Supplementary material

**Appendix table A1.** Meta-synthesis results of the included primary studies.

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| **Study** | **Sustainability &****design goal(s)** | **Rationales for adopting AT** | **Overall engagement with AT**  | **Author(s)’ overall reflection on the use of AT** | **Unit of analysis** |
| Aguayo, 2016;Aguayo & Eames, 2017 | Design and evaluate a community learning website to promote local residents’ understanding of the socio-ecological sustainability of a lake in southern Chile and the transition towards a sustainable lifestyle. | AT provides a frame to take into account the sociocultural elements regarding the use of technology interventions as mediating tools and accounts for systems thinking, complexity and dynamism of human behavior. | AT was employed as an analytical tool and design guideline for collecting and analyzing data in the design, implementation and evaluation phase of the ICT platform. | AT is helpful as it accounts for educational sociocultural, technological components of human activity while considering the complexity and transformation of activity systems. | Community’s socio-ecological activities after introducing the ICT platform |
| Smith & Turpin, 2017 | Design and evaluate an ICT platform to empower elderly women in a rural community in South Africa. | AT’s emphasis on sociocultural aspects, the interaction between human actors and environments, and the concept of tool mediation can provide a suitable foundation for the design, development and demonstration of the ICT platform. | AT was applied in the design, development and demonstration process of the ICT platform to make visible the relationships between the users, the ICT platform and the researchers, and to describe the social and political dynamics in the community. | AT can help to make the hidden needs of target users and the social and political dimensions of the larger community visible to the design process. | The ICT design research project in the rural community |
| Hasan et al., 2017 | Explore the potential of using IS to support the planning and execution of design interventions for climate change adaptation. | AT provides holistic coverage of the phenomenon of adaptation, which by its essential nature, involves action and change. | AT was enhanced with five dimensions to guide the development and analysis of a series of design interventions for solving complex climate change adaptation problems.  | AT provides a balance between scope and detail to accommodate the complexity in planning and implementing climate change adaptation projects. | Climate change adaptation activities: sea-level rise and heatwaves |
| Hasan & Ionescu, 2017 | Design an online system to enable small businesses to track and reduce the environmental footprint of their business activities. | AT prioritizes the motivations of activity over tools that can be changed or replaced. | The concept of activity was used as a holistic unit of analysis for identifying activities that have a significant environmental footprint. | AT provides a holistic notion of activity rather than artefacts. | Business activities of small business that have a significant environmental footprint |
| Sclater, 2016;Lally & Sclater, 2012 | Evaluate the effects of a Technology Enhanced Learning platform on supporting pedagogies of socio-ecological sustainability in Art and Design education. | AT provides a comprehensive theoretical framework that takes account of people’s motivations, goals, actions and artefacts along with the context in which activity is carried out. | AT was used to understand how participants acted and developed when engaged in co-designed creative activities on the platform. | AT in a broad sense as a theory can offer researchers the language, history, scope and power to be reflexively aware of different actors’ needs and interests. | Participants’ learning activities in the virtual platform |
| Khan et al., 2015 | Solve environmental management issues of electric and electronic waste by redesigning human interaction in sociocultural aspects. | To gain sustainability in different sectors that involve the process of consultation, knowledge, education, covenant, debate, participatory approach, social learning and behavior change. | AT was applied methodologically to design a framework for the development and problem solving of a waste management system.  | AT is used to involve all the relevant actors in the decision-making process to gain sustainability in the waste management system and ultimately create individual behavior change. | Electric and electronic waste managementcollaborative learning activities |
| Perold et al., 2019 | Design to support informal settlement residents’ transitions toward sustainable urbanism in Southern African. | Not explicitly mentioned | AT was applied as an analytical tool to identify contradictions between two co-existing activity systems (bottom-up informal settlement and top-down policy-driven strategies) in architectural practice. | By analyzing contradictions and how they are resolved, insight can be gained into the capacity building when architectural professionals engage in sustainable architectural practices. | Architectural practice between residents and local government |
| Svensson, 2020 | Introduce innovative eHealth services in the healthcare system at a municipal level to obtain a sustainable society. | AT provides a conceptual framework to account for the interaction between the social actors and the use of technology, and a lens for understanding contradictive motives between different actors in an activity system. | AT was used to understand the voices of different actors and analyze their contradictive motives in eHealth work practice. | Not explicitly mentioned | Home health care service after implementing the eHealth system |
