

Written evidence submitted by Icomera AB

Executive Summary

- Digital connectivity is a key component of both the customer experience and the operational efficiency of trains today and in the future, and will increasingly be so in the future – with constant high bandwidth coverage being a key expectation;
- The long-term impact of the Covid-19 pandemic, and responses to managing it, will have a direct impact on the form and function of public transport provision, including train interiors and the way in which digital connectivity is utilised;
- Fast and reliable wifi connectivity for business, work and education purposes has already become a key passenger expectation, and will continue to be a vital element in the choice to use rail transport. In the short-term, digital communication technology has a crucial role to play in providing access to information which underpins the reassurance rail customers need to have confidence in returning;
- Digital technology can play a vital role in helping to usher in a new railway age - but failure to grasp this opportunity will leave a vacuum to be filled by the next generation of personal transport such as ride-hailing services and autonomous vehicles;
- In the future, information will need to be shared cross-modally to enable door-to-door personal journeys, and safe and efficient modal transfer. Rail operators may be encouraged to expand their reach by offering end to end journeys by means of ownership of, or partnership with, 'last mile' operations facilitated by wireless connectivity;
- Connectivity enables front line staff to have a more positive engagement with customers, digitally empowering them to provide individualised assistance and safe passenger management;
- Connectivity can lead to the retention of all the flexibility of the walk-up railway whilst still providing the pricing advantages of yield management through offering dynamic seat availability information;
- Customers in the future simply will not accept rationing of internet speed so the provision of constant high bandwidth coverage via 5G and other next generation technologies will be an expectation in choosing to travel by train; and
- As the new framework for rail service provision is developed, it will be important to embed digital rail strategy objectives and deployment of innovations within the service specifications, with a particular focus on fast and reliable wireless connectivity, on-train IT management systems, and intelligent data-sharing processes.

1. Introduction: an unfinished revolution

- 1.1 Icomera AB welcomes the inquiry into future train design by the UK House of Commons Transport Committee, and the particular focus on the attractiveness to customers of the vehicle interior. We see digital connectivity as a key component of both the customer experience and the operational efficiency of trains both today and in the future.
- 1.2 This submission is an update to our initial written evidence of 29 July 2019, amended to take into account the short, medium and potential long-term impacts on operator and passenger needs accruing from the Covid-19 pandemic.
- 1.3 Icomera AB was founded in Sweden in 1999 with the objective of bringing the revolution in digital technology to public transport. Since our first UK deployment with GNER in 2004, we have grown to become the market leader in wireless connectivity across public transport in Great Britain. We opened our UK Headquarters at Chatham in 2015, and its subsequent rapid expansion makes tangible our role as a foreign direct investor bringing technology transfer, expertise and skills into one of our most important markets. We have a growing relationship with the University of Medway and held our first qualification ceremony for apprentices during 2019.
- 1.4 In 2017 Icomera was acquired by French international energy and services business Engie, and in July 2019 we acquired Derby-based design and engineering consultancy dg8 to strengthen our capabilities in the delivery of truly interconnected onboard systems and services for the public transport of the future. In September 2020 we acquired London-based GoMedia – the world’s leading provider of onboard infotainment for public transport.
- 1.5 Icomera’s success stems from the fact that we design and engineer our own systems, build our own hardware, write our own software and only work with industry-leading partners. This approach ensures we deliver reliable, consistent solutions that provide outstanding connectivity performance in high speed mobility environments.
- 1.6 Icomera is ready to complete the unfinished revolution in wireless connectivity for rail in Great Britain. In 2004, passenger wifi was regarded as an interesting and possibly slightly quirky innovation by just one rather unique train operating company. Since that time, it has become an absolute requirement from hundreds of thousands of customers every day, vital to the connected worlds of business, work, commerce and leisure functioning through a multiplicity of smart mobile devices.
- 1.7 Our current initiatives include testing Gigabit wireless trackside technology at Network Rail’s 5G testbed at RIDC Meton and working with Northern Rail where our technology underpins the deployment of the first fully Digital Trains in the UK, with all systems onboard being able to transmit operational data in real-time.

