

Representations of Childcare Robots as a Controversial Issue

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II. BACKGROUND

Abstract—This paper interrogates online representations of robot companions for children, including promotional material by manufacturers, media articles and technology blogs. The significance of the study lies in its contribution to understanding attitudes to robots. The prospect of childcare robots is particularly controversial ethically, and is associated with emotive arguments. The sampled material is restricted to relatively recent posts (the past three years) though the analysis identifies both continuous and changing themes across the past decade. The method extrapolates social representations theory towards examining the ways in which information about robotic products is provided for the general public. Implications for social acceptance of robot companions for the home and robot ethics are considered.

Keywords—Acceptance of robots, childcare robots, ethics, social representations.

I. INTRODUCTION

AUTOMATION in the workforce increasingly dominates technology news. The use of robots raises concerns about negative collateral impact on people's welfare and wellbeing, such as unemployment or safety and security risks that may arise from working with robots. The machines' capacity to perform the tasks for which they are designed remains an engineering matter. The demarcation into social and technological concerns is fuzzier with respect to robots designed for the care of vulnerable groups, in which case the robot's performance of its tasks can impact directly on its users' wellbeing.

Robot-assisted childcare is exceptionally contentious for it could implicate interference with the primary and deepest relationship any human being can have. The attachment bond formed between an infant and a human caregiver is believed to set the foundation for individuals' personality development, mental health and involvement in intimate relationships throughout the lifespan. Ethical appraisals of robot-assisted childcare, however, are hindered by a lack of empirical evidence about long-term impact. Consequently, the topic area becomes a depository of hopes, fears and even fantasies. These find expression in the public domain in the ways that news media, technology and parenting blogs, as well as in companies' promotional material, disseminate technological innovations.

In turn, social representations of childcare robots may serve as a litmus test of public attitudes towards this context of application.

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A. Acceptance of Robots

In a Eurobarometer survey conducted in 2012 with 26,000 people across 24 European countries, the majority (70%) felt positive about robots in general but were negatively disposed towards robots in domestic and social roles, and felt that the use of robots for the care of children, elderly and the disabled (presented as a single category) should be banned [1]. This category topped the list of areas where the use of robots was deemed objectionable (education came second). However, there were conspicuous cross-national differences. Public opinions against using robot in the care of vulnerable groups were strongest in Cyprus (85%) and weakest in Portugal (35%). Age and gender differences within national populations are also likely. In a survey conducted in 2016 in 12 countries across Europe, the Middle East and Africa, the British sample was the least receptive to having robots in healthcare, but within this national sample 55% of 18- to 24-year-olds were receptive to healthcare robots compared with 33% of older respondents, and 47% of male respondents, compared with 32% of females, were receptive to the idea [2].

Irrespective of demographic variables (e.g. age, gender) and cross-national differences in terms of cultural traditions, the country's investment in the robotics industry, and the likelihood of personal exposure to robots, people may apply qualitatively different criteria to robots in social roles than to robots in other settings. While the Japanese love of robots is legendary, and Japanese participants in [3] reported more encounters with actual robots than did American counterparts in the same study, Japanese and Americans alike felt warmer toward people than toward robots and preferred people to robots.

The aforementioned surveys do not provide information about attitudes to robots in childcare separately from robots in elderly care or with disabled adults. Nevertheless, the finding in [1] that banning robots in education came second highest to banning robots in the care of vulnerable groups could be construed as indicative of the reluctance to place robots in settings that can significantly impact on children.

B. Brief History of a Controversy

Although robots deemed suitable for children have been available for decades, they have not been commonplace enough for statistically robust measures of their impact on child development. Opinions are polarized and are underpinned by contrasting standpoints about what is in children's best interest. Faith in potential benefits underpins moral claims that place the onus on society to take advantage

of technological progress for our children's sake [4], whereas worries informed by extant knowledge of child development drive moral claims that place the onus on society to safeguard our children against likely psychological damage [5].

