Chapter 8
Valorisation
The work described in this dissertation was part of a larger project called 'Social Robots in Care' (funded by SIA RAAK-PRO). The aim of the overall project was to generate knowledge and expertise about the application of social robots in daily care practice. This chapter describes the actions that have already been taken to disseminate the knowledge that was acquired through the current research and looks at possibilities and emerging opportunities for valorisation.

Innovation in care and education

Social robots in care are of increasing interest to society. The use of robots can give a new impulse to the fields of healthcare and education. More and more robots are being developed to be used by different target populations, such as elderly people and people and children with disabilities. In the 'Social Robots in Care'-project, three different robots, in different stages of development, were tested within three target groups: children with autism, elderly people with dementia and children with physical disabilities (the target group and part of the project described in this dissertation). In this project, professionals, i.e. therapists and special educators, were involved intensively in order to provide thorough insight into the goals that exist for the target group, and into the potential of the application of the robots IROMEC and ZORA to support play and predetermined goals in rehabilitation and special education. The application of robots in this field is still rather uncommon and innovative. Numerous different materials, tools and toys are nowadays being used to stimulate and activate children with physical disabilities and to make their rehabilitation, learning and playing as successful and attractive as possible.

Relevance for different stakeholders

Although many (prototype) robots specifically meant for children with physical disabilities have been developed over the past decades, these robots are often still in a developmental stage, being used in a research context and often not commercially available. Not much is known about applying these technologies in daily care practice. The knowledge presented in this dissertation is not only relevant for application of robots IROMEC and ZORA, but may also be useful for other developments in the field of innovative care technology for children with physical disabilities, such as virtual reality, computer games and adapted toys. Because of the possibilities robots offer, that are (partly) described in this dissertation, there is enormous market potential. Different stakeholders in education, research and also in daily care and education practice may benefit from these studies. The potential value of robots (specifically IROMEC and ZORA) and
the related knowledge is described in the upcoming sections for the different stakeholders.

Children with (severe) physical disabilities and their network

The research described in this dissertation clearly shows that children like playing with robots, and also demonstrates the potential that robots can have in therapy and special education, especially for children with severe physical disabilities. The output of this study may be helpful to parents in coming up with new creative ideas to stimulate their children and to offer them new play possibilities. Although parents were not intensively involved, the fact their child participated in one of our studies may make parents aware of the potential of technology for the physical as well as emotional well-being of their child. This awareness may influence parents in the opportunities and possibilities they want to realise or use in their home situation. Although these studies focussed on children with physical disabilities who receive treatment or education in rehabilitation centres and special education schools, the results could be translated to the home context as well. Based on the results, parents might want to start using other commercially available technologies with functionalities that are comparable to the IROMEC and/or the ZORA robot e.g. toy robots or computer games.

In the three studies described in chapters 4, 5 and 6 of this dissertation, in total 61 children were involved. These children participated in the robotic play sessions and were also involved in the evaluation by indicating smileys representing their mood after each session. The study results showed that for example ZORA can contribute to movement skills and communication skills of the children. These domains may be also interesting for other target groups, for example children with autism. For children with autism especially the communication skills are interesting and worthwhile to further investigate, because it is known that children with autism often have a special interest in robots and the predictability and repetitions of a robot are preferred by children with autism.

Professionals in rehabilitation and special education

To make sure that care professionals could use the robotic interventions and that the children could benefit from them, all the interventions with the robots described in chapter 4, 5 and 6 were co-created and thoroughly planned together with all the participating rehabilitation therapists, teachers and/or group leaders, within the possibilities and limitations of the existing platforms. The involved professionals also applied the interventions in practice. In doing so, they not only contributed to the research, but also gained valuable experience in applying robot-based interventions in their therapy or education practices. By intensively involving the professionals they received training and clues to make working with robots easier in the future and to gain guided experience, which may contribute to actual implementation of robots and other care technology in
the future. Participation of the professionals in this project created numerous meaningful starting points which can be used by the professionals immediately. For example, by participating the professionals gained knowledge and experience of working with robots or new technologies, and this knowledge and experience might be passed on to their peers and colleagues in a natural way and make them aware of the importance of innovation, technology and participating in research. Furthermore, for some of the professionals it was an eye-opener to gain insights into the practice of measuring the achievements of the children. Overall, the professionals adopted an open attitude towards technology and robots which can contribute to application and implementation of technology in the future. These new insights could influence future interventions and measurements conducted by these professionals.

