Forward progress

An introduction to the use and benefits
of standards in the automotive sector

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...making excellence a habit.™

Foreword

66 BSI is dedicated to promoting excellence throughout the automotive sector. Working with organizations of all sizes in 172 countries worldwide, we improve performance, reduce risk and increase resilience right the way through the supply chain. 99

Howard Kerr, Chief Executive, BSI

Introduction

The UK automotive industry requires world class levels of product quality, productivity and competitiveness, as well as an emphasis on continual improvement. In addition, its complex landscape is underpinned by a dynamic technological foundation. All these elements, not to mention the global trade and export activities undertaken by the sector, are supported and shaped by standards every step of the way.

The knowledge, skills and experience that are embodied in standards help automotive businesses wherever they are in the industry, from multinational manufacturers to independent garages. They cover topics from automotive quality management to standards for crash repair. This report brings together industry voices from Jaguar Land Rover, Nissan and Changan, as well as those of our own experts, to outline today's key topics around automotive standards.

The rise of digital manufacturing, and the opportunities and challenges it presents the industry, as well as standards bodies, is discussed on page 4.

While the related topics of supply chain standardization and design engineering requirements are also covered on pages 10 and 14.

The rise of connected and autonomous vehicles has been well-discussed around the industry and in standards development committees in recent years, not to mention garnering significant mainstream media coverage. The ongoing plans for related standards, partnerships and legislation are outlined on page 16.

Training and certification are especially critical for an industry which emphasizes constant improvement, as well as the development and appropriation of new techniques and technologies. Turn to page 27 to get the lowdown on the most applicable and important training on standards for the automotive industry.

All our automotive standards are available digitally. Standards Online (BSOL) is the online standards database that makes using standards easier and more cost-effective. It provides 24/7 access to a comprehensive and constantly updated library of over 95,000 internationally recognized standards.

Finally, no UK report published in the current climate could ignore the implications for a post-Brexit automotive industry. We outline our intentions, plans and related activity on page 24 ●

Dan Palmer
Head of Market Development, BSI

Contents

Digital manufacturing
and supply chain resilience

Ben Sheridan, Market Development Manager at BSI, outlines how the rise of digital manufacturing techniques will help deliver significant supply chain improvements.

In recent years there has been much discussion around ways to improve UK productivity to keep pace with nations such as Germany and the USA[1], who have both achieved better growth rates in this regard over the last 15 years[2]. With that said, it is worth remembering that the UK automotive sector is a notable exception[3], and has reported excellent productivity growth figures despite years of difficult economic conditions and recession.

Additionally, the automotive sector has been looking to increase the number of components that are manufactured in the UK. To support this the Automotive Council has been promoting the opportunity which exists for supply chain members to re-shore operations to the UK[4].

While automotive OEMs successfully export most of their production, it is within the UK supply chain that the picture is less rosy — it cannot provide sufficient volumes of the most essential products, and as a result many suppliers are based overseas. If we look to Germany, we see they have very strong small and medium sized companies, known as the Mittelstand. UK SMEs tend to be smaller, often putting them at a disadvantage when competing with Mittelstand firms.

It's unlikely that individual UK supply chain companies can grow quickly enough to an appropriate size to compete directly with these global competitors. A more realistic alternative, however, lies in helping companies to work together to meet emerging customer requirements, adopting a more collaborative approach.

If UK companies can innovate in such a way that they will be more globally competitive, then this will in turn lead to more resilient and adaptive supply chains. The adoption of digital technologies throughout the supply chain will be pivotal to this achievement. Transforming our industry-wide approach in this way is crucial to maintain a competitive edge, and enable our automotive manufacturing companies to exploit advances in digital technologies, devices, data analytics and integration.

Broadly speaking, digital manufacturing will help the production of better, more varied vehicles, underpin more collaborative behavior and enable operational efficiencies, thus meeting dynamic customer demands more swiftly. A 2016 report predicted that by fully embracing digitalization in all applicable areas, the automotive sector stands to gain £6.9 billion every year by 2035[5].

There are several considerations and challenges in the move towards an end-to-end digital supply chain. Large OEMs need to ensure consistent adoption of a digital manufacturing approach across all relevant areas, and remove any obstacles to organizational change. In addition, a lack of digital skills and awareness may also be addressed at all levels of the company.

The Institute for Manufacturing (IfM) identified 10 key digital scenarios that describe the different ways in which companies within the supply chain will adopt digital technologies. These range from the automated replenishment of parts from suppliers, through to a fully automated and digitized factory, and beyond that to managing the product when in use.

The prospects for the automotive supply chain are exciting. OEMs are already connected to their supply chains through a common logistics language (MMOG-LE4), which aids data sharing. In future the supply chain will build on this and become fully digitally connected throughout the useful life of the product, creating further opportunities to add value.

For example, better visibility and agility around varying customer demand means the entire chain can improve scheduling, reduce downtime, overtime and inventory buffering. These capabilities also deliver the opportunity to improve preparations for new model launches, reducing the time taken to bring new models to market and the likelihood of product recalls. Sharing production test data allows supplier readiness to be remotely monitored to reduce cost and development time. This will lead to UK manufacturing supply chains that are more resilient and competitive[6].

