Ethics in Software Engineering: a Systematic Literature Review

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Foreword

This document comprises four appendices, namely Appendix A-D, each containing table(s) that offer additional information for interested readers.

Appendix A. Codification of the extracted values from the primary studies.

Table 1: Codification of the extracted values.

Schwartz's value categories	**Schwartz's values**	**Extracted values from the studies that were mapped to the Schwartz's values**	**Extracted values from the studies that were not mapped to the Schwartz's values**
Self-Direction (*SD*)	Choosing own goals	-	-
	Privacy	-	-
	Self-respect	-	-
	Creativity	-	-
	Freedom	Freedom (freedom, liberty)	-
	Curious	Curious	-
	Independent	Autonomy (autonomy, independent)	-
	-	-	Dignity (human dignity, humanness, humanitarianism, work ethic, morality, non-maleficence, beneficence)
	-	-	Identity (identity, being normal, identity control, knowledgeable, individuality, neutrality, self-perception)
	-	-	Solitude
	-	-	Attentiveness
Hedonism (*HE*)	Pleasure	Pleasure (pleasure, happiness, satisfaction)	-
	Enjoying life	-	-
	Self-indulgent	-	-
	-	-	Calmness (calmness, comfort, peace, convenience, relief, social comfort, sensory comfort, spatial comfort)
	-	-	Hope
Achievement (*AC*)	Ambitious	-	-
	Influential	-	-
	Intelligent	-	-
	Capable	Capable	-
	Successful	Successful	-
	-	-	Competence
	-	-	Efficiency (efficacy, utility, effectiveness, usefulness, productivity, efficiency, optimality)
Power (*PO*)	Authority	-	-
	Social recognition	Social recognition (awareness, social recognition)	-
	Social power	Social power (social influence, social power, legitimation)	-
	Wealth	Wealth	-
	Preserving individuals' public image	Preserving individuals' public image	-
	-	-	Ownership and property
	-	-	Knowledge
Security (*SE*)	National security	-	-
	Family security	-	-
	Reciprocation of favors	-	-
	Sense of belonging	-	-
	Clean	-	-
	Healthy	Healthy	-
	Social order	Social order	-
	-	-	Control (control for safety, surveillance, monitoring, control)
	-	-	Safety
	-	-	Privacy (privacy, data privacy)
	-	-	Support and protection (support and protection, support, caring, support & service quality)
	-	-	Anonymity (confidentiality, anonymity)

Table 1 – Codification of the extracted values.

Schwartz's value categories	Schwartz's values	Extracted values from the studies that mapped to the Schwartz's values	Extracted values from the studies that did not map to the Schwartz's values
	-	-	Certainty (assurance, certainty, verifiability, precision)
	-	-	Availability (accessibility, availability, traceability)
	-	-	Informed consent
Tradition (*TR*)	Respect for tradition	-	-
	Accepting my portion in life	-	-
	Moderate	-	-
	Humble	-	-
	Devout	-	-
	Detachment	-	-
	-	-	Cultural and spiritual values
	-	-	Lifestyle values
Conformity (*CO*)	Politeness	-	-
	Obedient	-	-
	Honoring of elders	-	-
	Self-discipline	-	-
	-	-	Flexibility (mobility, flexibility, adaptability, compliance)
Benevolence (*BE*)	Forgiving	-	-
	A spiritual life	-	-
	Loyal	-	-
	True friendship	-	-
	Mature love	-	-
	Honest	-	-
	Meaning in life	-	-
	Responsibility	Responsibility (accountability, responsibility, responsiveness)	-
	Helpful	Helpful (helping others, helpfulness, assistance, emergency help)	-
	-	-	Togetherness (togetherness, intimacy, solidarity, empathy)
	-	-	Continuity
	-	-	Involvement (involvement, family-centricity, social inclusion, inclusion, participation, communication, collaboration, management, connection, community, cooperation)
	-	-	Usability (universal usability, design for all, ease of use)
	-	-	Accuracy
	-	-	Transparency (transparency, explicability, explainability)
	-	-	Trust (reliability, trust, comprehensibility, articulateness, transparency, openness, authenticity, confidence)
	-	-	Integrity (integrity, completeness)
Universalism (*UN*)	A world of beauty	-	-
	Broad-minded	-	-
	Unity with nature	-	-
	Inner harmony	-	-
	Wisdom	-	-
	World at peace	-	-
	Equality	Equality (equality of opportunity, equality, equity)	-
	Protecting the environment	Protecting the environment (protecting the environment, sustainability, environmental sustainability)	-
	Social justice	Social justice (procedural justice, environmental justice, distributive justice)	-

Table 1 – Codification of the extracted values.

