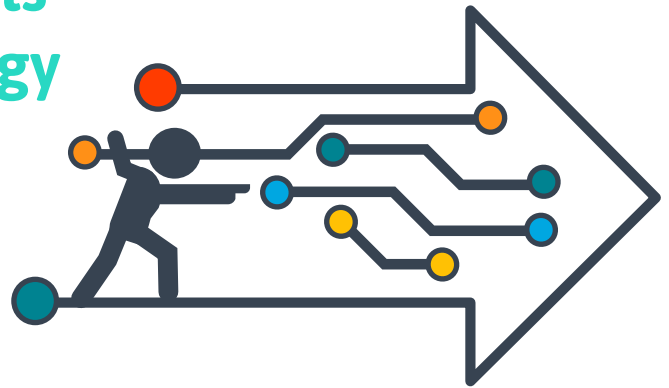


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# Digital Transitions: Supporting societal shifts related to climate, energy and mobility

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## ABSTRACT

Digitalisation sits alongside carbon neutrality as a political priority of the EU. They are framed as twin transitions in the hope that digitalisation creates sustainability outcomes. However, such gains are not automatic; they depend on how digital technologies are implemented, and what practices they support. There are outstanding challenges around ensuring access to digital technology, and in creating proactive governance and regulation of digitalisation. Future research needs to centre on critical themes of power and ethics to address accessibility and social marginalisation.

## SUMMARY

- Unsustainability is perpetuated when digitalisation locks in high energy behaviours, infrastructures, and business models.
- Proactive regulation should ensure that digital technologies are built around sustainability and equity outcomes.
- The greatest sustainability outcomes are achieved when digital technologies support social innovation (new ways of organising production and consumption), rather than supports more efficient business-as-usual models (e.g. the same supply chains and production processes).
- Future research must focus on questions of power and equity, and how to equitably and democratically govern digitalisation and digital technologies.
- Research and practice would benefit from co-creative approaches that allow the development of social and technical understandings of digitalisation.

## Introduction

A 'Europe fit for the digital age' is one of six commission priorities for 2019-2024. The Digital Strategy is based on three pillars: 1) technology that works for the people; 2) a fair and competitive digital economy; and 3) an open, democratic and sustainable society [1]. Under this third pillar, the strategy commits to use technology to assist in the transition to climate neutrality by 2025, while also

## KEY DEFINITIONS

**Digitalisation:** the shift from the physical world to the digital world (e.g. remote working, online meetings/conferences, and apps that aid decision-making). Digitalisation can shift physical supply chains, alter work and travel patterns, and support innovation towards sustainable decision making. Digitalisation includes shifts to online conferences and meetings or transition to virtual communities to connect people.

**Digital technologies:** the tools and applications to support this process, for example Zoom, crowdfunding platforms, apps for remote sensing in precision agriculture to avoid transport emissions, etc.

**Social innovation:** new ways of organising supply chains, consumption processes and ways of working that provide alternatives to business as usual. Examples include community energy and car sharing.

**The twin transition:** refers to the idea that transitions to a digital world and to a carbon neutral society reinforce each other.

reducing the carbon emissions from the digital sector. In this way, digitalisation sits alongside sustainability as the twin transitions whereby digitalisation and digital technology accelerate sustainability objectives [2].

There are significant challenges to achieving these twin transitions as digitalisation does not automatically lead to improved sustainability [2]. Corporate and industrial digitalisation strategies tend towards business as usual, but done more efficiently [3,4]. While this leads to reduced waste and emissions, it can also lead to greater production and consumption that cancel out these savings, thus not actually delivering overall sustainability benefits. Digitalisation itself can also be a driver of unsustainability, particularly around the energy demand of server farms and data centres [5,6].

While digitalisation tends to suggest a clear role for STEM research (e.g. in creating software, sensor, data management), there are significant contributions needed from SSH. There is need to consider the ethics of artificial intelligence and automation, the policy and governance of industry regulation, and the philosophical and political considerations around the roles industry, state and civil society could and should be playing in digitalisation. Further, opportunities and barriers to access of digital technologies play an important role in shaping the extent to which the twin transformations are achieved.

