Critical Reflection on Robotic Application Design: Initial Conversations with Roboticists

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***Abstract*— Roboticists are normally well indented. However, when they design their robotic applications, their biases regarding the definition of problem, the solution needed and the experts consulted means that some stakeholders may be better served than others. Over the last years, there has been a growing concern with the ethical development and evaluation of technical systems, including robotic systems. Inspired by Critical System Heuristics, this work discusses the design and analysis of a semi-structure interview to understand to what extend roboticists take a holistic and critical view of the applications they are creating. Preliminary results show that, even though roboticists are concerned with ethical issues, their practice seems to be limited to a handful of experts and stakeholders, and to have a limited consideration for the consequences of their designs.**

I. INTRODUCTION

The design of robotic applications is often well intended, in the sense that roboticists observe a "problem" in the world that they believe robots can at least partially solve. Then, during the design process, they normally consult the main stakeholders on what would be the best way to implement their vision. However, people invariably see the world through different lenses, which influences what they believe to be part of the "problem" and what should be the solution. As a result, when design ideas turn into action, some stakeholders are better served than others, and some may be forced to bear the consequences without getting any benefit at all.

Over the last years, there has been a growing concern regarding the ethical development and evaluation of technical systems. The field of Human-Computer Interaction (HCI) has proposed several approaches to embody values in the design of computer-based solutions. One popular approach is Value Sensitive Design (VSD), whose primary goal is tho consider and integrate human values into the design process of technological solutions, investigating the conceptual, empirical, and technical issues of a given technical design [1][2]. Other similar proposals are Reflective Design [3] and the works of Flanagan et. al to embody values into technology [4][5].

In the field of robotics, Aimee van Wynsberghe builds on VSD to introduce the Care Centred Framework and the Care Centred Value Sensitive Design (CCVSD), which are, respectively, a complementing framework and method for ethically evaluating care robots. Such evaluation can be done both retrospectively and prospectively. The same author also started investigating how the CCVSD framework could be applied outside the healthcare domain, such as in personal and professional services. McGinn explores the application of the Ethics Canvas (a collaborative tool based on the Business Model Canvas with the aim to foster ethically informed technology design) in two use-cases. The first one, in a retirement community where a robot mediates a Bingo-type group activity, and the second one, a therapeutic robot used in a paediatrics setting [6]. Another example is Šabanović, who defends a more critical understanding of socially interactive robots, paying particular attention to the social and cultural factors that influence their design, implementation and evaluation [7][8][9].

However, if we take a step back from computing and engineering, there are other interesting frameworks that help to reflect on complex and wicked problem situations and to accommodate different worldviews when designing interventions. These are more often applied to fields such as policy making, sustainable development and business processing modelling. Examples of such approaches are System Thinking (ST) [10][11], Soft System Methodology (SSM) [12] and Critical System Heuristics (CSH) [13].

CSH is a philosophical framework that uses boundary critique to support decision-making and evaluation of systems designs. Their creators acknowledge that when people describe situations and how they can be improved, they naturally select which set of issues to consider and to leave out. While this selectivity is unavoidable, making them explicit enables a more open and honest conversation and helps people to understand their differences and work constructively. CSH helps professionals to expose assumptions and to acknowledge the values, motivations and hierarchies that influence the framing of the situation, as well as the premises by which they assume that others should bear the consequences of their intervention.

Inspired by CSH, we wonder to what extend *designers of robotic applications take a holistic and critical view of the intervention they are designing.* In other words, we would like to explore whether they challenge their own perception of the "problem", the power structures that influence what is considered to be problematic, the knowledge basis that defines what is relevant information, and the moral basis for which we expect others to bear the consequences of what they design.

In order to start exploring this question, we interviewed roboticists to understand current practices in the design of robotic applications and to gather first impressions on whether issues of politics, power structures and, values, morals and legitimacy are taken into account. Our preliminary results suggest that most interviewees agree on the need of adopting user centred approaches in the design and development phases of robotic systems. However, such practices are still limited to including main stakeholders only and superficially considering the consequences of the designed systems.

