



The future of mobility

*If the bus is to play a leading role in the long term future of urban mobility, we need to be **scanning the horizon now and sowing seeds of change** to ensure that a very different bus world stakes its claim to exist.*

*We shouldn't be spending time and energy implementing a retro 1980's governance model for yesterday's buses but be focused on **designing a new age of the bus looking toward 2030 and beyond.***

*This is the **sixth** of fourteen weekly articles on what different aspects of that new bus future could look like and the kind of things we need to be sowing seeds for now if we are to truly **ride the wave of future opportunity.***

*We need to **be bold if we are to shine** over the next 40 years and do more than invest in a zero emission fleet, tinker with governance and introduce the odd capped fare.*

Episode Six – Technology

When the bus was last the prime mobility mode in the UK in the 1950's, it was, quite simply, a '**zero technology zone**'. The only 'technologies' in use were mechanical such as diesel combustion engines, manual gearboxes, manual steering, mechanical ticket issuing equipment, no bus doors and a lot of pens, pencils and paper behind the scenes.

The bus was, quite simply, '*of its time*' and that time went into a **spiral of decline as the era of mass car use began** its inexorable rise until the car began to take over our towns and cities with congestion, pollution, ill health and 'accidents'.

The bus stepped back to become a minority player in the mobility space.

It gradually began to **adopt modern technology in the early 80's** with the use, in a limited number of larger operations, of **computers, to construct bus and crew schedules** in a rudimentary way, and **ticket issuing equipment began to**

become electronic generating data in reams and reams of green computer listing paper with basic details of each and every ticket issued. **Reporting packages to make that data useable were generally abysmal.**

Like most other businesses, computers began to aid back office administration on accounting and payroll processes but **none of those developments did anything to arrest the decline in bus use** and the bus remained in its corner watching the 'progress' of private car commuting.

It was only in the **early 2000's** that **developments in technology showed any signs of making the bus more relevant in the modern world.**

Early efforts were made to begin to **track buses in real time in service to aid reliability and control and improve customer information.** However, the technologies behind them were **rudimentary and unreliable** and most 'real time' displays on street were either permanently switched off awaiting repair or provided flaky unreliable information.

Computerised scheduling improved slowly year on year but was **viewed with caution and suspicion by experienced schedulers** who usually felt they could produce better results with a pencil, a rubber and a big sheet of graph paper – which was, in some senses, true apart from the fact that those better-quality results took a **long** time to produce manually.

By the early 2000's, however, the industry began to feel **a true wind of technology driven change.**

The growth of the **internet, smart phones, Apps and Smart Cards** created the technological **infrastructure to transform the customer experience and operational efficiency** which could **make the bus relevant again and fit to compete with car commuting.**

Cars were a brilliant innovation for fast point to point journeys early on a Sunday morning **but their use more widely was plagued by the twin problems of 'traffic' and 'parking'** and no matter how much 'government' invested in **ever more roads and more car parks,** it could **never create enough space** for people to truly enjoy their own car.

When **Harold Macmillan,** Prime Minister in the 1950's, told the British population that that they had **'never had it so good'** and the **man in the street could now afford his own motor car,** he didn't realise it was one of those situations which was, **simply, too good to be true.**

Traffic, parking and pollution weakened the promise of the car age and technology would now bring the tools to allow the bus to slowly claim

back its role as the prime mode of urban mobility - reinvented for the digital age.

The first real indicator that the bus had a new future came with **Ken Livingstone's bold move to restrict car use in Central London** with the **Congestion Charge**, coupled with a major expansion in bus service provision and the development of **'Oyster' – a simpler, modern way to pay for public transport across the City.**

There is absolutely no doubt that the **characteristics of London are radically different** to the rest of the UK and **delivering a bus revolution there was always going to be much simpler than across the rest of the country** but the underlying traffic, parking and pollution dynamics are the same and, therefore, the **bus has a pathway to future success and one of the keys to access that pathway is 'technology'.**

Bold, smart use of modern digital technology can **make bus services** across the UK **by 2050 as different as an iPhone 15 is to an old 1930's black telephone receiver.**

So, **what are those technologies** and **how do they need to develop** as a core part of the bus renaissance **over the next 30 years?**

There are **eight distinct areas in which technology can transform the bus experience and ensure it is superior to anything the car can offer.** It is essential that the industry **today** begins to develop **a coherent, integrated plan to deliver transformation in seven of those eight areas** and remain alive to the potential of the eighth to put clear blue water between the current car commuting experience and the offer from a reinvented bus product.

