



ADVANCING
PUBLIC
TRANSPORT

REPORT

DIGITALISATION IN PUBLIC TRANSPORT

A REVOLUTIONARY IMPACT

Digital technologies have the potential to deliver a revolutionary impact on the public transport sector. This paper explores the meaning of “digitalisation” with the aim to allow UITP members to better understand what it is in the context of public transport, what opportunities it provides as well as the challenges it brings. It is not a position paper, rather it seeks to highlight the key issues to be considered.

It also seeks to provide a framework for UITP’s work on digitalisation, identifying the areas where UITP could and should develop activities. The document is accompanied by annexes detailing the on-going activities and published work which will be continually updated.



▶ Augmented reality for an enhanced customer experience

KEY ISSUES: OPPORTUNITIES AND CHALLENGES

- Changing governance, organisation & relationships
- Exponential growth of data
- Improved operational efficiency and maintenance
- Relationship with the customer
- Emerging players and New mobility services and platforms
- Autonomous and connected vehicles
- Cyber security, cyber safety and privacy
- Impact of digitalisation on human resources
- New streams of revenue



► Transport management systems and real-time journey planners are having an impact on public transport

WHAT IS DIGITALISATION?

Digitalisation is a major trend in business and everyday life. It refers to the adoption or increase in use of digital or computer technology by an organisation, industry, country and so on. In other words, it is the use of digital technologies to improve processes, lower costs and gain productivity (e.g. operation and maintenance) and to establish new business models providing new revenue, and value-producing opportunities; it is the process of moving to a digital business¹. It is the integration of digital technologies into everyday life by the digitisation of everything that can be digitised².

Society is evolving and customers are beginning to demand more services to suit modern lifestyles. The most important single aspects are the uptake of smartphones by the population and the availability of the mobile web making new services and the collection of personalised and geocoded data possible.

Digitalisation is already happening in urban and public transport. Its impact currently varies between regions, some public transport stakeholders consider it a major trend which is entirely redefining their business.

As they rethink segments of their business to take advantage of these opportunities, a number of operators and authorities are drawing up and implementing digital strategies across their whole organisation. Others, however, are struggling to keep pace.

Digitalisation brings a host of opportunities for the public transport sector, including opportunities to increase efficiency and improve quality, lower costs, open up new revenue streams, improve the customer experience and loyalty, and explore new services, with new concepts like 'mobility as a service' (MaaS) and new emerging technologies like driverless cars.

However, it also brings a number of significant challenges which must be faced. As digitalisation creeps into every aspect of the public transport business, clarifying where and how digitalisation is affecting the sector is a complex exercise. UITP has identified some key issues, and the different opportunities and challenges involved will be explored through these angles.

1. Oxford English Dictionary
2. Business dictionary

CHANGING GOVERNANCE, ORGANISATION AND RELATIONSHIPS

The fast pace of digitalisation in society at large and in other sectors means that the traditional public transport sector could be, with a few exceptions, left trailing, unprepared for the evolving expectations of customers and the competition offered by new players.

The most advanced operators and authorities are those which are implementing a strategy addressing digitalisation.

At the heart of this strategy is understanding the evolving shape of transportation globally and therefore clearly defining the current and future roles of operators and authorities. Such strategies cover issues such as a **re-design of the business models**, constant improvements with the help of score-cards and the corporate organisation to be fit for the digital age, setting up relevant departments and think tanks, fostering innovation by facilitating test-beds and incubators, moving towards integration with the smart city concept, embracing an open-data policy and ensuring open non-proprietary systems, facing the responsibility for cyber security.

The idea is to be organised to be able to adapt to digitalisation and make the most of opportunities. But bringing about such changes is not easy for traditional companies with long-standing structures and processes. The nature of the sector and its infrastructure makes fast digitalisation challenging. Furthermore, such changes



▶ *Ticket and payment innovations are central to the opportunities made available by digitalisation*

require new staff profiles or new skills requiring training. All of this comes at a significant cost. Making the transition to the new digital era comes with substantial change in capital structure and how money is spent. The investments are balanced by improvements and efficiencies but how quickly can these be attained? What percentage are you ready to spend on digital innovation, system maintenance, attracting qualified personnel and so on? How much are you ready to spend on traditional distribution of products?