We next describe the design of the interview adopted in this exploratory study (Section 2), followed by a preliminary analysis of its results. We conclude the paper summarising our observations and next steps (Section IV).

II. Interview Design

A. Goal

The goal of our study is to learn about current roboticists practices in the design of robotic applications and to gather initial insights on whether issues of politics, power structures, values, morals and legitimacy are considered.

B. Instrument and Design

We have used semi-structured interviews, combining closed and open questions as well as justification fields to gain further understanding on the participants' answers. The interview was designed to reach the following **Research Sub-Questions** (RSQ):

- **RSQ1** What is the experience of roboticists with respect to applied robotics systems?
- **RSQ2** What are their knowledge and experience on design methods?
- **RSQ3** What are their understanding of and experience with multidisciplinary teams?
- **RSQ4** What are their motivation and willingness to challenge the problem and solution?
- **RSQ5** Which stakeholders they considered relevant for a particular project?
- **RSQ5** What is the degree of critical reflection they put into robotic applications they were working on?

The interview questions were designed by two researchers and furthered refined with two CSH experts. The resulting questions were formatted as an online form. Table I depicts the final set of questions (including alternative answers) and how these map to the RSQ.

C. Procedure

Interviews were carried out online, through a videoconferencing tool (Skype), which lasted one hour in average. All interviews were recorded with the consent of the participants. Interviews were led by one researcher (two in total), who would share the screen with participant. The aim was that the participant could read the question and see the answers that were being marked, as well as the notes that the researchers were inputting from comments or answers to follow-up questions made by interviewees. In that way, it was easier for the interviewee to understand the question and correct any mistake on the notes taken.

D. Recruitment

We interviewed 13 roboticists, defined as experts in the design and development of robot systems. The selection process consisted on defining a profile of interest: *experienced and English-speaking practitioners working on the development of robotic applications*. First interviewees were selected from our own network. At the end of each interview, we asked for additional contacts to expand the study. Eleven interviewees were from Europe, one from the US and one from Singapore.

All interviewees were considered knowledgeable on the design of robotic application, both academically and professionally. They had in average 11 years of experience within the robotics field.

E. Coding and Analysis of the interviews

In order to answer the SRQ, we have analysed the interview questions according to the map show in Table I. We first, we carried out a quantitative analysis of the questions with closed answers. We then applied a *qualitative content analysis* with a inductive category development to the open questions and notes fields. For this analysis, two researchers created an initial set of categories and then revised it as they coded the data [14]. Three researcher participated in the analysis of the coded data, with each question being analysed independently by two researchers. Finally, we performed a cross-analysis of the different interview questions to identify possible factors that could affect the results obtained.

F. Threats to validity

As with any qualitative research, our work has threats to validity. The most important ones are due to (1) limited and homogeneous number of participants, (2) the fact that some of them knew the interviewer and (3) interviewers had a premise in mind they wanted to explore.

The first threat concerns the number and geographic location of participants. Due to time and resource constraints, we were only able to interview 13 professionals, all located in Europe. The number of participants limits our ability to generalise the results and may not be consistent with the views of professionals working in other world regions. Yet, their experience can give us important insights and help us to identify relevant lines of work.

The second threat to validity is due to the fact that our selection process started within our own professional network. As a result, part of the interviewees knew the interviewer and might not have felt comfortable to honestly answer all the questions. In order to mitigate this threat, we have followed the common advice to qualitative interviews, such as explaining the purpose of the research, not commenting on answers and keeping a non-judgemental attitude during the interviews.

