Research Article

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Sex robot technology and the Narrative Policy Framework (NPF): A relationship in the making?

https://doi.org/10.1515/pjbr-2020-0022
received May 24, 2019; accepted July 1, 2020

Abstract: The use of sex robots is expected to become widespread in the coming decades, not only for hedonistic purposes but also for therapy, to keep the elderly company in care homes, for education, and to help couples in long-distance relationships. As new technological artifacts are introduced to society, they play a role in shaping the societal norms and belief systems while also creating tensions between various approaches and relationships, resulting in a range of policy-making proposals that bring into question traditional disciplinary boundaries that exist between the technical and the social. The Narrative Policy Framework attempts to position policy studies in such a way so as to better describe, explain, and predict a wide variety of processes and outcomes in a political world increasingly burdened by uncertain reporting, capitalistic marketing, and persuasive narratives. Through content analysis, this study identifies coalitions in the scientific community, based on results gathered from Scopus, to develop insights into the manner in which liberal, utilitarian, and conservative influences alike are shaping narrative elements and content both in favor of and against sex robot technology.

Keywords: robotics, information policy, ethics, artificial intelligence, gender studies

1 Introduction

A little over a decade ago, Bill Gates calmly observed [1] that robotics appeared to be developing in much the same way as the computer industry had 30 years prior. According to the exponential progress forecasted by Moore's Law [2], robots in society should ultimately become as ubiquitous as computers are today, displacing or severely threatening entire industries, just as word processing software, spreadsheets, graphical design programs, and Internet retailers have done before them. Utilizing the power and adaptability of modern machine learning techniques, programming is on track to automatically extract all relevant information from gathered data to solve robotic tasks, achieving full automation and thus substantially bridging the gap toward autonomous, android-like machines [3]. While many experts believe every profession and industry will be affected to some extent, the true unknown is timing; it has been argued [4] that individuals will, at first, be augmented by artificial intelligence (AI) before being replaced altogether by robots that work around the clock, increasing productivity, improving precision, and, ultimately, eliminating the potential for human error. Social distancing, as we are experiencing today, may also have an unforeseen effect by rapidly accelerating changes in the workplace. Economists Brynjolfsson and McAfee have proposed [5] we are in the early stages of a "great restructuring" in that our technologies are racing ahead while many of our skills and organizations continue to lag behind. As a result, it is imperative we understand these phenomena, discuss their implications, and devise strategies that allow humans to race ahead with machines instead of against them.

It has also been argued [6] that while most human–computer interaction to date has been unemotional, relationships with artificial companions will ultimately be built differently because overarching goals will likely be bound with emotion – feelings that make others happy, confident, and content, while and at the same time accomplishing practical tasks simultaneously and in an economically minded manner. A growing trend in robotics meant to deal with this issue has been to design hardware and software that utilize the human psychological tendency to anthropomorphize objects, which can cause users to ascribe effective motivations to such humanoids, a domain defined by some in the industry as lovotics [7]. David Levy has argued for years [8] that there is nothing truly complicated about love and sex that cannot be engineered into a suitably designed robot in the near future, and that such humanoids might not only be psychologically pleasing but also be preferred to human companionship, with such

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machines themselves feeling a love that, while may be of artificial origin, nonetheless makes its user feel the same.

Whether it be in the form of machine learning, robotics, virtual reality, augmented reality, or a combination of such realms, new hardware and software paradigms are moving beyond digital and silicon toward a regime that serves the human mind and consciousness, ultimately the measure of all AI – low powered, distributed globally, low latency in proximity to its environment, inexorably bounded by time and space, and creative in the image of its creator [9]. As a result, a basic legitimacy exists for multidisciplinary policies in and for such categories of robots, occupying a normative role in prescribing conceptions and utilizing rigorous axiological reasoning to articulate goals for the future [10]. Marc Porat [11] originally investigated these activities and proposed a conceptual framework to define and measure it, laying the groundwork to formulate sound policy for a postindustrial information society, constructed around computers, the telecommunication network, and their effects on market and nonmarket events, branching outward almost infinitely into horizontal and vertical directions. The advent of advanced robotics and the Internet of Things (IoT) has created new tensions between different approaches and relationships embodied within technological artifacts, resulting in a range of new policy-making proposals that bring into question traditional disciplinary boundaries that exist between the technical and the social [12]. Such proposals have begun to identify coalitions that might benefit most (and least) from storyline narratives, potentially leading to new theories, methodologies, and frameworks for shaping future public policy. Given it has already been recognized [13] that humans may be better off governing science, technology, and innovation in an anticipatory manner, particularly as it pertains to robotics, the purpose of this article is to explore research narratives in this emerging field to determine what might become state of the art regarding policies governing human sexual relationships with robots.

2 Background

2.1 Sex robot technology

To many individuals, the idea of a robot lover remains a science fiction fantasy [14]. However, there have been extensive efforts to design and build sex robots since 1996, such as Harmony by RealDoll, who is fully customizable with 10 different personality types, has the ability to blink its eyes, move its head, engage in conversations, and remember previous encounters and conversations to offer better companionship [15]. Simply typing the phase *sex robots* into Google alone leads to over 1 million results, including headlines designed to influence broad categories of readers [16]. The fact that technology exists to develop artificial companions and that such agents will ultimately become highly desired commodities is not really in question: individuals are estimated to have spent almost $70 billion in 2017 on biological pets in the United States alone [17] and over $30 billion per year in the sex technology industry [18]. Recently, due to the coronavirus outbreak, sales of sex technology artifacts have increased by over 50% in Germany and 60% in both the US and Italy [19]. The issue is whether certain groups in society may find something morally inconsistent, disturbing, or inherently wrong with the idea of humans establishing social and/or sexual relations with robots and its potential effects on what it means to be human [20]. Sex robots may also be used to wield enormous influence on the shaping of human intimacy, social behavior, discrimination, and the digital divide in the future. Many, however, see issues of gender and objectification arising when robotics and sexuality collide, potentially creating broader societal rifts regarding what uses of a sex robot might be deemed appropriate and which laws or regulations may be required to govern the use of such devices [21].