This literature brief summarises existing understandings about digitalisation and digital technologies, and their role in the green transition, with a focus on the future opportunities for SSH research. The insights presented are informed by existing academic literature, policy literature, and interviews conducted with two experts: one from industry, and one from research-practice<sup>1</sup>. Interview insights were used to provide illustrative examples in this brief, and to guide towards topics in the literature.

## Current understandings

### Significant findings to date

SSH research on twin transitions, or digitalisation as a pathway to sustainability, is an emerging field. It remains largely dominated by STEM. Topics here include the developments of technology, data harmonisation and big data, digital twins, and quantifications of the impact to carbon emissions from digitalisation processes [see e.g. 5,7]. However, **there is an increasing amount of SSH literature available, often exploring the roles and processes of digitalisation to support sustainability transitions within specific sectors or research topics** (e.g. agriculture, energy). Agriculture is a particularly rich topic, and highly relevant to climate, energy and mobility. Here, digitalisation, for example through supporting precision agriculture, is proposed as a way to improve soil quality (including carbon sequestration), reduce energy use, and minimise transport requirements [8]. An exploratory review of the SSH literature on the topic of digitalisation in agriculture [9] revealed 5 thematic clusters of the roles SSH plays in understanding and shaping processes of digitalisa-

tion: 1) adoption, uses and adaptation of digital technologies on farms; 2) effects of digitalisation on farmer identity, skills and work; 3) power, ownership, privacy and ethics of digitalisation in production and value chains; 4) digitalisation and agricultural knowledge and innovation systems; and 5) economics and management of digitalised production and value chains [9].

The need for, and forms of, regulation of digitalisation is widely recognised. **Historical analysis shows that technology transition (e.g. to digitalisation) tends to happen faster than energy transition, and there is therefore a need to develop regulations that ensure digitalisation does not undermine future energy transitions by locking-in high-energy behaviours** [10]. Infrastructure, processes and logics of digitalisation become locked in, meaning that regulation occurring in response to digital development is resisted and causes problems to digital service providers [PD]. Proactive regulation ensures that digitalisation stays as a “good servant” to achieving sustainability, rather than a “bad master” [PD]. It requires foresight and understandings of the ethical, political and practical implications of digital technologies and their application. The Digitalization for Sustainability (D4S) project<sup>2</sup>, funded by the Robert Bosch Stiftung, has outlined a ‘Blueprint for the European Union’ on how to reconceptualise digitalisation for sustainability. The document, called ‘The Digital Reset’, outlines the more fundamental systems changes that need to be created so that digitalisation remains a good servant to sustainability [11].

The need for regulation is linked closely to questions of which actors take what roles in providing and maintaining public services and their capacities and legitimacy to do so. **These are fundamental questions of the ethics and politics of how power, roles and responsibilities are distributed in public service provision, raising tensions around the role of the state and the private sector.** The political priorities to digitalise rely on there being infrastructure, such as mobile, high-speed internet. This infrastructure is arguably a public good that is currently being provided by the private sector [PD]. Thus, there is a tension between the scope to invest private sector money, and the expectation to deliver services (e.g. fast, reliable internet) that meet the needs created in the European Green Deal, as expected by citizens [PD]. For example, the high level of competition between mobile network operators in Europe drives competition and spreads finances thinly, constraining opportunities for investment [PD]. There may also be tensions between the interests of internet providers and the provision of public infrastructure such as shared wi-fi networks in public spaces [12].

There are also concerns raised around the unequal access to digital services and how this affects the European Green Deal objectives to leave no one behind. For example, inequality in internet speeds, particularly between rural and urban areas can create a digital divide where people have different opportunities to access the information society [13]. Digitalisation has been proposed as a mechanism for overcoming some societal inequalities, for example by changing gendered working patterns [14]. However, the use of digital technology has the potential to further embed gender inequality and exclude women from decision-making and transition activities [14]. If women are traditionally excluded from e.g. investment decisions, the creation of crowdfunding platforms

<sup>1</sup> Interview contributions to the literature brief are indicated through bracketed initials

<sup>2</sup> <https://digitalization-for-sustainability.com/digital-reset/>



alone will not address this. Rather, for women to be included in decision-making and innovation for an energy transition, crowdfunding platforms must be accompanied by awareness raising and engagement with under-represented groups [SC]. In short, digitalisation alone is insufficient; it must fit within broader social changes.