Finally, the third threat to validity is that the design of the interview was partially inspired by CSH. We wanted

RSQ	Question
1	**Q1** What is the distribution (in %) of robotic-related projects you are normally involved in? *Alternatives: (a) fundamental (algorithms, control systems, architectures, models, etc.); (b) applied (robot design, robots in the wild, etc.)*
2	**Q2** Considering a design method/framework broadly as "an approach, procedures, techniques or tools that helps you to understand a problematic situation and determine solutions to it´´, what is your experience with them? *Alternatives (multiple choice): (a) No experience at all; (b) I studied them during undergraduate/postgraduate courses; (c) I have used them in less than 30% of all the projects I have been involved in; (d) I have used them in 30% to 60% of all the projects I have been involved in; (e) I have used them in more than 60% of all the projects I have been involved in.*
3	**Q3** In any of your last 5 projects, have you worked in multidisciplinary teams? Which disciplines were present? *Alternatives (multiple choice): (a) Computer Science, (b) Mechanical Engineering; (c) Electrical Engineering (d) Psychology; (e) Anthropology; (f) Design; (g) Art; (h) Physics; (i) Sociology; (j) Economics; (k) Business; (i) Mathematics; (m) Philosophy; (n) Medicine; (o) Other, which?*
4	**Q4** What is the distribution of common reasons for starting a robot related project? *Alternatives: (a) Technology-push: I have developed a technology and I design a solution from scratch to solve a problem I observed in the world; (b) Market pull: potential clients asks me to solve their problem; (c) I get incorporated in an existing project; (d) Other*
4	**Q5** At any point of an applied project, have you ever asked yourself if the problem to solve is really a problem? *Alternatives: (a) Never; (b) Sometimes; (c) Often; (d) Always. Why?*
4	**Q6** At any point of an applied project, have you ever asked yourself if the envisaged solution is the best solution? *Alternatives: (a) Never; (b) Sometimes; (c) Often; (d) Always. Why?*
5	**Q7** Think of an applied robotic project that you have worked on recently. Briefly describe it.
5	**Q8** Which stakeholders did you approach in the design of the robotic application above and how did you decide that they were the right ones?
6	**Q9** When designing the robotic application above: **Q9.1** Did you carefully reflect on why people's views on the problem to be solved are different from each other? **Q9.2** Have you considered how people's roles in the society or in an organisation influence what they consider to be a problem and what can be done about it? **Q9.3** Have you promoted explicit discussions among stakeholders about how people's values, beliefs, motivations, roles and expertise influence their views of the problem and solution (including your own)? **Q9.4** Have you tried to identify people, animals, nature or future generations that can be negatively affected but were not involved or represented in the design of the application? **Q9.5** Have you sought ways through which they could have their concerns expressed and properly incorporated into the system design? *Alternatives: (a) Not at all; (b) To some extent; (c) Considerable; (d) Very much*
6	**Q10** Can you rate the relevance of the following aspects in the design of the robotic applications: **Q10.1** Carefully reflect on why people's views on the problem to be solved are different from each other; **Q10.2** Consider how people's roles in the society or in an organisation influence what they consider to be a problem and what can be done about it; **Q10.3** Promote explicit discussions among stakeholders about how people's values, beliefs, motivations, roles and expertise influence their views of the problem and solution (including your own); **Q10.4** Identify people, animals, nature or future generations that can be negatively affected but were not involved or represented in the design of the application; **Q10.5** Seek ways through which they could have their concerns expressed and properly incorporated into the system design; *Alternatives: (a) Not relevant; (b) Somehow relevant (c) Considerably relevant (d) Very relevant*
2	**Q11** Do you know any design methods / framework that consider issues of ethics, values, politics, legitimacy, etc.?

TABLE I

RESEARCH SUB-QUESTIONS AND THEIR RESPECTIVE QUESTIONS. EACH QUESTION WAS FOLLOWED UP BY AN OPEN "NOTES" PARAGRAPH FIELD, WHERE THE INTERVIEWEE TOOK NOTES OF THE RATIONALE FOR THE ANSWERS.

to find out whether roboticists were considering issues of politics, power structures and, values, morals and legitimacy, which are the key aspects present in CSH. Hence, the researchers could be inclined to interpret the data to support their own views on the use of CSH. While such bias was very difficult to avoid, we tried to minimize it by having the data analysed by three researchers, two of which were not familiar with CSH.