Standards organizations have a significant part to play in keeping abreast of technological innovations, as well as the timely development and provision of best practices and standards in several major areas, including:

- the interoperability of machines and data — establishing the kind of information to be recorded and in which format

- improved use of data and the adoption of data-centric business models — enabling more informed engineering and strategic decision-making

- design in a connected environment — more collaborative models of design
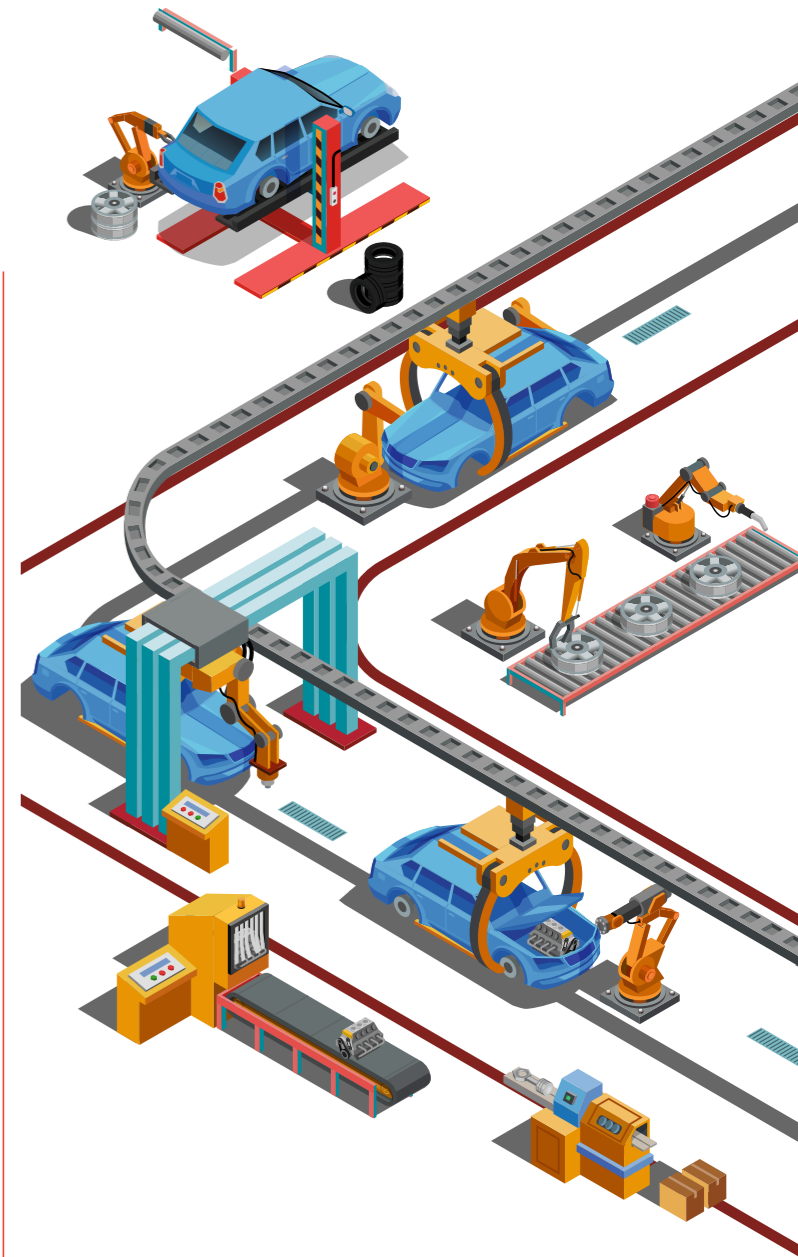
- IP governance and security - making decisions using others' data, and ensuring data ownership is clear

- assurance for digital models and digitally manufactured products

BSI is already working with industry partners to gather, develop and share existing and emerging good practices in digital technology adoption and capability, to help underpin the continued development of resilient automotive supply chains ●

References

1. Inman, P. (2016). Why is UK's productivity still behind that of other major economies? The Guardian. Available at: **https://goo.gl/vdMTDd**
2. Office for National Statistics, (2016). International comparisons of UK productivity (ICP), first estimates: 2015. ons.gov.uk.
Available at: **https://goo.gl/CecYvG**
3. Tovey, A. (2015). Britain's car industry roars ahead on productivity but skills may be a bump in the road. The Telegraph.
Available at: **https://goo.gl/EBztNB**

4. Davies, P., et al. (2015). Growing the Automotive Supply Chain: The Opportunity Ahead. London: Automotive Council, Foreword.
5. KPMG, (2016). The Digitisation of the UK Automotive Industry. London: KMPG, Introduction. Available at: **https://goo.gl/FhAf4N**
6. IFM, (2016). How Bright is Your Digital Future? ifm.eng.cam.ac.uk. Available at: **https://goo.gl/y2OXw2**

The connected vehicle

Dr Jonathan Harrod Booth, Chair at BSI for the British Standards EPL/278 Intelligent Transport Systems Committee, talks about the increasing complexity of the connected vehicle and the importance of global discussion in standards development.

> **Standards are fundamentally important to the automotive sector because of the required levels of product quality, productivity and competitiveness, as well as a need for continual improvement.**

The connected car communicates with other vehicles and surrounding infrastructure. It can transfer data on aspects such as driving conditions, vehicle status, and cargo monitoring; sending out and receiving information on everything from traffic signal timing to what variable message signs are displaying at the roadside and the status of multiple neighboring connected vehicles.

Cars are perhaps the most complex 'mobile' devices that people own and one of the biggest challenges is in ensuring that a vehicle's connectivity remains unbroken, wherever in the world it is being driven. This means that the industry needs to look beyond regional and national levels, and work together globally to make sure its products have the widest possible reach.