In Britain, the topic received publicity in newspapers' coverage of a 2008 science festival in which Professor Noel Sharkey spoke against so-called 'robot nannies'. The journal *Interaction Studies* subsequently dedicated a special issue of its 2010 volume to the debate. In the target article [5], N. Sharkey and A. Sharkey urged policymakers to implement preventative mechanisms to minimize misuses of robots by irresponsible parents. Several authors concurred; but others disagreed that the risks are realistic or that robot nannies are technologically feasible in the near future. The present author analyzed the contributions to the journal's special issue [6]. Thematic differences across the papers ranged in terms of three bipolar dimensions irreducible to each other: (a) utopian versus dystopian leanings; (b) factual versus speculative bases for argumentation; (c) technology-led versus psychology-led expositions. Some news media and blog articles from 2008 remain online in the public domain at the time of writing and have been included in this study's dataset.

More recently an influx of postings has followed the introduction of iPal (AvatarMind) in autumn 2016. Intended for production in China, iPal is marketed as suitable for children aged 3-8 years who might spend hours alone after school before their parents return home. Although the robot enables parents to remotely monitor their child and to interact with him or her via Skype, leaving children alone on a daily basis could have detrimental impact on their social and emotional development, as N. and A. Sharkey have reiterated in the media apropos iPal (included in this study's sample).

The above 'thread', however, may be only one of several ways in which technological innovations of relevance for childcare are appraised.

C. The Study

The present study is part of an ongoing inquiry into various aspects of the discourse of social robotics, a project that began with an interrogation of scientific and technical writings on human-robot interaction [6] and continues with interrelated projects that examine the discursive construction of social robots in selected contexts of application.

This specific study aims to identify social representations of childcare robots, drawing upon social representations theory (details below) toward an interpretative analysis.

III. METHOD

A. Data Collection

A preliminary research question concerns the kind of information that is readily accessible to members of the general public. It was addressed by carrying out internet searches, as follows.

English-language Google searches for the terms 'childcare robots', 'robot nannies', 'iPal' and 'Kuri', were conducted by the author during April 18 and April 24, 2017. Some sites

were reached through technology news alerts. All these resulted in a total of 52 eligible items (see Appendix for selection criteria). For coding and analysis purposes, an *item* is defined as content that is directly accessible when opening a given URL.

Formats. Most items combine text and images; some include also video or audio-only content. YouTube items picked up by the search engine have been included in the dataset.

Source categories. Items were categorized as: 'Corporate': commercial sites selling robotic products (8%). 'Academic': open access post-prints, universities press releases (15%). 'News': online newspapers, magazines, television channels (27%). 'Other': technology blogs, parenting blogs, societies or organizations without direct commercial investment in selling robots (50%).

Timeframe and timeliness. Items' release dates span the period of 2005 to spring 2017. Out of those, 58% are dated 2016 or 2017. The disproportionate availability of recent material should not be mistaken for a rising trend. It is likely that older material has been removed. Diachronic spikes in attention to the topic reflect the arrival of specific models. The earliest items (N=4) report on PaPeRo. All 2014 items (N=3) report on Pepper with an explicit reference to childcare (other items on Pepper were excluded). Out of items posted in 2016 and 2017, 50% report on iPal (N=15). Items posted throughout the interim years mostly discuss general aspects of childcare robots though some with references to robots that were commercially available at the time, or report about specific research projects.

B. Sample

A subset of the data, limited to items posted 2014 or later (N=36) was used for closer analysis since the author has considered earlier material on previous work (see [6]). The heterogeneous category 'other' includes technology blogs and magazines, parenting blogs, and a site introducing Japan (53%). 'News' sources are mostly UK newspapers (*Daily Mail*, *The Guardian*, *Evening Standard*), as well as *New Scientist*, *Japan Times*, and CBS (28%). The preponderance of British news media might reflect automated search parameters based on the author's locality. The 'academic' category consists of three papers and an American university's press release (11%). All 'corporate' items are promotional material by AvatarMind (separate domain names) (8%).