III. PRELIMINARY RESULTS

This section describes the preliminary results according to the Research Sub-Questions that we set for the study.

A. SRQ1: Practitioners' Experience

The interview started by asking participants about the distribution of time they dedicate to fundamental and applied research (Q1). The main motivation of fundamental research is to expand the knowledge and is normally driven by a scientist's curiosity or interest in a scientific question. On the other hand, applied research is designed to solve practical problems of the modern world, rather than to acquire knowledge for its own sake. This first question aimed at contextualising the participants' answers and to find out to which extent participants were actually involved in projects attempting to solve real-world problems.

As we can observe in Figure 1, most interviewees had worked both in fundamental and applied research. With the exception of interviewees two and nine, at least 50% of the projects roboticists worked on were applied.

Takeaway: Most interviewees had a considerable experience with applied research. Hence, they were considered 'experienced' to answer our questions and to give us interesting insights about what roboticist do to understand a real-world problem and design a solution to it.

B. SRQ2: Knowledge and Experience with Design Methods

All participants stated having some knowledge on design methods. Seven of them have used such methods in more than 60% of their projects (Q2, Figure 2). Most roboticists declared to use methods focused on end-users, such as User Centred Design (UCD). Some have not been

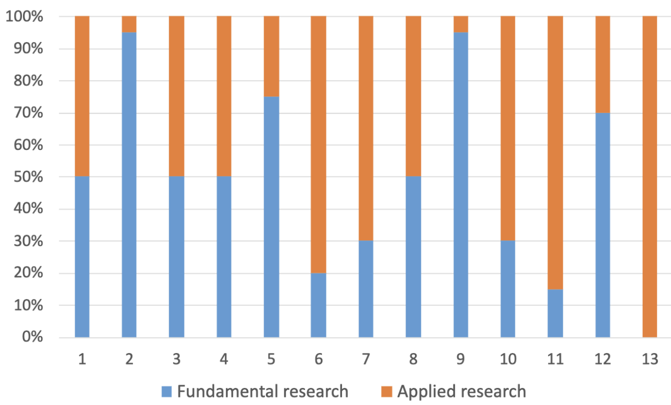

Fig. 1. Distribution (in %) of robotic-related projects types practitioners are involved in.

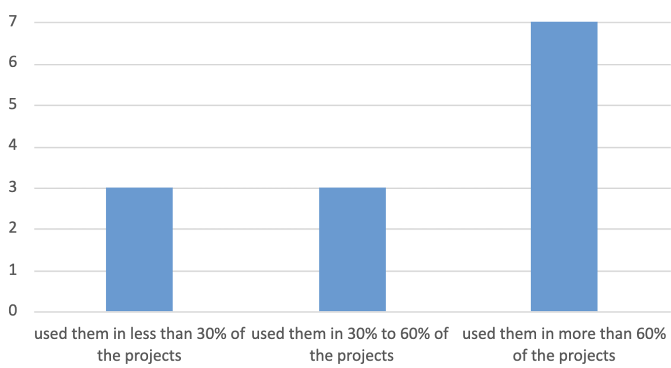

Fig. 2. Respondents experience with design methodologies.

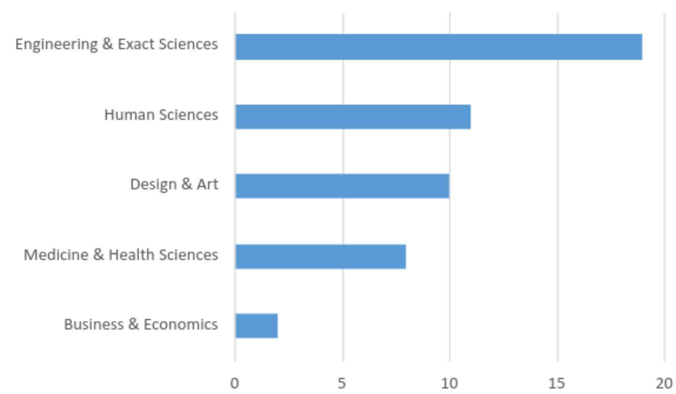

Fig. 3. Disciples involved in projects grouped by: Engineering&Exact Sciences (computer science, mechanical engineering/electrical engineering, mathematics, physics), Human Sciences (sociology, psychology, anthropology, philosophy), Medicine, Business&Economics and Design&Art.