There is much international discussion and teamwork around developing standards for the connected vehicle, with important and ongoing collaboration between several standards development organizations (ISO, ITU, CEN, ETSI, SAE, IEEE) to provide a rich landscape of appropriate standards.

Predicting the future is not easy. In an ideal world, infrastructures will have the capacity to communicate with all vehicles on the road at any one time. However, although continuous connectivity is the ultimate goal, there is a pressing need to develop technology that allows breaks in connectivity without affecting safety or performance.

The habits of over 100 years of driving are about to change drastically and this will have major implications for wider society. Motoring legislation and liability laws will need to be adapted around new systems and the public will need reassuring. And it is by working together, across country boundaries, to enrich existing and develop new international standards that the industry can clearly demonstrate it has the public's safety and best interests at heart ●

The automotive industry is a vital part of the UK economy accounting for a turnover of more than £71.6B

In 2015 the UK's car exports totalled £27.7B responsible for 9.6% of all export revenue (OEC)

Intelligent transport systems

BSOL offers standards for all types of communications in and between vehicles and fixed locations, including standards for information and communication technologies and navigation systems.

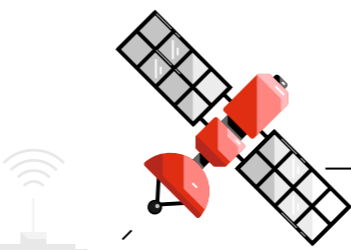**Route guidance/ navigation systems**
BS ISO 22840:2010
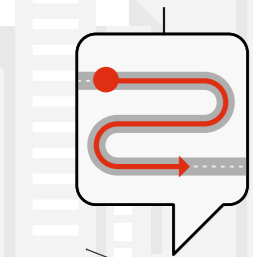
Traffic signals
(controllers and detectors)
BS EN 12368:2015

After-theft systems
BS EN 15213-1:2013

THEFT

D3   80

STOP

Telematics applications
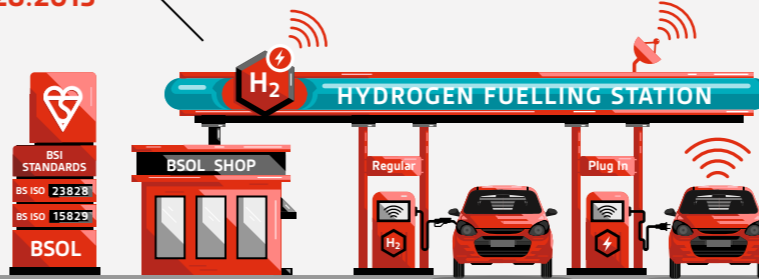BS ISO 15638-12:2014
BS ISO 15638-15:2014
Vehicle mass monitoring

Smart cities
PAS 180
PAS 181
PAS 182

Curve speed warning systems
BS ISO 11067:2015

Hydrogen cars
BS ISO 23828:2013

BSI STANDARDS
BS ISO 23828
BS ISO 15829
BSOL

BSOL SHOP

HYDROGEN FUELLING STATION

Regular   Plug In

H₂

Infrastructure to vehicle communications
BS ISO 15829:2013

TOLL ROAD

Freight containers
ISO/TS 10891:2009 Ed 1

H₂

Collision warning
(Test procedures)
PD ISO/TR 10982:2013

POLICE
ROAD CLOSED

eCall

0   00

Cruise control/ lane keeping assistance systems
BS ISO 15622:2010

Electronic fee collection
PD CEN ISO/ TS 14907-2:2016

Airbag
BS ISO 15829:2013

eCall with airbag
BS EN 16102:2011

Driver distraction
PD ISO/TR 17427-10:2015

H₂

MAKING EXCELLENCE A HABIT

> **With some 169,000 people employed directly in manufacturing and more than 814,000 across the wider sector, the UK automotive industry accounts for 12.0% of total UK goods exports and invests £4 billion each year in automotive R&D. (SMMT)**

Standards within the automotive supply chain

Standards enhance the supply chain of every industry by promoting compatibility between products and processes, and boosting confidence between suppliers and clients, as well as facilitating better communication between trade partners. Improved communication enables markets to function efficiently, ensuring that demand matches supply. Consequently, firms save time and search costs.

This is particularly true in the automotive industry, with clear links to improved relationships between supply chain firms and the OEMs. Standards also help automotive manufacturers meet regulatory approval in new markets and ease communication with global customers through agreed specifications.

Automotive OEMs benefit from more efficient processes because of agreed standards. Optimized inventory management and unit layout means fewer production interruptions and less in-process inventory, leading to more vehicles produced per day and higher plant productivity.

Standardization also influences quality management within the supply chain. Vehicle manufacturers and their suppliers are always striving to achieve consistently high quality levels, while minimizing costs. Quality management standards, such as ISO 9001 and its application to the automotive industry (IATF 16949, published in 2016), are utilized throughout the industry to achieve these goals.

Parts suppliers are required to certify to quality management standards and are subject to auditing. This reduces defects in the completed vehicle, as well as recall costs, inventory disposals and waste. In addition, quality management standards equip companies to proactively seek out the cause of defects and waste, and act to ensure they do not occur again.

When components from suppliers are standardized, purchasing processes are accelerated. Uniform specifications and design tolerances mean that time-to-market is reduced and product development departments can collaborate more efficiently with manufacturing and engineering teams.