As a by-product of the secularization of Western society and a trend toward liberalism, certain taboos are being destroyed, as evidenced by sexual instruments, in general, becoming culturally more acceptable in consumer markets [22]. The topic of sex in human-computer interaction has seen a steady stream of investigation over the past decade, especially when considering that sexual expression is cultural and a part of everyday life, ranging from the bedroom and across the social media landscape, potentially changing the political narrative as it tackles serious subjective dimensions including experience, embodiment, pleasure, emotion, and physical intimacy [23]. In fact, the evolution of sexual technology has been found [24] to center around a twentieth-century social history narrative based on the emancipation of Western women, one of the key mega-trends of that period. As a result, sexual technologies can be said to represent sexual politics, as those who make or design such instruments and own the means of production and distribution possess the ability to reflect gender and sexual mores, laws, and notions of obscenity [25]. With the introduction of design culture to the industry in the twenty-first century [26], values, methods, and practices have started to change, which has opened up

such technologies to more mainstream consumer acceptance. Thus, as industrial design practices continue to influence the industry, changes in the quality of products and services will undoubtedly bring about new innovation and competition to the market, as we see developing in the not-so-distant future as it pertains to sex robot technology.

The deployment of sex robot technology is expected to become widespread in the coming decades, not only for hedonistic purposes but also for sexual therapy, education, to perhaps keep the elderly company in care homes, and to possibly assist couples enjoy long-distance relationships. Many, including Coopersmith [27], have already forecasted no lack of funding will exist for the kind of research and development required to make robots attractive, attentive, and interesting as sexual partners, citing the evolution of the pornography industry as conclusive evidence regarding the flow of sexually motivated investment capital. Others [28] believe that clear, explicit connections exist between prostitution and the development of human-sex robot relationships and that extending such relations into machines is neither ethical nor safe. Such ideas may thus further reinforce that only the buyer of sex is recognized as a subject, while the seller is merely a thing to have sex with, raising serious issues as to the levels of gender and sexuality that are inflected into the making of sex robots. Future imagery and the use of sex robots therefore challenges our sense of who we are in relation to each other, changing our reality and ethical relations, and raising questions about policy and the blurred lines that exist between genuineness and falsehood [29].

2.2 Policy in information and communications technology

Digital technologies as a whole are dramatically shifting the nature of public policy concerns, particularly as they relate to privacy, security, and such aspects' implications on human safety and basic societal functioning. Given our current reality that IoT devices are becoming commonplace in both the home and workplace, critical questions remain to be answered, requiring knowledgeable experts in the fields of ethics, policy, law, governance, engineering, and computer science to weigh in at significant levels [30]. The availability of sex robot technology in the marketplace is testing existing boundaries and challenging our ethical and moral standards; additionally, they call into question what our beliefs about humanity are. Humans engaging in sexual interactions with robots could well become the catalyst that forces a larger, global community to address the rights (or lack thereof) of humanoid creatures in general, starting with the need for best practice recommendations and leading to discussions about the possibility of android rights (and responsibilities). Regulation of human–humanoid sexual interaction either by state or by federal governmental bodies will likely follow if the level of interaction either mimics current human sexual interactions or would create one or more social harms if such exchanges were left managed by industry alone [31].

Looking back over information and technology policy research, a greater recognition of value-critical approaches appears to be needed, particularly when reminding ourselves that a truly open and democratic debate should make explicit the variables that should go into determining "correct" answers [32]. Undoubtedly, this policy process involves an extremely complex set of elements, requiring knowledge of the goals and perceptions of hundreds of actors involving possibly very technical scientific and legal issues over periods of time spanning decades, all while interest groups actively seek to incorporate their specific "spin" on events taking place [33]. In the past, analysts would attempt to simplify these situations, usually beginning with the most influential textbook approach, which employs a conceptual framework that divides the policy process into a series of stages and then discusses factors affecting the process at each stage.

Traditionally, such policy analysis spanned across three major ideologies. The utilitarian ideal, rooted in scholars such as Laurence H. Tribe who, following the analysis of John Rawls, argued [34] that the public fosters a wants orientation based on their desires, leaving alternatives weighed in terms of self-interest, most often measured monetarily and remaining value free in such regard. A second perspective is social conservatism [35], with concern for family and religious ideals, making no pretense toward the values embedded in their policy stance. A third and final ideology across the policy belief spectrum, liberalism, aims at securing equality and freedom of opportunity for all individuals to make their own choices and decisions, so long as they do not interfere with the equal rights of others, offering no special privileges to any particular group [36]. The only constant across these belief systems is change, in both society and ourselves as humans, which has been said to be both methodologically and substantively critical for any theory of policy [37]. According to Stone [38], policy analysts must therefore immerse themselves into the real world, bursting with common problems, coalitions, and battles over what can or should be defined as the public good. While findings have shown that opinion tends to move before policy more than *vice versa* [39], constituents still do not appear to get what

they want from government, due to broad generalities, non-responsiveness, and flaws in the democratic process.

Unfortunately, the decentralized nature of information and technology policy evolution, especially in the United States, has resulted in a fragmented approach to both policy development and analysis; that is, as information policy development has been technology driven, policy research has been, for the most part, discipline bounded [40]. By the start of the twenty-first century, information and technology policy studies, once considered a relatively new area of concern, began to take form as a multidisciplinary domain, developing into four main clusters of scientific research: government information, scientific and technical information, social implications of information and communication technologies, and information infrastructure and regulation [41]. As a result, a new era of post-positive approaches began to emerge [42] in relation to social construction and policy narratives, amending positivism with the idea that theories, background, knowledge, and values can have an influence on what is observed scientifically by researchers. These new models of scientific inquiry now consider both quantitative and qualitative methodologies to identify ideas and topics of interest, expanding our understanding in the social sciences and other areas of research [43].