able to name a specific method, but they did refer to testing or validating the systems with final users. In fact, only five participants acknowledged having formally studied design methods before, which is a low rate compared to the usage rate. Being all experienced professionals who have completed their study several years ago, we wonder whether courses on design methods were not part of their official curriculum at the time, giving them no opportunity

When asked whether they knew about tools, methods and methodologies which specifically consider aspects of ethics, values, politics and legitimacy, two respondents mentioned Value Sensitive Design (VSD), one of which also referred to participatory Design and Care Centred Value Sensitive Design (VSD). Another participant stated that they had an anthropologist was part of the team and who was responsible of any ethical concern. One claimed to be familiar to ethical frameworks, which were not design methods. Two participants simply pointed out that their university had ethical approval process of their universities. Finally, seven participants mentioned having no knowledge of such frameworks.

Takeaway: While most participants makes use of design methods during the design of robotic applications, only a few have received formal training on the subject. Often their know-how is based on pragmatic situations, which include the use of common sense, self-training and/or learning from colleagues' best practices. Only a couple were able to name methods with an explicit ethical perspective and claimed using them. Most did not know any method or delegated the ethical concerns to others.

C. SRQ3: Multidisciplinary Teams

All participants reported working in multidisciplinary teams (Q3). In addition to the interviewees experience with multidisciplinary teams, Q3 sought evidence on the nature of such teams. Figure 3 shows the frequency of disciplines acknowledged. We can clearly observe that Engineering&Exact Sciences are the most frequent, which is quite obvious given that the projects fall within the robotics domain. A drop in frequencies follows, headed by Human Sciences (from which 7 out of 11 correspond to Psychology), Desgin&Art and Medicine&Health Sciences. Business&Economics are the least present, suggesting that a critical and careful analysis of the social-economic impact of their systems was not commonly carried out.

Additionally, all participants agreed that the teams should include different stakeholders, in many cases, domain experts, such as health personnel in medical applications. It is interesting to note that the eight participants who included 'Medicine' actually work in medical applications. Similarly, participants including 'Psychology' worked in projects targeted at vulnerable population, such as children, elderly or people with disabilities.

Take away: While all projects involved different experts, there seems to be a trend on including disciplines other than Engineering&Exact Sciences (i.e. technology related) mainly because of the knowledge as domain experts.

D. SRQ4: Motivation and Wiliness to Challenge on Robotic Applications

The reason for starting a project can pre-configure the power relations among those affected and those involved. Thus, practitioners were asked whether their project normally started due to a technology push (i.e., research on technology drives the development of a product) or a market pull (i.e. market needs require research and development of a technology for a new product)(Q4). The aim of this question was to understand their degree of freedom during the project development, since decision-making can be directly influenced by the interest of the different actors involved. We then asked them if they had ever challenged the goals or reasoning of the project and the proposed solutions (Q5 and Q6).

Eight participants indicated that they work more than half of the time in technology-push projects, while two responded they did so equally. The remaining three participants work only on market-pull projects, which makes sense since they work in industry.

Nine participants normally question themselves whether a problem is genuinely a problem, as shown in Figure 4. Two stated to have done it sometimes. When justifying their answers, three stated that they do so because they want to work on real problems. Two participants said they would not challenge the problem in technology push projects. One of them explained that at their company they always start performing market research to pinpoint customer needs. However, once the problem is identified, no more questioning is done. Finally, one interviewee said that "*we convince ourselves and others that a problem is a problem*", not re-thinking their position throughout the project. , there was no correlation between the type of projects roboticists work on and their attitude towards challenging the problem.