## Emerging practices

Centring social innovation is a way to ensure that digitalisation is a tool to support transitions to sustainability [15] and to achieve the above-outlined social change. For example in the Horizon2020-funded SocialRES project<sup>3</sup>, crowdfunding platforms are being used as a form of digital cooperative, bringing multiple small energy operators together with citizen investors [SC]. Aggregators are similarly important in community energy generation and energy cooperatives by bundling distributed energy resources and negotiating higher market prices [SC]. European regulatory frameworks place significant emphasis on the role of aggregators in the energy transition [16,17]. Digitalisation that seeks to just improve efficiency within business-as-usual models is of limited impact to sustainability [3]. **The most effective digitalisation processes seek to rethink these models, for example moving from centralised power generation and big-grid distribution to decentralised and community energy networks, and to work with digitalisation to underpin these processes [18,19].**

A centring of social innovation, and the need to challenge existing social relations creates an emerging emphasis on co-creation and transdisciplinary research approaches. SSH and STEM researchers working in partnership should allow exploration of technology development alongside social needs, use and explorations of ethics and access [20]. For example, in the Horizon2020-funded MUV project<sup>4</sup>, citizens were active participants in creating, and testing, apps and games for changing mobility behaviours in a range of urban areas. Bringing these different perspectives together and matching them to societal and practical needs pushes towards transdisciplinarity [9,21]. **Transdisciplinary and co-production processes create space for public debate and the elicitation of public values to consider whose values count, how they play out in digital technologies and their implementation, and how trade-offs should be managed [22].** This includes considering how technologies interact with social drivers of exclusion, and the behaviours that they embed or promote. It includes questioning who benefits from a digital technology, and who is potentially harmed. Indeed, research that explores the political dimensions of digital technologies must engage with such questions of power [23] and question the governance structures of digitalisation for sustainability [24].

Such co-creative, transdisciplinary approaches are often embedded within practice cases, or real world examples of developing and using a technology, that create new constellations of actors around innovation. For example, the SocialRES project has worked with 9 case studies of social innovation in renewable energy projects in the UK, Spain, Portugal, Germany, Croatia, and Romania. Digitalisation and digital technologies have supported a number of these innovations

3 <https://socialres.eu/>

4 <https://www.muv2020.eu/about/>

through e.g. crowdfunding of peer2peer lending, and virtual energy transactions. This case approach allows learning from the process of working with digital technologies, while matching them to the needs of the case, and seeing the different ways in which communities work with them [SC]. This can include bring investors, technology developers and end users together, for example in developing an app for precision agriculture [PD]. It can also take the form of exploring, with a community, the use of digital technologies to support e.g. a community energy project [SC].

## Future SSH priorities

**There are extensive opportunities for SSH researchers to input to questions of design, implementation and uptake of digitalisation.** These kinds of research questions are well covered in reviews pertaining to specific sectors where digitalisation is already playing a role in relation to climate, energy and mobility. For example, in their review Klerkx et al. [9] outline a broad range of specific questions relevant to digitalisation in agriculture, around ethics, identity, accessibility and regulation. Trahan and Hess [18] outline a range of questions from the area of energy transitions around the roles taken by actors in digital technology development and the risks they assume; and the impact to organisation structure and workforce characteristics. They point to the research opportunities to explore how local energy organisations are extending beyond priorities of affordability and into community benefit; or how such organisations are shaping relationships with vendors and energy distributors. Kunkel and Tyfield [25] outline a strategic research agenda for digitalisation and sustainable industrialisation in the Global South. From these sector-focussed reviews, it is clear that there is significant scope for SSH research that looks at the application and steering of digitalisation, drawing on disciplines from business studies, law, policy, behavioural science, sociology and ethics.