2.3 The Narrative Policy Framework (NPF)

Both regulation and policy literature have a long-standing tradition of employing narrative methodologies [44], especially when analyzing decisions, measuring change, and monitoring transformation, with plots oftentimes pitting forces of good against forces of evil. One new theoretical framework is the NPF,[1] which applies an objective epistemology (e.g., science) to a subjective ontology (e.g., social reality) [45]. This type of system is particularly useful when dealing with a socially constructed, less-stable concept, like sexual relationships, which have specific, identifiable structures but often become the source of heated disputes among relevant players. As a post-positive framework, the NPF attempts to position policy studies to better describe, explain, and perhaps predict a wide variety of processes and outcomes. This maturing methodological approach to policy framework aligns research with assumptions, provides clarity at its level of analysis, and allows for transparency with model specifications, design, and underlying data so as to be "clear enough to be wrong" [46]. Human cognition and communication research is guided under the NPF at three distinct levels[2] to categorize narrative elements,[3] specify causal drivers on theoretically important dependent variables, and guide hypothesis development [47]. This design has been shown [48] to illustrate competing policy narrative content[4] rooted in distinct ideological systems that exhibit variation in how victims and harm are defined, the manner in which heroes are glorified, ways in which blame is attributed to villains, what policy solutions are put forth, and the types of policy narrative communication strategies that ensue.

The NPF asserts that policy actors construct policy narratives in a strategic manner to sway public opinion toward a preferred policy outcome, influencing individuals and groups in society toward a particular belief system or narrative strategy, which are used to either bind entities together in the formation of advocacy coalitions or expand or contain interest and participation in a policy arena [49]. NPF research tests these narrative elements to determine which demonstrate the most statistical significance, helping to describe [50] how coalitions utilize such elements to further or hinder agenda elements. Generally speaking, when interest groups portray themselves as losing on an

1 The Narrative Policy Framework (NPF) is a systematic approach to narrative policy analysis that allows for both qualitative and quantitative methodologies. While developed only in 2010, the NPF has seen rapid adoption, appearing in academic journals such as *Critical Policy Studies*, *Policy Sciences*, and the *Policy Studies Journal*, as well as being featured in Paul Sabatier's classic *Theories of the Policy Process* (3rd Edition).

2 The NPF levels of analysis provide vantage points for examining the role of narratives in the policy process. The **micro-level** of analysis focuses on how individuals form and are shaped by narratives. The **meso-level** hones in on how policy actors construct and communicate narratives to influence policy. The **macro-level** centers on policy narratives that permeate institutions, society, and cultural norms.

3 Defining narrative components is crucial in guiding one's NPF research because they represent the structural building blocks. **Characters** are defined as entities who act or who are acted upon. At least one hero, victim, or villain must be identified. **Setting** represents the space where action unfolds over time. **Plot** focuses on the content of the story and helps to organize actions. **Moral** typically represents a solution with a call to action.

4 Narrative content infuses meaning into narrative elements to create policy realities. **Belief systems** represent shared ideals or values by individuals, coalitions, disciplines, and societies. **Strategies** are the ways in which narrators purposely construct policy realities for external communication.

issue, they engage in narrative strategies[5] that aim to expand the scope of conflict; conversely, when groups portray themselves as winning, they engage in narrative strategies that reduce an issue to the status quo [51]. By anchoring these narrative components to narrative content, the scientific analysis of scholarly publications, media coverage, and other documents produced by interest groups with stakes in the sex robot debate can be employed [52] to test connections, impacts, and ethical questions. Derived from long-standing academic approaches in social construction, bounded relativity, and generalizable structural elements, NPF assumptions combine scope and the development of empirical research into a multidisciplinary approach that can be arguably applied to the study of public policy in almost any domain or research front [54], including sex robot technology. The research herein will serve to focus on the role of policy narratives within and across author coalitions in this emerging field.

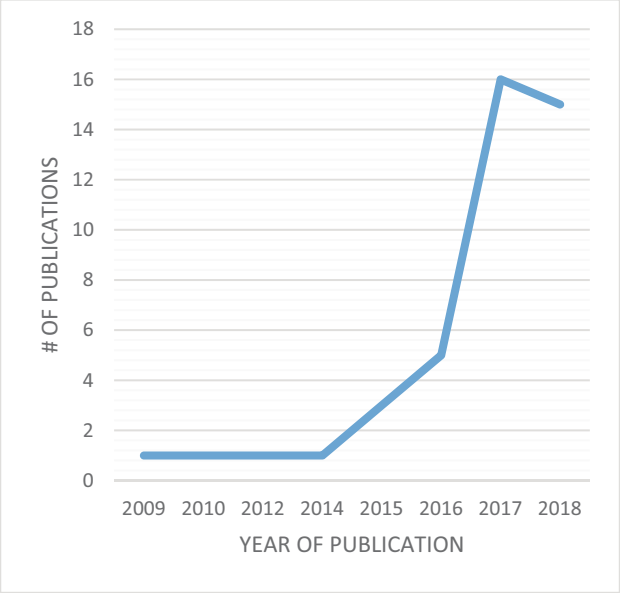


Figure 1: Number of citations with key word "*sex robots*" per year (Scopus).

3 Methods

3.1 Data set

A review of Scopus® (www.scopus.com), considered by some to be the largest abstract and citation database of peer-reviewed literature, including scientific journals, books, and conference proceedings, was searched on April 3, 2019, using the search string ["sex robots"] to identify studies on sex robotics. The results revealed 46 documents for the period 1935–2019, all published within the last 10 years (see Figure 1 for results); bibliometric data were gathered by year, author name, subject area, document type, source title, key word, affiliation, abstract, country, source type, and language. Printed or electronic copies of the documents were obtained from various sources, including Long Island University's library resources (http://liu.cwp.libguides.com), ILLiad Resource Sharing Management software (https://illiad.cwpost.liu.edu), Google Scholar (https://scholar.google.com), and Google Books (https://books.google.com).

3.2 Procedures

An initial decision when applying the NPF is to determine the appropriate level of analysis, which designates the scale of research. Because the overarching research question analyzed herein is how coalitions of published authors in Scopus have, to date, constructed policy narratives regarding the topic of sex robot technology, the meso-level was selected; explorations will examine both inter- and intra-coalitional dynamics across authors. NPF research at the meso-level examines the strategic construction and communication of policy narratives by coalitions with desired policy goals imbedded within. Conceived as a policy system, advocacy groups develop narratives that reflect shared policy preferences, while competing groups share, at the same time, divergent preferences, often using interchangeable, yet dissimilar, narrative elements. At this level, the ultimate goal is to affect policy preferences that achieve favorable policy outputs and minimize unfavorable outcomes.