The three most important factors or characteristics of an organisation ready for digitalisation are:

- Customer perspective preferred to internal or system view;
- An open staff attitude towards innovations and changes;
- Speed and agility, e.g. the ability to deliver much faster than in usual projects.

A SEQUENTIAL STEP-BY-STEP ORGANISATIONAL MODEL

- IT & digital expertise have to be set up in-house as a necessary first step (a knowledge management system encouraging the internal transfer of knowledge is good practice in this respect);
- Partnerships and alliances with industrial and third parties are encouraged to initiate certain digital projects quickly and inexpensively;
- A separate digital unit in the organisation (maybe also a virtual team) can bring rapid progress, slightly outside the heavy company structure;
- Finally, digitalisation has to become part of the whole organisation and be integrated in all departments/units. This will take some time and require many efforts and much change management and should therefore be set as a mid-term goal.

EXPONENTIAL GROWTH OF DATA

Increasing digitalisation of public transport has led to the exponential growth of the volume of data and information, shared, from multiple sources and consumed by a diverse range of actors. More and more data can be a blessing and a curse. Looking at the positives, it can be used by third parties to develop additional services, such as travel planner apps. It can be used internally to increase efficiency and lower costs by, for example, failure prediction for asset maintenance, or demand analysis for network and line planning. It is also thanks to data exchange and connectivity that public transport is at the heart of the Smart City concept, integrated with networks such as energy and others.

Public transport can also benefit from data from other sectors, for example weather prediction data. When data from customers and mobility providers is combined with sensors and cameras located around the city alongside geographical information systems, it can provide a total view of mobility, enabling traffic to be managed almost automatically and to predict where a traffic jam will occur before it has happened, thus enabling decision support system to offer corrective measures. This also paves the way for the true multimodal integration of the management of the movement of people and goods in the urban environment. As a result, the management of the city and its transport system can be more efficient and offer additional opportunities such as combined or integrated services.

Public transport could and should be a key component of the Smart City concept thanks to digitalisation (see UITP position on Smart Cities, 2014³). The Smart City concept is still evolving, but common standards and definitions are beginning to emerge. For example, a standard on smart city indicators, which includes transport, is currently under development (ISO 37120).

But, there are a number of issues. The sector is under increasing pressure to make its data publicly available. Many already do. UITP is in favour of open data (see Action Points entitled the Benefits of Open Data⁴) as it tends to increase travel information products for customers which therefore makes public transport more attractive and accessible, delivering net benefits.

Several UITP members are actively working to encourage and facilitate innovation using data by, for example, creating multi-source



▶ Thanks to data exchange and connectivity, public transport is at the heart of the Smart City concept.

data platforms to aggregate, cleanse and repackage data, making it more accessible, thus stimulating innovation. For example, Catalogue (www.catalogue.global).

Managing data, however, whether for your own use or by making it public, takes effort, can be technically difficult not to mention the complex policy debates regarding organisations with current information monopolies.

Few public transport companies exploit their own data to its full potential. Furthermore, there are important issues of availability, integrity, confidentiality and privacy which need to be carefully addressed (see section on cyber security and privacy). Data generation and processing also have very tangible costs, a burden which increases as end-users multiply.

OTHER INNOVATION INITIATIVES RELATED TO DATA HAVE ALLOWED SOME UITP MEMBERS TO DRAW SOME LESSONS SUCH AS:

- Early-stage funding is difficult and has to come quickly and without business plan;
- Early-trial failures are normal and part of the necessary trial-and-error approach to innovation;
- Organisations have to have a certain budget for innovations and trials.