1.8 The Committee has highlighted the importance of the vehicle interior to the attractiveness of the trains of the future to customers, especially the young. In this updated submission, we take account of the how the Covid-19 pandemic has changed, and may continue to shape, the operation environment for public transport, the needs and expectations of rail customers and operators, and the potential role of digital technology in shaping the trains fit for the post-pandemic future. We trust that this response, covering in detail the importance of connectivity whilst on board the train, will be of interest.

2 The evolution of rail customer expectations

2.1 There has been a light-hearted public debate in Britain over several decades as to whether rail users are “passengers” or “customers”. Yet it is undoubtedly true that the degree of discretion open to today’s travellers means that they make retail choices in increasingly similar ways to consumers of other services and products.

2.2 Access to the internet and social media also means that consumers of travel can evaluate and report on the quality of rail services frankly, publicly and in real-time in the same way as for any other retail service. This means that positive interaction with the customer at every point of the rail journey is increasingly important, and the quality of the wifi that is the very enabler of connectivity can be as significant as seat availability, punctuality or other elements of the journey experience.

2.3 Rail needs to be attracting ‘Generation Z’ – the digital natives born into a connected world since the mid-1990s - who are universally focused on the future. Generation Z should be natural customers for the railways. They are less likely to drive cars and more inclined to use a whole range of services for which personal ownership of hardware is not required. They are also acutely aware of issues around the climate emergency and reducing their own impact on the environment.

2.4 Yet they are also the most discerning group of consumers ever to have to cater for, brought up in a world of increasingly almost instant delivery of their requirements and with very high expectations of quality. Rail will have to meet these expectations consistently to retain their patronage.

2.5 Recognising the existence of an aging population overall, however, it is also essential that questions of connectivity are not wholly directed towards the needs of younger rail users. Increasingly all travellers are digital travellers, and the more mature rail customer using the train for business may well have been drawn away from the car or the aircraft by the connectivity offered onboard.

2.6 There is also increasing usage by older leisure passengers who are increasingly digitally capable and very interested in the total passenger experience including augmenting their journey with digital information en route and planning the attractions to be visited at the destination. Connectivity can be about more fully enjoying the broader range of travel experiences and activities, and not simply focused on those using digital devices.

2.7 Connectivity is already important in guaranteeing personal security by providing real time and historic monitoring of incidents on board trains and enhanced communications for onboard staff. This provides particular reassurance to travellers who feel more vulnerable to antisocial behaviour and crime.

- 2.8 Certainly in the short-term future, rail service provision and customer travel choices will be intrinsically linked to the broader impacts and decision-making regarding public safety, economic recovery, working culture and practice, business sustainability, and individual travel choices based on confidence as well as need. In the longer-term, these issues will also be a factor in shaping the form and function of our future trains. This will include the way in which technological innovation is utilised as a mitigating, measuring, facilitating and transformational tool.
- 2.9 Looking ahead to post-Covid rail usage, the RIA already anticipates a number of key changes – with people travelling more flexibly leading to flatter peaks, different train formations, and revised ticketing. Such changes will impact on service provision, but also on the way in which digital technology is used as an integral part of train and service management and planning.
- 2.10. Despite the broader range of unknowns, it is a certainty that aspects of the fourth industrial revolution – including nano-technology, cloud based computing, M2M (machine to machine) communication, always-on connectivity, quick reliable, intelligent information distribution – will play a significant role in the shaping the trains of the future, their management, and customer choices and experience.