Data elements from Scopus were loaded into Microsoft Excel for literature, statistical, and visual analyses. All 46 documents were reviewed for both narrative components and narrative content, using a modified coding framework as prescribed in previous NPF codebooks [54]. Coding components included in this research were to identify *policy narratives* (in terms of coalitions), *setting*, *characters* (as defined by the NPF as those individuals who play the roles of heroes, villains, or victims), *moral and/or policy solution*, *plot*, *belief system*, and *narrative strategy*. Six

5 While a variety of narrative strategies currently exist, the most commonly used today [53] include: **scope of conflict**, which distributes costs and benefits of a proposed policy across the array of characters; **causal mechanisms**, which focuses on the strategic use of characters intentionally, inadvertently, mechanically, and/or accidentally; and the **devil–angel shift**, which emphasizes "good" over "evil" or *vice versa*.

documents were removed from the coding analysis due to the following reasons: one was written in French; one was written in Italian; one was listed twice in English and Spanish; and three were citations of conference proceedings in which one or more of their contents were separately included as citations in the analysis.

Similar to Dupuis (2019), each coding category was kept open-ended to allow for themes to emerge in a more holistic manner and to better acknowledge and account for ways in which the various narrative elements were linked together [55]. After performing a thorough review and content analysis of the materials, each document was coded into one of three mutually exclusive, all-encompassing narrative coalitions: those in favor of sex robots, those opposed to sex robots, and those requiring additional sex robot research. This third category of additional research emerged from the content analysis process when it became evident that a number of published documents were unsure of voicing support for or against sex robots until more information became available.

The narrative element of setting was used to measure author disciplines, interpreted as the subject area(s) from where the author's perspective was derived. Additionally, 12 distinct characters were identified and assigned to the roles of hero, villain, and victim (if present) by coalition to evaluate commonalities within and differences across perspectives. Moral or policy solutions were coded next, based on the impacts sex robot technology might have on society, followed by narrative plot, from which two major themes emerged: power/control or change. Finally, each document was coded for both a belief system, which formed the basis for the research, and a narrative strategy, which provided insight into the types of story told by each author coalition.

Within each narrative coalition, it became rapidly apparent through the content analysis process that each group crafted different policy narratives through a number of common *character* configurations. For instance, authors in favor of sex robots often portrayed sex robots as the hero, while authors against sex robots depicted them as villains, potentially furthering the gender divide and exploiting women and children as pornography has purportedly done in the past. Additionally, each narrative coalition employed different concepts of benefit and harm through corresponding plots and recommended moral and/or policy solutions. For instance, a plot of power and control was often used to tell the story of female objectification through sex robot creators as villains, while a plot of change was employed repeatedly to illustrate how society, as the hero, can establish robot ethics that improve human relationships and reduce alienation. As a result, in the research to follow, some narrative elements were analyzed as a whole (e.g., across the coalitions), while others were examined within their narrative coalitions, to account for this phenomenon.

4 Results

4.1 Overview of global research on sex robots

Within the fields of human-computer interaction and human-robot interaction, the past few years have witnessed a strong upsurge of interest in the more personal aspects of human relationships with artificial partners. This has been seen not only among the general public, as evidenced by an increase in coverage in print media, TV documentaries, and feature films, but also within the academic community, attracting researchers, artists, and industry professionals alike to present and discuss innovative works and concepts [56]. The idea and use of sex robots has clearly become a common theme in mainstream society today. Yet, as illustrated in Figure 2, published scientific research to date in Scopus is limited to only 16 countries, of which only 8 have published 2 or more scholarly works; the United Kingdom leads all efforts with 15, with Germany and the United States both a distant second with 5 each. To help better understand the nature of such research, Figure 3 provides imagery of author-identified key words indexed in Scopus, which contained the following terms appearing at least five times each: sex robots, robots, AI, robotics, philosophical aspects, ethics, human, intelligent robots, pornography, and psychology values. Clearly, this emerging research area, while still in its scientific infancy, poses to cover much epistemological ground as academic investigation continues into the future, particularly as robotic devices become more readily owned and operated in society for the performance of both general and specific tasks alike.

4.2 Story framing: narrative coalitions and settings

By examining each document's abstract, article title, source, key words, and content, items were coded into one of three narrative coalition groups; summary results are depicted in Figure 4. This exercise proved to be rudimentary in nature – author perceptions definitively