More critically, and looking across sectors, a common thread through these research agendas is **a call to investigate questions of power, and how they play out across different actor groups in the process of digitalisation and the design (and thus impacts) of digital technology.** Power shapes access, and shapes the way in which digital technologies tackle or perpetuate inequalities. In engaging with technologies, there is a need to consider “who governs, whose systems framings count, and whose sustainability gets prioritized” [23]. Indeed, such questions relate to the issues outlined above around the roles played by actors, and the ethics and politics therein. Examples for SSH research could include exploring the barriers and opportunities to participation in digitalisation processes for marginalised communities, and indeed how social innovations and digitalisation fit to a range of cultural and socio-economic contexts. Policy research could further identify the discourses of digitalisation, and explore how these reflect the lived realities of the communities they should impact.

Beyond the specific research questions to be pursued, there is also a priority with regards to the skills and understandings that SSH researchers need to develop. **A particular SSH priority is to improve digital understanding or literacy amongst SSH communities. SSH researchers tend to be largely digitally illiterate and theories of digitalisation are thus analogue and fail to capture the nuance and oppor-**



**opportunities of digitalisation** [26]. There are calls for increasing recognition of the role and scope of digitalisation in our own research practices [27], and how this shapes what we are able to research, how, and how we understand the world [e.g. 28]. Roth [26] calls for a digitalisation of social theory, rather than just a social theory of digitalisation. Indeed, improved digital understanding by researchers themselves would allow recognition of the huge potential of digital platforms in shaping social innovation [SC]. This would require SSH researchers to be more focused on what might be, and what could be, rather than focusing on what has already happened [PD]. Co-productive, practice case approaches help to connect SSH researchers with a greater understanding of the potentials and pitfalls of digitalisation.

## Key Takeaways

### Takeaways for the European Commission

- Proactive regulation must embed sustainability within digitalisation processes to ensure that digitalisation doesn't lead to higher carbon emissions and serve to undermine the EU's commitment to carbon neutrality by 2025. Digitalisation is not an automatic pathway towards carbon neutrality. Digitalisation can create path dependencies in high energy behaviour which are hard to retrospectively change, can encourage unsustainable behaviours, or reinforce existing inequalities and unsustainable business practices.
- Research funding should focus on creating social innovation supported by digital technologies, rather than focussing on the digital technology as the core outcome. Energy and mobility systems can be transformed by social innovation, for example through decentralised energy supply and distribution (community energy). Digital technologies help to support their set up, implementation and scaling up processes. Funding should therefore be targeted to fostering the social innovation, rather than leading with digitalisation as the primary goal.
- Future research should include critical consideration of the democratic governance of digitalisation. Research that develops social innovation and digital technology should include consideration of the roles, rights, responsibilities and access to digitalisation. Such research must explicitly engage with the political and ethical implications of digitalisation.

### Takeaways for Stakeholders and Businesses

- Digital technology developers should seek early engagement with SSH research to co-create digital technologies and digitalisation processes that lead to great social and sustainability benefits. Digitalisation is not a purely STEM process. Questions of what the technology will support, user needs and access, and decision-making processes are all areas of SSH research that must be included within development plans and roll-out strat-

egies. They can be addressed alongside the technical questions for greater uptake and impact.

- To ensure no-one is left behind, the development of digital technology and its implementation must be accompanied by comprehensive infrastructure and capacity building. Digitalisation will not automatically overcome barriers to the participation of marginalised groups, and indeed could create further barriers. Digital tech must be designed in with input from under-represented groups to ensure accessibility.

### Takeaways for the SSH Centre project

- Many researchers may need to improve their understandings of the role of digital technology, its potential, the types of technologies available, and how they are used. There are significant opportunities for meaningful and impactful SSH research on digitalisation. However, digital literacy and an active interest and experience of using such technologies will help to fully understand and unpack these research opportunities. Opportunities for such engagement exist through the WP5 and WP6 Open Science and Open Education activities of the SSH Centre.
- SSH Centre can ensure that critical basic research on the topic of digitalisation is included in WP2's collaborative book chapters, and by ensuring representation of more theoretical perspectives in the ECR knowledge brokerage training. Critical basic research is needed to explore normative questions of who has their voice heard and priorities met in digitalisation processes, who loses, and why. These should not be overlooked in favour of those with more tangible, applied perspectives.
- SSH research needs to explore how gender and other barriers shape inclusion and use of digital technologies, and how digital technologies intersect with processes of marginalisation. The SSH CENTRE project could facilitate discussions on this topic through the policy insight events and focus groups.

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