3. Return to Rail - Public Health and Confidence

- 3.1 The most immediate challenge for public sector transport is in providing reassurance to customers with regards to any health concerns they have in resuming public transport use. This is crucial to enabling rail operators to achieve economically viable capacity. The immediate recovery of the sector will be based, in large part, on confidence.
- 3.2 The role of digital technology in facilitating this confidence is a current priority focus for Icomera and our customers.
- 3.3 This includes a focus on the utility of digital communication technology to provide up-to-date and live safety information messages so that transport customers can have access to a wide range of critical information. Covid-19 health briefings, reminders and updates on safe behaviours, the latest news and advice, and alerts about local and regional lockdowns and other information about their destination can be relayed to passengers via direct channel to their devices.
- 3.4 Via our Personal Passenger Information Service, passengers can also receive live information about their journey and onward connections. It also provides the potential for service feedback channels which can collect passenger feedback or comment in real time, enabling the operation centre to monitor and respond to passenger concerns and opinions.
- 3.5 Before people arrive at a train station our Pre-Boarding messaging service can advise them on when and where to board their scheduled train. This can help station and train operators to manage passenger flow safely and to minimise dwell time.
- 3.6 Further, by connecting on-board CCTV to the secure onboard network it is possible to manage and monitor CCTV in real time, providing live monitoring of passenger loading, disposition (managing social distancing), the wearing of face masks and observance of other required safe behaviours.

- 3.7 In addition, we are working with transport operators on the potential to capture and utilise passenger metrics, to provide real-time information regarding the number of passengers on any given service, and mapping passenger flows. Over time, this information can be aggregated and utilised by operators to optimise timetables and fleet allocations.
- 3.8 Such information has significant utility in maintaining public safety, and can also be utilised to complement track and trace systems.
- 3.9 Fast and reliable mobile and wifi connectivity is crucial for the optimal function of these initiatives, and the systems and technologies on which they are based can be re-focused to meet the future needs and challenges of the post-covid future as they evolve.
- 3.10 From an accessibility perspective free wifi services also enable passengers from any socio-economic background to access these key information services. Digital technology is also being used to make it easier for those with sight impairments to navigate rail services safely and as independently as possible.

4. Rail within the future of Mobility as a Service

- 4.1 Digital technology correctly applied to passenger trains could help to usher in a new railway age. Rail in particular and mass transit more generally should be the enablers of successful twenty-first century towns and cities and an economy where personal ownership of the means of transport is largely regarded as unnecessary and undesirable.
- 4.2 Failure to recognise and grasp this opportunity will leave a vacuum to be filled by the next generation of personal transport such as ride-hailing services and autonomous vehicles. Whilst these technologies will have a role in the spectrum of transport options, they should not become the primary or default options for travel if we are to enjoy a sustainable and low-carbon future.
- 4.3 Even if personal transport becomes primarily electrically-powered at the point of use, the generation of electricity for this mode will be less efficient and sustainable than the predominant use of mass transit. Personal transport also requires a complete new national infrastructure for charging which does not currently exist, as well as other on-street technology to protect pedestrians and cyclists.
- 4.4 At the end of the day, a car is still a car even if electrically powered and autonomously driven, so over-dependence on this mode will continue to encourage unsustainable levels of road congestion as well as particulate emission from brakes, tyres and other sources of friction. The last motoring age occurred in part because the car supported the personal journey more effectively than public transport. We should not allow a new motoring age to come about through repetition of this phenomenon.

- 4.5 Although the personal journey is an end-to-end trip from door-to-door which can rarely be completed by train alone, the mobility connection for the first and last few miles should ideally be undertaken by an active mode such as walking or cycling or by a sustainable mode such as bus or tram. The opportunity for rail is to be seen by consumers as the backbone of public transport supporting the personal journey of the twenty-first century.
- 4.6 In this way, the train can compete effectively against the apparent seamless convenience of private hire purchased via a ride-hailing app by offering a different kind of joined up mobility experience managed via smart mobile devices. This vision will require unprecedented connectivity with the real-time flow of information in order to be able to respond rapidly and intuitively to unforeseen events and seamlessly guide the digital traveller through the modal changes of the journey.
- 4.7 In the context of a climate emergency and air quality crisis in many cities, Icomera believes that such information should be shamelessly modally biased through Mobility as a Service (MAAS) and other applications so as to encourage the use of active and sustainable travel modes. Yet modal bias for environmental reasons must not lead to consumers feeling they are being directed towards inferior or dated products.
- 4.8 Urbanisation and the advantages of living in cities – which are likely to be attractive to Generation Z - should make absolute sense for mass transit. Yet the evidence of ridership patterns in cities such as London well served by efficient public transport suggests that private hire supported by ride hailing apps is the mode of travel seeing the fastest growth even in advance of the full deployment of MAAS.
- 4.9 There are already perceptions (often misplaced) that private hire purchased via apps are more digitally accessible and represent modern door-to-door convenience, faster journeys and better value for money. For some there is also a consideration of personal security which is perceived as greater in a private hire vehicle than in the more open environment of a train, tram or bus – especially at night. Seamless connectivity with the delivery of accurate information on routes, services, real journey times and prices can boost the attractiveness of rail in this highly competitive market.
- 4.10 From the Government's perspective, future rail franchisees may be encouraged to expand their reach by offering end to end journeys by means of ownership of, or partnership with, 'last mile' operations. This would be a way of enhancing the value of franchises and preventing the reverse process whereby ride-hailing app providers seek to offer the core rail journey as part of their product.
- 4.11 Many early railway companies aspired to own the end to end journey – both for passengers and small freight items. History could come full circle as the smart use of space – especially off-peak – could enable the return of parcels traffic with secure despatch and collection at stations.