Schwartz's value categories	Schwartz's values	Extracted values from the studies that mapped to the Schwartz's values	Extracted values from the studies that did not map to the Schwartz's values
	-	-	Welfare (human physical welfare, human psychological welfare, human material welfare, economic-cost, cost-effectiveness, cost reduction, emotional well-being, psychological well-being, physical health, general interest)
	-	-	Fairness
	-	-	Freedom from bias
	-	-	Altruism

Appendix B: List of primary studies over publication venues and venue types.

Table 2: Number of the selected studies over publication venues and venue types.

Publication venue (PV)	Venue type (VT)	Studies	No.
Science and Engineering Ethics	J	[74, 56, 49, 72, 18, 73, 15]	7
Ethics and Information Technology	J	[34, 81, 43]	3
Informatik	J	[6, 3]	2
ACM Transactions on Computer-Human Interaction (TOCHI)	J	[10, 40]	2
Sustainability	J	[39, 60]	2
Technology Innovation Management Review (TIM Review)	J	[2]	1
International Journal of Decision Support Systems (IJDSS)	J	[82]	1
Designing of Augmented Reality Environments (DARE)	J	[28]	1
Artificial Intelligence Safety and Security	J	[68]	1
Journal of Design Research (JDR)	J	[61]	1
Big Data and Cognitive Computing (BDCC)	J	[65]	1
Journal of Adolescent Research (JAR)	J	[4]	1
Knowledge, Technology and Policy (KTP)	J	[75]	1
Technical Communication Quarterly (TCQ)	J	[58]	1
International Journal of Child-Computer Interaction (IJCCI)	J	[53]	1
IEEE Technology and Society Magazine	J	[57]	1
IEEE Transactions on Professional Communication (TPC)	J	[79]	1
Cognition, Technology and Work (CTW)	J	[36]	1
PLoS One	J	[71]	1
Studies in Logic, Grammar and Rhetoric	J	[55]	1
Mind and Machines	J	[67]	1
JMIR cardio	J	[17]	1
Assistive Technology	J	[44]	1
Humana.Mente	J	[66]	1
AI and Ethics	J	[69]	1
Health and technology	J	[62]	1
Geo-spatial Information Science	J	[42]	1
International Journal of Social Robotics	J	[70]	1
Human Computer Interaction and Emerging Technologies	J	[54]	1
Journal of decision systems (JDS)	J	[48]	1
Procedia Computer Science	J	[76]	1
Conference on Human Factors in Computing Systems (CHI)	C	[84, 46, 59, 47]	4
Decennial Aarhus Conference on Critical Alternatives	C	[77, 85, 37]	3
Hawaii International Conference on System Sciences (HICSS)	C	[20, 27, 30]	3
International Conference on Human-Computer Interaction (HCII)	C	[25, 64, 12]	3
IEEE International Symposium on Technology and Society (ISTAS)	C	[41, 14]	2
International Conference on Information Systems (ICIS)	C	[83]	1
ACM Conference On Computer Supported Cooperative Work (CSCW)	C	[1]	1
ACM International Conference on Supporting Group Work (GROUP)	C	[50]	1
Decennial Conference on Critical Computing: Between Sense and Sensibility	C	[78]	1
International Conference on Interaction Design and Children (IDC)	C	[52]	1
Annual Computer Security Applications Conference (ACSAC)	C	[21]	1
Participatory Design Conference (PDC)	C	[8]	1
International Conference on Ubiquitous Computing (UbiComp)	C	[29]	1
International Conference on Mobile Business (ICMB)	C	[19]	1
International Conference on Advanced Information Systems Engineering (CAiSE)	C	[5]	1
European Conference on Computer-Supported Cooperative Work (ECSCW)	C	[7]	1
ACM/IEEE International Conference on Human-Robot Interaction (HRI)	C	[16]	1
IEEE Conference on Open Systems (ICOS)	C	[51]	1
International Conference on Collaboration Technologies and Systems (CTS)	C	[32]	1
International Conference on Unmanned Aircraft Systems (ICUAS)	C	[13]	1
International Conference on Engineering Psychology and Cognitive Ergonomics (ICEPCE)	C	[35]	1
Directions and Implications of Advanced Computing Symposium (DIAC)	C	[26]	1
IEEE Intelligent Vehicles Symposium (IV)	C	[63]	1
ACM Conference on Fairness, Accountability, and Transparency (FAccT)	C	[9]	1
STS Conference Graz	C	[45]	1
International Conference on Wirtschaftsinformatik (Wi)	C	[80]	1

Table 2 – Number of the selected studies over publication venues and venue types.

