Digitalisation of Finland's transport sector

Pekka Leviäkangas

Curtin University, Australasian Joint Research Centre for Building Information Modelling, School of Built Environment, Australia

ARTICLE INFO

ABSTRACT

Digitalisation is the most significant technological trend faced globally and has its impact on the transport sector among others. Finland has been in the front line for making use of ICT and digitalisation. This exploratory research paper addresses Finland's transport sector and the digital disruption it is facing. The approach is a mix of quantitative and qualitative research. Descriptive statistics are drawn from national and international data bases to show the inter-relationships between digitalisation and productivity of industries, including the transport sector. Government documents and official plans form another main set of source data. Based on these data, a PESTEL analysis is performed which shows that the challenge posed by digitalisation is somewhat represented in the governmental programmes and mid-term plans of the state agencies. However, some uncovered areas are identified. In particular, the results imply that social aspects of transport sector digitalisation are inadequately addressed. Intermediate results suggest that productivity and digitalisation seem to go hand in hand with a weak correlation, but time series suggest that investments in ICT have not improved productivity of the transport sector to the expected extent. Finland's government is responding to the digital disruption, but the transport sector as a whole is not very strongly represented on the government's agenda. Central agencies are more proactive, however their responses are more techno-economical than social. In sum, the assessment of this study is that most impacts of digitalisation can be considered positive, but not all. Intergovernmental organisations, such as the OECD, have recognised many obvious, wider social challenges of digitalisation that should be reflected more clearly on national policies.

1. Introduction

Digitalisation is the most significant technological trend faced globally. It will affect individuals, communities and entire nations. Internet of Everything (IoE) combined with intelligent sensor production, assisted by economies of scale, and platforms such as mobile devices, consumer electronics and urban infrastructures make it possible to sense and monitor almost anything, almost anywhere and almost anytime. Telecommunications networks have been integrated and they are global. Our capabilities to program algorithms that add to the intelligence of the digital system and automate the system's operating logic have increased dramatically, and the computing power over the cloud offer the digital possibilities unprecedented. Digitalisation and IoE also means that massive volumes of data are collected from different sources and by different actors. The World Economic Forum report forecasts that almost one trillion sensors will be connected to the internet by 2025 [1].

Big Data, cloud computing, ubiquitous technologies, digital economy, etc. are concepts that describe the different aspects of this mind boggling megatrend. The news is big and so will be the impacts. OECD estimated that there is a high risk of new type of unemployment if the digital and ICT skills are not quickly addressed by education systems [2]. We are also faced with the prospect of a growing mismatch between workers who have strong ICT skills and those who merely use them. "People who tell computers what to do and people who are told by computers what to do" is a phrase coming from renowned academics. European statistics show how routine jobs have been on a constant decline since 2005 with a drop of more than 10% in less than a decade, meaning roughly one percent unit per annum [3].

Different countries, industries and sectors vary in the extent to which they are making use of ICT and digitalisation. Finland, for

example, was seventh in the World Economic Forum's ranking for 2015–2016 regarding overall competitiveness, 13th regarding technological readiness, but first in the availability of latest technologies. Firm level technology absorption was ranked 10th [4]. On the European Digital Agenda Scoreboard comprising of aspects of connectivity, human capital, use of internet, integration of digital technologies and digital public services the Nordic countries Denmark, Sweden and Finland were in the top three [5].

How much different sectors or industries are ICT intensive, i.e. in other words, how digitalised they are, is often an unknown variable but statistics from the United States show that, for example, construction is the least digitalised sector whereas the financial industry and professional and business services seem to be the most digitalised ones [6]. Friedrich et al. [7] provided an interesting comparison between industries, mainly based on Eurostat materials. Construction was second last before the hotels and restaurants sector. Transport was not too far ahead, while financial services, insurance, computers & electronics and advanced manufacturing were in the lead. The overall picture from Europe and the US is strikingly similar. The same pattern is visible from Finnish national accounts, showing that the transport sector (including transport and warehousing) investments in ICT were about 5% of the country's total ICT investments for 1998–2012, while the leading sectors in ascending order were banking and insurance (ca. 10%), information and communications technologies industries (ca. 18%) and manufacturing industries (almost 30%) [8].

