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The Magazine for I.T. Professionals

Main Article

1.0 Introduction

1.1 Background

The automotive industry has benefitted from the contribution of Information Technology in a variety of areas, which all involve the design, development, testing, and delivery of safer, lighter, stronger, and more fuel-efficient vehicles on our roads.

Information Technology has provided the automotive industry great technological advancements, not only deep within the infrastructure of the vehicles including integration and management of the drivetrain and manoeuvrability, but also in the management of fuel delivery, emissions control, vehicle safety components and systems, driver assistance, information and alerts, and

passenger entertainment.

Driverless technology, a completely computer operated autonomous car involving sensors, radar and Global Positioning System (GPS) is now a reality. The modern car, now involves over 200 million lines of code within the software which manages the interconnected systems within the vehicle and can be subjected to a variety of threats including software glitches, hacking, and compromising of communication systems.

1.2 Aim

The aim of this essay is to highlight the importance of information technology challenges which impact the automotive industry.

Information Technology has provided a major influence in the relationship between automotive manufacturers, dealers, original equipment manufacturers (OEMs), and its customers through design, engineering, automated assembly, database information systems, information management, and information distribution.

Since 1885 the automobile has gradually changed from a simple personal vehicle transporting people and cargo, propelled by a combustible engine, to a technologically integrated and interconnected communications hub on wheels, driven by an intelligent and mobile computer system (King 2005).

All computing systems which involve a vast amount of complex software coding to control various systems and components throughout the vehicle and communicate to external sources, will be subject malicious threats and inadvertent coding errors.

2.0 Issues

2.1 Issue: Emissons Control

Lowering current greenhouse gas emissions is a primary challenge of the global community to reduce the current and future effects of climate change on our planet. Our dependency on fossil fuels and our emissions of greenhouse gasses need to

severely reduce the impact and change on global climate conditions which appear near or are at tipping point (Melville 2010).

The Chinese automotive market is the largest in the world, and a key indicator of how the automotive market is progressing. However, it is impacted by the uncertainty of the long-term motorization policy which sustainable transport, pollution policies within its cities, energy security policies, investment in public transport infrastructure policies, and high density living of its urban population point to a decline in vehicle ownership.

The prioritisation of the pollution control, of the existing 2020 Phase IV fuel-efficiency targets of 5 litres per 100 km, which equates to approximately 120grams/km of carbon dioxide [CO20], will be maintained (Couchman et al. n.d.)

Information technology performs an important role in Emissions Control Systems of modern automobiles. The catalyst-based three-way catalytic converter, more commonly known as the catalytic converter, was first introduced as

an inclusionary product to the vehicle's mechanical system from the 1970's (Lee 2012).

The application of Information Technology assisting emissions control became realised in 1976 for the release of the Volvo 240 model, after it became evident the combustion process had to perform at near perfect stoichiometric conditions, or the decline in cleaning efficiency would result. The Lambada-sond solution was developed, which introduced sensors, between the exhaust manifold and catalytic converter chamber, relaying fuel/air ratio figures to a computer that contained a state table which enabled fuel injection adjustments (King 2005).

As the need for tighter emissions control is required by automotive manufacturers in the future, so will the dependency on information technology research on alternative, renewable, and environmentally friendly fuel sources that power the drivetrain.

2.2 Issue: Digital Disruption

> Many hours are spent online, researching our vehicle purchase, as

buying a car represents our second most significant purchase after buying a house. Automotive websites have provided a significant amount of information on our next car purchases, including facts, figures, and images are available online prior to visiting the dealership. As consumer requirements change depending on social, economic and environmental factors changing, such as vehicle sharing, autonomous driving, and electrified vehicles, so will the automotive industry's adjustment to provide those technologies and infrastructure. Consumer trends, car ownership costs, condensed city living, and air pollution are contributing factors towards consumers opting for alternatives to car ownership (Gao et al. 2014).

Car purchases of the future will involve a completely computerised and connected vehicle to a network of other vehicles, driven by electric motors where electricity is provided by alternative, renewable and environmentally friendly sources, such as wind farms, to reduce carbon emissions (Gao et al. 2014).

2.3 Issue: Connected Cars

Modern day vehicles and older vehicles fitted with aftermarket information systems, have established the automobile as a communications device, connecting the car to other cars and networks, and now among the Internet of Things. Transmitting and receiving data, including vehicle speeds, driving habits and safety information, the car is connected by GPS to the car manufacturer or OEM information system via Dedicated Short Range Communication (DSRC) devices (Kar et al. 2017).

Vehicle service information, car accidents, traffic congestion, or alternate travel re-routing due to road closures due to flooding or fire are the major information benefits to the driver in a connected car. However, communication of the connected car via the vehicle's Telematic system, which utilises both mobile phone Voice Over Internet Protocol (VOIP) and satellite navigation Global Position System (GPS) technologies for transmission and reception of

information from the vehicle, is subject to jamming. GPS transmission and reception are at risk to jamming via radio frequency (RF) interference commonly used by commercial drivers to overcome vehicle tracking (Kar et al. 2017).

A security and privacy issue, low-cost jammer identification system was successfully presented to identify use of in-vehicle GPS jamming, and GPS spoofing which is used to transmit inaccurate GPS signals providing false data to GPS receivers. The jammer identification system can be utilised by local law enforcement at a relatively low cost, and can be employed by mobile (in vehicle) or stationary law enforcement units (Kar et al. 2017).