Publication venue (PV)	**Venue type (VT)**	**Studies**	**No.**
International Conference on the Ethical and Social Impacts of ICT	C	[11]	1
Societal Challenges in the Smart Society	C	[31]	1
International Design Conference	C	[33]	1
International Workshop on Agent-Oriented Software Engineering (AOSE)	W	[24, 23]	2
Pervasive Computing and Communications Workshops (PerCom)	W	[22]	1
Ethik und Moral in der Wirtschaftsinformatik (EMoWI)	W	[38]	1

Appendix C: List of ethical values according to the primary studies.

Table 3: Extracted values from the primary studies based on Schwartz's conservation dimension.

Schwartz's value categories	**Extracted values from the studies**	**Explanation**	**Example**
Security (*SE*)	Social order	Refers to the stable state of society, which is necessary for individuals to communicate, e.g., communication through technology.	By hard-coding of some procedures in the platform or through running bots, e.g., using bots that pre-screen edits to detect vandalism, or reverting changes and sending a short message to the editor, Wikipedia cares for the value of social order [57].
	Healthy	Refers to individuals' well-being, both physical and mental, which should be protected by the systems and not cause harm, like injury or death.	By reducing waiting time for blood sample transportation and improving the physical welfare of patients, humanitarian cargo drones care for the value of health [14].
	Privacy	Refers to individuals' claim or right to determine what information about themselves can be communicated to others.	By keeping the users' information privately and securely, e.g., when they logged into the system, what they searched, and how they query the system, the groupware system cares for the value of privacy [50].
	Availability	Refers to the access of authorized users to the information in systems when needed, regardless of their location.	By giving users access to the information relevant to their tasks, regardless of their location or organization of employment, the health information system (HIS) cares for the value of availability [79].
	Safety	Refers to the system avoiding unintended hazards towards individuals and society, detecting and mitigating physical risks, and protecting individuals, property, and the environment against the threats associated with the systems.	By protecting homeless young people and keeping them safe, e.g., by accessing aid via their cell phone, Mobile phone technology cares for the value of safety [84].
	Certainty	Refers to the system making users free from doubts and ensuring they meet their requirements and needs.	By assuring parents about effectively carrying out the treatment steps at home, the sensor-based physiotherapeutic assistance system (for home therapy) cares for the value of certainty [38].
	Control	Refers to the ability of individuals (like designers) to keep the information and its flow safe through technologies.	By embedding some functionalities in the online entertainment platforms that enable parents to define time, content and activity restrictions, and monitor children online, these platforms care for the value of control (in this case, control for safety) [53].
	Informed consent	Refers to permission and agreement of individuals before conducting actions towards them in the context of the systems to protect the safety of data and individuals. It encompasses criteria of disclosure and comprehension (for *informed*) and voluntariness, competence, and agreement (for *consent*) of people.	By allowing users to become aware of when cookies occur or for what purposes they would be used, the Mozilla Browser cares for the value of informed consent [26].
	Anonymity	Refers to keeping stakeholders' identities private in a system.	By concealing the identity of the reviewers to make judgments based on quality (not academic positions), conference management systems care for the value of anonymity [23].
	Support and protection	Refers to the preservation of individuals from threats or harms caused by the systems.	By allowing women to use missed calls to signal the men that they wish to communicate with them (but without financial burden), the media technology cares for the value of support and protection in the context of long-distance romantic relationships in Arabic culture [1].
Conformity (*CO*)	Flexibility	Refers to the adaptation of systems to changes wrt the existence of uncertainty, e.g., adaptation to changes in customer needs and new technological developments.	By modifying generation or consumption patterns in reaction to an external signal like a price change to meet the consumers' needs, the smart grid system cares for the value of flexibility [72].
Tradition (*TR*)	Cultural and spiritual values	Refers to behaviors of individuals in the social and public environments wrt other individuals' expectations.	By embedding different components in the robots (like mind and emotions) according to cultural or religious differences existed among countries, the humanoid robots care for cultural and spiritual values [16].

