Chapter 6

Ethic Reflections about Service Robotics, from Human Protection to Enhancement: Case Study on Cultural Heritage

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Additional information is available at the end of the chapter

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Abstract

In a vision of future implications of human-robot interactions, it is vital to investigate how computer ethics and specifically roboethics could help to enhance human's life. In this chapter, the role of design expertise will be emphasized by setting multiple disciplines into a constructive dialogue. The reflections will take into consideration different themes, such as acceptability and aesthetics, but above all the ability to generate value and meaning in different contexts. These contexts could find a description in the concept of human enhancement, connected through each other with the skills of the design research. The methodology of the design research will find applicability in the case study of Virgil, where a roboethic approach is contextualized into a cultural heritage field. In this field, it is shown how the ethical approach will bring a benefit to local communities, but at large to any social and cultural strategies involved in the stakeholders' network.

Keywords: roboethics, service robotics, design research, cultural heritage, human-robot interaction

1. Introduction

This chapter presents a reflection about the future implications of human-robot interaction. It is a common belief, in fact, that robotics, especially the service category, will have a great impact on many aspects of our society in the near future. Society is actually experiencing what Łichocki et al. [1] defined as a "robotic demographic explosion." Given the complexity of this emerging society, the interdisciplinary cooperation between different disciplines will play a strategic role in this coming era of human-robot coexistence [2].

The development of service robotics implies that, very soon, human and robots will need to learn how to share not only environments but also activities. This might result in competition between the two subjects, as in the case of industry automation and the issue of job loss [3]. In this scenario, roboticists will play a decisive role in the establishment of the boundaries of this competition. Being aware of this responsibility will also shape the future directions of this discipline.

The theme of human replacement in many activities is already widely addressed, both from scientific community [1, 2, 4] and from mass media [5–7]. Furthermore, the relationship between man and machine has always fascinated science fiction writers who often enjoyed imagining futuristic scenarios where robots affirm their domain. These dystopian futures, over the time, favored a general negative attitude of people toward robots, who were mostly described suspiciously by the writers.

The scientific debate, instead, has always questioned which effect might bring this scientific and technological progress on productive systems and, in particular, on human activities. The main position statements, from the scientific/humanistic perspective, are represented by two conflicting ways of thinking. On one hand, the technological progress of robotics is considered a positive phenomenon, whereas on the other hand, there is skepticism against the diffusion of robots.

Regarding this skepticism and the main fears, an issue is represented by the fact of not knowing where the technological progress is leading: the concept of technological singularity [8], namely, the civilization status where the technological progress accelerates beyond the human capacity of understanding and forecasting its behavior. However, some experts stated that there is no need to worry, since the diffusion of new technologies has always created new jobs for people, while replacing the old ones [9]. The result, then, is a displacement rather than a replacement.

Therefore, a possible answer could be to rethink the human role, by redesigning its behaviors and life style. It is necessary, then, to investigate the key aspects of these new conditions. If machines can perform a work better than human, it is not reasonable to not allow it to do that work. Humans, then, should take this as an opportunity to do/become something else. Regarding this, Brynjiolfsson and McAfee affirmed that "there's never been a worse time to be a worker with only 'ordinary' skills and abilities to offer, because computers, robots, and other digital technologies are acquiring these skills and abilities at an extraordinary rate" [10].

Thus, the theme of competition in work environment is still a hot topic in the debate about human-robot interaction. This is due to the fact that, even if machine were developed by humans to support them in risky, harmful, and repetitive works, the development of artificial intelligence is nowadays raising the risk of excluding people from productive processes. However, many researchers believe that this statement is not valid anymore. Frey and Osborne [11], in fact, highlighted three main kind of human tasks for which there is no risk of replacement from computing and robotics, at least in the short term. These three categories consist of tasks that require a high sensorial perception and manual dexterity, creative tasks, and tasks that require social intelligence. According to the authors, these tasks are still not replicable by artificial intelligence, since it is not possible to design a software that is able to equate sensorial perception or manual dexterity, and because the psychological processes that characterize creativity and social intelligence are difficult to be specified. As a matter of fact, even machine learning algorithms based on big data are unable to codify certain human processes, such as negotiation, persuasion, or concern, that are required in certain tasks. These assumptions drove Frey and Osborne to redefine trades and professions on the basis of the previous tasks categories. The more these tasks are relevant for a work, the more the related profession needs to be prevented from the risk of automation.