Similarly, when it comes to questioning the solution, eight participants consider if the envisaged solution is the best one and four do it sometimes (Figure 4. Four practitioners did so in order to improve the solution, three to check they were developing the best/an adequate solution, and another two simply considered this a very important question. Other reasons mentioned were (1 person each): to make sure that the solution will be adopted, to check if a robot is really needed, and because the environment is constantly changing so they need to adapt the solution. An interesting comment was that "*It might be a good solution, but it might not be sustainable*", which is one of the factors we think it is worth reflecting on. Despite the general awareness about the importance on challenging the solution, one participant also highlighted the risk of continuously doing so, arguing that sometimes you have to stop questioning it because otherwise the project would not move forward.

One person (who works 100% on market-pull) never questions the solution, stating to normally agreeing with what has been proposed by others. This same person never challenges the problem. Moreover, one roboticist justified the need to trust the domain expert when s/he did not challenge the solution: "*I had to trust the doctors that it was the right solution*".

Takeaway: We have observed that most practitioners ask themselves whether the envisaged solution is the best one on a regular basis. Slightly lesser practitioners normally reflect on whether the problem they were trying to solve was really a problem. A more in-depth interview is needed to understand how exactly they challenge the problem and the solution and whether power structures influence their decision-making or limit a critical thinking.

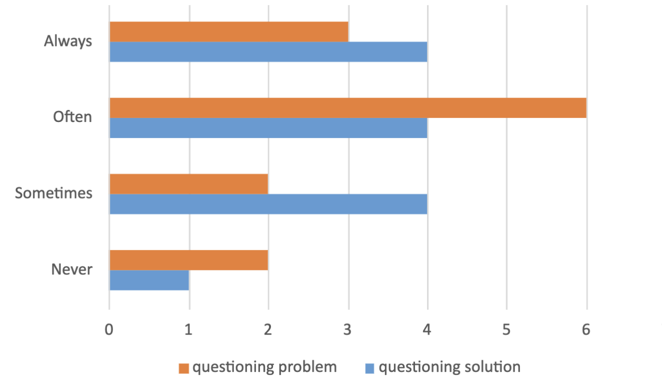

Fig. 4. How often practitioners challenged the problem to be solved and the proposed solution.

E. SRQ5: Relevant Stakeholders

Participants were asked to briefly describe a specific applied project to question about concrete practices based on a real example (Q6). We then asked them which stakeholders were approached in that project and why were they considered to be relevant (Q7).

Twelve roboticists chose to talk about project involving robots "in the wild", who interacted with humans. Eight were targeted to vulnerable population, such as hospitalised people, children, and elderly. The remaining interviewee chose to talk about a project that focused on a particular capability development (pick and place).

Except for one, all other participants claimed to consult primary users (Figure 5). The next most common choice was to talk to 'experts on users', i.e. professionals that work with the primary end-user on a frequent basis (e.g. doctors, nurses, teachers, etc.), who sometimes were also secondary users, followed by 'experts on the domain', such as companies in a particular industry or technology experts. Entities representing the users (e.g. charities and unions) and sponsors were also incorporated in few occasions, and only once policy-makers were mentioned. In terms of the reasoning behind including those stakeholders, the main justifications were: to better understand the problem, requirements and context; to evaluate the system; or to learn about the technology. Interestingly, one participant stated that the chosen stakeholders helped to understand the political and social contexts.

Takeaway: Most of the projects have involved 'primary/secondary users' and 'experts'. However, the reasoning behind their inclusion seems to be more often related to understanding the requirements and constraints of the system, rather then their social and political contexts.

