exhibit and brainstormed together about potential content for the tour, after seeing the robot moving between stops within the exhibition. Some topics discussed and insights emerging from the tour creation were:

Prioritising narrative. It became clear that each exhibit can have numerous narratives embedded in it - providing a tour requires choosing one of those narratives to prioritise. This raises further questions around who should decide which narrative is spotlighted, and where responsibility lies for ensuring other narratives are not 'drowned out'.

Affordances and constraints. The Temi is capable of showcasing different media types on its built-in screen, including video, photographs, and narrating text aloud. Curators tapped into their expertise and creativity in light of the robot's features and limitations (e.g. fixed sequence, little interactivity).

Tour content. Curators were careful to discuss whether the tour should focus on providing additional context for items on display, or offering supplementary material that otherwise would not be accessible to the visitors.

Tour theme. The curators discussed the possible narratives embedded in the exhibit and chose 'beauty' as the theme for the robot tour. This theme was chosen as it was not a theme explicitly explored in the exhibit, allowing the robot to tell a different story to that seen at first glance.

Creating flow. To craft the narrative for the tour, the curators returned to physically looking around the gallery to identify cohesive elements that would play together to ensure narrative flow.

Identifying stops. Curators then worked collaboratively with the research team to identify stop points for the tour, drawing on knowledge gained in the feasibility and mapping session, as well as experiential knowledge of the gallery space. Six stops were defined across the three gallery rooms.

Populating content. Curators provided the research team and robot provider with a mixture of video, text, and photographs to populate the content for each of the stops. The videos included the curators showcasing and discussing additional items not displayed in the gallery, interspersing the robot tour with elements of pre-recorded guided tours delivered by the curators.

Testing. The full tour was compiled by the robot provider and tested by the research team prior to deployment to leave time for unforeseen issues to be identified and addressed (although in this case, only minor tweaks were needed).

8 DEPLOYMENT AND RESEARCH

We finally had everything prepared and were able to deploy the robot on the last week of the exhibition, between Tuesday 16th and Sunday 21st of July 2024. On the first day of the deployment, we arrived at the Gallery one hour before the exhibition opened to visitors in order to prepare. The robot provider brought the Temi robot and set it up, including its charging dock, by the entrance of the exhibition space. We met the gallery staff and invigilators that would be working there that week and explained to them our project and how the robot worked, giving them time to ask questions. We also put up the posters with information about the robot and our study. On that first day, we did not collect data. We just invited visitors to try the robot and observed how they interacted with it. Towards the end of the day, when the crowds subsided, we tested potential camera placements for the following days' data collection.

During the next three days of the deployment (Wednesday, Thursday and Friday) we focused on collecting video data of visitors' interactions with the robot. When people expressed interest in the robot, or lingered around the entrance of the exhibition space, we approached them and talked to them about our project. If they were willing to take part in the study, we turned on our recording cameras, put up signs informing bystanders that recording was taking place, and recorded them as they followed the robot's guided tour. We had one camera attached on the robot, one held by a researcher who followed the participants, and two stationed in the central areas of each main gallery room. This allowed us to record the tour from multiple angles and capture peripheral, bystander behaviours (e.g., people moving away from the moving robot). In addition to the researcher following the participants with the camera, there was always one additional researcher present, looking after the other cameras and available to answer the questions of bystanders regarding the recording. In the cases where people were interested in the robot but not willing to be study participants, we allowed them to try the robot tour without being recorded. At the end of each day, we uploaded all video data onto our secure university project OneDrive and removed it from the devices.

For the final two days of the exhibition (Saturday and Sunday), we again ceased data collection and allowed visitors to freely try the robot if they wished. By that time, the museum staff had grown accustomed to it, and were able to monitor its use on their own (e.g., turn it on and off, ask it to return to its starting position, explain to visitors how to use it and intervene if it stopped working). Throughout the deployment we also spoke informally with visitors and staff about their views on the robot and took field notes on people behaviors around it.

9 DISCUSSION

9.1 Facilitating trust in the robot

The initial observation derived from our project is that we organically followed a gradual process to build trust with the stakeholders, from no exposure to the robot, to initial exposure in a safe controlled space, to feasibility testing in the empty gallery, and finally deployment amongst the public during opening hours. Our key insight is a dynamic understanding of **trust as both a process over time and an emergent feature occurring during interaction**. For the former, we refer to the trust building process with the stakeholders to ensure the robot is reliable, in this case, that it will not collide with people and the exhibition. Further, we note the example of the invigilator present at the feasibility session trusting the robot because she saw the mapping process happen. This highlights the importance of involving people in the process, and how even only letting them witness the robot in action can support trust building. For the latter, we refer to those observed instances in which museum stakeholders and even visitors trialled the robot's capabilities, such as by walking in front of it to test the autonomous navigation and object collision features. However, it should also be remarked that as this museum and gallery are run by our University, there may have been some pre-existent trust in research projects.