C. Caveat and Qualification

The dataset gives an indicative snapshot of topic-related information that was available online on April 24, 2017 (the cutoff date for data collection). The selection is not presumed to be exhaustive. Sampling informational flows on the Internet could be likened to a dip in the proverbial river (one cannot enter twice the same river). Although repeated Internet searches picked up many of the same links, the lists were not entirely identical. The relative arbitrariness of an automated search is compounded by customization to the geographical location from where the search is conducted. Despite these

limitations, the dataset is serviceable for the purpose of identifying prevailing themes, preoccupations and patterns of social representation.

D. Social Representations Theory

French social psychologist Serge Moscovici developed social representations theory as a conceptual framework for investigating how scientific knowledge is circulated, resisted and transformed in responses to challenges that particular ideas pose in different social milieus [7]. This framework has become internationally established as a field of inquiry in the social science, including media research [8]. Social representations in Moscovici's sense are not reasoned or deliberate constructions of something. Instead, they are constellations of ideas, beliefs, attitudes and explanations that are inherent in actions, discourse and everyday practices, and serve as a tacit backdrop for further actions, discourse and practices concerning some aspect of social reality.

Reference [9] defines social representations as knowledge structures that are organized around a structuring core and used against the backdrop of actions and goals in dynamic context-sensitive ways. To paraphrase, the present inquiry concerns dynamic, context-sensitive knowledge structures that express and generate beliefs, opinions and feelings about robot-assisted childcare.

Reference [10] locates representation in the relationship between represented objects (concrete entities or abstract ideas), subjects or carriers of the representation, and a project (formal or implicit) within which the representation holds particular meaning. Following suit, the present analysis concerns relationships between: O – robots (actual or imagined) as the represented object; S – carriers of information about them: the authorial voice (subject) implied in the ways that the robots are depicted; P – the particular project: reasons and motivations that impel describing these robots.

IV. ANALYSIS

A. The Contingency of O-S-P Dynamics

The extent to which the issue of robot-assisted childcare is constructed as controversial fluctuates according to the particular project that underlies specific carriers of information about robots.

Sample items assigned to the 'corporate' category provide the most simplistic representation. Due to the timing of the study, these consist solely of promotional material by AvatarMind. The robot (O) is iPal, the company's project (P) is selling it, and the carrier (S) is found in promotional material (text, images and videos). The website's front page contains a slide show of the robot with a child and text describing iPal as "a great companion robot for kids" that with its cute appearance and technological features "will be your child's best friend" [11]. The authoritative statements insinuate a basis in expertise that allows the manufacturers to predict social-developmental outcomes with the same confidence as averring that iPal is equipped with cutting edge

technology. Further information about AvatarMind describes its personnel as "robot experts ... with deep experience in artificial intelligence, motion control, sensors and power management technologies" [12]. Sceptics may note the absence of experts in child development, socialization and wellbeing.

Responses to iPal in news media and various 'opinion' blogs reveal the dynamic nature of social representations. The talked-about robot (O) remains constant while motivations for talking about it differ in accordance with different projects (P), and consequently rhetorical modes and devices deployed by S may differ. Whereas sales pitch rhetoric does not invite audiences to enter a dialogue with the subject matter, other items in the sample perform such invitation from the outset in headlines phrased as a question: "Would you let this robot babysit your child?" [13]; "The iPal – a help or hindrance to child development?" [14]. Headlines such as these open a space for debate even before one finds out whether the blogger's opinion is favorable or disapproving.

The construction of the topic as controversial acquires further nuances in news items, where the journalistic agenda (P) is to inform the public about events and states of affairs. In [15], the *Daily Mail* not only invites readers to engage with the topic, but also informs that there is a controversy; the headline reads, "Would you let a robot look after YOUR child? Meet iPal, the controversial child sized machine whose inventors claim it can be used as a babysitter."