5. Future traincrew skills

- 5.1 Connectivity not just for customers but also for visible, empowered front line staff is becoming critically important. It enables staff to have a more positive engagement with customers, effectively digitally empowering them. This is essential if staff are to be in the position of knowing more than the customers sooner than the customers. During the 2018 timetabling crisis the opposite was often the case as disgruntled customers shared information speedily over social media.
- 5.2 Well-informed and empowered staff will continue to be very important for non-digital passengers and those with impairments or disabilities that make them more reliant on station and train personnel.
- 5.3 Icomera has innovated in the area of workforce skills by offering to our own customers the facility to train their frontline staff in assisting rail users to connect with wireless services and to rectify problems with on-train equipment. We see this digital empowerment as a potentially fruitful area for increasing their job satisfaction and productivity.
- 5.4 Icomera and GoMedia have also been developing digital applications with a focus on improving passenger assistance – both on train and in stations – through the use of information overlay or augmented reality technology.
- 5.5 This application can, for example, enable a member of staff to identify a particular customer who requires assistance (by overlaying an arrow on to a live image of a coach, concourse or platform), or – for the passenger – provide a route and/or information overlaid on a live image or a schematic to provide directions to onward connections, exits, shops and service points.
- 5.6 In addition, wireless connectivity is already bringing enormous benefits in the efficient management of train fleets and assisting depot staff with maintenance tasks, enabling predictive interventions to be made to anticipate technical failures.

6 Future train connectivity scenarios

- 6.1 Icomera sees digital connectivity as a vital component in realising a positive future for the passenger train. Connectivity, as described above, can help to make rail the backbone of a sustainable, low carbon public transport network providing ease of access to reliable, affordable services.
- 6.2 Wireless connectivity on trains already does much more than deliver wifi to customers via their own personal devices. It is also providing the same enhanced on-train information to customers via screens and so helps those without their own smart devices – a group that will always continue to exist. We call this ‘omnichannel passenger information’.
- 6.3 We believe connectivity can lead to the retention of all the flexibility of the walk-up railway whilst still providing the pricing advantages of yield management through offering dynamic seat availability information. Incentives to travel outside the peaks can also be made even more sophisticated in this way. Real time connectivity with the train and the seat occupant would enable no-shows for reservations to be more easily indicated, empowering staff to direct passengers to vacant seats.
- 6.4 In this context, delighting the customer with the availability, quality, reliability and affordability of mass transit offerings will become even more important as the connected traveller will be able instantly to share their displeasure regarding substandard services via social media.
- 6.5 Icomera has always been in the business of facilitating flexible working to make the train journey a seamless part of the day for those who desire this. So, if employers are genuinely moving to flexible working processes instead of the factory model, we can help the transition from excessive peak time travel with the corresponding benefits to fleet utilisation this will bring.
- 6.6 With a more even loading of trains throughout the day, Great Britain may be able to emulate other countries in developing the business carriage concept allowing meetings to be held on the move, once again supported by wireless connectivity.
- 6.7 Whilst it is possible to imagine scenarios of much easier interchange between rail and other modes facilitated by connectivity, a greater level of integration between existing franchises is a more immediate objective. Customers care little about the boundaries between rail operators and are exasperated by policies such as not holding connecting trains during periods of disruption. Smarter information with knowledge of the actual journeys being made by customers would enable better choices to be made by operators in these circumstances.