Supplier parts can be designed by the OEM or recommended by the supplier and given a product number, allowing the product to be sold across the distribution network.

Ultimately, standards in the automotive supply chain are responsible for increased customer satisfaction because they directly influence vehicle quality, recall frequency and delivery times. Faster vehicle servicing is also possible thanks to standards because dealerships and after-sales networks have easy access to a catalog of replacement parts to service vehicles. Standardized parts and an efficient distribution network both help to deliver faster customer service •

Automotive life cycle

BSOL offers standards for all parts of the automotive life cycle from initial design to end of life, including standards for assembly, production and aftercare.
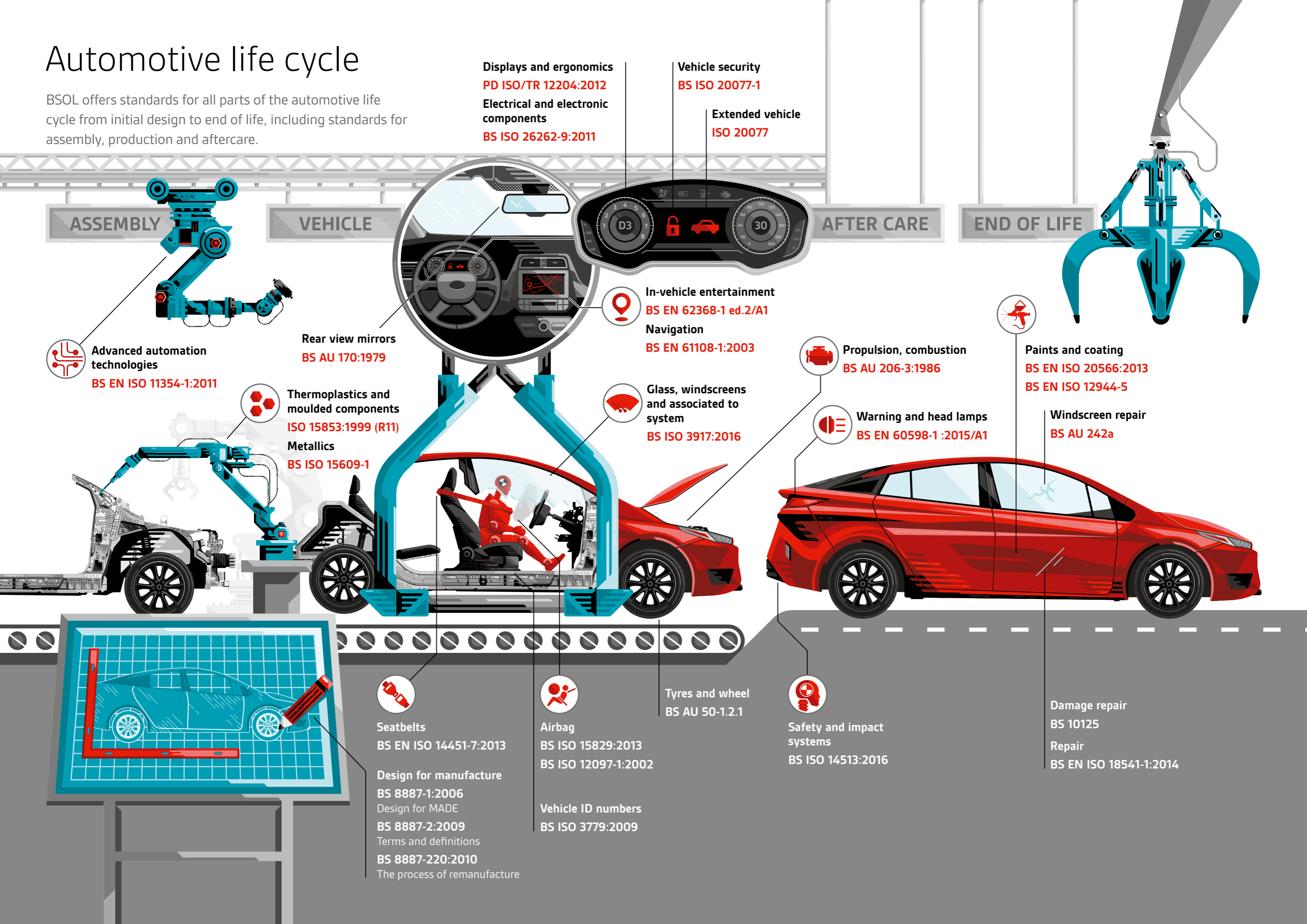
ASSEMBLY

VEHICLE

AFTER CARE

END OF LIFE

Displays and ergonomics
PD ISO/TR 12204:2012

Electrical and electronic components
BS ISO 26262-9:2011

Vehicle security
BS ISO 20077-1

Extended vehicle
ISO 20077

Advanced automation technologies
BS EN ISO 11354-1:2011

Rear view mirrors
BS AU 170:1979

In-vehicle entertainment
BS EN 62368-1 ed.2/A1
Navigation
BS EN 61108-1:2003

Thermoplastics and moulded components
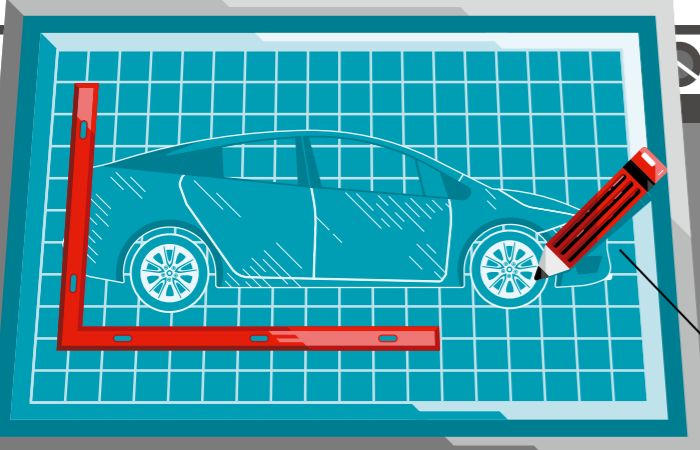ISO 15853:1999 (R11)
Metallics
BS ISO 15609-1