All these reflections highlight that technological development should not be the sole driver for the future of society, but rather, new common strategies and methodologies are required to manage the relationship between humans and machines. One of these development strategies is represented by *roboethics*. This term, coined by Veruggio [12], stands for a discipline that aims to establish the basis of human-robot relationship. This discipline is based on two main principles: the dialogue between all the actors involved in a project, and the creation of relationships among these actors for achieving shared solutions. From the service robotics, and the human activity replacement, point of view, roboethics is important, because it does not provide answers, but it rather generates the conditions that, in a project, can foster the appropriate questions about the impact of a robot both on society and the territory.

The academic debate that is developing around the use of robotics in everyday life has therefore attempted to propose a reflection about ethics and work of the future. The discussion is designed on competitive factors between human beings and machines such as cross-cultural competencies, transdisciplinarity, and adaptive thinking [13]. In general, at this precise moment in the history, the paradigms of machine usage are changing, as well as the motivations of their production. There is a shift from machines built to protect and preserve humans, to machines that can enhance human abilities, giving to the human itself a new meaning.

2. Human enhancement

Gerd Leonhard [14] affirmed that it is correct to exploit technology, as long as people are not addicted to technology themselves. In fact, on one side, digital systems are getting more and more efficient, whereas on the other side, people are losing some human characteristics. Regarding this, the futurist Leonard coined a neologism: androrhythms. This term is meant for describing what is particularly relevant for people: human's rhythms, not machine's rhythms, namely algorithms. The androrhythms includes human aspects, such as empathy, compassion, creativity, and storytelling. The risk, unfortunately, is to lose these rhythms in favor of automation [14].

The main impact that robotic technologies might have on humanity can be associated at three main levels: activities, environment, and relations. Roboethics should take into account all these levels not only by addressing all the possible negative consequences but also all the opportunities to enhance humanity and create value [15]. Regarding human activities, for instance, robotics could be used to support existing tasks by providing new tools or by replacing existing tasks for people while providing them new tasks. From the environmental point of view, robotics may be used to replace people in unsafe environments, to prevent environmental damage from human, or to provide more effective tools for environmental care, such as restoration, or energy management. Finally, concerning relations, robotics might be an opportunity for connecting people through remote embodied interaction, or it could be used to promote social behaviors in people with special needs, such as autistic children, hospitalized patients, or elderly [16].

In the book "The second machine age," Erik Brynjolfsson and Andrew McAfee try to predict the future relations between human jobs and robotics [10]. Many tasks that human find easy and natural to execute in the physical world are tough to be managed by a robot. As per Brynjolfsson and McAfee, the working classes that are going to be replaced ruthlessly by this technology evolution are analysts and market expert, because their repetitive working methodology of analysis is going to be substituted by an algorithm managed by an artificial intelligence. Concerning physical activities, humans have more flexibility in respect to machines. Automate a single work task activity, like solder a wire or put a screw, it is relatively easy except if the machine operates in a controlled environment and all the passages that the robot has to progress are clear and that is why in the production chain, machines are always overseen by humans. Neumeier [17] defines this as a robot curve of a job. "The Robot Curve shows that pushing capabilities down the curve produce profits. Every time a new idea become a professional practice or a professional practice becomes a rote procedure, or a rote procedure becomes a robotic operation, there's a chance for someone to profit" [17]. Neumeier did not see the robotic revolution as a closure; for him, the robot curve is a waterfall of opportunity that flows from the creativity to the automated. For the researcher, the humanity is in a recession, because we are confusing cause and effect and we are trying to apply industrial age ideas to robotic age realities, and the result has been a creative and economic vortex. As designers, we have to start to rethink the future work and give to the future worker new skills, not in competition with the ones of the machines. In this sense, the Institute for the Future IFTF, an independent, nonprofit research organization, in 2011, published the report Future Work Skills 2020 [18] (**Figure 1**).

In the report, both the characteristics of the future work and the main technology driver to achieve those results are described. In conclusion, the demographic grown run faster than the grown of the workplace and the productivity is no more related to the occupation. Martin Ford, the author of the book "rise of the robot," underlines how the automation may lead to a global unemployment: millions of workers will be out from the labor force without the possibility of getting back into it. The question is: What will these people do? There is no an absolute answer to this issue, but today, humanity can count on an incredible set of knowledge. We have a huge baggage of data and information, crossing them, we could have the possibility to solve problems that we drag from centuries [19].