B. Context Sensitivity and Context Creation

Social representations are not only context-sensitive [9] but also create a context for construing the represented object or ideas.

Another British newspaper, *The Guardian*, not only informs that a controversy exists but also that it is escalating because of iPal [16]. The headline contains an unattributed quotation (made by N. Sharkey who is interviewed in the article): "'This is awful': robot can keep children occupied for hours without supervision." It is followed with the exposition, "A child-size robot designed to take on distinctly adult responsibilities takes the debate over the automation of human jobs to the next level."

Sharkey's ethical objections since at least 2008 pivot on risks of psychological damage to children [5]. Whether automation will put au pairs out of a job is irrelevant. In [16], giving due space to Sharkey and acknowledging that child-robot interaction is ethically more fraught than robots in the workforce; the reporter nonetheless embeds the former in the latter. She comments that "Childcare has rarely, if ever, been a particularly well-remunerated or respected job, but it is essential." [16]. Put colloquially, if you are worried about robots replacing workers in major industries, consider also the consequences of automatization in a marginalized sector of the workforce, where replacing humans with robots could have dire consequences for children. Item [16] is thus responsive to timely concerns about robots in the workplace. In the first instance it evinces how social representations are reformulated in context-sensitive ways. It also creates a context for

continuing the construction of childcare robots as a controversial issue.

Representations evolve in ways that are sensitive also to geographical setting. Items [15], [16] link to a background that followers of technology news in the British media are likely to be familiar with (Sharkey is well known in this country). Yet at present, iPal is marketed mainly in China. Item [17] quotes Wang of AvatarMind as reporting that 80% of participants in a test phase in China had said they loved it. However, there is no information about the size of the sample, its demographics, and criteria for participant recruitment.

Receptivity to childcare robots in any society is likely to reflect childrearing practices that are embedded in cultural traditions as well as economic exigencies of the particular country. In Japan, robotics promises solutions to workforce shortages. Under the headline, “Robotics makes baby steps toward solving Japan’s child care shortage,” [18] describes in considerable detail a new project and a prototype that could be ready for a trial run by summer 2016. There is an artist’s image of a sentinel drone guiding a cart of nursery school children. The webpage requires some scrutiny to note that *Japan Times* published it on April 1, 2016, and that keywords in a sidebar include April fool’s day. There seems to be no independent corroboration of the specified project and prototype. The hoax is nonetheless a legitimate datum for this study. It has the trappings of a genuine article, and uncritical readers outside Japan might be fooled by it; hence it adds to representations of childcare robots.

C. Representation by Avoidance and Omission

Social representations are disclosed not only in actual content but also in what is left out, whether deliberately or because it is deemed irrelevant or not considered in the first place.

Deliberate omissions may be seen in the construction of promotional material. Aiming primarily at the American market, Mayfield Robotics promotes Kuri as a ‘home robot’ who could be regarded like a member of the family. Although several of Kuri’s functions parallel iPal’s, its promotion avoids suggesting that it will be a child’s companion in the parents’ absence. This distances Kuri from the controversy over robot-assisted childcare. Indeed, since the words ‘childcare’ or ‘robot nannies’ do not appear in Kuri promotional material, internet searches such used for generating the dataset did not pick up links to corporate items related to it (items from other sources that mention Kuri apropos childcare have been included in the sample).

It can be expected that sales spiel would seek to deflect attention from controversial issues. Appraisals that selectively attend to some salient issues but overlook other issues pertaining to robot-assisted childcare are more indicative of tacit social representations. Like [13]-[15], the headline of [19] – “Robot nannies: should gadgets raise your kids?” – invites dialogue with the subject matter. The article, posted on an IEEE blog, is an appraisal of risks arising from potential abuses of technology. Interviewed in [19], the vice president of the IEEE Society on Social Implications of Technology,

Isaak, points out that devices such as Kuri and Aristotle (a smart baby monitor) could be hacked, enabling strangers to watch the child, or might be used to sell products to young children. Pointing out ethical concerns, Isaac identifies scenarios likely to raise issues of legal responsibility: “If a robot accidentally hurts a child, how will this be handled in court? Conversely, how should the robot respond if it witnesses child abuse in the home?” Conspicuously absent in [19] are concerns about long-term risks to the social and emotional development of children raised by gadgets.

