

Towards an UX/CX research-framework for HRI along the Customer Journey - a methodological note

Interdisciplinary UX/CX research-framework along the Customer Journey

Artur Lisetschko

Hochschule Ruhr-West
Bottrop, Germany
artur.lisetschko@hs-ruhrwest.de

Medina Ferizovic

Hochschule Ruhr-West
Mülheim an der Ruhr, Germany
Medina.Ferizovic@hs-ruhrwest.de

Matheea Beder

Hochschule Ruhr-West
Mülheim an der Ruhr, Germany
Matheea.Beder@hs-ruhrwest.de

Simone Roth

Hochschule Ruhr-West
Mülheim an der Ruhr, Germany
Simone.Roth@hs-ruhrwest.de

Sebastian van Ledden

Hochschule Ruhr-West
Bottrop, Germany
Sebastian.vanLedden@hs-ruhrwest.de

Aysegül Dogangün

Hochschule Ruhr-West
Bottrop, Germany
Ayseguel.Doganguen@hs-ruhrwest.de

ABSTRACT

The overarching societal integration of social robots requires positive experiences. However, frameworks for specifically considering the interaction experience with social robots in public spaces do not exist. Previous research suggests that the experience concepts of User Experience (UX) and Customer Experience (CX) should be equally considered in the design process of applications of social robots. Building on this, we propose an interdisciplinary framework for evaluating and optimizing UX and CX in human-robot interaction (HRI), along the Customer Journey (CJ). The framework differentiates interdisciplinary evaluation criteria along adapted contact phases compared to the conventional CJ including the identification of associated touchpoints with a focus on UX and CX. It considers how the individual touchpoints and experiences made at each touchpoint (pain and gain points) during the respective phase can be methodically evaluated and related to each other. It is meant as a concept from which implications can be derived as to how UX and CX can be integrated into the interaction concepts in order to achieve a long-term stable intention to use and loyalty.

CCS CONCEPTS

• **Human-centered computing** → **Human computer interaction (HCI)**; **HCI design and evaluation methods**; **User studies**; **HCI theory, concepts and models**.

KEYWORDS

User experience, UX, customer experience, CX, customer journey, methods, instruments, framework

1 RELEVANCE OF AN INTERDISCIPLINARY PERSPECTIVE ON HRI

Human-robot interaction (HRI) as an interdisciplinary research field is encouraged to consider perspectives from other disciplines [51] to not only create more consistency in the field [5], but also to generate more holistic approaches to solutions [14, 21]. To date frameworks are missing to specifically consider and evaluate the interaction experience with social robots. This raises challenges for the use of social robots in public spaces, as positive experiences are essential for the social integration of social robots [62].

Creating such experiences requires systematic approaches to the design and evaluation of interaction [38], but have been so far sparsely exercised in HRI in terms of user experience (UX) [2]. According to predominant literature, UX represents a crucial factor for the acceptance of social robots [17]. UX is only one of many possible disciplinary perspectives of experience [62]. Another perspective is offered by economics in the form of customer experience (CX), with both perspectives having in common their multidimensional nature and the focus on a subject of experience (customer or user). In contrast to UX, a CX perspective with social robots has hardly been considered in the literature so far [56] and diverse evaluation approaches are pursued for both concepts [16, 51].

Thus, the question arises how both experience concepts, UX as well as CX, can be considered in the design of interaction with social robots in order to promote receptiveness of customers or users. A first promising approach is provided by [57], who describe an iterative method to develop commercially viable social robot applications with effective UX that also considers CX objectives. Based on the CJ in the considered deployment context, targets of both concepts merge smoothly by considering the interests of business partners in the UX design. However, the lack of distinctness between UX and CX in design not only complicates identification of potential determinants of social robot experience, but also which experience concept is used to assess prototypes in the field.

To address this, as well as the research question above, we propose an initial concept of an interdisciplinary framework for evaluating UX and CX for social robots in public spaces to promote a consistent approach and cross-disciplinary collaboration in the field of HRI [6, 14, 51]. Derived from the conventional customer

Permission to make digital or hard copies of part or all of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for third-party components of this work must be honored. For all other uses, contact the owner/author(s).

Veröffentlicht durch die Gesellschaft für Informatik e.V. in P. Fröhlich und Vanessa Cobus (Hrsg.): *Mensch und Computer 2023 – Workshopband*, 03.-06. September 2023, Rapperswil © 2023 Copyright held by the owner/author(s).
<https://doi.org/10.18420/muc2023-mci-ws17-366>

journey (based on Lemon and Verhoef[37] and its similarities to UX modeling approaches (e.g., Roto et al.[47]), an adapted sequence of contact phases was formulated to structure the framework. In an interdisciplinary literature review we examined interaction scenarios of HRI against the background of our adapted phase sequence to provide interdisciplinary and discipline-specific target factors for each phase together with initial suggestions for evaluation methods and instruments.