Glass, windscreens and associated to system
BS ISO 3917:2016

Propulsion, combustion
BS AU 206-3:1986

Warning and head lamps
BS EN 60598-1 :2015/A1

Paints and coating
BS EN ISO 20566:2013
BS EN ISO 12944-5

Windscreen repair
BS AU 242a

Seatbelts
BS EN ISO 14451-7:2013

Design for manufacture
BS 8887-1:2006
Design for MADE
BS 8887-2:2009
Terms and definitions
BS 8887-220:2010
The process of remanufacture

Airbag
BS ISO 15829:2013
BS ISO 12097-1:2002

Vehicle ID numbers
BS ISO 3779:2009

Tyres and wheel
BS AU 50-1.2.1

Safety and impact systems
BS ISO 14513:2016

Damage repair
BS 10125

Repair
BS EN ISO 18541-1:2014

BSI standards in design engineering:
Leading the way

BSOL offers standards for all parts of the automotive life cycle from initial design to end of life, including standards for assembly, production and aftercare. Sarah Kelly, Lead Programme Manager, BSI, discusses how key standards are at the forefront of modern automotive design engineering.

Here at BSI we are very proud of all our standards, but particularly those which have had an influence well beyond their intended purpose, or stood the test of time. BS 8888, the UK's technical product documentation and specification standard, is a great example of one which has achieved both. It was created to update and supersede BS 308, the world's first engineering drawings standard, published in 1927.

BS 8888 is the UK's national framework for engineering drawings and geometrical tolerancing. It covers all the requirements for technical product specification, and their component parts. Frequently used by design engineers, the standard explains the way that engineering drawings should outline and present these specifications. BS 8888 outlines the symbology and information that automotive companies need to include in their drawings, be they manually produced, 2D, or created using CAD systems and 3D modeling software.

The standard is unique to the UK, but has proved so useful that several other countries are now following our lead. Many are developing similar national standards to help their automotive industries work with the ISO system of geometrical product specification.

BS 8888 brings together, in one easy-to-follow document, all the international standards needed to prepare technical product specifications. The aim is to help UK industry move over more fully to the ISO system of geometrical product specification. BS 8888 acts as a gateway, or roadmap, to around 200 other ISO standards on documentation, specification and verification. It tackles the complexity of these ISO standards by making the material that engineers need on a regular basis available in one place in the body of the standard, ensuring easy access and use.

> **BS 8888** brings together, in one easy-to-follow document, all the international standards needed to prepare technical product specifications.

The standard is updated frequently to reflect the changing nature of all the international standards to which it relates. Most recently it has been restructured to make key information easier to find, and improve the flow of requirements to reflect how they are used by designers and engineers. We also included more on the use of 3D models and CAD, and extra detail around the requirements for surface texture and datums.

Every update ensures the standard remains a single point of reference for design engineers, clearly conveying essential product specification and drawing information. In addition, it enables users across the automotive supply chain to speak the same language when graphically representing products. BS 8888 provides precision and accuracy, leaving no room for misinterpretation of specifications, helps smooth the transfer from design concept to the manufacturing process, shortens the product development time, and increases speed to market.

Another important series of standards for design engineers is BS 8887 – Design for Manufacture, Assembly, Disassembly and End-of-life processing (MADE). These standards aim to ensure a more sustainable, or circular, approach is introduced right at the very start of the design process. For the automotive industry this means ensuring that products are designed to be used for more than one lifecycle, or produced in such a way they can be easily disassembled or remanufactured after their initial deployment ●

Key standards in engineering design

Standard	Description
BS 8888:2017	Technical product documentation and specification.
BS EN ISO 1101: 2013	Geometrical product specifications (GPS). Geometrical tolerancing. Tolerances of form, orientation, location and run-out.
BS EN ISO 5459:2011	Geometrical product specifications (GPS). Geometrical tolerancing. Datums and datum systems.
BS 8887-1:2006	Design for manufacture, assembly, disassembly and end-of-life processing (MADE). General concepts, process and requirements.
BS 8887-2:2009	Design for manufacture, assembly, disassembly and end-of-life processing (MADE). Terms and definitions.
BS 8887-220:2010	Design for manufacture, assembly, disassembly and end-of-life processing (MADE). The process of remanufacture.