Moreover, it should be noted that the initial worries (before the feasibility day) from the gallery and museum management existed because the content they were exhibiting is not theirs. It's not just trust in the robot on the line, but trust in the museum as a venue for exhibits, artists, funders, curators, and visitors is also at stake. If there is an accident during deployment, it is not only the research team that have to deal with the bulk of the damage. Thus, making sure the museum and other stakeholders have everything they need (e.g., time, reassurance, demonstrations) to be on board is a crucial part of the process.

Lastly, there is further work to be done for facilitating robot ownership and long-term adoption by museums and galleries after deployments like this one. In previous projects, we have seen a move whereby ultimately museum and gallery stakeholders are the ones leading technology development and deployment. Future work should explore the path towards museum and gallery management, staff, and curators being in charge instead of, or equally involved as researchers.

9.2 Managing research timeframes and stakeholder engagement

One of the biggest challenges faced in this project was managing and balancing the timelines of the stakeholders involved (i.e. the museum staff, the curators, and the robotics company) and aligning it with the research team availability and research process. For instance, in the spirit of participatory and co-design HCI, we were hoping to co-create the tour with the curators and involve the staff members (including front-of-house invigilators) in earlier stages of the planning, but given the time constraints, we could not document any of the sessions or arrange more elaborated activities, as we were waiting for ethical approval. For the same reasons, curators had very limited time for the tour creation.

It is important to note that for this case study, **some activities could only happen once the exhibition was on display**, for example, the deployment requires that the robot maps the specific room layout in advance to co-designing the tour. Given that the exhibitions normally run for about 3 months, in addition to varying time availabilities, we had limited time to organise and conduct the necessary activities (e.g. mapping, co-designing). This constraint, however, may be only relevant to museum and gallery spaces that display temporary exhibitions.

Although we did not collect data of our engagement with all the gallery staff and invigilators, we had conversations with them during the deployment week and obtained positive feedback from their experience working in the gallery while the robot was providing the guided-tour. For instance, one of the invigilators told us that the robot did not induce worries about replacing their role but instead made the job interesting and fun, especially after 3 months of the same exhibition. Given the involvement of multiple stakeholders, we noted that **varying interests, expectations, and expertise were at play** (e.g. the curators know how to design a museum tour, but they cannot program the robot, whereas the research team or the robot provider cannot create the tour content.), including our own (i.e. aiming to observe and collect data about robot usage in the gallery). There are perhaps more stakeholders than it is feasible to suggest a researcher should interact with, however, ensuring the time and space for channels of communication to snowball was important (e.g.museum management getting curators involved). Thus, future deployments of robots should seek that each party derives some benefit from the process, provide appropriate communication between them, and sensible time for everyone to contribute throughout.

10 CONCLUDING REMARKS AND RECOMMENDATIONS

The insights from our experience planning, designing and researching the robot deployment in a real museum offer valuable implications for the future deployment of robots in public spaces, particularly in relation to the heritage sector. Key lessons learnt from this project reveal that stakeholder engagement is crucial for trust building, but balancing varying interests, expectations and expertise should be considered throughout the process. We observed that trust in the capabilities and robustness of the robot emerged from gradual exposure to it, and that the robot was not only the medium through which the tour was provided, but it was a salient material inspiring and shaping its content and design. We provide the following recommendations for others wishing to conduct similar robot deployments in museums and galleries, foregrounding how to provide value to, whilst promoting meaningful engagement with, real-world organisations and stakeholders.

- Mapping the stakeholders' interests to the value the deployment could provide to them. This could include attracting more visitors (in-person or remote), enhancing the visitor experience, reaching out to a specific target group, promoting their business, bring good publicity, etc.
- Facilitating gradual exposure to the robot, if possible, in different settings with different safety stakes.
- Preparing demos of robot capabilities (in person and video recorded) preferably related to the use cases of interest. This will achieve a number of goals including introducing the robot to stakeholders who are unfamiliar with it, showcasing its functionality, testing its robustness, facilitating trust and prompt creative practice. Be prepared to update or create new demos as the project evolves.
- Exploring the robot as "design material" by prompting and facilitating creative practice with it for artists and curators (e.g. observing and using the robot during brainstorming and tour creation).
- Outlining the specific characteristics and purposes of the exhibition to design the robot deployment, such as layout, status (i.e. temporary or permanent), and information available (or not) in the room. Every exhibition will present different challenges and affordances.
- Considering the focus of the project within the spectrum: from only deployment (e.g. focus on technical and social feasibility, limited data collection, less focus on interaction) to only research (e.g. collecting data of robots already in deployment, focus on naturalistic interaction). This can help to prioritise scope and efforts to be accomplished within the time available.

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