2 THEORETICAL FOUNDATIONS

2.1 Working definition of UX and CX

In the following, we provide working definitions of UX and CX and show parallels as well as limitations of their comparability. Thereupon, we argue for the simultaneous consideration of both concepts from the perspective of the CJ and derive an interdisciplinary adapted version as the basis of our framework.

User experience (UX) encompasses emotions, preferences, beliefs, and accomplishments that users experience before, during, and after interacting with a social-technological system in a given situation [2]. UX is assumed to be largely determined by pragmatic and hedonic qualities [27, 28]. Pragmatic qualities require that tasks can be processed effectively, efficiently, and safely through use of the system, thus covering the usability component. Hedonic qualities result from the fulfillment of the psychological and emotional needs of the user. The perception of both qualities is reflected in attractiveness, an overarching evaluation of the product that leads to acceptance or rejection [1, 50]. Given that in user-product interactions robustness of technical aspects is being practically assumed, while the need for positive experiences increases, UX in design becomes significantly more important for creating a desired user experience [2, 24].

The concept of customer experience (CX) is closely related to UX and, according to [59], can be described as a multidimensional construct that captures all interactions a customer has with a company or its brand throughout each contact phase. The primary focus is on all touchpoints between the customer and the company or brand that a customer experiences during their entire customer journey (CJ). Each touchpoint with the brand is anchored in the consumer as an experience. The aggregated individual experiences at each touchpoint, form the overall experience represented in the CJ ([37], p. 70; [34] p. 450). The CJ involves several phases of the actual act of purchase, depending on the context ([37] p. 82). The conventional view considers the CJ to be divided into a pre-purchase, purchase, and post-purchase phase [37]. A positive CX, along all phases of the CJ, motivates the consumer to repeatedly interact with the company [22]. Awareness of the CJ can therefore be helpful for organizations at numerous levels to perform as a co-creator of the customer experience and, consequently, to build a strong customer relationship. If a positive experience prevails more frequently, consumers achieve a "loyalty loop," and they interact and purchase again without going through the earlier stages of the CJ again [22].

2.2 Interrelating UX and CX

We consider UX to be a specific experience that occurs punctually along the CJ in different manifestations on a repetitive basis. Thus, UX emerges as a part of the CX and can cumulatively mature into

a spectrum of experiences of individual users or consumers with a social robot [47]. According to [40], the emotional attachment of users to a technological device can be viewed as the sum of cumulative emotional experience episodes in different contexts. These episodes can be categorized from a UX perspective into three dimensions: a visceral level (first impression), a behavioral level (use of the device), and a reflective level (interpretation of interaction with the device). CX, on the other hand, includes both individual experiences at each touchpoint and the aggregate of a customer's interaction experiences in the form of the CJ. UX, considered as a component of CX, "should always be seen in the larger context of CX" [23]. Moreover, UX influences can be temporally categorized comparable to those of CX [24] and accordingly divided into a pre-use, use, and post-use phase [36]. HRI studies [9, 11, 51] demonstrate that UX with social robots is temporally dynamic, thus requiring studies of longer time periods. Similarly, Roto et al.[47] propose to consider four UX time spans that condition each other in sequence: anticipatory UX, momentary UX, episodic UX, and cumulative UX.

Due to their conceptual intersection, we argue that research on both concepts of experience can be integrated into a framework based on an adapted CJ and that the totality of the interactional experience to be evaluated emerges across a series of touchpoints within multiple phases [37, 42]. Building on this, we now describe the multi-perspective evaluation approach of our interdisciplinary framework.

3 AN INTERDISCIPLINARY FRAMEWORK FOR EVALUATING UX AND CX IN HRI

To structure our interdisciplinary framework for evaluation of UX and CX with social robots in the context of public spaces, we introduce an adapted sequence of phases derived from the classical CJ [37] and the conceptual commonalities between UX and CX discussed above [36, 47]. Similarly, to the classical CJ we derived three sequentially interdependent phases: pre-contact, contact, and post-contact phase. Based on results of an interdisciplinary literature review we explicate these phases by providing discipline-specific perspectives on suggestions for evaluation.

From an UX perspective, the pre-contact phase marks anticipatory or imagined UX prior to first or repetitive use [47]. This builds on expectations derived from prior experiences with comparable technologies and other sources of information (e.g., advertising, opinions) [46]. Anticipatory UX can have a predisposing influence on UX emerging in the contact phase as the quality of the experience in the moment is being judged against initial expectations [44, 57]. If adequate expectations are communicated upfront, a valid mental model is established that prevents expectation discrepancies [35], creates accurate conceptions of the robot's capabilities [41], and thus fosters positive UX. To address expectation discrepancies and confirm expectations on interaction as an overarching UX goal, tailored pre-questionnaires about prior experience with robots are recommended (e.g. [39]), complemented with interviews featuring open-ended questions about expectation conformity post interaction [44].