3. [http://www.mobi-uitp.org/PermaLinkRecord.htm?archive=155125797330&file=Official Position](http://www.mobi-uitp.org/PermaLinkRecord.htm?archive=155125797330&file=Official%20Position)

4. <http://www.uitp.org/benefits-open-data-0>

IMPROVED OPERATIONAL EFFICIENCY AND MAINTENANCE

Public transport daily operations involves endless amounts of routines and processes in the background, many of which can be improved using modern technology, ultimately improving service quality, reliability and efficiency. Indeed, in this area digitalisation is not a new phenomenon with the automatisation of a variety of tasks taking place since the 1970s. In particular, the availability of an increasing amount of data makes monitoring of infrastructure, equipment and rolling stock more accurate and more automatic. Maintenance orders can then be generated automatically at the right time, relieving human intervention and avoiding unnecessary interventions or mistakes. Digitalisation allows to move from interval- and time-based preventive maintenance to condition- and status-based predictive maintenance, allowing to intervene “just before the failure occurs”, not too late, but also not too early. The digitalisation of maintenance introduces measurability and combined with the concept of constant improvements can lead to a higher availability and reliability of rolling stock and infrastructure, and therefore to better cost-efficiency. Indeed, thanks to predictive maintenance, vehicles are immobilised for shorter periods of time and this will optimise the fleet size. In the end, the life-cycle cost is reduced. **Efficiencies through digitalisation also contribute to the decarbonisation of public transport.** The smart use of resources through an efficient management of the energy onboard vehicles and in the whole system can significantly reduce emissions. Operational efficiency gains through eco-driving, energy savings in installations such as escalators, lifts, building heating and lighting and so on, all contribute.



▶ Yards and shops like this one in Sao Paolo will see their processes evolve from interval-based to condition-based maintenance

Public Transport IT systems today are generally proprietary and generally not open to third party suppliers. This includes vehicle systems with the information from the vehicle manufacturers and back office systems. Digitalisation enables an open and interoperable IT platform which would improve many of the existing operation processes and facilitate many of the optimisation ideas above, such as lower operating and capital cost, better upgradeability,

guaranteed interoperability and open competition in a setting encouraging innovation. These tangible benefits directly answer the challenges faced by public transport and can be obtained through an accelerated deployment of a modular plug-and-play architecture for on-board systems, based on the EN13149, SIRI, NeTEx standards⁵ and the supporting work led by the ITxPT Association⁶ for deploying this cost-effective interoperability of systems.

MORE EXAMPLES OF OPERATIONAL OPTIMISATION

- ▶ Demand forecasting and better identification of mobility needs for effective network and line design planning and/or service rescheduling
- ▶ Ticket control, validation & e-fines
- ▶ Digital signalling and control systems enabling increased capacity from existing and new infrastructure, whilst lowering operating costs through centralised control and automatic train operation
- ▶ Industry 4.0 data automation and data exchange principles being applied within the transport industry including Internet of industrial things, virtualised control and cloud computing
- ▶ Big data analytics/cloud enabling improved real-time decision support systems with useful intelligence been extracted from data (requiring 5G)
- ▶ Staff dispatching based on real-time information
- ▶ Customer reporting and feedback apps
- ▶ Video analytics
- ▶ Incident management software
- ▶ Vehicle and back office IT platforms
- ▶ Ticketing interoperability
- ▶ Combined and real-time information services

Many of these innovations require significant investment in data analysis, and staff with the relevant skills.

5. CEN TC278 WG3 standardisation body specifies:

- the EN13149 standard parts 7/8/9 which defines onboard communication protocols
- SIRI and NeTEx which define a standardised way of exchanging scheduled data and real time information at backoffice level

6. The importance of accompanying the stakeholders in the standard's implementation led to the creation of the Information Technology for Public Transport Association (ITxPT) www.itxpt.org

RELATIONSHIP WITH THE CUSTOMER

Digitalisation is changing the relationship with the customer and is driving us to rethink the customer relationship in many cases. Today, public transport not only connects places, but directly connects to its customers via mobile devices and in real time basis. The exploitation of data can allow operators and authorities to provide more efficient services responding to the individual needs of customers, for example optimising route-planning or offering personalised real-time information services. This can be further enhanced through the development of relationships with local businesses, for example offering a half price coffee to travel off-peak.