Table 3 – Extracted values from the primary studies based on Schwartz's conservation dimension.

Schwartz's value categories	Extracted values from the studies	Explanation	Example
	Lifestyle values	Refers to the habits, attitudes, tastes, economic level, etc., that constitute the mode of living of an individual or group.	By considering the users' energy-saving strategies and sustainable behaviour changes in the design of structure and content of the website, e.g., searching and creating user-generated content, the websites care for the value of lifestyle [12].

Table 4: Extracted values from the primary studies based on Schwartz's openness to change dimension.

Schwartz's value categories	Extracted values from the studies	Explanation	Example
Self-direction (*SD*)	Autonomy	Refers to individuals' ability to decide, plan, and act in ways they believe will help them achieve their goals, with or without the help of others (individuals or systems).	By allowing others to check on elders remotely, elders can live independently longer without their families' help, the CareNet Display (as a pervasive health care technology) cares for the value of autonomy [22].
	Freedom	Refers to the ability of individuals to have control over their activities or be free in their choice in the context of systems.	By embedding the implantable chip of Radio Frequency Identification (RFID) technology in the body of humans for unobtrusive sending and receiving of data for medical purposes or using in passports, this technology could undermine the value of freedom [47].
	Curious	Refers to individuals' interest to explore everything to become aware of different aspects about the systems.	By monitoring and measuring the cognitive load and the emotional state of train traffic controllers, the CLES monitor can satisfy the curiosity of team members in each other's functioning that can affect the value of curiosity [35].
	Solitude	Refers to the right of individuals to be left alone.	By providing a specific warning for vulnerable populations, the privacy addendum for an open source software can affect the value of solitude [29].
	Attentiveness	Refers to individuals for paying close attention and recognizing important things.	By perceiving the minute cues of the care-receivers (i.e., patients) and being attentive to patients' frailty when lifting, the robots in the hospitals care for the value of attentiveness [74].
	Dignity	Refers to the rights of individuals to be respected and treated ethically in interaction with systems.	By enabling caregivers to interact with the elder in a more relaxed way and to treat them with more respect, the CareNet Display (as a pervasive health care technology) cares for the value of dignity [22].
	Identity	Refers to individuals' understanding of who they are over time (both continuity and discontinuity over time).	By developing the humanitarian cargo drones to transport blood samples, the vulnerable local communities (e.g., with low-income) are able to develop their identity. So, drones can affect the value of identity [13].
Hedonism (*HE*)	Pleasure	Refers to a feeling of satisfaction and enjoyment in interaction with systems.	By assessing the overall quality of individuals' life favorably, the smart city cares for the value of pleasure [39].
	Calmness	Refers to a peaceful psychological state in individuals.	By replacing loud and disruptive medical helicopters, the humanitarian cargo drones care for the value of calmness [13].
	Hope	Refers to a future-oriented expectation of attaining personal goals which are dependent on personal activities, characteristics, and external factors.	By considering the reminder feature that alerts patients to take the insulin, the diabetes apps care for the value of hope [19].

Table 5: Extracted values from the primary studies based on Schwartz's self-enhancement dimension.