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Connected and autonomous vehicles:

Getting the standards right

BSI is working with key industry stakeholders to ensure the right mix of standards are in place to support the development of Connected and Autonomous Vehicles (CAV) in the UK. Nick Fleming, Market Development Manager, outlines all you need to know.
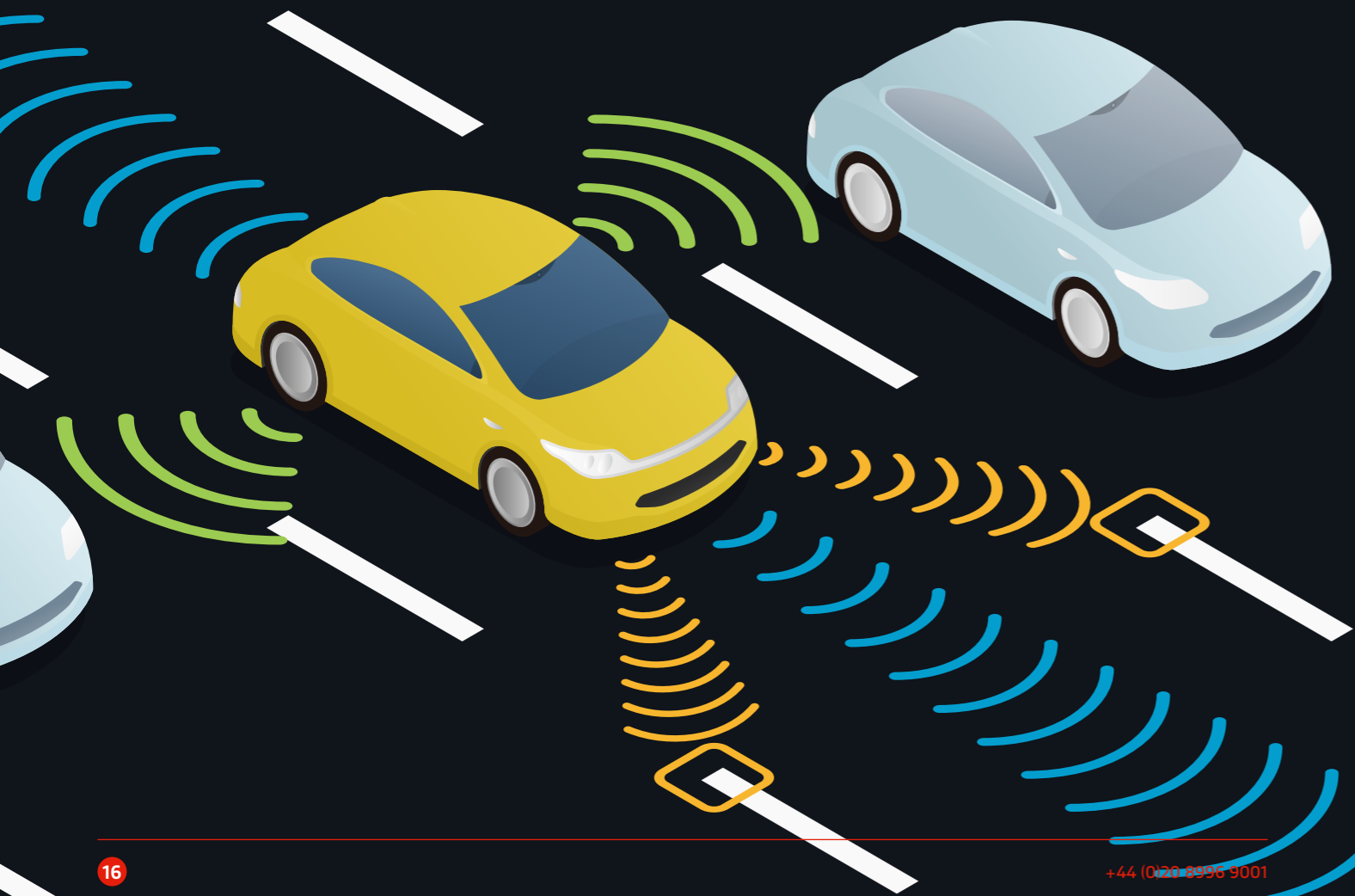
A House of Lords Science and Technology Select Committee report[1] has emphasized that both standards and regulations will be important in realizing the full benefits from connected and autonomous vehicles (CAVs).

Published in 2017, and prepared jointly by BSI and the Transport Systems Catapult, Connected and Autonomous Vehicles − A UK Standards Strategy[2], follows a six-month research project supported by the Centre for Connected and Autonomous Vehicles (CCAV) to explore and identify standardization priorities to support the development and deployment of CAVs in the UK. Vital to the research was to better understand the challenges facing the industry and consumers, as well as clarify where standards could most help.

The automotive industry is experiencing a period of important innovation, perhaps the most significant in the last 100 years. There is an increasing raft of new digital technologies, complex communications, robotics and AI. Sensors now power advanced driver-assistance and automation systems. As vehicles become more software dependent and their electronic control systems progressively centralized, new engineering techniques are becoming necessary to manage system interfaces and their connectivity.

There are also public safety and liability concerns, as the responsibilities between drivers and systems become blurred. As a result, ensuring the safe deployment of CAVs, through new verification and validation techniques will be critical to their success. UK government is investing in several national demonstrator projects, trials and competitions to support a pro-innovation approach to development of CAV technologies.

BSI surveyed and consulted with a wide cross-section of the automotive industry. This included OEMs, Tier 1 and 2 suppliers, software developers, telecoms companies, test centers, CAV R&D projects and academia to better understand what standards are currently used, and where new agreements may be needed.

The research findings highlighted that key standards, including the BS ISO 26262 series on functional safety, were already widely used by the automotive industry and its supply chain. However, the study also revealed that further adaptations and complementary standards would be needed to fully address safety in the design and development of driverless or highly automated vehicles.