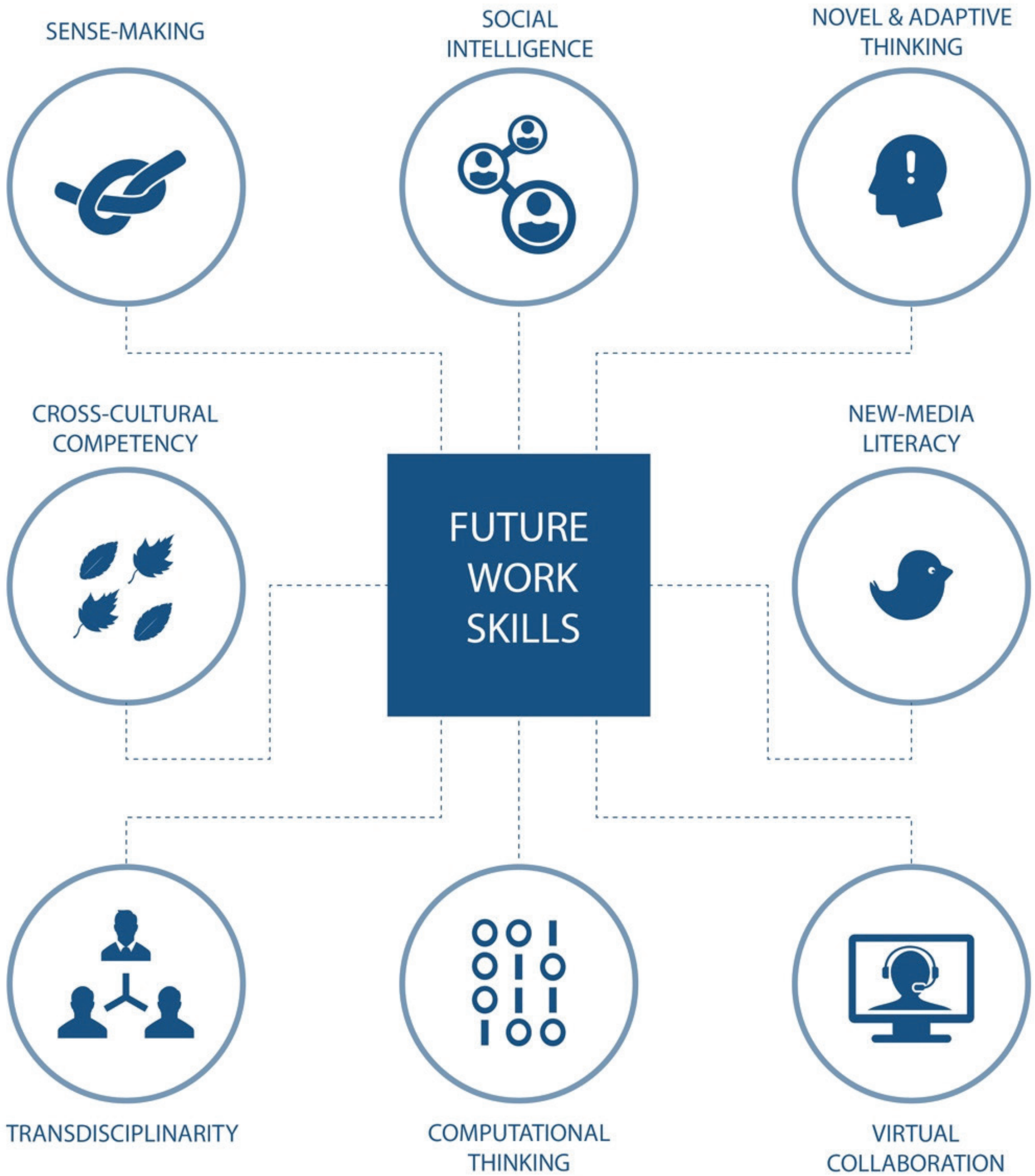

Figure 1. Future work skills referred to the work by Davies et al. [18].

3. The role of design research

Recently, different competences were conveyed in the robotic field. If robotics was firstly a primary field for mechanical and electronic engineering, nowadays multiple discipline and knowledge contribute to it. The evolution of robotic artifacts led researchers to question themselves about different themes, such as acceptability and ethics. For this reason, it was necessary to extrapolate the debate to different disciplines: design is just one example. Through the contemporary design discipline, in fact, roboticists extend their ability to generate value and meaning, creating relationships among technology, human needs, and contexts. Accordingly, the design discipline can contribute to the robotic field at three main levels: artifact, stakeholders, and context.

The design actions that focus on the *artifact* level consists mainly in the application of design practice methods for the development of novel robots. In this regard, Luria et al. [20] provide a further description of the aspects addressed through the design process, especially in the case of social robots. They explain that designers are asked to face three interrelated robot's aspects, namely, morphology, nonverbal behaviors, and interaction schemas [20]. Many case studies present detailed descriptions of robot's design processes, in which it is possible to identify some common actions. The first design ideas are usually explored and shared through sketches and 3D models, as shown by Refs. [20–22]. Then, a key role is played by the prototyping actions. From low-fidelity to high-fidelity prototypes, tangible artifacts, which appear or behave as desired, allow fast testing and iterations, as reported by Šabanović et al. [23]. Finally, usability testing represents another common action in the design of novel robots. Vandevelde et al. [24], for instance, developed a robotic toolkit, that is easy to build, by doing multiple design iterations and regularly testing with non-expert users.