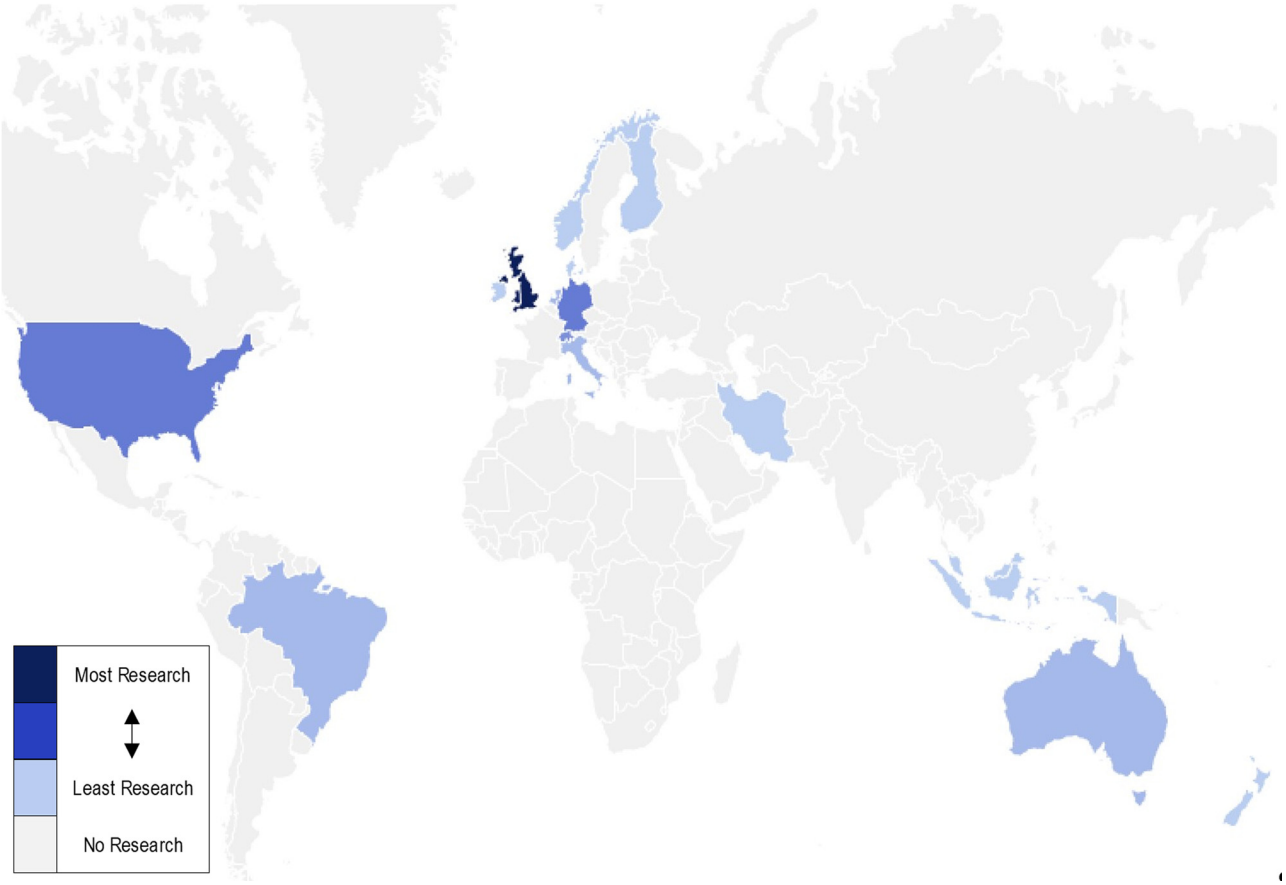


Figure 2: Global research status of *sex robots* (Scopus).

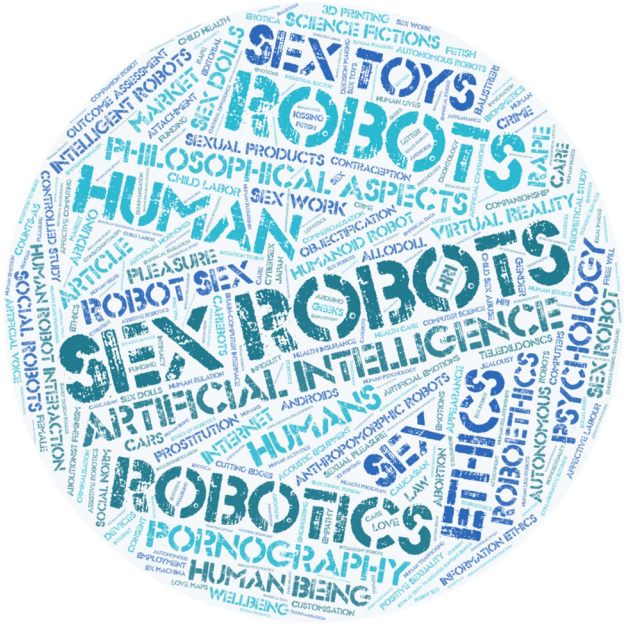


Figure 3: Word cloud of *sex robot* key words (Scopus).

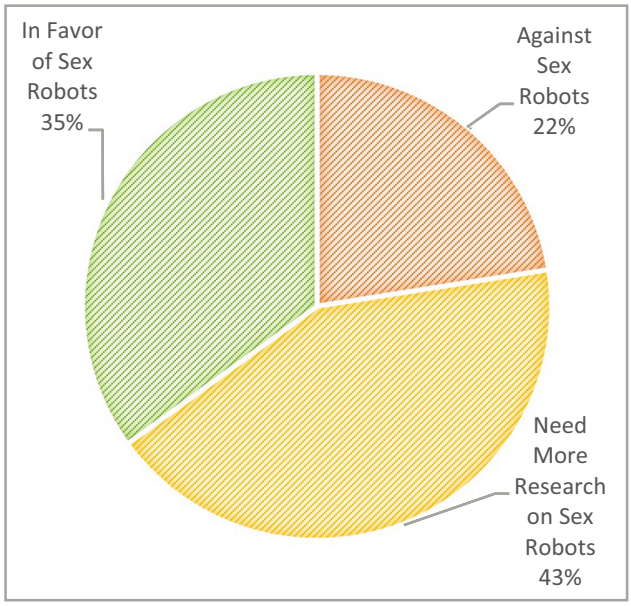


Figure 4: *Sex robot*-coded author coalitions (Scopus).

gravitated toward one of these three categories. As mentioned earlier in this document, by keeping the coding open-ended, a third coalition of authors requiring more research wound up becoming the largest group (43%), with the remaining items split between those in favor of sex robots (35%) and those against the creation and/or use of such devices (22%).

Each document was then coded to a narrative setting based on its subject area(s) as identified by Scopus, which currently indexes 334 individual categories in its database within health sciences, life sciences, physical sciences, and social sciences and humanities. Over 25% of the documents referenced computer science as a discipline, with social sciences (16%), mathematics (15%), arts and humanities (13%), and engineering (10%) accounting for the other major narrative settings. Results, illustrated in Figure 5, demonstrate that this emerging research front has a number of interdisciplinary commonalities with computer science, thus accounting for a wide and well-distributed narrative setting for which authors can portray their stories in a manner that could influence policy in one or more of these associated subject areas.

4.3 Story lines: characters and moral/policy solutions

Figure 6a–c depicts the frequency of characters coded by this study as heroes, villains, and victims[6] in the 40 articles identified in Scopus across narrative coalitions. Of particular note was society representing the hero character in 48% of the citations; sex robot technology, their creators, and men representing the villain in 70% of the documents; and women, human beings, and society representing the victim in 75% of the works analyzed. These statistical results depict a clear overall storyline from a character perspective: one of society, as a whole, developing policies that protect human beings, particularly women, from the potential harmful and/or negative effects of sex robots and a preconceived male-dominated sex robot industry. It also demonstrates how a particular character (e.g., society, sex robots) can play a different role across varying narrative strategies.