Schwartz's value categories	Extracted values from the studies	Explanation	Example
Achievement (*AC*)	Capable	Refers to being able to achieve and under human control.	By being capable of providing a high standard of care (e.g., by possessing strength and intelligence) to cater to the needs of patients, care robots consider the value of capability [68].
	Successful	Refers to accomplishing a desired aim for receiving benefits from the systems.	Design team by implementing functionalities (like a timer for parental involvement) in child platforms and parental controls to improve the quality of their platform cares for the value of success (in this case, commercial success) [53].
	Efficiency	Refers to individuals' ability to utilize the system in an optimal way.	By using mobile health (mHealth) technologies, Quality of Life (QoL) assessments might become more enjoyable, less time-consuming, and more efficient for people with severe mental health problems. So, mHealth technologies can affect the value of efficiency [49].
	Competence	Refers to individuals' abilities that help them properly carry out their tasks and be responsible for the results.	By lifting the care-receivers (i.e., patients) at the appropriate speed and angle without hurting or dropping them, the robots in the hospitals care for the value of competence [74].
Power (*PO*)	Preserving individuals' public image	Refers to beliefs and public attention about stakeholders based on their actions in relation to the systems.	By answering a question well or contributing to writing good code in the groupware system (through users), this system can affect the value of the reputation at a software engineering organization [50].
	Social power	Refers to attaining a dominant position or control over others in the context of the systems.	By emphasizing within-community achievements of editors within the Wikipedia community (e.g., gaining high regard, or completing an immaculate history of interactions), this platform can affect the value of social power [57].
	Recognition	Refers to recognizing something or individuals based on previous knowledge in the context of the systems.	By monitoring train traffic controllers through the CLES monitor, the hardworking controllers can feel recognized when the monitor shows others how hard they work. So, the monitor can affect the value of recognition [35].
	Wealth	Refers to material possessions and financial benefits in the context of the systems.	By supporting the peer review process and publishing high-quality research through the conference management system, the publication's and the publisher's reputation potentially increase. So, the system can support the value of profit [23].
	Ownership and property	Refers to the right to a property including the right to possess it, use it, manage it, derive income from it, etc.	By giving patients online access to their health information in the context of Electronic Health Records (EHR) system, they may regard themselves as the owner. So, the system can affect the value of ownership and property [34].
	Knowledge	Refers to technical knowledge that individuals have in relation to the systems.	By publishing high-quality research and barring substandard level publications, the conference management system can support the value of knowledge [23].
Hedonism (*HE*)	Pleasure	Refers to a feeling of satisfaction and enjoyment in interaction with systems.	By assessing the overall quality of individuals' life favorably, the smart city cares for the value of pleasure [39].
	Calmness	Refers to a peaceful psychological state in individuals.	By replacing loud and disruptive medical helicopters, the humanitarian cargo drones care for the value of calmness [13].
	Hope	Refers to a future-oriented expectation of attaining personal goals which are dependent on personal activities, characteristics, and external factors.	By considering the reminder feature that alerts patients to take the insulin, the diabetes apps care for the value of hope [19].

Table 6: Extracted values from the primary studies based on Schwartz's self-transcendence dimension.

Schwartz's value categories	Extracted values from the studies	Explanation	Example
Benevolence (*BE*)	Responsibility	Refers to the properties that ensure actions of individuals or organizations may be traced uniquely to the individuals or organizations.	By ensuring the care-receivers (i.e., patients) about the right direction for care or maintaining an accurate assessment of their needs through the care-givers (i.e., robots), the robots in the hospitals care for the value of responsibility [74].
	Helpful	Refers to the ability of individuals to provide help or direction to others through the system.	By sharing workload information to support operators to help each other when needed, the virtual assistant in the context of train traffic control cares for the value of helpful [36].
	Togetherness	Refers to being close to other individuals for different reasons such as (financial) support, conveying emotion, having communication through technology.	By creating individual work out of group work and displacing some of the built-in social outlets in domestic work (e.g., changing the way of doing laundry or washing dishes because of using electric clothes dryers and dishwashers), domestic technologies could affect the value of togetherness [46].
	Transparency	Refers to the openness, clarity, and understandability of the system, its functions, and data, which help reduce user misunderstandings.	By occupying multiple roles within conference management systems, reviewers who are also authors may see the ranking of their own papers. So, these systems need to pay attention to the value of transparency [23].
	Involvement	Refers to the cooperation of different individuals and organizations as equal partners at every decision-making level of developing systems, from assessment and planning to implementation and evaluation.	By involving parents in the child's activities, knowing what their children do, and showing the children that they care, the parental application cares for the value of involvement [52].
	Trust	Refers to expectations between people who can experience goodwill, extend goodwill toward others, feel vulnerable, and experience betrayal. Trust in software systems refers to having faith in systems to demonstrate honesty and predictable behavior and keep loyalty and trueness.	By supporting interactions among persons (especially interactions that may leave some persons vulnerable to the actions of other persons), augmented reality considers the value of trust [28].
	Accuracy	Refers to data that should be free of errors, and the proper and precise function of a system, e.g., accurate operation, measurement, and feedback provided by the system.	By providing highly accurate measurement and feedback of the therapy, the sensor-based physiotherapeutic assistance system for home therapy cares for the value of accuracy [38].
	Integrity	Refers to moral and ethical principles for doing the right things by individuals. Integrity in software systems refers to complete and uncorrupted data.	By protecting reviewers' anonymity, conference management systems care for the value of scientific integrity [23].
	Usability	Refers to level of comfort in the use of systems to make all people (non-technical users or everyone from all demographic groups) successful users.	In [19], the diabetes apps care for the value of usability through supporting some acts. For example, by supporting adjusting lifestyle and mitigating conflict with cultural norms; providing instructions, resources, and commands in non-English languages; supporting the needs of gender and age differences; providing culturally appropriate and adaptable self-management methods.
	Continuity	Refers to the maintenance of continuous operations in a system.	By providing functions for parents to be able to treat their children continuously at home, the sensor-based physiotherapeutic assistance system for home therapy affects the value of continuity [38].
Universalism (*UN*)	Justice	Refers to the capability of doing what is just and also being just in action.	By ensuring transparency, completeness, and unbiased information in decision-making, the smart grid system cares for the value of procedural justice [72].
	Equality	Refers to behaving equally with users and the contribution of all of them in the system without considering hierarchical considerations and judgments.	By allowing the contribution of all users in the context of peer production systems (like Wikipedia), these systems care for the value of equality [57].