Additionally, existing ITS (Intelligent Transport Systems) standardization programs, covering vehicle-to-vehicle communications and other advanced features, were found to be important to development and performance of CAV systems.

The study clarified key challenges facing the development of CAVs. Aside from a general agreement that continued standards development was universally required, there were several other considerations raised. These included the need for widespread public education and acceptance of CAV technologies, the necessary work needed to ensure infrastructure reliability and the related integration of CAVs with existing transport systems. Also, that CAVs had significant implications for policy makers and legislators, as well as safety assessors.

The research identified that standards could support CAV development in several ways including by:

- improving safety
- supporting integration of systems
- accelerating infrastructure development
- promoting data, communications and systems interoperability
- increasing public trust

Looking ahead to opportunities for the automotive sector, and UK industry in general, the research indicated that whilst globally accepted standards are the end-goal—given the increasingly international automotive and transport markets—there are definite opportunities for the UK to take a leadership position in developing standards to support and accelerate growth in niche or strategic areas.

BSI's report identifies several priority areas where standards will be particularly helpful in supporting CAV development. These include standards for vehicle-to-vehicle communications, road and traffic management, cyber security and general vehicle and system security, privacy and data standards; and the standards required for effective testing of autonomous vehicles.

The full report, including the priority areas and recommendations for CAV standardization, can be downloaded from the BSI website ●

References
1. Science and Technology Committee. (2017). Connected and Autonomous Vehicles: The future? HL 115. Available at: https://goo.gl/MCvsl2
2. BSI (2017). Connected and autonomous vehicles: A UK standards strategy. London: BSI. Available at: https://goo.gl/IOAl3u

Nissan:
Standards in sustainability and material efficiency

Mark Ellis, Materials Design and Testing Manager Europe, explains the role of standards in ensuring optimal sustainability and materials efficiency.

At Nissan, we use a raft of standards in our materials design and testing[1]. They ensure we work in a consistent and compliant way, and we use them extensively when validating products for specific regional requirements. Standards help us respond to legislative changes across all the international markets we serve. In addition, they play an extensive role in delivering on our sustainability commitments.

At their core, standards inform an efficient use of available resources and promote a focus on the circular economy — meaning the sustainable application of materials, via recycling and reuse strategies across the supply chain. Working with recycling partners we can ensure that 20% of the plastic, up to 40% of the aluminum and half of the precious metals we use in our new cars come from recycled sources.

The End of Life Vehicles EU Directive also requires certain ISO standards to be applied to materials coding, as well as steering manufacturers towards designing for increased materials recycling. We do not begin production on any proposed new vehicle unless we can demonstrate that it's 85% recyclable, and 95% recoverable.

With the drive for ever-greater weight reduction through material design, recycling also becomes increasingly challenging for new and complex lightweight materials, which in turn requires frequent attention to ensure standards are upheld ●

> **Standards help us respond to legislative changes across all the international markets we serve. In addition, they play an extensive role in delivering on our sustainability commitments.**

Reference
1. Access to European Law. Directive 2000/53/Ec Of the European Parliament and of the Council. eur-lex.europa.eu. Available at: https://goo.gl/kVoJ69

Jaguar Land Rover:
Standards in functional safety

Roger Rivett, Functional Safety Technical Specialist at JLR,
outlines the critical role of standards in the company's global
planning and design functions.

> ❝ **Functional safety standards are a universal language and set of definitions, that everybody across the industry, and related supply chains, can understand.** ❞

A s a globally growing business that trades with the rest of the world, almost everything we do at Jaguar Land Rover is governed by standards. And nothing is more important than functional safety. In the past, working on vehicle safety was firmly grounded in the material world. Our attention was on parts, components, tolerances, failures – components failing and the effect they would have on the vehicle, its inhabitants and pedestrians. Today, we still focus on these things but have other considerations, driven wholly by the rise of software control in mainstream vehicles.

With purely mechanical machines it was all about reliability, engineering materials and systems, so they wouldn't fail. With software controlling a significant and increasing proportion of modern vehicle functions, the complexity and potential for failure is multiplied. The discipline of functional safety is critical for car manufacturers in understanding these risks, to the user and the public, as well as in deriving relevant engineering solutions.

The variety and depth of software control used in modern high-end vehicles would probably surprise many outside the automotive industry, to the extent now that if the software power source or connection is lost, a car will not move. Even in modest cars it's becoming increasingly significant. It's often said that the modern motorcar has more software in it than a jet fighter, so it is clear to see how functional safety standards must continually evolve alongside the technology. They have always been a first line of defence for our industry's material, engineering, and mechanical thinking, but they now encompass critical functional safety requirements for software.

We routinely refer to ISO 26262, which defines safety requirements for automotive equipment throughout the lifecycle of all electronic and electrical safety-related systems. It aims to address potential hazards caused by software malfunction. This functional safety standard spans the entire development process, and provides an important means for determining risk classes and automotive safety integrity levels (ASILs). Each ASIL is established by performing a risk analysis of the potential hazard by looking at the severity, exposure and controllability of the vehicle operating scenario.

Furthermore, the progression of driverless, autonomous vehicle technology is moving steadily forward and our existing cars are ever-more connected with external networks. This all adds a further layer for international standards organizations and committees to negotiate. For example, the question of how secure a highly internet-connected vehicle needs to be, so that it can resist attempted hacking and cyber-attacks? This has a bearing not only on the specific software makeup, but on every system it controls. How easily could hackers partially or completely disable user control? In determining related standards, a balance must be struck—if connected cars are to be made impenetrable in this regard, how easily could malfunctioning safety systems be overridden (either by the user, or an external agent) in an emergency?