Figure 7 depicts the frequency of moral and/or policy solutions[7] within each narrative in the 40 coded articles, based on a review of document content, irrespective of narrative coalition. These results illustrate a rather wide variety of solutions proposed in published research to date, with many of the indicators relating to aspects of human emotions, relationships, and sexuality, while others highlight the prevention of criminal activities and the establishment of legal or ethical guidelines to control functionality or behavior. Overall, the literature demonstrates a second overall theme from a moral perspective: that policy in the realm of sex robot technology must consider a wide variety of solutions, as this research front touches upon many aspects of what it truly means to be human.

4.4 Storytellers: plots, belief systems, and narrative strategies

In terms of the remaining narrative elements and content, due in part to the specific nature of the data, along with the open-coding process identified at the start of this research project, it became useful to analyze results within each coalition. By employing this method, specific types of narrative strategies used by author groups could potentially be identified in terms of how they are used to influence public opinion or shape future policy outcomes to reach favorable conclusions. From a plot[8] perspective, it is interesting to note in Figure 8 that the *change* theme was coded to every single document that took a favorable approach to sex robot technology. Those in the coalition requiring more research were divided almost equally between the *change* and *power/control* themes, while those in the author group against sex robots predominantly used the *power/control* theme to tell their narrative story. These alignments paint a very clear picture of the spectrum of narrative plots each coalition currently uses to shape public perception. Those who support sex robots want to show them as a force of positive change, while those against sex robots want to highlight their use as further power and control over victim groups. The undecided coalition uses both plot types to link characters

6 Individuals have engaged with narrative characters across the roles of heroes, victims, and/or villains throughout history, as authors routinely depict their mental states in a progression through time. Authors generally employ narrative structures to bring readers to respond sympathetically or antipathetically toward them. This very mechanism of character participation and multidimensionality can then influence or stir readers to think or act in terms of perspective taking [57].

7 Authors typically employ moral and/or policy solutions as the underlying achievement of the predefined hero character in the protection of one or more victim character groups from harm. It can also be considered a story's call to action.

8 Operational definitions for the purpose of this research were the two basic plots used across literature and cinema and in many previous NPF publications, specifically *stories of power/control* or *stories of change*.

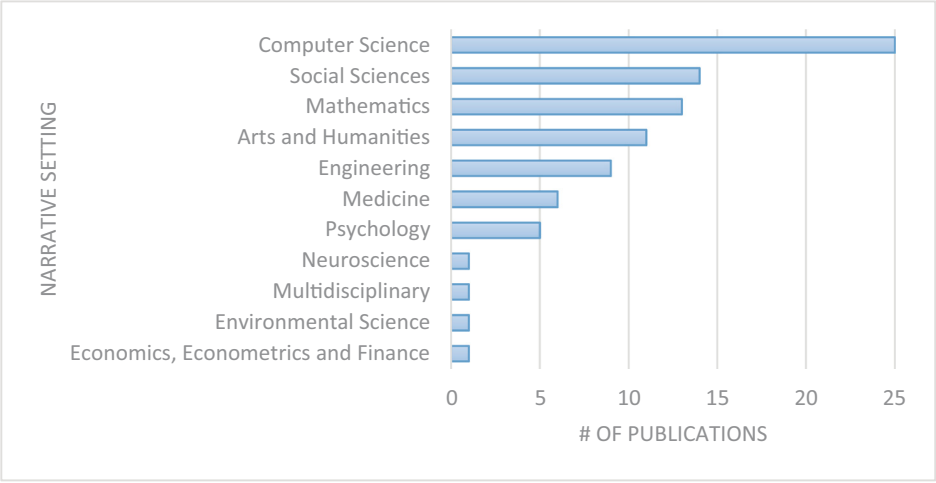
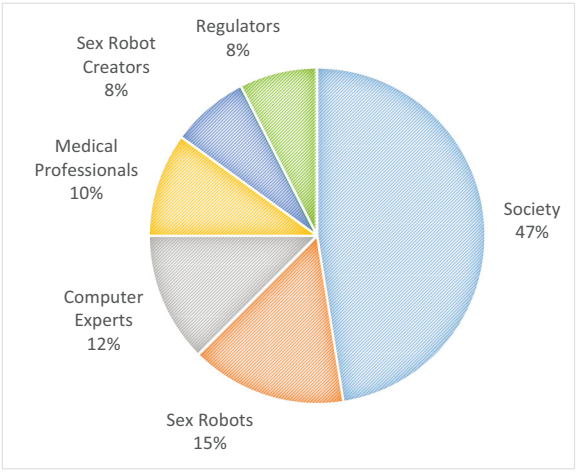


Figure 5: *Sex robot*-coded narrative settings based on academic discipline (Scopus).



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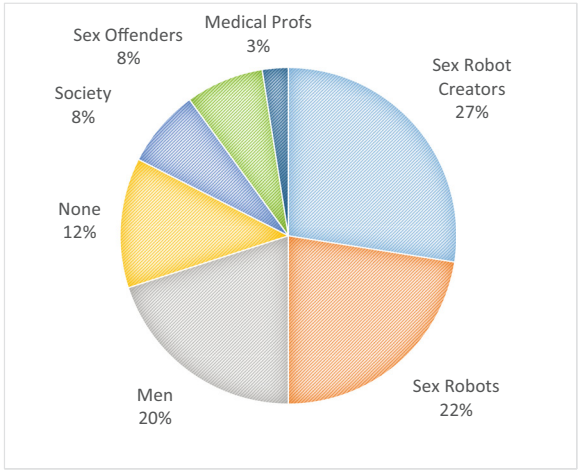

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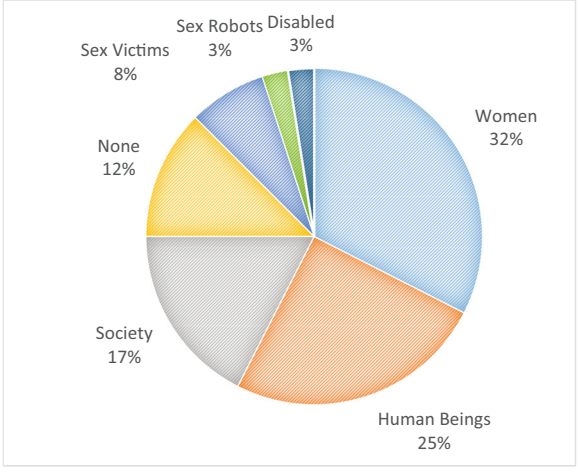

(c)

Figure 6: (a) *Sex robot* **hero**-coded character frequency (Scopus). (b) *Sex robot* **villain**-coded character frequency (Scopus). (c) *Sex robot* **victim**-coded character frequency (Scopus).