Given the focus on practice-based methods for the design of artifacts, it is possible to state that at the first level, the design action is characterized by the adoption of the Research through Design (RtD) approach [25]. In fact, even though none of these examples make explicit reference to RtD, they all employ "methods, practices, and processes of the design practice with the intent of generating new knowledge" [26] which perfectly falls in the definition of RtD given by Zimmerman and Forlizzi.

RtD, however, is not limited to the employment of design practice methods. As also mentioned by Zimmerman and Forlizzi, RtD emerged from different design approaches, such as participatory design and critical design, that go beyond the artifact in favor of a deeper understanding of human perception, emotional reactions, and emerging behaviors. These aspects introduce the second level to which design research can contribute: stakeholders.

As *stakeholders* are intended *any entity who can affect or is affected by a project, referring to the definition by* Freeman [27]. As a matter of fact, the efficacy of each project results on one hand from motivations, visions, and methods of who develop a project, whereas on the other hand, it depends on many user acceptance factors. Given this fact, it becomes crucial to identify all the actors who can potentially interact with the project. A key action for that is represented by stakeholders mapping [28], which results in graphical visualizations that allow to increase awareness on implications and consequences that a project might have [29].

Other key design actions, focused on the stakeholders, address more specific aspects of perception and people's attitude toward robots. In particular, participatory design methods, such as interviews, questionnaires, hands-on workshops, etc., are often adopted with various aims. They can be employed to get knowledge about different aspects of robot's acceptability, such as in the questionnaire-based study by Choi et al. [30] aimed to identify positive and negative aspects of edutainment robots according to parents. In other cases, these can be aimed at observing emerging interactions, for example, an ethnographic study with users performed in elderly care center in Japan [31]. Furthermore, participatory design can engage creatively the stakeholders: to cocreate robotic solution that in this way results from the mutual shaping between society and technology [32].

Participatory design actions can also be focused on the understanding of physical and socio-cultural factors that determine the specific nature of a *context*. This third level of design actions, in fact, is often characterized by actions like context mapping [33], immersive investigations, interviews, and direct observations, which aim at investigating the current scenario, as well as to develop design proposals, that usually take the form of design scenarios [34] or storyboards.

It is evident that these three main levels of design actions are deeply interconnected. Every design project, indeed, affects all the factors mentioned above. Even though some projects might focus on more specific aspects of human perception, whereas others more on contextual challenges, every project has some implications at all the three levels. Every design project, in fact, results from the simultaneous investigation of four key assets: form, function, value, and meaning. Speculations about the form, which can be considered the traditional matter of design, takes shape from the combination of creativity with technical feasibility and new technological opportunities. Function, instead, results from the meeting of technology with actual needs. The value is created at the crossroads of economic profit and the humanities' search for interest. Finally, meaning arises out of the encounter between the hermeneutics of humanist culture and the intuitions of art. These aspects, specific of the design culture, match with roboethics, and the design methodologies represent a valuable tool to develop acceptable robotic solutions.

The project Virgil, a telepresence robot for cultural heritage, was developed by taking these considerations on ethics and the role of design research. The project was aimed at achieving an ethical solution by addressing the artifacts, all the possible stakeholders, and the specificity of the contexts.

4. Virgil, a case study with a roboethic approach

Virgil [35] is a project that was conducted by Politecnico di Torino in collaboration with the TIM Jol CRAB, a private research lab focused on cloud-robotics-related projects, among which is the telepresence robotics. The research, developed with applicative purposes, represented a good chance to apply the methodologies of roboethics design. Starting from an in wild experience set up in the Racconigi's castle, a territorial museum inserted in the cultural heritage of the Piedmont; the primary goal of the project was to develop a robotic service application for cultural heritage (**Figure 2**).

This experience, drawn up by participatory design approaches, was aimed to enrich the museum visiting experience, through a digital tool that increases the interactivity of the visit. At the beginning of the design process, shared ethical reflections were made through the iterative

Figure 2. Racconigi's Castle, Italy.

dialogue between the design team and the stakeholders. Four important ethical guidelines have been highlighted. Firstly, the robot has to enhance the work of the museum guide and does not be competitive with it (technology as support). Second, the telepresence operability of the robot makes it capable of being moved and show in real time the inaccessible area for people of the museum. Third, the robotic solution does not have to overstructure the environment and spoil the artistic aura of the cultural heritage. Fourth, the robot can overtake the issues related to the architectural barrier and make the whole area accessible for people with motion disability (**Figure 3**).

