ANNEX 3

Key terms

Annex 3: Key terms

In the following, you will find the complete list of all key terms from the publication *Perspectives on Robots A reality check on imagined futures*. Key terms are sorted by chapter. REELER researchers from a broad range of disciplines, from engineering to economics, have developed these transdisciplinary key terms as part of establishing a shared vocabulary for discussing topics that breach disciplinary borders. As such, REELER's definitions may depart from typical mono-disciplinary understandings.

1.0 Introduction

Collaborative Learning: A process of alignment of different motives and expectations in working toward a common goal.

Motive: The underlying reason for engaging in activities of collaboration to achieve a common goal defined as 'an object'

Robot: Simultaneously a conceptual entity and material object, affecting people in different ways.

Robot makers: People directly involved in robot development.

Developers: People with technical expertise, whose role is to develop robots in whole or in part (e.g., mechanical engineers, computer scientists, industrial designers).

Facilitators: Decision-makers whose role is to set the framework for development. This includes people with legal, regulatory, or bureaucratic expertise (e.g., funding bodies, regulatory agencies), but also persons who otherwise facilitate the funding, access to market, or testing (e.g., lawyers, investors, marketing, or public-relations persons).

Application experts: People with an expertise in the application area or sector particular to the robot under development. They have a role of sharing their expertise with developers, and are often robot buyers (e.g., a contractor or building developer for a construction robot, or a dairy owner for a milking robot).

Affected stakeholders: Those who may use robots or be affected by robots, directly or distantly.

End-users: People who will use (operate or interact with) the robot directly (e.g., a patient using a rehabilitation robot, a machine operator at a factory, or a consumer using a robotic vacuum).

Directly affected stakeholders: Non-users who encounter the robot and are affected by it (e.g., a family member assisting patient with use of a rehabilitation robot, or a nurse interacting with a cleaning robot).

Distantly affected stakeholders: People who will likely never operate, use, or interact directly with the robot, but may nevertheless be affected by it (e.g., a physiotherapist made superfluous, a farmworker on a traditional farm rather than a farmer working in a precision-farming setting).

Intermediaries: Those acting as go-betweens for robot makers (especially developers) and robot recipients (affected stakeholders and end-users).

Spokespersons: An intermediary who speaks on behalf of recipients based on their own experiences. Often these people are management level in the same organization as the end-users (e.g., the factory owner speaking on behalf of the workers).

Alignment experts: Intermediaries seeking to align robot makers and affected stakeholders based on empirical knowledge of both. Often these people have an expertise in Social Sciences or Humanities (SSH) (e.g., an anthropologist or ethicist).

Learning: The process of developing material and conceptual knowledge through engagement with a situated social and material world.

2.0 Robot Beginnings

Innovation: Exploitation of an invention (i.e. using something existing in a novel way). Invention is the discovery/creation of something new.

Sociomaterial world: A mix of social, cultural, material, and temporal influences that continuously shape one's framework for experiencing the world.

Business case: An argument for robot development based on expected commercial value.

3.0 Collaboration in the Inner Circle

No key words

4.0 Ethics beyond Safety

Ethics in robot design: Personal and collective awareness of ethical issues as well as the ability to actively engage with both ethical reflection and practices with the goal to pursue value-sensitive design and responsible research and development in robotics. The key premise is the orientation towards 'others', which includes the practice of taking other people's perspectives and understanding their motives.

Human safety: Bodily and mental integrity of people.

Distributed ethics: Making robots is distributed – but that also means ethical responsibility for the whole project should be distributed.

Roboethics: A field of ethical inquiry, which deals with how humans design, interact and relate to robots. In particular, how to ensure that the spread of robotic technology benefits rather than harms humanity.

5.0 Inclusive Design

Inclusion/exclusion: A multi-dimensional concept that here points to the fact that whenever design decisions are made, they involve the process of full or partial inclusion/ exclusion of individuals or groups of persons from the given dimension of the reality in question.