Momentary UX arises with the contact phase by experiencing real interaction accompanied by elicitation of specific emotions and feelings [47]. In this phase, qualitative recordings and observations

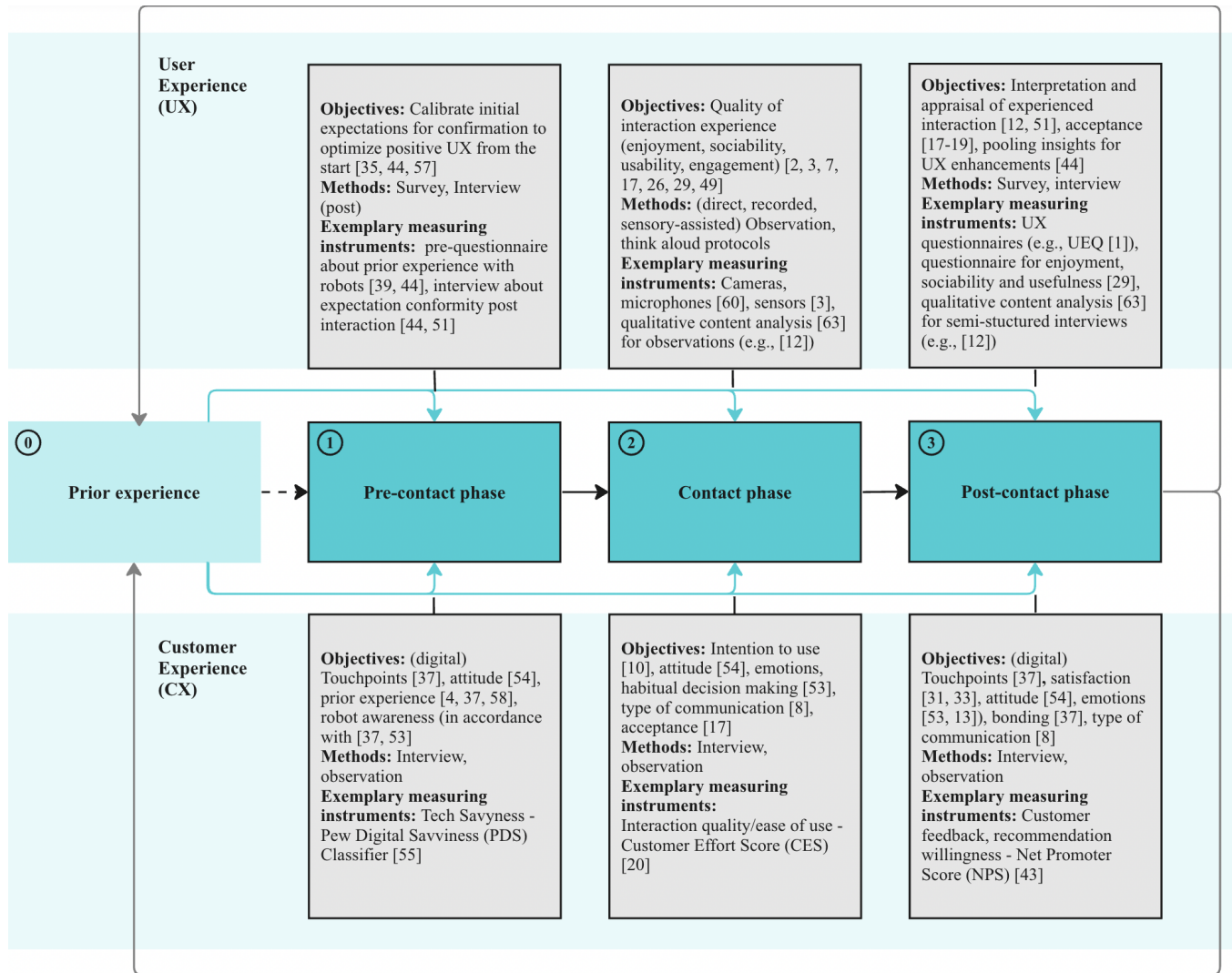


Figure 1: UX and CX evaluation framework for social robots in public spaces. Phase sequence adapted according to Lemon and Verhoef [37] and Roto et al. [47] (own illustration).

combined with think aloud protocols become essential to analyze quality of experience and interaction alike [12, 60, 61, 63], while keeping ecological validity of the captured data relatively intact. In this context, engagement denoting the perceived relatedness between interacting individuals is seen as a powerful metric to assess the quality of interaction experience with social robots in public [3, 48]. It can be directly assessed in an interaction via noticeable changes in human's nonverbal body language (e.g., movements, gaze) [3] and then complemented with follow-up surveys [52]. Nonverbal behavioral data gained via technical sensors have been proposed as quantitative metrics of perceived social intelligence [3] providing firsthand insight into the extent to which social cues are perceived and communicated in a "human" manner [15]. It is critical here to ensure a high interaction quality by unveiling and addressing any pain points that might hinder enjoyment, sociability,

and usability to benefit the accomplishment of users' hedonic and pragmatic goals for positive UX [2, 7, 17, 26, 29, 49].