According to the roboethics reflections, the main guideline followed during the project was to avoid the human work replacement of the museum guide. Furthermore, instead of replacing the human work, it was enhanced by providing a novel tool, together with new skills and new interaction opportunities. Applications of robots for museum purposes can be resumed in three categories: as a museum guide, in telepresence, like installation. For which concern robot used like a museum guide, the two model samples taken in consideration in the developing of the project were TPR-Robina and Robot Norio. TPR-Robina is a typical example of use of robot in substitution of the human work. The robot was used in Kaikan's museum [36] in early 2000 for welcoming and routing the visitor. The application was not successful because of issues related to the interaction between the people and the robot, it was basically too slow when answering the visitor's questions. Robot Norio, on the contrary, was used to enhance the capability of a disabled guide to conduct in a remote way a tour of the visit at Château d'Oiron [37].

The solution presented with Virgil's project stays in between the two samples. It is possible to say that nowadays, this kind of application presents some deficiencies regarding adaptability to the tour of visit, aesthetic coherence, and easiness of communication with the visitors (in particular robot as museum guide).

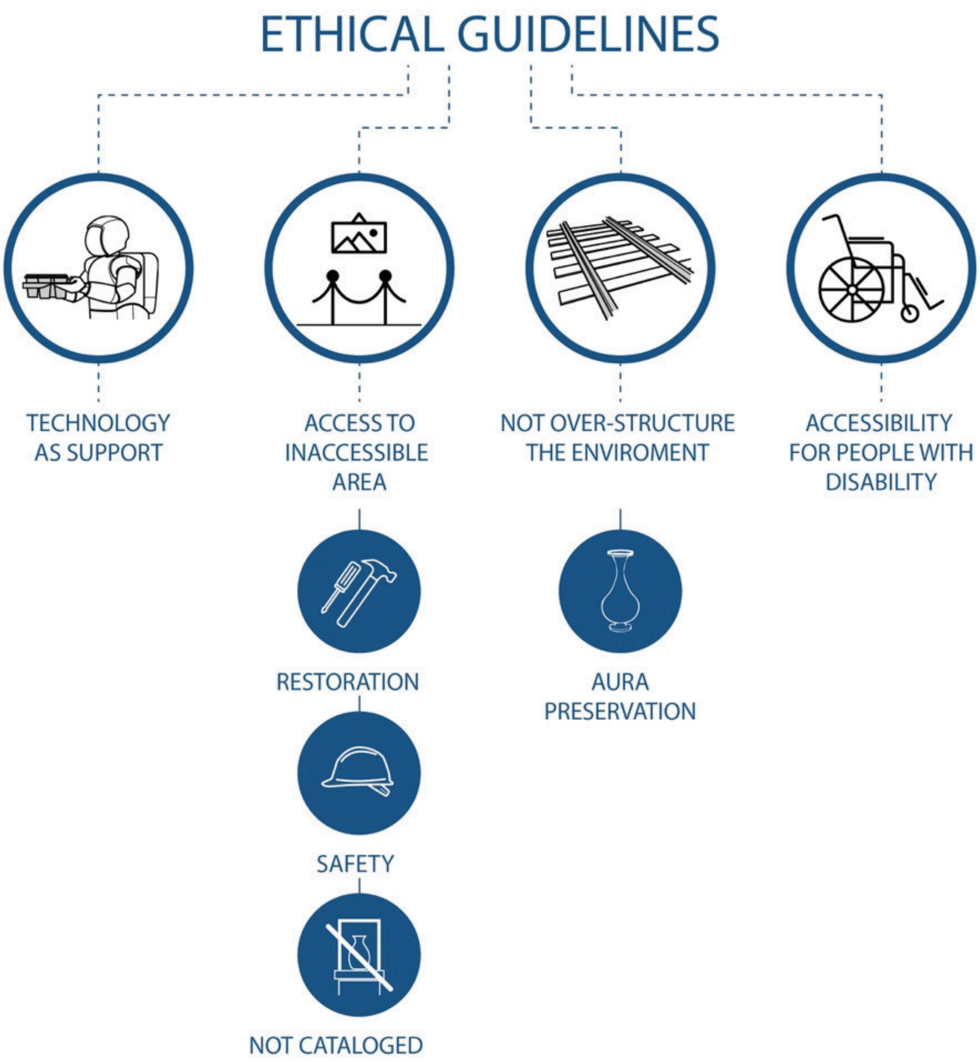

Figure 3. Ethical design guidelines for cultural heritage.