D. Technology-Led Representation

Items’ source and headline phrasing do not are not reliable predictors of whether the contents construct the subject matter as controversial. Both [15] and [20] are ‘news’ items and similarly pose a headline question. Item [20] appears on Forbes website with the headline, “Could your child’s best friend be a robot?” The answer is unequivocally affirmative according to this two-page article, which describes only positive aspects of child-robot interaction – an exposition evocative of promotional spiel. The promotion is not of a particular product (several different models are assessed) but of the conviction that young children will benefit from interacting with robots. The writer (Yao) is the head of R & D in a firm for enterprise AI and bots. She is clearly passionate about this technology and has vested interests in recommending it.

Another ‘news’ item [21] promotes robots for preschool children. The journalist identifies a roboticist (Admoni) at Carnegie Mellon University and unnamed “other experts” who reportedly “see these machines playing a significant role in children’s emotional, social, and cognitive development in the near future.” It could be opined here that experts in robotics are hardly qualified to advice on children’s developmental needs. Experts such as psychologists who may be professionally qualified to comment on children’s social and emotional needs are seldom consulted in the sampled items though [21] quotes also a Cornell University psychologist (Shen) who investigates child-robot interactions in preschool settings: “‘The goal is not to have the robot replace interactions with humans,’ she says, ‘But more to supplement them.’”

The social representation that emerges at this juncture could be summed up colloquially as ‘good tech, bad human’; that is, robots are good for children, whereas the risks lie in human factors such as neglectful parents, pedophile hackers, and unscrupulous vendors. It is germane here that although [20], [21] do not refer to robot-assisted childcare, these items are nevertheless included in the sample because they send a clear message about the benefits of robots for young children: Children have fun with robots. Robots can serve as educational aids.

Responsible parents may not misuse the technology in the manner that worries some critics, notably N. Sharkey [16] and A. Sharkey [22] in interviews with the media. Indeed, educating parents was one of the preventative solutions proposed in contributions to the ‘robot nannies’ debate in

Interaction Studies, reviewed in [6].

V. CONCLUSION

This study is the first of its kind, to the best of the author's knowledge, in terms of using social representations theory towards an interpretative analysis of publicly available information and commentaries about social robots. The above analysis reveals the highly contingent and 'fluid' nature of representations.

On reflection, the question of whether childcare robots are a controversial issue is best rephrased as the question, under what conditions are these robots likely to be constructed as controversial? A tentative answer is the particular discourse into which the topic is entered – psychology or technology. As mentioned earlier, the analysis of the 'robot nannies' debate in [6] identified a dispersion of contributions to the journal's special issue in terms of technology-led and psychology-led arguments. At the 'psychology' extreme, [23] called for changing the criterion from just the absence of harm to what would promote the child's development and wellbeing. In that same special issue, [24] cites research findings that children who had higher involvements with technological artifacts were less likely to view a living dog as having a right to just treatment and to be free of harm. Young children habituated to robotic companions might not acquire the moral responsibilities that real companionship entails. Such findings give cause for concern.

APPENDIX

Selection criteria. The following items were discarded:

- articles on sites that require registration to access the article or available only for purchasing;
- previews of book pages containing the search words;
- articles in which childcare was merely included in a list of robot applications;
- articles on projects with young children that do not concern childcare (e.g. robots in schools, robots with autistic children, children making robots);
- fiction;
- repetitions of the same article in different sites.

Only the first six pages of the Google search results for 'childcare robots' were used, as subsequent pages progressively included repetitions and irrelevant links.

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