Inclusive design: An approach to design that recoginzes user diversity, and encourages reflection on one's own normativities to make informed design decisions that include as many of the people who could benefit from the designed product as possible.

Normative thinking: A type of thinking where a group of persons develops specific implicit assumptions and conceptions of reality ('norms') and believe that all other individuals or groups naturally should accept these.

6.0 Innovation Economics

Dilemma of specification sequentiality (and bootstrapping out): Fundamental dilemma in new product development that requires a developer to either fix technological specifications to determine detailed user requirements or assume user requirements to determine basic specifications for technology to develop. Both decisions limit future options. The solution proposed here is to 'bootstrap' out by alternating between obtaining user feedback with increasingly more specific designs and trying to materialize new product technology based on increasingly more concrete user requirements.

Uncertainty: Property of technology and market research as well as product development & design activities that economic actors need to cope with.

Bounded rationality: Human cognitive limitation in rationalization of decisions.

Technology transfer: The process of adapting technology to particular usage or in an environment different from when originally conceived.

Absorptive capacity: A concept expressing the (often limited) ability of people (e.g. engineers) to comprehend and use external, new technological knowledge entirely.

Co-location / face-to-face communication of tacit knowledge: Observation that tacit knowledge is best communicated in face-to-face communication. Actors engaged in processes requiring frequent exchange of such knowledge best co-locate for efficiency.

Collaborative governance form: Given the market failure for and the uncertain temporary value of knowledge, firms prefer collaboration in exchange and creation over market transactions ('buy') and vertical integration ('make').

Free-rider problem: Whenever everyone can use new knowledge for free, nobody is willing to invest in research and development, such that, consequently, the amount invested in research and development is (too) low.

Means for value appropriation: Ways for actors to ensure capturing the monetary rewards for conducting research and development of technology, e.g. patents, secrecy, branding.

Staggered expansion: Strategy to expand the group and type of stakeholders involved in specifying user requirements, and test/ pilot runs over the course of several new product development iterations. For example, first focus on stylized requirements defined in-house, then involve intermediaries, then involve lead-users, etc.

Incremental vs. radical innovation: Two types of innovation. Incremental innovation concerns mere extensions of the existing design, consolidating the existing paradigm. Radical innovation introduces a new paradigm, generally a breakthrough increasing the performance in some dimension(s) in the order of several magnitudes.

(Spatio-)temporal patterns: Notion that type of research and development changes over the course of the industry evolution, notably cycling through breakthrough, exploration, design dominance, and exploitation phases. Moreover, also the location of research and development activities as well

as the distance over which collaboration takes places may change over time.

Path dependency: Tendency of new technological knowledge to build upon and be compliant with the extant, surviving technology paradigm.

7.0 Learning in Practice

Knowledge: A corpus of ideas about the world which is codified (both as concept and as words, pictures, symbols and other material externalisations) for communication through social relations.

Naïve human: A term used by robot makers (and computer scientists) to refer to persons unfamiliar or inexperienced with robots (or other digital technologies).

Technology apprehension: An initial reluctance to use a new technology, tied to a lack of experience or lack of information.

Situated knowledge: Knowledge acquired through social engagements in a particular activity, context, and culture in situ i.e. (at local sites).

Technology resistance: Opposition to an implemented technology, whether by passive non-use, active misuse, or deliberate sabotage.

Organized learning: The process of developing organization of knowledge or know-how through engagement with the social and material world.

Technology-in-use: An understanding of a technology not as a static object, but as a thing defined and redefined by its context of use.

Education: The social infrastructure and systematization of learning organized knowledge.

8.0 Imaginaries

Humanoid: Entities that are human-like in appearance. E.g. bipedal, stereoscopic vision, opposable thumbs.

Imagination horizon: A collectively available pool of conceptual resources, from which individuals draw out the elements constitutive of a given imaginary.

Robot as materiality: A theme relating narrowly to the technical aspect of a robot, i.e. which material properties (if any) must be present, and which processes much be instantiated for an entity to be a robot.