From these considerations, the robot Virgil, a tool for museum's guides to enhance their cultural storytelling, has been developed.

Between the stakeholders involved in the project, museum guide is one of the figures that will benefit from the project. The museum guide, in fact, embodies the ambassador of the knowledge and it is a vassal of the museum identity. The guided tour is the learning tool par excellence, one of the most traditional ways for educating the visitors and one of the pedagogical instrument more direct and efficient used for developing the understanding and comprehending the artifacts exposed. A universal pattern of exposition of the guided tours does not exist; every museum presents a different scenario of exposition: different collection, different spaces, a different narrative ability of the guide, and different composition of the group of visiting.

In the project development, the work of the museum guide it has been analyzed very carefully to understand desiderata and planning of the tasks. Traditionally the museum experience is an active communicational process between the museum (broadcaster) and the visitor (receiver) through an artifact (medium) [38]. The work of the museum guide is facilitating this relation, accompanying and stimulating the communicational process. The pillar on which is based the work of the museum guide is the dialogue within the visitors; an inspiring and interactive exchange composed of a succession of questions and answers could create a very useful tool for the learning and could allow to visitors to give a personal interpretation about what they are watching.

Visitors did not go to the museum as an "empty container," they bring with them their beliefs, their knowledge, and their culture, so they have not to be handled as a passive receiver of the information but as actors dynamically enrolled in the process. Museum guide should not only have to care for the exposition of the set of artifacts present in the museum, but it has to bring attention also to the way the visitors are perceiving and living the tour.

The complexity of the tasks required to the Guide, and consequently the educational success of the visit, depends on the fact that the communication process is not linear but circular. The objective of the museum guide work is not only to furnish a message or a strict and static information; the guide has to draw educational experiences taking care of the context and stimulating the active participations of the visitors during the museum tour.

The list of tasks (**Table 1**) that the museum guide needs to accomplish during its work can be summarized in three main categories: public speaking, planning, and organizational.

The importance of the dialogue with the museum guide, then, plays a crucial role in the relationship between the visitor and the museum, in particular, for which concern public speaking task. Recently, however, this role was challenged by the competition with digital tools, which usually get a high emotional impact, at the expenses of the cultural value of the experience. Among those devices, robots played in recent years a crucial role. Applications of robots for museum purposes can be resumed in three categories: as a museum guide, in telepresence, like installation.

From a design evaluation conducted on several cases of use, it is possible to say that nowadays, this kind of application presents some deficiencies regarding adaptability to the tour of visit, aesthetic coherence, and easiness of communication with the visitors (in particular robot as museum guide).

From these considerations, the robot Virgil, a tool for museum's guides to enhance their cultural storytelling, has been developed. In the first stage of the project, the robot is driven into the fragile areas of the museum (closed for restoration, or safety) by the museum guide. Visitors could see through the camera set on the top of the robot environments otherwise inaccessible (**Figure 4**).

The museum guide earns benefits in this service because of increase with the robot its communication capability with the visitors. The robot provides the use of a series of multimedia contents such sounds and video, developed by the museum guide and helpful to enhance the visit experience.

Public speaking tasks	Describe tour points of interest to group members and respond to questions
	Provide directions and other pertinent information to visitors
	Escort individuals or groups on cruises, sightseeing tours, or through places of interest
	Monitor visitors' activities to ensure compliance with establishment or tour regulations and safety practices
	Speak foreign languages to communicate with foreign visitors
Planning tasks	Conduct educational activities for school children
	Select travel routes and sites to be visited based on knowledge of specific areas
	Research various topics, including site history, environmental conditions, and clients' skills and abilities to plan appropriate expeditions, instruction, and commentary
Organizational tasks	Greet and register visitors, and issue any required identification badges or safety devices
	Assemble and check the required supplies and equipment before departure
	Train other guides and volunteers

Table 1. The tasks of the museum guide.