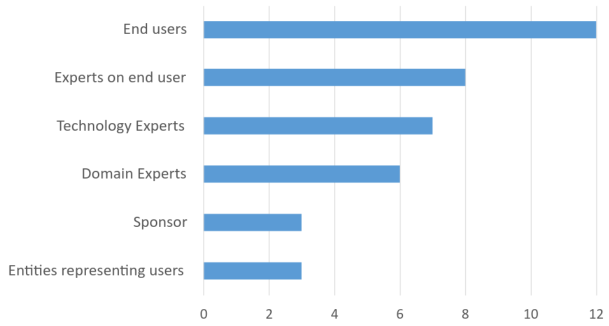

Fig. 5. Most frequent stakeholders involved in the development of a particular robotic application.

F. SRQ6: Degree of Critical Reflection on Robotic Applications

Two main themes were considered: (1) reflection and open discussion seeking insight on how different people's views, values, beliefs, roles, etc. influence on the understanding of problems and solutions (Q9.1-Q9.3 and Q10.1-Q10.3 in Table I); and (2) identifying the underrepresented and whom could be negatively affected by the system (Q9.4-Q9.5 and Q10.4-Q10.5 in Table I).

All participants recognised differences among people's views (e.g. "*End-users have there own wants*") (Q10.1), with seven considering these differences on a regular basis (Q9.1), as show in Figures 6 and 7. Some specific differences included ethical concerns (psico-social impact of providing a wheelchair to a user), people's personal goals ("*roboticists concerns are about keeping the system up; while nurses are worried about being able to do their job*") or technology feasibility vs. users' expectations of technology ("*we knew we couldn't address all issues. We specified to what extent we could do something*").

However, when it comes to evaluating how a person's role influence over how a problem is understood (Q9.2), seven participants do it regularly, while three do so to some extent and three, not at all, despite later on all of them acknowledged its high relevance (Q10.2). One participant indicated that the projects are evaluated at different levels of the institution, i.e. "*we have to build a solution that not only works for the innovation manager, but also for all the people on-site.*", while another one reported doing so "*all the time*". Interestingly, these two participants were part of client-based projects within industry. Thus, we wonder whether research-based projects may fail in such type of analysis due to a lack of systematic use of methodologies when developing applied projects. On the other hand, only one participant raised a concern based on her own experience stating that "*as a PhD you have to do what you have to do*", evidencing that sometimes power structures do have an influence on how problems are analysed, and unfortunately, roboticists may feel they do not have a say.

Finally, when asked about promoting explicit discussions to better understand people's different views based on their values, beliefs and motivations (Q9.3), seven interviewees indicated doing so in a regular basis, while eleven recognised its relevance (Q10.3). However, there was a large variety in their responses, such as "*we organised workshops [in research conferences] to discuss with different stakeholders*", "[...] *specially the experts different views*", "*discussions were focused on the solutions*" or "[the health system institution] *was worried about costs*". It is not clear thus to what extent such discussions were truly seeking understanding of the roots of conciliating, mutual understanding and conciliation of differences, or whether they were general discussions (workshops) or requirements gathering exercises. Moreover, two participants raised the concern whether it is their responsibility to open such discussions, evidencing that there are cases where practitioners feel restricted towards questioning problems and/or solutions.

Contrary to the previous set of questions, when participants were asked asked about the underrepresented and/or negatively affected, most of their answers fell on the less frequent scales. For instance, five participants did not considered them at all, and seven only to some extent (Q9.4) We can clearly observe that as we move away from considering immediate stakeholders in the short run and try to foresee further implications in time, or those who in "principle" are not supposed to be involved or affected, the questioning about the design greatly diminishes. In fact, one participant indicated that there could not be any negative effect, while another one only focused on potential functionality issues as a negative impact (i.e. safety related problems). Five participants did raise two actual common debates regarding people's fear about being replaced by robots and losing their jobs or visualising a future where the presence of robots might reduce personal human care. However, no specific negative impacts with respect to their projects were described, suggesting that only general thoughts where considered, but not deeply analysed. Contrary to current practices, participants agreed on the relevance of including the overlooked (Q10.4-Q10.5). But the fact is that, overall, almost none (11 out of 13) did try to seek ways through which the underrepresented could be somehow included in the design process (Q9.5).