Robot as concept: A theme grouping together phrases that pertain to the conceptual side of a robot.

Anthropomorphism: The ascription of internal states characteristic of humans (such as emotions) to non-human entities (such as animals).

9.0 Economics of Robotization

General-purpose technology: Technology with applications in many sectors, a major impact on economic growth, and transforming society. Examples are smelting of ore, writing, the steam engine, electricity, the computer, the internet.

Robotization: To convert for automated operation or production by robots or robot-like machines.

Production rationalization: Increasing the efficiency of an existing production process by changing the division of labor, redefining production steps, and introducing alternative production technology (such as robots).

Qualitative transformation: A notion underlining that not only 'having a job' matters when thinking of the impact of robotization on employment, but also the type of work, the skills required, and the job satisfaction.

Rehumanization argument: Line of reasoning arguing in favor of progressive robotization because robots can and may take over dull, dirty, and dangerous work deemed ungratifying and thus free up humans that can then focus on work requiring supposedly distinctly human qualities. Robotization thus facilitates rehumanizing work of people to do supposedly gratifying, meaningful work rather than supposedly ungratifying, meaningless rationalized production activities.

Quality – meaning fallacy: The (possibly) mistaken belief that jobs requiring more human qualities (notably social skills, creativity, intellect) are considered more meaningful or desirable to or more appreciated by workers.

Inclusive growth: A central policy objective of the European Union emphasizing that all classes of society across all nations should benefit from economic growth.

Countervailing force: An economic mechanism in which the introduction of robots creates work and thus compensates the destruction of work.

Structural change: An economic core concept on how the composition of an economy evolves over time in terms of sectors and occupations, often due to cascading effects of development and application of new technologies.

Labor mobility: The ability to take up other jobs (possibly but not necessarily requiring other skills), which may, but need not, be in another geographical location.

Vacancy chain: An economic phenomenon (observed in one of our computer simulation models) in which workers move

to better paying jobs by upskilling, thus leaving vacancies filled by others with lower skills.

Dynamic efficiency & innovation policy: An economic growth policy, proposed to facilitate creation of and efficient reallocation of labor across occupations and sectors.

10.0 Meaningful Work

Work: Remunerated human labor, both as a means unto itself and as a means of production.

Automation: The mechanization of human labor, both inherent and productive

Technological determinism: The attitude that automation is inevitable, or, that the reasons for automation are self-evident; technological progress as an unstoppable force.

Technochauvinism: The assumption that technology is superior to all other potential solutions, or, in automation, to all other sources of labor.

Transformation of work: The experienced changes to work and workers as a result of automation and digitalization.

Technology resistance: Opposition to an implemented technology, whether by passive non-use, active misuse, or deliberate sabotage.

Luddism: (historical) A movement by English textile workers to oppose the introduction of machines that would diminish their craft and undermine labor practices; (popular) a derogatory term for technological apprehension; (modern, Neo-Luddism) an anti-technology lifestyle/movement.

11.0 Gender Matters

Sex: Biological characteristics that classify an individual as female or male.

Gender: Socio-cultural process and social meanings ascribed to men and women (Report 2013; Rüst 2014)

Feminism: The advocacy of women's rights on the ground of social, political and economic equality of the sexes.

12.0 Human Proximity

Proximity gap: Physical and conceptual distance between persons, including differences in understandings, values, or motives (as illustrated in the Human Proximity Model).

Collaborative learning: A process of alignment of different motives and expectations in working toward a common goal.

Alignment experts: Intermediaries working to align robot makers' and affected stakeholders' motives, based on empirical knowledge of both.

Core expertise: The skillset and knowledge base one has developed through education and/or experience.

Relational expertise: A capacity to recognize the motives of those with different core expertise, to understand the value of their expertise, and to mutually align motives in joint work.

Cultural brokerage: Translating motives, values, and understandings between persons with different cultures and disciplines to increase human proximity and promote relational expertise.

Common language: A common ground of mutual understanding, knowledge, beliefs, assumptions, pre-suppositions, etc.