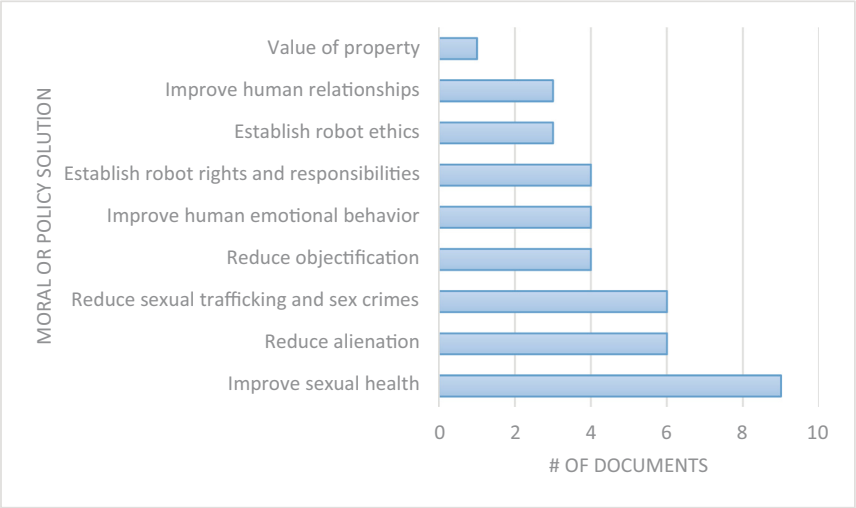

Figure 7: *Sex robot*-coded moral or policy solution frequency (Scopus).

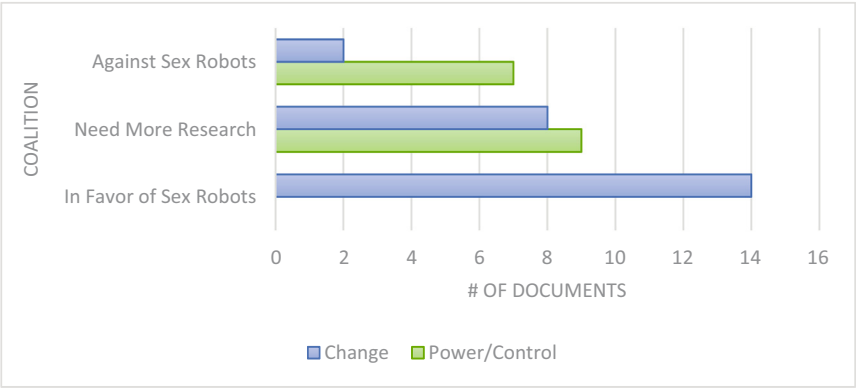

Figure 8: *Sex robot*-coded narrative plot frequencies by coalition (Scopus).

to each other and to their settings in various prescribed ways. Additional research appears warranted in this area to better understand the detailed mechanisms of how plot type is used to support those either in favor of or against in an emerging field like sex robot technology.

Continuing on in the theme of analyzing data within coalitions, it is interesting to look at coded belief systems,[9] illustrated in Figure 9; as it pertains to this narrative element, *sexual wellness* and *robot ethics* are the predominant categories utilized by all three coalitions, albeit as a preference to various degrees. *Sexual wellness* was used by the narrative coalition in favor of sex robot technology over 60% of the time but was used infrequently by the other two coalition groups. Conversely, *robot ethics* was used most often by the coalition requiring more research on sex robots. The two narrative coalitions not in favor of sex robots also used additional belief systems (i.e., gender studies, evidence-based research, religious studies, and human rights) to support their narrative content to varying degrees. One can thus conclude, from published research to date, that those in favor of sex robots utilize a specific narrative belief system (sexual wellness), while those against or requiring additional research cast a wider net to caution those of the potential perils that may exist within the future of the sex robotics industry. While only 40 documents were coded, the results shed light on specific stories utilized by coalitions in their attempt to influence society's perspectives on both sex robot technology and their ultimate use in the future.

9 Six belief systems were identified in this research as being used by the three narrative coalitions to orient prospective audience members in a stable manner across time and space: *gender studies*, *sexual wellness*, *religious studies*, *robot ethics*, *evidence-based research*, and *human rights*.

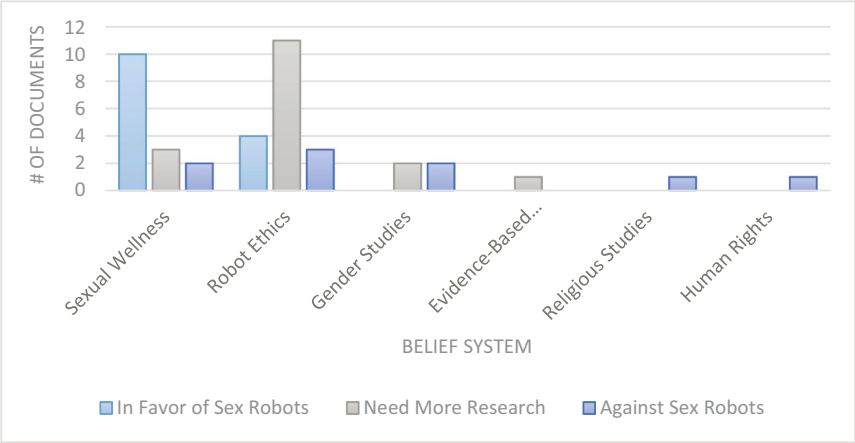

Figure 9: *Sex robot*-coded belief systems by coalition (Scopus).