Takeaway: Interviews suggest that roboticists are aware of the different views present among people, but in practice, they mostly focus on a subset, i.e. mainly primary and secondary users' needs vs. designers, engineers, researchers and direct stakeholders' aims. Other types of stakeholders or outsiders were rarely mentioned, evidencing that despite the goodwill on including others' views, current practices are still far from not only truly understanding the problem from a broader perspective, but also from genuinely considering future impact of current design.

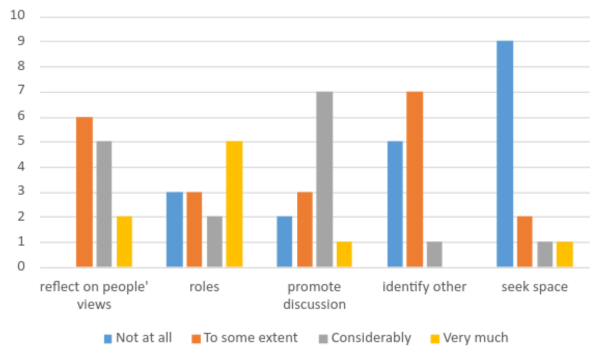

Fig. 6. Frequency of responses regarding current aspects considered to achieve critical reflection.

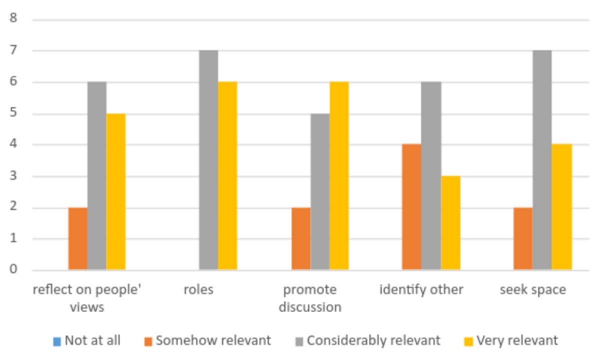

Fig. 7. Frequency of responses regarding relevance of aspects to achieve critical reflection.

IV. CONCLUSION AND FUTURE WORK

In this paper, we have carried out an initial exploration on whether *designers of robotic applications take a holistic and critical view of the intervention they are designing*. In order to do so, we have set out six research sub-questions listed in Section II-B. The overall conclusions are:

1) Interviewed roboticists are working on applied research, so they were considered knowledgeable to give us relevant insights on the current practices when developing robotic applications;
2) Around half of them claim to commonly use design method and most have no formal training on it. Only a couple of participants explicitly consider an ethical perspective when designing their solutions;
3) When it comes to multidisciplinary involvement, most teams include experts in exact sciences and engineering, designers, and experts on the application domain of the robots (mostly in health science);
4) While most practitioners reflect on where the solution is the best one –being aware of certain trade-offs–, slightly less challenge the problem itself;
5) The stakeholders considered relevant are normally 'primary/secondary users' and 'domain experts', not commonly including expert opinion from other fields such as social science, philosophy or anthropology;
6) Despite recognising the importance of viewing the world through different perspectives, including those underrepresented, current practices mainly consist on collecting views from main stakeholders only, and not truly reflecting on completely unforeseen or invisible views.

Thus, our preliminary results suggest that even though there is a certain level of awareness about user and value centred approaches and practitioners claim to partially consider issues of politics, power structures and, values, morals and legitimacy, gaps and inconsistencies in responses suggest that the treatment of such issues is limited. However, the limited data gathered in this initial study does not allow us further interpret the results. Thus, in future work, we want to carry out a more detailed interview to further qualify what exactly they consider with respect to these issues as week as how they explore and respond to these. Finally, we want to study whether CSH can be used to support the design of more ethical robotic systems, by applying it to a real-world research project on elderly care.

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