The Internet of Things

Projects – Places – Policies

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1. Author: Xiangxuan Xu
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2. Authors: Xiangxuan Xu and Patrik Ström
   Title: The transformative roles of knowledge-intensive business services in developing green ICT
   Book: Published in Jones A, Ström P, Hermelin B and Rusten G (eds), *Services and the Green Economy*, London: Palgrave Macmillan, 99–124. 2016.

3. Author: Xiangxuan Xu
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The ongoing transition from the Internet age to the Internet of Things age is a paradigm shift of knowledge production and interactions: information and knowledge can be produced and disseminated either without or with very little human interventions. Non-human actors are given cognitive abilities, thus joining with humans to become the producers and carriers of knowledge, especially more tacit type of knowledge. This qualitative change calls for re-conceptualising the multilevel knowledge dynamics that integrates the local-global and digital-physical dimensions. The thesis combines the geography of information with geography of knowledge and innovation to build an economic-geographic theory of context for IoT. It enhances our understanding of the spatial characteristics and consequences of adopting IoT technologies in society.

The popular notion of IoT as connecting anything from anywhere at any time suggests a return to the "end of geography" debate. This thesis argues that these spaceless sentiments of IoT are indeed exaggerated and even misleading. On the contrary, successful realisation of IoT is not about linking anything at any place, but to connect something at some place(s) for potential users. Things, places and people are inherently spatial constructs. This thesis explores those underlying spatially embedded mechanisms in projects and places, including the policies that address the emerging IoT issues.

It concludes that context can affect the production of IoT applications through various aspects in the spatial structure of knowledge and innovation networks. Regions and places can be test-beds for developing IoT applications because knowledge and policy networks take a long time to develop. Knowledge-intensive activities are at the core of the activities that are taking place on a multilevel geographical scale, where local presence and international reach through contacts and clients are essential for knowledge transfer. The adoption of IoT services is affected by contextual factors of social-economic conditions on different geographical levels, ranging from the individual/households level, the organisational level, to the societal level.

The adoption of IoT technologies can redefine the contexts of specialisation. Automation and telematics can change the production and interactions of information and knowledge by including non-humans as the active actors in a more flexible network across geographical scales. This change is called the *contextuality of relevance and connectivity*, and it re-organises the division of labour and the actor's networks. As a result, it can affect the spatial evolution of local/regional specialisations to the globalisation processes. New types of proximity may have an impact on the spatial re-configurations of these networks, e.g., *information network proximity* and *information system proximity*. The rise of the IoT age has the potential to enhance the "context-based" specialisation. In such scenario, the future competitiveness may rely on how much a firm, a region, or a nation is able to relate its specialisation to the "distributed contexts" and how well these entities can generate knowledge and innovation from a "context-based" coordinating and motivating of economic actions.

Key words: Internet of Things, digitalservice development, knowledge-intensive business services, EU ICT policy, smart public bike sharing, geography of knowledge, digital economy

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