Researchers

The studies described in this dissertation significantly contributed to the knowledge about the application of robots in rehabilitation and special education. This research gives us insights into essential steps in the development and evaluation process of new technologies, in terms of usability and feasibility, which are prerequisites for performing studies on the effects of these robots in the future. Robots are being developed and commercially available more and more, and create a lot of enthusiasm and new possibilities, also in the field of care and education. Because of this enthusiasm it is important to search for an evidence based foundation for the application of robots. The studies described in this dissertation initiated the first steps into evidence-based research and application of robots IROMEC and ZORA, to check if professionals and children are enthusiastic and if there is evidence that it would be good to continue with the development of robot-based interventions. More research is needed to further investigate the effect of specific interventions with socially assistive robots for children with severe physical disabilities. Useful interventions which were developed from a user-centred perspective proved to be practically applicable and meaningful for daily practice. Involving the end-users intensively led to more commitment to the actual use and acceptance of robots in rehabilitation and special education in specific, and in the field of healthcare in general. Further research is necessary to study the effects of socially assistive robots and specific interventions (e.g. ZORA) for children with severe physical disabilities. Some suggestions for further research are given in the general discussion of this dissertation.

Industry and developers of technology

The results of the studies described in this dissertation, which indicate the great potential of robots, are of interest to industry and developers of technology, as they are keen to further develop existing technologies for play and create new ones. Insights on, for example, usability and feasibility information about the products may help technology
developers to improve current products or may be used as input for the development of new technologies. In turn, the (newly developed) robots and other care technologies can make a big difference in the lives of children with severe physical disabilities.

Companies that develop and create social robots should continuously update their products and improve them with new insights, ideas and suggestions directly from the care context. The involvement of robot industry in research as well as in the implementation of robots would be recommended. This involvement may contribute to improvement of robotic interventions. Furthermore, to be able to implement interventions with social robots in a broad field, maintenance and service are extremely important. Which during the studies described in this dissertation was mainly done with students. In addition, to make sure robotic and other technological care interventions are successful, it is important to make sure that the professionals and/or family members who are going to work with them are trained properly, which could be a responsibility of the suppliers of the products.

The author of this dissertation will discuss future steps about the improvement and re-design of robotic interventions with the companies providing robot ZORA. Insights and experiences form this dissertation may contribute to the success of ZORA and may help to improve this social robot for the context of rehabilitation and special education.

**Education**

The expertise gained during the studies described in this dissertation has contributed and will continue to contribute to different types of education, for example, the development and evolution of several areas of education; healthcare, social work, pedagogics, technical studies, design education and ICT, but also inter-professional education. The expertise from our studies contributes to the continuous innovation of education and to an optimal connection with the needs that exist in care practice. First of all, several bachelor students had the possibility to participate in the studies (in the form of an internship or graduation project or as job student), and, as such, got the opportunity to gain expertise in the field of social robots in the context of rehabilitation and special education. Furthermore, the insights gained from this research were used to develop modules for different levels of education (such as vocational education and bachelor education) for the departments of healthcare and engineering. For example, it is important for engineering students to learn about and understand the context of healthcare and to see what technology might offer to this domain. In addition to the knowledge integrated in the different modules of curricula, numerous workshops, lectures and demonstrations were conducted for national and international audiences, students and healthcare professionals, to achieve broad dissemination of knowledge. The results of this research do not only contribute to regular education, but have also been used to develop training sessions for the professionals involved in the studies. These training sessions were developed to get the professionals acquainted with the
robot and to learn how to work with it using a role play. Because knowledge about care
technology, and especially robotics, is crucial for current (and future) healthcare profes-
sionals, there is a large potential for educational institutions to invest in courses on this
topic for students as well as for education of professionals who are life-long learners.
Different educational programmes on different levels in the area of healthcare, educa-
tion and technology, may benefit from the knowledge and expertise gained in this field.

**Exposure Activities**

Next to education, the most obvious valorisation activity performed during the project
which is still ongoing is to present the results to national and international research and
professional communities. Studies presented in this dissertation have been published in
or submitted to international peer-reviewed journals. Furthermore, the dissemination
of results took place via posters, presentations, and workshops at international and
national conferences on various topics related to technology in care (assistive technolo-
gy, robots in care). The project members of the ‘Social Robots in Care’-project wrote a
Dutch booklet containing the outcomes of the project as well as their (and other partic-
ipants’) experiences during the project. The booklet was written for those who partici-
pated in the project, but also for educational and dissemination purposes. The project
gained a lot of interest from researchers all over the world, and from health profession-
als in the Netherlands and abroad working on similar topics. Because of the fast pro-
gress in technological developments, attention for the implementation of new technol-
ogies and for the knowledge and expertise that is accumulated about them in practice
and education is crucial.