After interaction the post-contact phase follows and entails subsequent reflection on prior experience to assess the interaction episode yielding episodic UX [47]. At this point in time it is suitable to employ standardized UX instruments such as AttrakDiff2 [25] or a short version of the User Experience Questionnaire (e.g., [1]) to gain quantitative data about recently made judgments in total. Examining additional factors from research about social robot acceptance (e.g., intention to use, companionship) [17-19] might provide valuable information about sustainable UX solutions to support adoption and integration of social robots into everyday life. As user feedback provides valuable information on interaction quality, concluding in depth interviews substantiate a profound understanding of users' feelings, perceptions, way of thinking, expectations and judgments reflecting their total experience [51]. Furthermore,

studying returning users enables assessment of cumulative UX representing the aggregate of assessment of all interaction episodes and phases in between [47]. With prior experiences accumulated, new anticipated UX can be generated to feed the pre-contact phase of the next iteration [46]. In conclusion, by pooling the throughout the phases obtained evaluation results together and contrasting them with given experience goals [12, 44], UX obstacles can be identified via triangulation and addressed for future iterations.

To come now to a disciplinary shift and add ideas from the CX literature a brief overview on the CJ phases is given in the following. The CX perspective focuses on the recognition of consumer's needs in the pre-contact phase or anticipation phase. Consumers actively strive to overcome the emerging imbalance between their desired state and the current state where a need has arisen ([53], p. 339). In view of CX an identification of touchpoints along the CJ is crucial for companies, in order to remain relevant in the further process [37]. To offer value to the consumer the company acts as a solution for establishing the balance between need recognition and potential need fulfillment. At this stage, it becomes relevant to assess the consumer's prior experience and also measure pre-contact attitudes towards the social robot [4, 37, 54, 58]. First indicators for attitudes towards technology in general can be affinity for technology according to the Pew Digital Savviness Classifier [55].

In the contact phase of CJ where the evaluation of alternatives takes place up to the decision making, insights into habitual decision making become relevant. Following on from this, emotional influences or framing effects are also discussed in the literature (see [53], p. 352; [32, 45]). As well as attitude, variables in this phase also include a consumer's actual intention to use a social robot and the type of communication as well as acceptance [8, 10, 17]. Furthermore, relevant influences on decision-making in particular can also be identified in interviews regarding interaction quality and for example with the approach of framing [20, 32].

In the post-contact phase contrary to the conventional consideration, we recommend an adaptation within the transfer to a post-contact phase considering the research context of social robots in public spaces. This phase is characterized by the evaluation of the contact and the resulting attitude and the arising state of satisfaction or dissatisfaction of the consumer. Repeated interaction from the consumer with the social robot strengthens a long-term relationship and future bonding. Particularly after the task has been completed, the key elements in this phase are the level of consumer satisfaction after the interaction experience [13, 31, 33, 53]. These can be measured for example with the use of the net promoter score or customer feedback and recommendations [30, 43]. From an economic point of view, it remains interesting to explore how traditional after-sales services can be adapted to the interaction context between consumers and social robots. It can be acknowledged that also after the direct interaction with social robots offers of after-contact services are still possible and strengthen the bond with the social robot.

Figure 1 shows an overview of the current draft of the framework. For every phase a recommended set of methods and instruments addressing objectives of the respective perspective of discipline.

4 CONCLUSION AND OUTLOOK

In this paper we pointed out the relevance of an interdisciplinary view on HRI and set a common ground for interrelating UX and CX. Based on this we introduced a first outline of a literature-based evaluation framework for HRI along an adapted CJ. With this, we propose a comprehensive evaluation structure that provides initial indications of an interdisciplinary evaluation of HRI with the aid of specific evaluation methods and instruments to address specific key objectives. It aims to offer a precursor to holistically view the CJ with a social robot by encompassing two complementary experience perspectives with regard to UX and CX.

Hence, modelling HRI by a tripartite phase structure (i. e., before, during, and after interactions), provides us not only with distinctive access points for evaluation of UX and CX with social robots in the public domain but also helps us to comprehend their temporal variability. Guided by related literature, we highlight through both disciplinary lenses for each phase significant key objectives and by what methods and instruments to evaluate for. In this sense, our interdisciplinary framework attempts to provide a preliminary and generalizable evaluation approach to guide the design of HRI, specifically aiming at social robots in public spaces.

Since implementation of robotic systems is highly dependent on context, task, and user base at hand [28], other specific target objectives might be also worth to consider. Note that while respective evaluation methods can be derived from studies of other fields (e.g., HCI or consumer studies) [16, 38], they still must be appropriately adapted to HRI and chosen accordingly on required data, resources available (i.e., time and money) and design phase [2, 51]. Setting concrete experience goals (e.g., UX goals) to denote high-level objectives can help to identify suitable methods by defining quantitative and qualitative metrics for appraising the desired interaction quality between humans and robots[2].

As our work is still progressing, the framework will evolve over time. The next step will be to enrich our literature based framework with interdisciplinary criteria regarding the actual integration of social robots in public spaces along the CJ. Based on this, we will conduct a research design to validate our findings in the research context of social robots in public spaces. Furthermore, interviews with organization representatives will be conducted. The generated insights from the interviews will be incorporated to further advance our framework and help identify relevant focus areas in detail.