Punctual, reliable, quick journeys

Whilst redesigning our towns and cities to prioritise **Active Travel** and **Mass Transit** will remove many of the traffic congestion issues which impact on the speed and reliability of bus services, there are a range of other factors which can also cause variability in journey time by season of the year, day of the week, time of day, weather, levels of demand and many other real world situations.

Traditionally, those have all been dealt with by averaging out their impact into a manageable, but not precise, journey time leading to **inefficient deployment of buses and drivers, impacting negatively on cost and fares, and inherent unreliability.**

With developments in **Artificial Intelligence, Big Data and Machine Learning**, technology products like **Cityswift's 'Explore'** and **'Evolve'** allow operators to schedule

much more precisely and **deliver better levels of punctuality at lower levels of cost** and continued focus on improving, and adding to, those tools will see buses become much more precise, consistent and reliable, **significantly improving customer satisfaction and experience.**

The old way of estimating an average journey time and winging it on the day to deal with any variations is no longer good enough. The industry needs to embrace those technologies and set itself **much higher punctuality and reliability standards aiming for 'perfection' rather than 'good enough'**. That is a development which can be pursued right now and improved over time as the technology develops further.

The number of excuses for delivering average bus services are falling by the day and **any operator not delivering year on year improvements in reliability and punctuality over the next decade is simply not trying hard enough.**

Simplified Payment and Pricing

Technology has allowed major strides to be made in **simplifying payment and pricing over the last 20 years** but there is much more still to do.

Pricing and payment is still a barrier to growth in bus use and will be an ongoing issue as action is taken politically to substantially reduce car use in urban areas.

There needs to much **more clarity and consistency across the UK on how to pay for bus travel, and how pricing works**, if we are to demystify using the bus.

Allowing every town or city and every operator to invent their own ticketing 'wheel' isn't going to facilitate mass transfer of customers from private car to bus.

Innovation, competition and dynamism are important elements of any consumer market and need to be encouraged in the bus market, too, but in a wider environment where ease of use is the prime objective.

That widespread, universal ease of use and understanding is in the interests of every single operator and every single transport authority.

To do that requires a set of core actions –

All retail transactions with drivers removed from all local urban and commuter bus services.

All bus services, without exception, accepting contactless payment by card or phone from all major payment providers without any driver interaction.

The ability in all urban areas to automatically open a capped product by touching their card or payment device on a validator on boarding governed by a UK wide set of standard rules.

All validators on all bus services recognising a valid travel account held on a customer's contactless card or device.

Common branding, rules and procedures across the UK applying to bus pricing and payment.

This will remove the mystique and friction surrounding bus payment and pricing replacing it with **clarity and simplicity giving everyone confidence to catch a bus any time anywhere without wondering how or what to pay.**

There should be a transparent, well understood default charge applied to any card or device presented to a validator unless the card or device incorporates a token for a valid travel account which will otherwise take precedence.

This nationally applied protocol will require **universal operator and authority agreement** upon a whole series of issues which will take time to work through and resolve. It will, however, **rip away all sorts of current barriers to bus use** whilst still leaving considerable scope for individual operators and authorities to use their initiative and innovate on both pricing and payment.

This will take time to develop hence a need to begin to **consider the implications and the pathway to delivery now as it is a critical component of delivering much more universal bus use** on the road to net zero.

We can all think of a million and one reasons why this will be a challenge but none of them will be more powerful than the benefits of this approach to delivering mass bus use.

Wherever you are in the UK, you need to be **completely clear that you can board any bus to anywhere and know that your card or payment device is a valid ticket and you will pay a transparent price.**

The technology might very well be complex but it will be deliverable if the will is there.

The commercial issues will be many but the prize for the bus industry will be well worth them being resolved if it leads to buses carrying many more people in 2050 than they did in 1950.

More efficient fleet maintenance and deployment

The nature of **bus fleets will change dramatically over the next decade** as they migrate to zero emission as already discussed in [Episode Four](#).

The **zero emission technology**, of itself, will **simplify maintenance and, ultimately reduce overall fleet size** as maintenance intervals for the simpler drive chain will be extended and battery management will become the bigger issue.

AI and Big Data will see much **more live monitoring of fleet condition and more efficient programming of any maintenance required.**

Using AI and Big Data to optimise bus scheduling will also create circumstances where peak fleet requirement will vary by month of the year allowing annual vehicle inspections to be reprogrammed to the lower demand months and away from the higher demand months.

All of this should lead to **a smaller fleet deployed more intensely and reliably.**

Technology and data will be the key to those developments.