▶ Mobile ticketing in Milan



▶ Digitalisation is changing the relationship with the customer

Electronic ticketing is the most visible features of the digitalisation of the customer journey. Although electronic ticketing has existed in many places for many years, there is still room for advancement, for example interoperable e-tickets, or the acceptance of bank card payments without dedicated tickets. Thanks to digitalisation, there are many alternatives available today on top of traditional

smart card based technology which began 20 years ago. Open payment, account based, mobile ticketing, GPS Position Service, Be-In-Be-Out through Bluetooth are only a few examples of options that transport operators can choose from to suit their local context.

Travel data is another game-changer from the point of view of the customer. Apps with real-time travel planners are common place and well used among customers, but the potential is not limited to timetables and real-time traffic information. The goal is to provide sufficient choices for customers to allow them to optimise their journey choice based on a combination of preferences for cost, time, comfort or convenience. Other information which could be integrated for the benefit of the customer include:

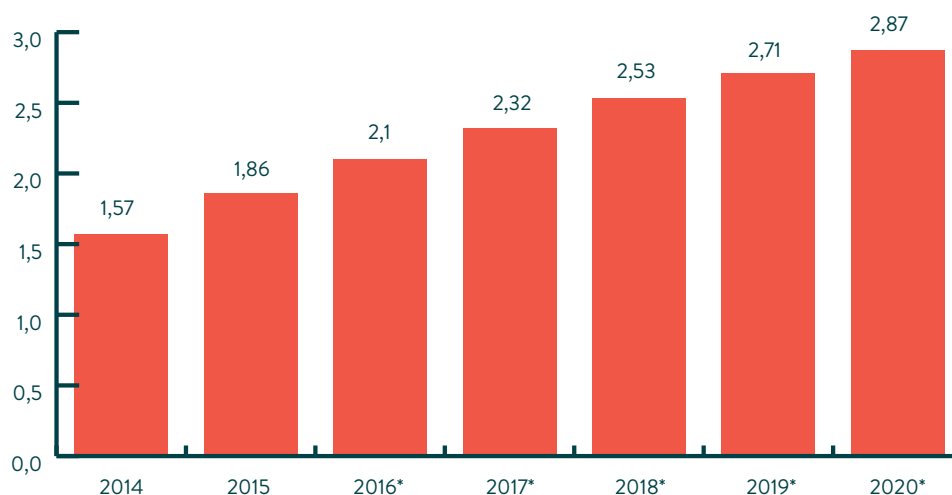
- Multi-modal ticket and travel information
- Collaboration schemes with public transport related companies
- Best ticket-price information
- State of crowdedness of individual vehicles/carriages
- Accessibility e.g. step-free
- Real-time information on service-disruption and alternatives
- Passenger reporting of damage, broken equipment, uncleanliness



▶ We are on our way to 3 billion smartphones globally

All of the above is possible thanks to the rise of the **smartphone** and **data ubiquity**. We are on our way to 3 billion smartphones globally⁷, impacting all types of commerce and customer-supplier engagement. The overall connected device growth is even greater, accompanied by a data explosion

NUMBER OF SMARTPHONE USERS WORLDWIDE FROM 2014 TO 2020 (in billions)



▶ Source: eMarketer⁸

7. <https://www.statista.com/statistics/330695/number-of-smartphone-users-worldwide/>

8. <https://www.statista.com/statistics/330695/number-of-smartphone-users-worldwide/>

EMERGING PLAYERS AND NEW MOBILITY PLATFORMS AND SERVICES

Whilst it is true that it is the trend towards constant connectivity which is driving or at least facilitating new services and new players in the mobility market, and although the picture is changing rapidly, not all customers are constantly connected. According to a 2016 study by Keolis⁹ which surveyed in depth almost 3,000 French citizens on their digital habits, citizens can be organised into three categories: “digi mobiles”, “connected” or “offline”. Only 31% of those surveyed are “digi mobiles”, i.e. constantly connected. 39% are “connected”, i.e. surf the internet primarily using desk-top computers. 30% are offline. This digital divide risks isolating those offline if mobility providers focus solely on the “digi mobiles”, hampering social inclusion.