With all this complexity, and the rapid pace of technological development, it is important that the development of global standards is undertaken in partnership with all major stakeholders in every country to ensure they are appropriate and not over or under-powered. Globally agreed standards provide a level playing field, and a common reference point.

Functional safety standards are a universal language and set of definitions, that everybody across the industry, and related supply chains, can understand. Given the mobile nature of the technology in question, it is imperative that automotive functional safety standards governing connectivity and software control don't change when you drive across a border ●

Changan:
Adopting global standards for future growth

Ian Tudor is Product Development Lifecycle and Project Management Process Developer at Changan Automobile Group. He describes the importance of implementing standards to help growth in the global marketplace.

> **The widespread use of standards across an organization also brings cost savings for the business. The ultimate quality of the final product is influenced, which has implications for sales figures as well as organizational reputation.**

Changan Automobile Group can trace its corporate origins way back to the 1860s. Today it has an increasingly international footprint, with dedicated research centres in China, Italy, Japan, UK and USA. The company has also invested heavily in the research and development of new energy vehicles, focusing on technology development for conventional and hybrid vehicles.

The UK satellite office in which I work is dedicated to powertrain design and development for Changan's next generation of vehicles. We work with standards every day, and provide guidance and support for the ongoing integration of global standards within the wider organization. We are on a mission to design and develop high-quality, high-performance powertrains to support Changan's global requirements and future growth plans.

The majority of Changan's traditional automotive sales volumes have come from the domestic Chinese market, but to continue to expand into wider international markets, existing national and regional standards need to be reconciled with those used on the global stage.

Much of the research and design work within my team focuses on well-documented and recognized processes to maintain the quality of our output. Standards also have a part to play throughout health and safety, quality management, material and component-design activities.

Standards are important to our business. For instance, we refer to standards such as ISO 9001 when our engineers are researching material and gear requirements. Accessing the information we need for these activities through the Standards Online (BSOL) library makes life much easier for our engineering teams across the globe. It also ensures we are referencing the latest revision of every standard. Our subscription allows access by multiple users at any time in any country, eliminates paper copies and provides helpful search functionality.

The role that our UK office plays in the global organization is one of advanced research, mentoring and guidance for on-going powertrain strategy. We have a technical focus, but it is not just our engineers who frequently refer to standards. Managers also gain useful insight into quality requirements via the database.

The widespread use of standards across our organization also brings cost savings for the business. The ultimate quality of the final product is influenced, which has implications for sales figures as well as organizational reputation. I'm confident that substantial savings are realized across our business as a whole through the routine use of standards.

Looking ahead, we expect to see increasing attention to standards which regulate the nature of software control in vehicles across the industry. Cars are becoming more connected with the internet and external infrastructure, while the development of the automated driverless vehicle technology continues at pace. As well as having implications for research and design teams, there are many more for those who discuss, agree and revise global standards, not to mention legislators.

The overall uptake and adoption of global standards within Changan has been extremely promising and has been gaining momentum for some time. BSOL covers a good proportion of our global standards requirements, and will continue to improve the quality and safety for all our products ●

Brexit and standards
in the automotive sector

BSI has been working since the referendum to consult with its members, as well as Government and other key stakeholders, about the role of standards for UK business and consumers post-Brexit. Richard Collin, Head of European and National Policy, explains how voluntary standards support business in this sector, and discusses the implications for BSI's membership of other international standards-developing organizations.

The automotive sector is one of the most significant for UK exports, and industry standards are used to aid production, communication and trade. There is a long history of developing British Standards for this purpose, covering safety, components, testing and so on. Most of these British Standards have now been replaced by international standards.

Standards also enable easier compliance with regulations. Many automotive regulations are international in origin, developed by the United Nations Economic Commission for Europe (UNECE). Within the European Union, these UNECE 'standards' have been adopted by legislators.

Post-Brexit, the UK may seek to continue to apply these regulations as national law. Many of these regulations are linked to established international standards from ISO (International Organization for Standardization) for components, such as the ISO-fix child restraint system.

BSI will continue to be a member of ISO and the IEC (International Electrotechnical Commission), enabling the participation of UK industry, consumers and other stakeholders in standards development and the maintenance of British influence globally.

The European Standards Organizations, CEN and CENELEC, produce European standards in several automotive areas. These are mainly in new fields of technology, such as intelligent transport systems (where many standards are also international) and electric vehicles, as well as the use of renewables and end-of-life processes.

CEN and CENELEC are independent, private organizations, with a membership broader than that of the EU. This is a private, market-led system and is essential in allowing reciprocal market access for industry across Europe. Each member country's national standards body must adopt all European standards identically as national standards, while withdrawing any existing standards which conflict. This is known as the single standard model.

Over the past 30 years, the adoption of the single standard model has reduced the number of standards across Europe from an estimated 160,000 national standards to some 20,000 European standards today.

BSI's ambition is to remain a full member of both CEN and CENELEC: to maintain the UK's influential position in the world of voluntary business standards and thus to remain competitive. Full membership also mitigates the risks and costs to UK business that divergent or multiple standards would bring. This sentiment is echoed by businesses across the UK ●

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Ian Tudor, Changan Automobile Group

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