Table 6 – Extracted values from the primary studies based on Schwartz's self-transcendence dimension.

Schwartz's value categories	Extracted values from the studies	Explanation	Example
	Protecting the environment	Refers to sustaining environments to meet the needs of the present without compromising the future.	By using electric power instead of fossil fuels (62% of electricity in Denmark comes from renewable sources), cargo drones care for the value of environmental sustainability [14].
	Fairness	Refers to the system that should not discriminate unfairly against specific individuals or groups of individuals in favor of others, or should not bias in order to make reasonable judgments.	By not taking biased or discriminatory actions based on information about the stakeholders and treating all individuals involved equally, autonomous vehicle technologies care for the value of fairness [63].
	Freedom from bias	Refers to overcoming systematic unfairness perpetrated on individuals and groups.	By not discriminating unfairly against any group of stakeholders or privileging one policy over another, the large-scale simulation system (UrbanSim) cares for the value of freedom from bias [8].
	Altruism	Refers to helping others through the systems without personal gain or benefit (for example, providing individuals with some services).	By helping others without personal gain through pervasive brain-computer interfaces, e.g., answering a question about local doctors, these interfaces could affect the value of altruism [59].
	Welfare	In the context of software systems, welfare refers to the protection of the well-being of all people, which consists of (i) physical welfare that deals with bodily well-being, such as physical and mental health, (ii) material welfare that refers to physical circumstances, economics and employment, and (iii) psychological welfare that refers to psychological and emotional states of users like comfort, peace, and mental health.	In [19], the diabetes apps care for the value of welfare through supporting some acts. For example, by improving mental and physical health conditions, facilitating self-monitoring of disease symptoms, supporting and educating patients in overcoming depression.

Appendix D. List of stakeholder roles' concerns.

Table 7: Concerns of stakeholder roles (system users and system development organisation).