However, it is clear that more and more customers will become “digi mobiles” and demand better digital experiences every day, meaning that we will have to be able to build and improve our digital products much faster. Their expectations are set by using other services, to which they compare their transport experience. Part of offering “better” digital experiences is being able to offer **personalised customer experiences**, where customers see what they need to see, when and where they need it. This can drive new experiences or enhance existing experiences, for example improving self-service for smartcards. Public transport needs fast customer focused development and internal/external data which can be accessed easily through APIs (Application Programming Interfaces) to avoid messy integrations with legacy systems. Data needs to be updated in real-time or close to real-time. So speed in both development and data delivery are key.

In many places, a large share of the population does not use public transport at this time. For example, 75% of the “digi mobiles” surveyed by Keolis do not. By providing integrated solutions with digital tools, more people will hopefully be attracted to use public transport. Integration of parking management could be of key success factor.

Whether or not customers are connected, thanks to digitalisation **customer segmentation** can be optimised thanks to movement tracking data, leading to the better understanding of customers and their mobility behaviours allowing improved service planning. It can also facilitate co-creation of transport services, for example engaging with other stakeholders, developers and passenger groups to develop services more suiting specific needs.

Technology is a key enabler for the appearance of new mobility services and platforms, for instance free-floating car-sharing, ride-sourcing and ride-sharing apps, which rely on and produce large amounts of data to develop their businesses. Similarly, technology has enabled the appearance of integrated mobility platforms, such as **Mobility as a Service (MaaS)**, which can provide a single entry point to a full range of urban mobility services, including public transport.

The emergence of these new services and concepts, together with the development of the autonomous vehicle, could be a potential game changer of the traditional public transport sector. There are many question marks surrounding them, for instance who will be the digital integrator of all urban mobility services, are these new mobility services beneficial in terms of reducing congestion, pollution and car ownership, are they complementary to public transport or what will be the impact of the autonomous vehicle on modern urban mobility. The services are popular and providing competition in the mobility market. In this environment, public transport’s position remains that high-capacity public transport in densely utilised urban areas will remain the backbone of mobility in order for cities to remain liveable and sustainable. This means that public transport needs to position itself accordingly, coordinate and interact with new players and services. Particularly on the eve of the era of the autonomous vehicle, public transport should lead the transition. It is an opportunity to gain new customers by pro-



► Technology is a key enabler for the appearance of new mobility services and platforms

9. <http://www.keolis.com/fr/medias/communiqués-presse/liimpact-digital-dans-mobilite-avec-lenquete-nationale-keolis-netexplo>

viding a complete mobility solution as flexible and convenient as the private car. Public transport should provide a mobility service from A to B to customers, ensuring that complementary services like car/ride sharing, taxi, parking, walking, cycling, bike-sharing, demand-responsive transport and so on are included in the offer. A modern mobility provider, focused on coupling the best digital experiences with the best of transport experiences is in a very strong position to lead this shift.

For many new and/or improved services, regulations will need to change. For example, current EU law states that a bus route must have a set timetable and stops, which is a barrier to implementing mobility on demand services.