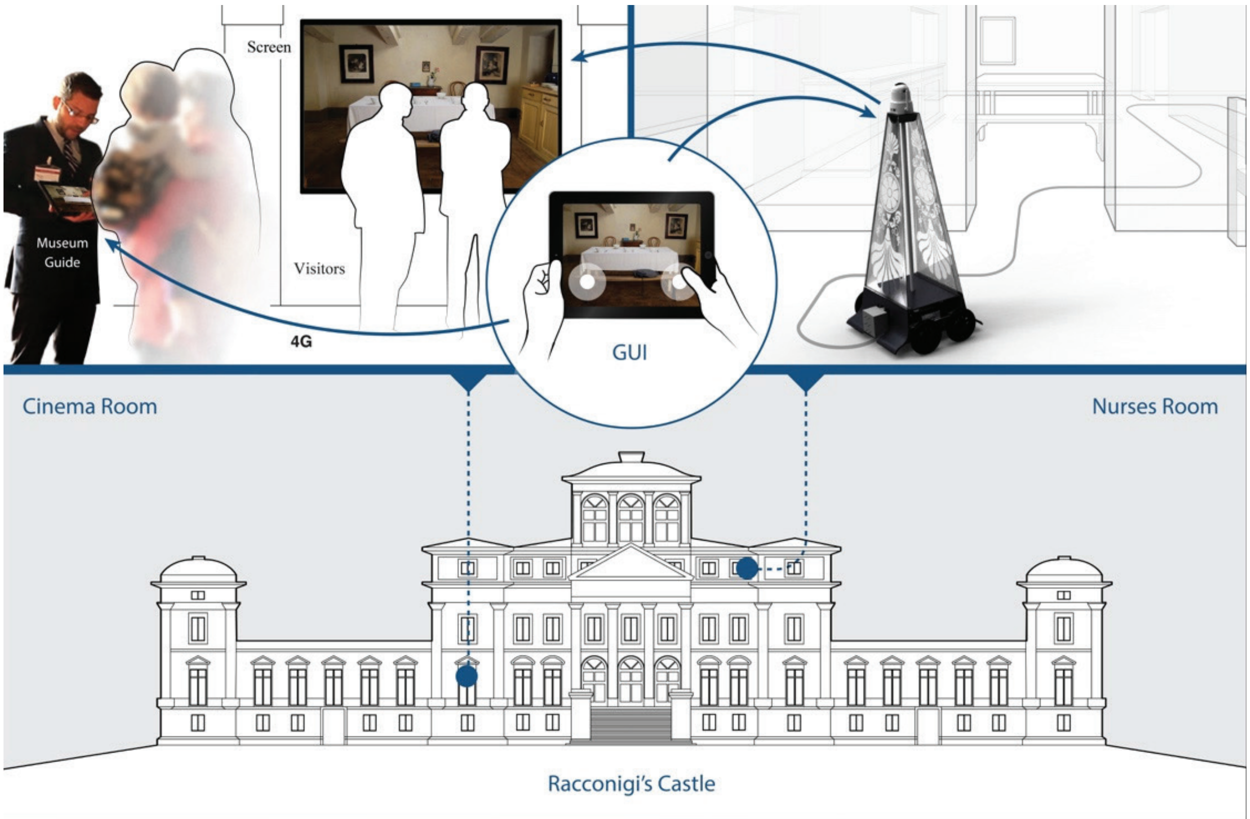

Figure 4. Virgil service concept.

The museum guides assume a central role in the visiting experience because they are entrusted with both the cultural storytelling and the robot control. Human-Robot Collaboration generates an enhancement of human work and further professionalization. Different from the industrial field, the use of robots generated a solid replacement of human work and, consequently, an increase of unemployment [2]. The introduction of robotics in other fields enhances the concern that the same phenomenon could occur. For this reason, during the design process, it is necessary to think about the human work, avoid its replacement and, moreover, enhance it [39].

5. Lessons learned as knowledge for the cultural heritage field

In order to investigate the expertize in the cultural heritage field, it is essential to explore how to attract visitors to their local heritage stimulating the economic and socio-cultural development in a sustainable approach [40]. The development of a local economic growth can be certainly connected to the innovation through the enhancement of new tourism implications, which implies the establishment of new promotional and cultural experiences [41].

Nevertheless, it's possible to hypothesize that if the cultural and social activities are not carefully planned under the aim of a neat social innovation, it's possible to incur "into the decline of heritage sites and an increment of environmental, social and cultural costs" [42]. But speaking specifically about the collection's display inside museums some of the issues emerging from our finding is relate precisely to the alienation of the visitors to the artifacts, which can be translated into a great loss in terms of the display's fruition [43].

Within this context, a roboethic approach can become extremely relevant in terms of sustainability, exploring the economic benefits with impacts on the hosting communities, heritage assets and the environment factors. All these elements will contribute to implement the local wellbeing and cultural promotion of the communities through the use of ICT devices, guided with the help of a service design methodology that follows the guidelines of a roboethic approach in order to enhance the museum experience. The roboethics guidelines help the museum experience enhancement as a tool to better understand and approach the artifacts [44].