Related value category	Value	Example of system users' concerns	Example of system development organisation' concerns	Studies
Security	Security	-	Security risks in relation to an insulin pump system, like (i) maintaining the integrity and confidentiality of data and (ii) ensuring remote control that should only be accessed by pre-approved individuals [2].	[2]
	Availability	Concerns about data access in relation to identity technologies [10].	The data needs to be usable and available to all in the context of OpenStreetMap [42].	[10, 42, 17, 21, 29]
	Safety	Concerns about safety risks toward teens in the context of parental control applications [4, 52, 53, 83, 85, 32].	The need of control for safety in the context of online entertainment platforms [52, 53, 83, 85].	[4, 52, 53, 83, 85, 32, 10, 33, 60, 16, 18]
	Anonymity	Concern about protecting authors/reviewers' identity in relation to the conference management system [23].	-	[23, 48]
	Privacy	Concern about transmitting personal data to clinics in the context of diabetes self-management using mobile apps [19].	Disclosure to unauthorized parties, unauthorized use of individual data, unauthorized use of aggregated data, unauthorized inference with unexpected external information in the context of a privacy addendum for an open source software license [29].	[29, 19, 71, 21, 23, 35, 82, 61, 50, 48, 49, 39, 42, 76, 11, 38]
	Support and protection	Concerns about receiving social support in relation to eHealth technologies [17].	-	[17, 48]
	Healthy	Concerns about the physical harm that can be caused by a good home-based nocturnal seizure detector [71].	Concern about people's health in relation to a supervisory command and control system for a U.S. Navy cruise missile [18].	[71, 18]
	Informed consent	Informed consent concerns in relation to the Mozilla Browser [27].	-	[27]
Benevolence	Usability	Usability concerns (e.g., ease-of-use) in the context of the Mozilla Browser [27].	-	[27, 9, 19, 60, 49, 71]
	Involvement	Parents expressed issues related to involvement (e.g., knowing what their children do, and showing the children that they care) in relation to parental software for young children [52, 53, 83, 85].	-	[52, 53, 83, 85, 5]
	Trust	To have reliable information and advice in relation to eHealth technologies [17].	Concerns about making humanoid robots reliable [16].	[17, 16, 1, 19, 33, 35, 60, 50, 48, 42, 71]
	Transparency	Concern about clarity of the conference management system [23].	Concerns about transparency in the context of humanoid robots [16].	[23, 16, 60]
	Responsibility	Users need and use software-based risk-assessment instruments (SBRAIs) to support their accountability in respect of third parties [48].	Concern about the unclear division of responsibility or potential burden of responsibility in relation to a good home-based nocturnal seizure detector [71].	[48, 71, 23, 60]
Conformity	Flexibility	Users need software-based risk-assessment instruments (SBRAIs) to remain compliant with regulatory or organizational requirements [48].	-	[48, 9]
Universalism	Protecting the environment	Concern about sustainability and environmental protection in relation to urban simulation system [8].	-	[8, 13]
	Equality	The rights of equality and non-discrimination in relation to smart cities [39].	-	[39, 8]
	Freedom from bias	Users want to be free of bias and any other form of distortion in relation to software-based risk-assessment instruments (SBRAIs) [48].	Concerns regarding the perception of bias in the indicator information, including what information is provided about the indicators and how they are organized and presented to the user in the context of large-scale urban simulation [7].	[48, 7]

Table 7 – Concerns of stakeholder roles.

Related value category	Value	Example of system users' concerns	Example of system development organisation' concerns	Studies
	Fairness	Being fair in the context of the conference management system [23].	Concern about balancing the value of fairness in the context of large-scale urban simulation [7].	[23, 7, 60, 67, 69]
	Welfare	Concerns about physical welfare, psychological welfare, and material welfare in the context of humanitarian cargo drones [13].	Concerns about people's well-being in the context of OpenStreetMap [42].	[13, 42, 1, 19, 60, 18]
Power	Ownership and property	Concern about property rights in relation to urban simulation system [8].	-	[8]
	Preserving individuals' public image	Compromising their reputation (e.g., by answering a question poorly) in relation to a corporation's groupware system [50].	-	[50]
Self-Direction	Dignity	-	Concerns about respecting human dignity in relation to humanoid robots [16].	[16]
	Autonomy	Loss of autonomy in diagnosing in the context of healthcare ICT [61].	Respecting human autonomy regarding sensor-based physiotherapeutic assistance system for home therapy [38].	[61, 38, 17, 19, 60, 48, 67, 69]
	Identity	To be seen as a person rather than a patient in relation to eHealth technologies [17].	-	[17, 48]
	Freedom	Restriction of freedom in relation to a good home-based nocturnal seizure detector [71].	Providing users with greater liberty, while freeing them from being dependent on a commercial or government source in relation to OpenStreetMap [42].	[71, 42, 39]
Tradition	Cultural and spiritual values	Maintaining a healthy lifestyle in relation to eHealth technologies [17].	Concerns about respecting cultural and spiritual values (e.g., mind, emotions) in the design of humanoid robots [16].	[17, 16]
Achievement	Competence	-	Ethical issues related to competency in the context of sensor-based physiotherapeutic assistance system for home therapy [38].	[38]
Hedonism	Calmness	Feeling fear, anxiousness, or insecurity about their health in relation to eHealth technologies [17].	-	[17]
	Hope	Being supported in coping with negative emotions imposed by the disease in the context of mobile apps for diabetes self-management [19].	-	[19]

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