AUTONOMOUS AND CONNECTED VEHICLES

The emergence of autonomous and connected vehicles could be a game-changer for the public transport sector. The appeal of the electric autonomous vehicle is clear: they can move in a coordinate fashion, creating less congestion, fewer accidents and less pollution. For users they increase individual comfort but if they are introduced as comfortable private cars, there is a risk it could increase the number of private vehicles on the roads, adding to congestion and urban sprawl. This would be disastrous for urban mobility and sustainability. However, if used for collective transport, i.e. supporting public transport as the backbone of urban mobility by helping to provide first and last mile solutions, economically viable on-demand public transport services during extended operating time frame at low cost, offer more mobility options to all (elderly people, disadvantaged communities, less populated areas), door-2-door, neighbourhood- and feeder services, evening and night services, and encouraging behavioural change in favour of shared mobility in general, thus decreasing private car ownership, they could help lead to greener, more liveable sustainable urban areas. Indeed, some studies, such as ITF's study on the impact of self-driving cars, suggest that 9 out of 10 conventional cars could become redundant under certain circumstances¹⁰. It sounds so simple, but questions arise on the ability of the public transport sector to embrace the opportunities offered by autonomous vehicles and how autonomous vehicles will be regulated. Who will provide fleets of shared electric autonomous vehicles employed as "robo-taxis" or mini-buses? How to ensure fair market pricing? How will it transform the business model of public transport? What about the transition period which would see traditionally driven vehicles sharing the road with autonomous vehicles? These are important questions of policy that need to be addressed in a timely manner before they are overtaken by the adoption of autonomous vehicles.

The technology developed for autonomous vehicles could also offer opportunities for public transport. Development in sensors, machine learning, on-board computing and connectivity for the automotive industry could bring opportunities to develop more autonomous trains and buses, further improving efficiency and lowering operational and life-cycle costs. (For effects on human resources and cyber-safety see below.) In fact, public transport is the natural field for the implementation of autonomous vehicles since it has already, in many cases, segregated infrastructure and monitoring and control tools and resources. Nevertheless, before autonomous vehicles, the era of connected vehicles is even closer, where data exchange, collaboration and cooperative riding can have an impact in urban mobility, enhancing travel times, infrastructure efficiency and the user/driver experience.



▶ CarPostal autonomous vehicle in Sion, Switzerland

CYBER SECURITY, CYBER SAFETY AND PRIVACY

The more digitalised and connected public transport, or any business, becomes, the more cyber security becomes relevant.

Securing passenger, operations and business data to ensure privacy, avoiding malicious attacks such as extortion and operational sabotage are among the issues. It is also important to establish trust with customers that their data is secure, and that they are safe and secure as they travel.

10. http://www.itf-oecd.org/sites/default/files/docs/15cpb_self-drivingcars.pdf

Cyber security is to a large extent a management issue, necessitating strong awareness and leadership from top management level, in order for the security to be ensured at the technical level.

In order to provide high quality services, it is important to understand your clients. Public entities are often afraid to use personal information where private entities are not always willing to share the information about their clients. Providers of mobility services should be able to know their clients and provide personalised and real time mobility information especially when disruptions occur.

On the European level, a new law has been introduced on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation¹¹).

An emerging issue is that of cyber safety: with the increase in demand for connectivity from businesses, the travelling public and especially ITS and connected road traffic (wi-fi, 4G, 5G, LTE etc) there is a growing appetite for bandwidth spectrum. Some safety critical core activities of public transport like state-of-the-art signalling (for example CBTC) need total protection from external interferences. UITP is working hard on regulation and standardisation areas to allow in the future a discriminatory access and availability of sufficient protected communication to allow safe operation on metros.

On street level, it will be crucial that tram and buses are included in the ITS deployment strategies for connected vehicles and communicating road. Private vehicles should not only be able to detect and recognise each other but also other road users such as bus and trams which have different dynamic behaviours from cars.



► Cyber security is becoming increasingly relevant

IMPACT OF DIGITALISATION ON HUMAN RESOURCES

Digitalisation is having and will have an impact on jobs and staff in the public transport industry.

The public transport sector will have to embrace digitalisation while ensuring that its employees will be trained and will find their place in the new environment.