2.4 Issue: Transportation as a Service

Transportation as a Service, (TaaS) also known as Mobility as a Service (MaaS), is a recent user needs based concept combining differing transportation modes, such as a public transport, car sharing, bike sharing, and taxis. All mobility services are available on demand to a consumer, and linked to their

tailored mobility account, similar to a mobile phone contract, and booked via a smart phone application (Jittrapirom et al. 2017).

Piloted within various schemes in several countries such as Finland, Germany, Netherlands, and Switzerland, MaaS utilises Information Communications Technologies (ICTs) as the major function within the concept as a user on demand service, requiring all available modes of transport within the concept and the consumer to be connected. The concept also involves a shift away from individual car ownership, to a consumer access base offers the user a customised mobility solution and the goal of achieving a more economically and environmentally more sustainable transportation choices (Jittrapirom et al. 2017).

Automotive manufacturers will need to adapt from primarily a product delivery service, to also a customer user access service, where their manufactured connected vehicles are available to subcontracted leasing companies of the MaaS concept.

2.5 Issue: Software Engineering

The modern car now consists of ever increasing electronics and computers including software which is embedded in the engine control unit, vehicle safety systems, and its information system to improve the safety of the vehicle and its occupants, and their comfort (Grimm 2003).

The major risks to software dependent systems are malfunctions, where a safety system may deploy airbags due to faulty sensors, or revert from regenerative braking to hydraulic braking, resulting in vehicle software recall (Cable 2003). The software which monitors and controls the deployment of safety systems such as air bags, stability control, engine drop points and anti-brake skidding are primary concerns to the automotive consumer, and should be subject to software design reviews of internal and outsourced products, thoroughly tested from function to performance in real-life scenarios (Cable 2003).

As the car is now a mobile communications device, transmitting and receiving vehicle related information such current position and

vehicle status to service providers or emergency assistance the communications systems, its network, and the delivery of software instructions to the computer, will be subject to interference and disruption from malicious hacking, and hijacking (King 2005).

3.0 Summary & Recommendations

The Information Communications Technology industry will need to remain a primary partner to resolve future challenges within the automotive industry including research, development, deployment and security of environmentally sustainable vehicles.

Future vehicles will need further partnership and assistance from the ICT sector to design lighter and stronger cars, with alternatively fuelled drivetrains, to adapt to stricter global emissions controls.

Expertise will be sought from the software engineering, hardware engineering and I.T. Security fields with the onset of digital disruption, connected cars, transportation as a

service, for development and maintenance of the related software and updates which maintain those systems.

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References

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References

afroautos.com, The Biggest Car Market In The World [image], http://www.afroautos.com/development-industry/car-ownership-in-china-a-blessing-in-disguise-government-responses-to-traffic-jams-smog-and-associated-effects/, Accessed 08 May 2018

Bootstrap, History, *About*, https://v4-alpha.getbootstrap.com/about/history/, Accessed 09 May 2018

Cable, J, 2003, A yellow light for technology behind the wheel: former software executive

worries that the increasing amount of technology embedded into vehicles could lead to more glitches--recalls, *Industry Week, 259(12),* p. 64.

computerworlduk.com, The UK and Ireland isn't ready for digital disruption, Dell EMC report finds [image], https://www.computerworlduk.com/it-business/are-uk-ireland-ready-for-digital-disruption-3667213/, Accessed 08 May 2018

Couchman, C, Fulbrook, A, Fulthorpe, M, Griffiths, N, & Hayfield, A, *Five Critical Challenges Facing the Automotive Industry: A Guide for Strategic Planners*, http://cdn.ihs.com/www/pdf/AUT-TL-WhitePaper-5.pdf [Accessed 01 April 2018]

dreamstime.com, Software Engineering Concept Flowchart, https://www.dreamstime.com/stock-photo-software-engineering-concept-flowchart-hand-drawing-blackboard-image56237350 [image], Accessed 08 May 2018

Gao, P, Hensley, R, & Zielke, A, 2014. A road map to the future for the auto industry. *McKinsey Quarterly*, Issue Oct, pp. 1-11.

gizmochina.com, Samsung Galaxy S9+ SD845 [image], https://www.gizmochina.com/product/samsung-galaxy-s9-sd845/, Accessed 08 May 2018

Grimm, K, 2003, *Software technology in an automotive company: major challenges.*Portland, IEEE.y

insidesmallbusiness.com.au, The tax obligation of uber drivers [image], https://insidesmallbusiness.com.au/planning-management/the-tax-obligations-of-uber-drivers, Accessed 08 May 2018

Jittrapirom, P, Caiati, V, Feneri, A, Ebrahimigharehbaghi, S, Alonso-González, M, and Narayan, J, 2017, Mobility as a service. *Planning,* 2(2), pp. 13-25.

Kar, G, Gruteser, M, Boi, F, Martin, R, Troppe, W, & Zhang, Y, 2017. *Enhancing Vehicle Data Availability and Privacy for Connected Cars*, New Brunswick: ProQuest Dissertations and Theses.

King, J, & Lyytinen, K, 2005, Automotive informatics: Information technology and enterprise transformation in the automobile industry, Dutton, W.H. ed., 2005. *Transforming*

enterprise: The economic and social implications of information technology. mit Press, pp. 283-33.

Lee, J, & Nicholas, B, 2012. Digital innovation and the division of innovative labor: digital controls in the automotive industry, *Organization Sience*, 23(5), pp. 1428-1447.

Melville, N, 2010, *Informatin systems innovation for envionmental sustainability*, Michigan: MIS Quarterly.

viljamisdesign, ResponsiveSlides.js v1.55, http://responsiveslides.com/, Accessed 08 May 2018

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- Discretionary — Local Navigation menu

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