With our contribution to the workshop we intend to stimulate discussion on the possibility and application of interdisciplinary research frameworks in the field of HRI. In exchange with the community at large, we aim to elaborate on the intricacies of our framework in particular and explore the relationship between CX and UX as well as its significance for social robotics further.

ACKNOWLEDGMENTS

The presented work was supported by the RuhrBots (www.ruhrbots.de) competence center (16SV8693) funded by the Federal Ministry of Education and Research Germany.

REFERENCES

- [1] Catherine Alberola, Götz Walter, and Henning Brau. 2018. Creation of a Short Version of the User Experience Questionnaire UEQ. *i-com* 17, 1 (2018), 57–64. <https://doi.org/10.1515/icom-2017-0032>

- [2] Beatrice Alenljung, Jessica Lindblom, Rebecca Andreasson, and Tom Ziemke. 2017. User Experience in Social Human-Robot Interaction. *International Journal of Ambient Computing and Intelligence* 8, 2 (2017), 12–31. <https://doi.org/10.4018/IJACI.2017040102>
- [3] Salvatore M. Anzalone, Sofiane Boucenna, Serena Ivaldi, and Mohamed Chetouani. 2015. Evaluating the Engagement with Social Robots. *International Journal of Social Robotics* 7, 4 (2015), 465–478. <https://doi.org/10.1007/s12369-015-0298-7>
- [4] Eric J. Arnould, Linda L. Price, and Avinash Malshe. 2006. Toward a Cultural Resource-Based Theory of the Customer. In *The Service-Dominant Logic of Marketing*. Routledge, 109–122. <https://doi.org/10.4324/9781315699035-16>
- [5] Christoph Bartneck, Dana Kulić, Elizabeth Croft, and Susana Zoghbi. 2009. Measurement Instruments for the Anthropomorphism, Animacy, Likeability, Perceived Intelligence, and Perceived Safety of Robots. *International Journal of Social Robotics* 1, 1 (2009), 71–81. <https://doi.org/10.1007/s12369-008-0001-3>
- [6] Paul Baxter, James Kennedy, Emmanuel Senft, Severin Lemaignan, and Tony Belpaeme. 2016. From characterising three years of HRI to methodology and reporting recommendations. In *2016 11th ACM/IEEE International Conference on Human-Robot Interaction (HRI)*. IEEE, 391–398. <https://doi.org/10.1109/HRI.2016.7451777>
- [7] Nasim Beheshtian, Kirsikka Kaipainen, Kalle Kähkönen, and Aino Ahtinen. 2020. Color Game: A Collaborative Social Robotic Game for Icebreaking: towards the Design of Robotic Ambiances as Part of Smart Building Services. In *Proceedings of the 23rd International Conference on Academic Mindtrek (Tampere, Finland) (AcademicMindtrek '20)*. Association for Computing Machinery, New York, NY, USA, 10–19. <https://doi.org/10.1145/3377290.3377292>
- [8] Oliver Bendel (Ed.). 2021. *Soziale Roboter: Technikwissenschaftliche, wirtschaftswissenschaftliche, philosophische, psychologische und soziologische Grundlagen*. Springer Gabler, Wiesbaden.
- [9] Roland Buchner, Daniela Wurhofer, Astrid Weiss, and Manfred Tscheligi. 2012. User Experience of Industrial Robots over Time. In *Proceedings of the Seventh Annual ACM/IEEE International Conference on Human-Robot Interaction (Boston, Massachusetts, USA) (HRI '12)*. Association for Computing Machinery, New York, NY, USA, 115–116. <https://doi.org/10.1145/2157689.2157712>
- [10] Martina Čaić, Gaby Odekerken-Schröder, and Dominik Mahr. 2018. Service robots: value co-creation and co-destruction in elderly care networks. *Journal of Service Management* 29, 2 (2018), 178–205. <https://doi.org/10.1108/JOSM-07-2017-0179>
- [11] Amedeo Cesta, Gabriella Cortellesa, Andrea Orlandini, and Lorenza Tiberio. 2016. Long-Term Evaluation of a Telepresence Robot for the Elderly: Methodology and Ecological Case Study. *International Journal of Social Robotics* 8, 3 (2016), 421–441. <https://doi.org/10.1007/s12369-016-0337-z>