The different issues can be summarised as follows:

- How will **technological changes** affect public transport companies, their service delivery processes and employment levels and job profiles? In particular, the impact of automation.
- What skills are needed to place the customer needs at the centre of the organisation? What kinds of **qualifications** are needed, and how will companies' demand for certain qualifications be matched with available **skills**? Can we afford the new staff profiles? Can we afford not to hire them? We need technical/digital competences in many more places in our companies than today. It doesn't matter if you are a manager, work with IT, sales, marketing, customer care... The expertise of an organisation must advance faster than the rate of change that the organisation desires. This means the talent must change. There

11. <http://www.eugdpr.org/>

are two ways to get there: **hiring and training**. New talent need a modern and inspirational work environment, as well as bonuses, work from home (digital workspace), culture etc.

- Will future technical developments create a **new understanding of what work is**, and what constitutes a typical working relationship/contract? How will they affect workplaces and safety issues, employee availability and stress levels, working time concepts, co-determination rights and actual practice?
- What will **flexible jobs** and **flexible work organisation** look like in the future? Is crowd-working/crowdsourcing the new norm and how will such work be developed in public transport companies, (anchored in the current social security system, and in labour legislation)? What is the organisational culture needed to make this system work?
- Can the social **security systems** and the related **labour legislation** cope with a new generation of workers and jobs? And if not, what needs to be done?

The reduction of front-line staff has already been seen due to the introduction of technologies such as automated metro and automatic ticket-telling machines. Changing staff deployment through technology can cut costs making public transport operators leaner and more efficient and move staff closer to customers to improve customer service, and make working conditions easier, in particular for the ageing workforce. Employers have to reskill and upskill their workforce. Digital skills are now becoming ever more important in a variety of professional categories. They require training in order for the workforce to develop the skillsets needed in a highly digitalised environment. Leadership and an entrepreneurial spirit are essential for driving the digital transformation forward.

The idea of autonomous vehicles eliminating the need for bus drivers, for example, would drastically reduce the work force of the average public transport operator, which typically employs hundreds if not thousands of such staff. This would completely change the business model of public transport, the biggest cost of which is typically staff costs, and would impact one of public transport's important advocacy arguments in its favour, that it is one of the biggest local employers in urban areas.

All of these changes imply rethinking the culture of management during and beyond the transition period. Public transport companies need to address the following questions:

- How to achieve a balanced and fair management of existing staff and newly recruited ones?
- How to make automation a company project and a lever of management towards better performance? How to involve staff, create the conditions for their empowerment and communicate?
- How to use automation to motivate all staff to provide excellence in service quality? Which HR policies (recruitment, training, rewards, career development etc).

- How to use automation's image of modernity to attract new competences and better address different groups of potential workers thus enhancing workplace diversity and inclusiveness?
- The power of automated lines to enhance the status of jobs in public transport, or to create value for the staff, or to value human capital.

These issues are very important, as such the Working Group set up by the Business & Human Resources Commission to address them is a significant step forward.



▶ Will autonomous vehicles eliminate the need for bus drivers?

NEW STREAMS OF REVENUE

Digitalisation offers opportunities to public transport organisations to increase and diversify their revenues. These opportunities include digital advertising, connectivity services and infrastructure, digital customer services and the combination of sales channels. They also include making the most out of the value of data, an avenue being explored by UITP's Transport and Economics Commission.

Digitalisation brings new players and new market rules with possible 'game changing' business models and innovations, such as:

- Platform economy (third party sales, ride-sharing, ride-selling ...) and its combination with mobility services (e.g. Uber, Inter-city Buses, Moovel with car to go, BlablaCar);
- Demand-oriented travel on an app basis, tracking of journeys;
- Data aggregators and "all in one suppliers" (e.g. Google, Amazon);
- Sales intermediates (e.g. consolidators like Amadeus, Trainline).
- Autonomous vehicles as cars, robo-taxis and automated public transport vehicles.

For such an emerging scenario, we can identify various features which play a key role in the development of a new playing field:

- Geo-localisation of people (demand) and vehicles (supply);
- Production of digital services with “no” marginal costs;
- Personalised advertising business model of Google, Facebook etc.;
- Customer demand for real-time information and travel alternatives in case of service problems.