Autonomous bus operation

The notion that in the next few decades, we can eliminate the need for bus drivers as the fleet will drive, itself, is clearly simplistic.

Can we imagine a standard urban double deck bus out on the streets of Manchester or Canterbury all on its own in mixed traffic with miscellaneous customers getting on and off seamlessly without incident?

Putting a vehicle of that size and value out on its own in an urban area raises far too many risks and issues, no matter how safer the autonomous driving mechanism, itself, is compared to a human driver.

However, **autonomous driving technology does offer potential in three areas.**

Internal depot movements

It is already the practice in certain locations for buses to **operate autonomously within the confines of a depot** for fuelling/charging, cleaning, maintenance and parking.

This will increase the fleet capacity of depot sites, as parking can be more precise, making much better use of scarce driver resource and lead to other efficiencies.

Segregated urban shuttles

Autonomous technology is already in place utilizing **small pods or minibuses in suitably segregated areas providing short shuttle movements.**

That kind of operation will grow over time.

High Frequency Bus Rapid Transit

It is possible to envisage creating **segregated BRT infrastructure, either elevated, underground or simply barriered off, delivering core high frequency urban operations with autonomous 24m bi articulated fleet maximising passenger capacity.**

In those circumstances and at those volumes, **supervisory and customer service staff would always be present for security and safety** but the vehicles could safely be **autonomous at high speeds in close proximity to each other delivering higher frequencies than would be possible with human drivers.**

The concept offers major benefits particularly in big cities and would be a **cheaper option than rail based metros or trams.**

As with many of the other concepts in this series of articles, there is an **immediate need for early research** to identify suitable potential operations and locations.

Marketing

The future marketing of the bus to a much wider demographic will pose all sorts of new challenges encompassing network and product design, pricing and payment options, customer relationship management, call centres, retail outlets, service information, Apps, websites, bus and infrastructure design, fleet presentation etc where technology will play a part.

The market of the future, if the car is tamed, will be substantially bigger and more diverse requiring a fundamentally different approach to marketing.

It should, ideally, be a competitive consumer one which will see both generic marketing of the concept of bus travel carried out at industry, operator and authority level and competitive marketing by individual operators offering choice to consumers to inspire innovation and growth.

Data and Technology will be essential components of that marketing activity.

Safety

Absolute standards of safety are a non-negotiable requirement for bus and coach operators at all times. **Technology, particularly in the areas of data and data analysis, are critical aids to measuring safety and identifying potential threats** and continued investment in safety related technology will be increasingly important as the volume of bus operation and patronage grows exponentially.

Revenue Protection

Moving toward fully digital payment for bus travel with no interaction with the driver is essential if we are to deliver the reliability, punctuality and speed required by customers.

However, removing the interaction with drivers required to achieve those improvements does **create risk in terms of fare evasion and revenue protection.**

Protecting revenue in those circumstances will require a **combination of comprehensive physical checks carried out by dedicated revenue protection personnel on the network** with their activities **targeted by data analysis to identify areas of vulnerability and risk.**

Continued research and investment in revenue protection tools will be imperative.

New Technology Frontiers

Sometimes described as 'unknown unknowns' !

This document identifies a whole range of areas where we know that investment in technology will enhance the customer experience and quality of future bus operations required if we are to transition from private car mobility to a combination of [Active Travel](#) and [Mass Transit](#) in all its forms.

Technology has developed rapidly in the bus space since the early 1980's to the point where **many current developments could not have been predicted decades ago** and there is no doubt that there will be **further unexpected technological developments over the next 25 years which will improve bus operations by 2050.**

It is essential to encourage ongoing investment and research in bus related technology and an ongoing openness to change and embrace new technologies as they arise.

We can, however, be quite certain that, by 2050, there will be game changing technology developments underpinning bus operation that no one has yet conceived of.

Conclusions

Many people formed the view that the **bus was dead and buried by the early 1970's** and truly superseded by mass access to the car.

We have learned an awful lot about the true implications of mass car travel since then and also about the potential of the bus as a consumer product.

Today, it is clear that we **cannot continue to build our communities around the car** and meet our climate obligations, let alone create a pleasant, liveable urban environment.

Simultaneously, **technology, in a variety of forms, particularly in respect of zero emission propulsion, a sensible approach to autonomous operation, much more precise operational delivery through data and superior pricing and payment technologies will now allow us to build a bus product fit for 2050 and beyond.**

Fully exploiting the value of technology, the future of the bus is bright and bold.

Next Week

Next week, in **Episode Seven**, we will address **Marketing**.