- [12] Aparajita Chowdhury, Aino Ahtinen, and Kirsikka Kaipainen. 2020. The superhero of the university. In *Proceedings of the 23rd International Conference on Academic Mindtrek*, Markku Turunen (Ed.). ACM, New York, NY, USA, 1–9. <https://doi.org/10.1145/3377290.3377304>
- [13] Stephanie Hui-Wen Chuah and Joanne Yu. 2021. The future of service: The power of emotion in human-robot interaction. *Journal of Retailing and Consumer Services* 61, Article 102551 (2021). <https://doi.org/10.1016/j.jretconser.2021.102551>
- [14] Kerstin Dautenhahn. 2007. Methodology & Themes of Human-Robot Interaction: A Growing Research Field. *International Journal of Advanced Robotic Systems* 4, 1 (2007), 15. <https://doi.org/10.5772/5702>
- [15] Kerstin Dautenhahn. 2007. Socially intelligent robots: dimensions of human-robot interaction. *Philosophical transactions of the Royal Society of London. Series B, Biological sciences* 362, 1480 (2007), 679–704. <https://doi.org/10.1098/rstb.2006.2004>
- [16] Laurens de Gauquier, Malaika Brengman, and Kim Willems. 2020. The Rise of Service Robots in Retailing: Literature Review on Success Factors and Pitfalls. In *Retail Futures*, Eleonora Pantano (Ed.). Emerald Publishing Limited, 15–35. <https://doi.org/10.1108/978-1-83867-663-620201007>
- [17] Maartje M.A. de Graaf and Somaya B. Allouch. 2013. Exploring influencing variables for the acceptance of social robots. *Robotics and Autonomous Systems* 61, 12 (2013), 1476–1486. <https://doi.org/10.1016/j.robot.2013.07.007>
- [18] Maartje M. A. de Graaf, Somaya Ben Allouch, and Jan A. G. M. van Dijk. 2017. Why Would I Use This in My Home? A Model of Domestic Social Robot Acceptance. *Human-Computer Interaction* 34, 2 (2017), 115–173. <https://doi.org/10.1080/07370024.2017.1312406>
- [19] Maartje M. A. de Graaf, Somaya Ben Allouch, and Jan A. G. M. van Dijk. 2016. Long-term evaluation of a social robot in real homes. *Interaction Studies. Social Behaviour and Communication in Biological and Artificial Systems* 17, 3 (2016), 461–490. <https://doi.org/10.1075/is.17.3.08deg>
- [20] Matthew Dixon, Karen Freeman, and Nicholas Toman. 2010. Stop Trying to Delight Your Customers. *Harvard Business Review* 88, 7/8 (2010), 116–122. <https://hbr.org/2010/07/stop-trying-to-delight-your-customers>
- [21] Matthew Dixon, Nick Toman, and Rick DeLisi. 2013. *The effortless experience: Conquering the new battleground for customer loyalty*. Portfolio Penguin, New York, NY.
- [22] David C. Edelman. 2010. Branding in The Digital Age: You're Spending Your Money in All the Wrong Places. *Harvard Business Review* 88, 12 (2010), 63–69. https://www.academia.edu/41554585/Branding_in_The_Digital_Age_David_Edelman
- [23] Interaction Design Foundation. 2023. User Experience and Customer Experience what's the Difference? <https://www.interaction-design.org/literature/topics/customer-experience>
- [24] Rex Hartson and Pardha Pyla. 2012. *The UX Book: Process and Guidelines for Ensuring a Quality User Experience* (1st ed.). Morgan Kaufmann Publishers Inc., San Francisco, CA, USA.
- [25] Marc Hassenzahl, Michael Burmester, and Franz Koller. 2003. AttrakDiff: Ein Fragebogen zur Messung wahrgenommener hedonischer und pragmatischer Qualität. In *Mensch Computer 2003: Interaktion in Bewegung*, Gerd Szwillus and Jürgen Ziegler (Eds.). B. G. Teubner, Stuttgart, 187–196.
- [26] Marc Hassenzahl, Franz Koller, and Michael Burmester. 2008. Der User Experience (UX) auf der Spur: Zum Einsatz von www.attrakdiff.de. In *Tagungsband UP08*, Henning Brau, Sarah Diefenbach, Marc Hassenzahl, Franz Koller, Matthias Peissner, and Kerstin Röse (Eds.). Fraunhofer Verlag, Stuttgart, 78–82.
- [27] Marc Hassenzahl and Virpi Roto. 2007. Being and doing: A perspective on user experience and its measurement. *Interfaces* 72 (2007), 10–12.
- [28] Marc Hassenzahl and Noam Tractinsky. 2006. User experience - a research agenda. *Behaviour & Information Technology* 25, 2 (2006), 91–97. <https://doi.org/10.1080/01449290500330331>