| Bai & Guo, 2011 | Develop eHealth services for elderly care with an emphasis on sustainability, generality and expandability properties. | AT provides a systemic view to developing a sustainable eHealth system by identifying different actors, their relationships and motivations. | AT was used to design the architecture of the e-health system by identifying the components and relationships between these components of the healthcare activity. | The interchangeable and mutually interdependentsubject-object relationships within neighboring activities are the key for design to accommodate different roles of actors. | Care providers and care receivers’ activities |
| Lin & Hsieh, 2014 | Evaluate the design of telehealth services and investigate what factors affect the sustainability of the services. | AT provides a framework for studying different forms of human practices as development processes with both individuals and social levels interlinked at the same time.  | AT was used to identify the contradictions in the activity system of key stakeholders that may affect the sustainability of a service innovation project. | AT is suitable for understanding the dynamics of complex service innovation systems, modelling the actions taken by different actors in the system, and identifying contradictions that affect the sustainability of newly developed services. | The entire new telehealth service development process |
| Selvefors et al., 2015 | Explore design implications and opportunities for supporting people’s everyday energy conservation from a goal-oriented perspective. | AT considers people’s actions in relation to motives, goals, contextual factors, and other actions and activities, thus is suitable to study people’s everyday energy use. | AT was used to explore how people perceive their possibilities to engage in energy conservation from a goal-oriented perspective. | AT takes into account people’s multiple motivations, contextual preconditions, and alternative actions and activities related to their everyday activities. It thus provides a new lens to explore people’s energy conservation. | People’s energy demanding activities in everyday life contexts |
| Viktorelius & Lundh, 2019 | Evaluate the design of an energy monitoring system and energy saving policy for improving energy efficiency in shipping. | AT offers an explicit focus on the contradictions that might ensue in sociotechnical work systems when introducing newtechnologies, rules or objectives. | AT was used for analyzing and understanding energy conservation and operational energy efficiency in the complex sociotechnical setting of work practices in shipping. | CHAT emphasizes the importance of considering tensions and contractions within or between different components of activity when new artefacts are introduced. | Work practices onboard the ships  |
| Hasan & Meloche, 2013 | Identify ICT-mediated opportunities in solving environmental challenges. | AT supports a holistic perspective in finding innovative solutions to address wicked problems and complex environmental challenges. | AT was used to interpret the key factors that emerged from the collected empirical data. | Shifting focus from things to activities when considering innovative solutions to sustainability challenges helps researchers to evaluate the environmental impact of whole activities rather than focusing on the sum of individual actions. | Innovative ICT-mediated activities that can reduce carbon footprints |
| Ssozi-Mugarura et al., 2016 | Evaluate an ICT intervention for sustainable water management in rural communities in Uganda. | Go beyond how people use technology and uncover motivations for and attitudes to technology use. | AT was used to analyze the contextual factors that influence the mediation capacity of the ICT intervention. | AT offers insights on different aspects such as the context in which the technology was being used, the technology itself, the activity and users that were being supported. | People’s activities in relation to the use and uptake of the introduced ICT intervention |
| Chu et al., 2020 | Explore the design opportunities to intervene in the interaction between consumers and date labelling to reduce packaging-related household food waste. | AT focuses on understanding the role that different artefacts play in the target activity system from a systemic perspective. | AT was used to conceptualize subjects’ interaction with internal and external mediating tools and the corresponding tensions and contractions into an integrated model.  | AT helps to identify and understand the existing tensions and contractions that the subject encounters in an activity system. | Consumer food edibility assessment system |
| Chen et al., 2009 | Explore the design of information technologies to address socio-economic emergency communication challenges. | AT provides a systematic approach to elicit and analyze the internal elements, structure, and relationships of core communication elements. | AT was used to analyze the key issues in and understand the requirements for emergency communication system design. | AT helps to breakdown the complex system into inter-related components and identify the key problems, consequences, and design opportunities in these components.  | Disaster emergency communication system |