7. Avoiding the rationing of bandwidth

- 7.1 If wireless technology is to play a central role in the railway of the future, mobile connectivity is the fundamental utility that must be available throughout the journey. Customers in the future simply will not accept rationing of internet speed, so the provision of constant high bandwidth coverage will be an expectation in choosing to travel by train.
- 7.2 In Sweden Icomera has already demonstrated the first 1Gbps internet speeds to high speed trains using 5G networks. These super-fast broadband services will be both expected and needed in the UK railway of the near future.
- 7.3 Some may see 5G as rendering obsolete the onboard connectivity systems manufactured by Icomera and others but the opposite is in fact the case because 5G is not simply another 'G'. The new generation of mobile coverage uses multiple frequencies and embraces non-cellular technologies. Therefore, the sophisticated box on the train needs to be able intelligently to move between and combine all of the potential 5G technologies, utilising the most relevant at any point on the rail journey.
- 7.4 In the context of a future 5G 'train of things' - where all devices on board are sharing data in real time within and off the train in different network slices - there will be a need for holistic digital train management whereby the communications quality and security for all of the end users must be centrally managed. Rich operational data when applied to augmented intelligence will become increasingly important to the safe and efficient operation of the railway. This enterprise managed network approach is new for trains but is tried and tested in other static corporate office or retail environments.
- 7.5 Such a vision will require a massive increase in consistent bandwidth across the rail network which must be delivered cost effectively for the users of the corridor. Moving to a 5G world, over and above the services delivered by the public mobile operators, will create a need for some additional infill trackside technologies either for capacity or for super fast data transfer. With the Digital Railway vision being for less trackside infrastructure, the objective should still be to make use of existing structures and infrastructure wherever possible.
- 7.6 This makes the role of Network Rail vital as the custodian of those trackside structural assets for access, power and other support. Yet the history of centrally designed and procured mega projects for wireless connectivity enhancement on Britain's railways has been one of consistent failure. Projects such as Live Train, Project Quicksilver and the recent Transpennine initiative have all failed to deliver an output.
- 7.7 There have been a number of initiatives with mobile operators to improve coverage on particular train operating company routes. Although these have achieved some limited success in improving connectivity, the benefits have been limited geographically and have sometimes proved only temporary.

- 7.8 The scale of this challenge means that models for a purely private sector solution to bandwidth may be reaching their limits. Problem areas for coverage may need at least some match funding to assist in delivering a joined-up approach which could also improve connectivity to communities alongside the railways. Again, history will be repeating itself as the railways originally brought the telegraph to many places.
- 7.9 Yet the key lesson for Icomera from over a decade of onboard wifi delivery in Great Britain's railways is that no single trackside technology or provider can solve the connectivity conundrum. It is therefore vital that rolling stock is equipped with systems that remain future-proofed and agnostic to network technology provision.
- 7.10 It is also right that customer-focused train operating companies continue to play leading roles in the development and expansion of wireless provision rather than the industry waiting for a centralised guiding mind to come up with the perfect all-embracing solution.
- 7.11 For franchises this means the Department for Transport specifying passenger experience outputs for customers rather than prescriptive technological solutions being dictated that risk being yesterday's news at the point of franchise award. This is, after all, the approach the DfT takes now with rolling stock.
- 7.12 Trains for the Future, both new and legacy rolling stock, will need reliable, consistent and secure connectivity in order to deliver and manage the tidal wave of operational data that will be generated by Digital Trains. This data forms the key to achieving the efficiencies and cost-savings that a post-Covid world is going to demand.

8 Conclusion

- 8.1 Icomera would be pleased to expand on any points made in this submission by providing a witness to one of the Committee's hearings.

Icomera AB

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