- [29] Marcel Heerink, Ben Kröse, Vanessa Evers, and Bob Wielinga. 2010. Assessing Acceptance of Assistive Social Agent Technology by Older Adults: the Almere Model. *International Journal of Social Robotics* 2, 4 (2010), 361–375. <https://doi.org/10.1007/s12369-010-0068-5>
- [30] Dan Huang, Qiurong Chen, Jiahui Huang, Shaojun Kong, and Zhiyong Li. 2021. Customer-robot interactions: Understanding customer experience with service robots. *International Journal of Hospitality Management* 99 (2021). <https://doi.org/10.1016/j.ijhm.2021.103078>
- [31] Jing Wen Jia, Namho Chung, and Jooyoung Hwang. 2021. Assessing the hotel service robot interaction on tourists' behaviour: the role of anthropomorphism. *Industrial Management & Data Systems* 121, 6 (2021), 1457–1478. <https://doi.org/10.1108/IMDS-11-2020-0664>
- [32] Daniel Kahneman. 2013. *Thinking, fast and slow* (1st pbk. ed. ed.). Farrar, Straus and Giroux, New York.
- [33] Philip Kotler and Kevin Lane Keller. 2016. *Marketing management* (15, global edition ed.). Pearson, Boston and Columbus and Indianapolis and New York and San Francisco and Amsterdam and Cape Town and Dubai and London and Madrid and Milan and Munich and Paris and Montréal and Toronto and Delhi and Mexico City and São Paulo and Sydney and Hong Kong and Seoul and Singapore and Taipei and Tokyo.
- [34] Anne-Madeleine Kranzbühler, Mirella H.P. Kleijnen, Robert E. Morgan, and Marije Teerling. 2018. The Multilevel Nature of Customer Experience Research: An Integrative Review and Research Agenda. *International Journal of Management Reviews* 20, 2 (2018), 433–456. <https://doi.org/10.1111/ijmr.12140>
- [35] Minae Kwon, Malte F. Jung, and Ross A. Knepper. 2016. Human expectations of social robots. In *2016 11th ACM/IEEE International Conference on Human-Robot Interaction (HRI)*. 463–464. <https://doi.org/10.1109/HRI.2016.7451807>
- [36] Effie L.-C. Law, Virpi Roto, Marc Hassenzahl, Arnold P.O.S. Vermeeren, and Joke Kort. 2009. Understanding, Scoping and Defining User Experience: A Survey Approach. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (Boston, MA, USA) (CHI '09)*. Association for Computing Machinery, New York, NY, USA, 719–728. <https://doi.org/10.1145/1518701.1518813>
- [37] Katherine N. Lemon and Peter C. Verhoef. 2016. Understanding Customer Experience Throughout the Customer Journey. *Journal of Marketing* 80, 6 (2016), 69–96. <https://doi.org/10.1509/jm.15.0420>
- [38] Jessica Lindblom and Rebecca Andreasson. 2016. Current Challenges for UX Evaluation of Human-Robot Interaction. In *Advances in Ergonomics of Manufacturing: Managing the Enterprise of the Future*, Christopher Schlick and Stefan Trzcieliński (Eds.). Springer International Publishing, Cham, 267–277.
- [39] Karl F. MacDorman, Sandosh K. Vasudevan, and Chin-Chang Ho. 2009. Does Japan really have robot mania? Comparing attitudes by implicit and explicit measures. *AI & SOCIETY* 23, 4 (2009), 485–510. <https://doi.org/10.1007/s00146-008-0181-2>
- [40] Donald A. Norman. 2005. *Emotional design: Why we love (or hate) everyday things*. Basic Books, New York, N.Y.
- [41] Steffi Paepcke and Leila Takayama. 2010. Judging a bot by its cover: An experiment on expectation setting for personal robots. In *2010 5th ACM/IEEE International Conference on Human-Robot Interaction (HRI)*. 45–52. <https://doi.org/10.1109/HRI.2010.5453268>
- [42] Nancy M. Puccinelli, Ronald C. Goodstein, Dhruv Grewal, Robert Price, Priya Raghubir, and David Stewart. 2009. Customer Experience Management in Retailing: Understanding the Buying Process. *Journal of Retailing* 85, 1 (2009), 15–30. <https://doi.org/10.1016/j.jretai.2008.11.003>
- [43] Frederick F. Reichheld. 2003. The one number you need to grow. *Harvard Business Review* 81, 12 (2003), 46–54, 124.