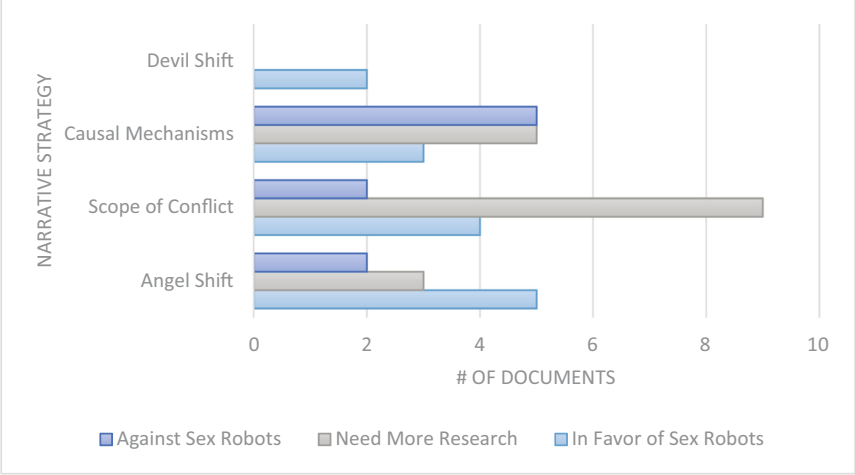

Figure 10: *Sex robot*-coded narrative strategies by coalition (Scopus).

Finally, the coding process was applied to the narrative strategies[10] of documents within each of the three coalitions; Figure 10 depicts these results. While the devil shift was only utilized by those in favor of sex robots (a notable finding in itself), the other three narrative strategies were used by each coalition to different extents to formulate their stories. Proponents for additional research primarily employed the scope of conflict strategy to lay out the pros and cons of each side of the argument as well as causal mechanisms to discuss what could potentially happen if policy formulation leans to one side or the other. Those in favor of sex robots, however, used all strategies to support their viewpoints, carving out different ways in which to portray their coalition's beliefs in a positive way – remembering, however, that such stories also tended to showcase a theme of sexual wellness through a plot of change. Those against sex robots, on the other hand, primarily used causal mechanisms as a warning to what could transpire if their policy opinions were not placed into effect, pairing this strategy oftentimes with society as the hero and sex robots, and/or their creators, as the villain(s).

5 Discussion

Recent research findings [58] have shone light on the usefulness of narratives in policy discussions across many

10 In the case of sex robots, all four main narrative strategies were identified as being utilized by author groups to shape policy realities: the *angel shift* (e.g., casting the hero as the winner, with the audience frequently transported into that role), *causal mechanisms* (e.g., how character intent affects the policy issue), *scope of conflict* (e.g., distribution of cost and benefits across the characters identified), and the devil shift (e.g., casting the villain as victor over the heroes).

academic disciplines, including advertising, communication, psychology, political science, and neuroscience; as previously stated, the NPF attempts to apply post-positive methodological approaches to subjective social realities, using scientific methods, to help shape public policy. Given the current social media environment, the reach of narratives is far, dissemination is instantaneous, and, as a result, postindustrial society, with its focus on consumers and marketing, expends considerable amounts of energy turning public policy debates into battles over competing storylines [59]. Hence, interest group narratives develop both primary beliefs and political strategies in hopes of using such rhetorical devices to define winners and losers as tactics to drive future policy decisions and potentially reap capitalistic gains [60], such as the widespread deployment of sex robot technology for pleasure, education, therapy, or companionship.

This study helps to further explore and understand the impacts of sex robot technology, an emerging research field, and identifies some of the common narrative themes, form, and content used in published scholarly articles to date. The three coalitions use specific plots, belief systems, and narrative strategies to arrange characters and settings in such a way so as to facilitate or hinder industry development in the future. Clearly, more empirical investigation is necessary to define how and what sex robots are produced, the purposes they are (and not) programmed to fulfill, and how such technology-at-large can (or will) change the nature of relationships and our ability to be human in what some surmise to be a futuristic society dominated by the context and currency of information.

The research portrayed herein suffers from a number of limitations including, but not limited to, the potential for an overrepresentation of liberal bias from the scholarly community and the use of a small sample of published articles currently indexed in Scopus. Future research will focus on gathering and coding media perspective on the topic at the NPF's micro-level, through searches of both Google (https://news.google.com) and Bing (www.bing.com/news) news sites, to gain further insight into individual perceptions and beliefs surrounding sex robot technology.

6 Conclusion

One of the fundamental reasons policy research exists in information and communications technology is to make intelligent and socially responsible interventions in the exercise of power and control over such artifacts [60]. Democracy can be considered nonexistent unless public opinion plays a role in the shaping of policy, even if it works dynamically in a constraining, rather than directive, manner [61]. While the idea that democratic societies should be open, accessible, and transparent to the governed are not new, such points are receiving newfound prominence [59] due to the emergence of social technologies such as sex robots, especially in this newfound era of social distancing. While this emphasis creates uncertainty regarding the nature of regulation as a whole, it also can help shape the way in which future discussions will occur and what regulatory tools can or should be utilized in a particular emerging field [62].

Through the application of the NPF, this study pinpointed two key themes across author coalitions. First, society will be required to develop policies that protect human beings from the potential harmful and/or negative effects of sex robot technology. Second, sex robot policies must consider a wide variety of solutions that include disciplines that go beyond traditional computer science. From an intercoalitional perspective, scientific publications that support sex robots oftentimes illustrate them as a force of positive change, predominantly using a belief system of sexual wellness, while those against sex robot technology highlight their use as a story of power and control over a number of key victim groups based on gender, ethics, religion, and human rights. Because policy on sex robots remains undecided at this moment in time, those authors in the coalition requiring additional research employed a mix of plot types, settings, characters, and strategies to better illustrate the properties of effective policy narratives and how those narrative could be used in the policy process.

As a relatively new theory [63], the NPF turns an empirical eye on the truth claim of the power of narrative and asks, using science as its theoretical scaffolding by developing micro-, meso-, and macro-level hypotheses and methodologies, do narratives play an important role? As it pertains to sex robot technology, the research herein clearly illustrates that well-defined coalitions are utilizing specific policy narrative strategies, elements, and content to support their stories for and against this futuristic technology. While all fields discuss the nature of humans to varying extents, in many ways, sex robot technology seemingly touches upon what is the very essence to be human and, as a result, additional research with respect to policy in this arena may be truly a worthwhile investment of scholarly time and effort.

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