In this chapter, we described also the key role of the innovation in the small communities' heritage tourism and how it can welcome the effective change of destination to host the local activities, such as the Terre deiSavoia association, and the Racconigi's Castle. In order to and allow a meaningful collaboration with heritage tourism managers and all the stakeholders. "*Tourism activities and their contribution can be particularly valuable in accomplish long-term commitment to sustainability intents*" [42].

To the best of our knowledge this research wills to contribute to and fill the gap by creating a methodological framework for community participation in heritage tourism planning and management and above all exploring the guidelines for a sustainable and ethical approach toward service robotics applied to cultural Heritage. The research follows a case-study approach and it is currently focused on the Royal Residence of Racconigi.

Nowadays, cultural heritage can be seen as a good testing ground to implement new digital and non digital solution for enhance the user, but most of all, the visitor experience, and heritage tourism, according to Hampton [45] is defined by the will of the visitors to get in touch with their local heritage, and all the historic landscapes, the archaeological sites, local architectures and uses and customs from the past can be a source to feed this will of experience a specific heritage.

Heritage tourism can be also seen as a tool to promote the economical growth of small museums, especially as a bond that connects different expertise from different field of studies or labor [46]. Although not exclusively, heritage tourism has become particularly relevant to culturally rich and remote regions that wish to stimulate growth and compensate for their depressed primary and secondary industry sectors [47].

According to Dragouni and Fouseki [42], creating new connections for a prosperous heritage tourism innovation system should take into account a multi-stakeholder approach, which will define the venue for service design strategies that will take into account social equity and environmental quality, in a sustainable path [42].

These new connections can take advantage of new needs of enhancement of local museums, which could be the starting point of a new academic, social and economical discussion between the stakeholders.

Is possible, therefore, that the value of the roboethics reflections, and above all the main methodological guidelines linked to give importance to the role of people inside the ICT industry, will help to avoid the technological unemployment. On the opposite these reflections will enhance the human factors with a technological help. Prior to enhance the human factors it became essential to give access to people to digital and robotic tools that can improve daily life and labor. In our case study at the Royal residence of Racconigi, was possible to observe the enhancement of the museum guide tools, especially in the human inaccessible contexts. The access to tools and new context would create a positive cycle of cultural heritage valorization in terms of sustainability.

In the Italian Cultural heritage, scenario is possible to investigate and find many local heritages that need the benefit of a well-conducted promotional and dissemination project. These projects could be a positive example of put in evidence how inaccessible places.

The challenge in the described case study was to promote the dialogue between the engineering, the design, the museum, and the academic field in order to enhance the cultural heritage dissemination [48]. One of the advisable outcomes of this research was to create an enveloping design structure that connects professional to museum visitors, giving new hints for experience their heritage.

New connections and museum fruition tools will be born from new needs of enhancement of local museums, which could be the starting point of a new academic, social, and economical discussion between the stakeholders.

It is important to bear in mind the possible bias in response to these new needs, focalizing on how to facilitate the access of visitors to their heritage. Building up a new technology that fosters public spaces to the audience with a roboethic approach is essential in order to make a concrete chance to generate a more accessible culture. Giving tools to understand the heritage can be a turning point into an innovation cultural process, because otherwise the public would not be able to understand the cultural meaning of the artifacts [49].

6. Conclusion

Given the fact that the spectrum of robot's typologies that will be present in our future is constantly increasing, it is becoming crucial to reflect on the ethical implications of human-robot coexistence. From the widely addressed theme of human replacement, especially regarding jobs, it is now emerging the need for understanding where and how the use of robotics is acceptable and desirable. But from primary reflections focused on safety issues, namely how to prevent robot by hurting or replacing people, it is now getting of a primary interest to define way not only to guarantee safety but also to enhance human activities and expertise.

In this regard, design research methodologies can contribute through thanks to their traditional tendency to address projects by simultaneously investigating artifacts, stakeholders, and context. These tree aspects, in fact, are constantly addressed with the attempt of understanding the socio-cultural context and the possible implications that a project could have. For this reason, design research might play a key role in shifting from technology-driven process that currently characterizes robotics to more ethical and acceptable approaches.

As an example of what might entail a roboethic design approach, this article presents the Virgil case study, a telepresence robot for the remote exploration of inaccessible areas of a castle. This resulted from the identification of main ethical design guidelines, and the analysis of both the stakeholders and the context. On one hand, it appeared necessary to empower and enhance the role of museum guides, while on the other hand emerged the issue of inaccessibility for a significant number of areas of the castle.

Providing an answer to these issues represented not only an ethically acceptable solution but also a great chance to innovate and raise the attractiveness of the heritage. So, designing with a roboethic approach is not only a way to do the right thing and avoid undesired drawbacks, it rather represent a desirable way to create new values and opportunities.

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