- [44] Julia Rosén, Jessica Lindblom, and Erik Billing. 2022. The Social Robot Expectation Gap Evaluation Framework. In *Human-Computer Interaction. Technological Innovation*, Masaaki Kurosu (Ed.). Lecture Notes in Computer Science, Vol. 13303. Springer International Publishing, Cham, 590–610. https://doi.org/10.1007/978-3-031-05409-9_43
- [45] Simone Roth and Medina Ferizovic. 2023. Generational differences in framing for social robot usage intention from a consumer behaviour point of view. *The Economic Perspective on Artificial Intelligence (EPEAI) - Conference Proceedings* (2023). in press.
- [46] Virpi Roto. 3rd September 2007. User experience from product creation perspective. In *Proceedings of the COST294-MAUSE Affiliated Workshop*, Effie L.-C. Law, Arnold P.O.S. Vermeeren, Marc Hassenzahl, and Mark A. Blythe (Eds.). 31–34.
- [47] Virpi Roto, Effie Law, Arnold Vermeeren, and Jettie Hoonhout. 2011. *User experience white paper: Bringing clarity to the concept of user experience*. s.n. geen ISBN Result from Dagstuhl seminar on demarcating user experience, September 15-18, 2010.
- [48] Selma Sabanovic, Marek P. Michalowski, and Reid Simmons. 2006. Robots in the wild: observing human-robot social interaction outside the lab. In *9th IEEE International Workshop on Advanced Motion Control, 2006*. IEEE, 596–601. <https://doi.org/10.1109/AMC.2006.1631758>
- [49] Christina Schmidbauer, Marcel Umele, Tanja Zigart, Astrid Weiss, and Sebastian Schlund. 2020. On the Intention to Use the Pepper Robot as Communication Channel in a Business Context: Results of a User Acceptance Survey. In *Proceedings of the 8th International Conference on Human-Agent Interaction* (Virtual Event, USA) (HAI '20). Association for Computing Machinery, New York, NY, USA, 204–211. <https://doi.org/10.1145/3406499.3415062>
- [50] Martin Schrepp. 2023. User Experience Questionnaire Handbook: All you need to know to apply the UEQ successfully in your projects. <https://www.ueq-online.org/>
- [51] Elaheh S. Shourmasti, Ricardo Colomo-Palacios, Harald Holone, and Selina Demi. 2021. User Experience in Social Robots. *Sensors* 21, 15, Article 5052 (2021). <https://doi.org/10.3390/s21155052>
- [52] Candace L. Sidner, Christopher Lee, Cory D. Kidd, Neal Lesh, and Charles Rich. 2005. Explorations in engagement for humans and robots. *Artificial Intelligence* 166, 1-2 (2005), 140–164. <https://doi.org/10.1016/j.artint.2005.03.005>
- [53] Michael R. Solomon. 2020. *Consumer behavior: Buying, having, and being* (13th ed.; global ed. ed.). Pearson, Harlow (England).
- [54] Julia G. Stapels and Friederike Eysel. 2021. Einstellungen gegenüber sozialen Robotern. In *Soziale Roboter*, Oliver Bendel (Ed.). Springer Gabler, Wiesbaden, 231–250.
- [55] František Sudzina. 2015. Do gender and personality traits (BFI-10) influence self-perceived tech savviness?. In *Selected papers of the 18th International Conference on Information Technology for Practice 2015*. VŠB - Technical University of Ostrava. Faculty of Economics, Ostrava, 87–94.
- [56] Meg Tonkin. 2020. *Socially responsible design for social robots in public spaces*. Thesis. University of Technology Sydney.
- [57] Meg Tonkin, Jonathan Vitale, Sarita Herse, Mary-Anne Williams, William Judge, and Xun Wang. 2018. Design Methodology for the UX of HRI: A Field Study of a Commercial Social Robot at an Airport. In *Proceedings of the 2018 ACM/IEEE International Conference on Human-Robot Interaction* (Chicago, IL, USA) (HRI 18). Association for Computing Machinery, New York, NY, USA, 407–415. <https://doi.org/10.1145/3171221.3171270>
- [58] Stephen L. Vargo and Robert F. Lusch. 2004. Evolving to a New Dominant Logic for Marketing. *Journal of Marketing* 68, 1 (2004), 1–17. <https://doi.org/10.1509/jmkg.68.1.1.24036>
- [59] Peter C. Verhoef, Katherine N. Lemon, A. Parasuraman, Anne Roggeveen, Michael Tsiros, and Leonard A. Schlesinger. 2009. Customer Experience Creation: Determinants, Dynamics and Management Strategies. *Journal of Retailing* 85, 1 (2009), 31–41. <https://doi.org/10.1016/j.jretai.2008.11.001>
- [60] Astrid Weiss, Regina Bernhaupt, D. Schwaiger, M. Altmaninger, Roland Buchner, and Manfred Tscheligi. 2009. User experience evaluation with a Wizard of Oz approach: technical and methodological considerations. In *9th IEEE-RAS International Conference on Humanoid Robots, HUMANOIDS09*. 303–308. <https://doi.org/10.1109/ICHR.2009.5379559> 9th IEEE-RAS International Conference on Humanoid Robots, HUMANOIDS09 ; Conference date: 07-12-2009 Through 10-12-2009.
- [61] Astrid Weiss, Regina Bernhaupt, Manfred Tscheligi, and Eiichi Yoshida. 2009. Addressing user experience and societal impact in a user study with a humanoid robot. In *Adaptive and Emergent Behaviour and Complex Systems - Proceedings of the 23rd Convention of the Society for the Study of Artificial Intelligence and Simulation of Behaviour, AISB 2009*. 150–157. 23rd Convention of the Society for the Study of Artificial Intelligence and Simulation of Behaviour, AISB 2009 ; Conference date: 06-04-2009 Through 09-04-2009.
- [62] Karolina Zawieska and Jessica Sorenson. 2023. Towards HRI of Everyday Life: Human Lived Experiences with Social Robots. In *Companion of the 2023 ACM/IEEE International Conference on Human-Robot Interaction* (Stockholm, Sweden) (HRI '23). Association for Computing Machinery, New York, NY, USA, 347–350. <https://doi.org/10.1145/3568294.3580103>
- [63] Yan Zhang and Barbara M. Wildemuth. 2009. Qualitative Analysis of Content. *Applications of Social Research Methods to Questions in Information and Library Science* 308, 319 (2009).