For the public transport sector to address such changes in the mobility landscape, some initiative must be taken to avoid disruptions. The notion of disruptive models is considered as a high priority, with ever increasing need for mobility providers such as operators to reinvent its customer services through increased flexibility in its services. This will allow them to become a true mobility provider. Equally, the development and setting up of mobility platforms, has been identified as a key tool to own. Finally, there is a need to re-assure the public transport authority that there remains a control on the levers that influence the new emerging mobility markets.



► *Digitalisation offers opportunities to public transport organisations to increase and diversify their revenues*

CONCLUSIONS

Digitalisation is not an issue for the future. It is already happening and the public transport sector needs to embrace it, to take advantage of the numerous opportunities it offers as well as preparing itself for its role in the future mobility market. If not, many traditional public transport companies risk being left on the sidelines, their value chains cut or impacted by new stakeholders which are better responding to customer expectations. **Public transport must remain the backbone of mobility in urban areas in order for them to be sustainable.** Public transport operators and authorities should develop 'digitalisation strategies' to ensure this.

Digitalisation is firmly placing the customer at the centre of developments, and it is customer behaviour, together with technological advancement, which is the main driver of change, leading to the emergence of new mobility services. Personal mobile devices, such as the smartphone, are and will remain key in terms of ticketing, journey planning and inter-modality, and although customer connectivity is not yet ubiquitous it is just a question of time. Multi-modal platforms with app-based services for real-time travel planning are set to stay and the autonomous vehicle will have its place.



► Digitalisation is not an issue for the future. It is already happening

The public transport sector must foster digital innovation and be bold in trying out innovative solutions.

A spirit of trial and error is necessary, without fear of inevitable failures along the way. It cannot wait for others to take the lead. It must also anticipate new developments such as automated and connected vehicles, ride-sourcing apps, payment services and promote appropriate regulations. The public transport sector must challenge existing supplier monopolies, avoid vendor lock-in and open up for competition on open platforms in order to spur innovation.

Process improvements is a challenge and a consequence of implementing new technologies. The actors need to address these challenges by not focusing on the technology changes but rather on the process changes and continuous improvements. Organising data, services, infrastructure and devices under a common, open, integrated, interoperable and complex architecture still remains one of the main structural challenges.

Digitalisation must also be understood, under this new scenario, as collaboration, sharing and learning. For public transport, it is also an opportunity to reflect on its role and look beyond the sector to see where mobility fits into society and the 21st century urban environment.

The public transport sector faces a huge challenge in adapting to face these changes, and there is no time to lose. But if it succeeds in transforming itself to a supplier of the evolving expectations of customers, public transport will thrive, urban mobility will improve, with huge benefits to societies.

UPCOMING UITP WORK PRIORITIES:

- This framework paper aims at supporting members and the **UITP working bodies in identifying needs and opportunities for further projects on digitalisation.**
- **Action Points on impact of autonomous vehicles:** Following on from the Policy Brief on the same topic prepared by the Combined Mobility Platform, the aim of the Action Points is to highlight that the public transport sector itself needs to consider the potential impact of autonomous vehicles, and how to anticipate this.
- Following the work of the Latin America Division, UITP will **survey** its members to get a state of the art picture of the state of digitalisation in public transport.
- UITP should **foster digital innovation** in the sector by highlighting such projects by members, supporting their endeavours and providing a platform for exchange.
- UITP will collect and publish on **Mobi+ best practice examples** of members implementing digital strategies or otherwise embracing digitalisation.

This is an official **Report** of UITP, the International Association of Public Transport. UITP has over 1,400 member organisations in 96 countries throughout the world and represents the interests of key players in this sector. Its membership includes transport authorities, operators, both private and public, in all modes of collective passenger transport, and the industry. UITP addresses the economic, technical, organisation and management aspects of passenger transport, as well as the development of policy for mobility and public transport world-wide.

This report was prepared by by the Information Technology and Innovation Commission and the Information Technology and Services Industry Committee, with input from the Transport and Economics Commission.



A digital version is available on **Mobi+**