In order to understand why some industries and sectors are laggards, more in-depth analysis of such cases is needed. The threat is present that the gaps not only between countries and individuals are getting wider, but also that some industries are left behind by digitalisation development. Although digitalisation will be bringing not only opportunities but also challenges to industries, it seems that so far digitalisation has been a source of growth and profitability. The European Commission has promoted The Digital Single Market strategy, which was adopted in May 2015. The strategy includes 16 initiatives to be delivered within 2015–2016. It is anticipated that successful implementation of the strategy will contribute EUR 415 billion per year to Europe's economy, create jobs and transform our public services. For Europeans the strategy promises digital skills, enhanced use of digital technologies, improved job opportunities, and modern open government [9].

Some major challenges faced by the transport sector include climate change, environmental impacts, aging population, urbanization, digitalisation, and a shift in people's attitudes and life styles [10]. When making strategic plans for future transport system these grand, systemic challenges need to be considered accordingly [11]. In Finland the responsibility of coordination and promoting the digitalisation is assigned to the Ministry of Transport and Communications.

2. Aims, scope and theoretical frame

This paper addresses Finland's transport sector and the digital disruption it is facing. The Finnish transport sector digitalisation is analysed in the light of transport sector statistics, national accounts data and the documents of government and administration. Finland's transport sector represents a late mover in digitalisation [8] compared to other sectors of the economy and other industries of the country. This is also the case globally [12] when comparing transport and other sectors. The aim is to present how national policies, strategies and efforts have contributed to digitalisation how well digital disruption is covered by national policies and strategies of the government, ministry and central agencies of

transport sector. Additionally, the aim of this paper is to show the significance of digitalisation to the transport sector as a whole. A sector is defined simply as an area of economy, that includes the producers, consumers or clients and administration that is related to the sector, following a dictionary definition: "A distinct part or branch of a nation's economy or society or a sphere of activity such as education." (Oxford Dictionaries, www.oxforddictionaries.com). However, a standard national accounts coding is given and followed throughout this paper, giving an operational and quantitative definition of the transport sector.

The term *digitalisation* is largely relying on the concept of Intelligent Transport Systems (ITS), defined *as the application of modern information and communication technologies to transport system*. This definition is in line with the majority of given definitions, for example [13,10], and yet it embraces the entire system as indicated in the definition: infrastructures, related industries, administration and stakeholders. The systemic view to transportation has been particularly strong in Finland for the last two decades [14]. Fig. 1 visualises the perception of ITS as viewed by European Telecommunications Standards Institute [13], but which is somewhat narrower from the Finnish perception, that for example includes light traffic as an integral part of the system. Industries that supply to the system, administration that oversees and regulates it, citizens and commercial users that use it or utilise it as their market, as well as civil organisations, for example public transport promoting NGOs, can be regarded as stakeholders - and thus parts - of the system.

The findings of this paper, i.e. the policy analysis in the PESTEL framework, identify areas covered by the policies and strategies, but also areas not covered and which would require measures and actions - or at least recognition. The reasons and explanations hindering or boosting digitalisation are outside the scope, but would be a natural continuation of this analysis. The impacts of digitalisation are robustly assessed in the PESTEL framework and are based on mainly a subjective synthesis of the author, summarising the results of the work carried out for the Ministry of Transport and Communication Finland by VTT Technical Research Centre of Finland Ltd [15]. VTT's assessment revealed that particular industry characteristics and actions taken by the administration were specific to Finland indicating that the country had, and should have, its own approach. Whilst the generic nature of digitalisation is intuitively appealing, some degree of tailoring in responses is probably always necessary due to the technological advancement level of a country and its industrial structure. With this in mind, the intergovernmental strategies proposed by the European Union, OECD and World Economic Forum are briefly discussed and evaluated. If international organisations' strategies seem to be targeting the identified challenges in Finland, these strategies can to some extent be seen to be confirmed by at least one observed country case. If international or global strategies and observations are not in conformance with the Finnish case, either the global strategies' applicability can be questioned or the Finnish strategies could be off targets.

However, the abovementioned conclusions must be regarded as unconfirmed observations, since the 'right' strategy and responses can be missed by both at national and international levels. The primary contribution of this analysis is the assessment of the coverage of Finland's actions, strategies, and policies when facing the digitalisation challenges within the scope of the transport system.

The theoretical foundation of this paper is mostly laid on systems theory [16]. Systems theory has a multidisciplinary foundation: systems can be technological, social, ecological, economic, etc.