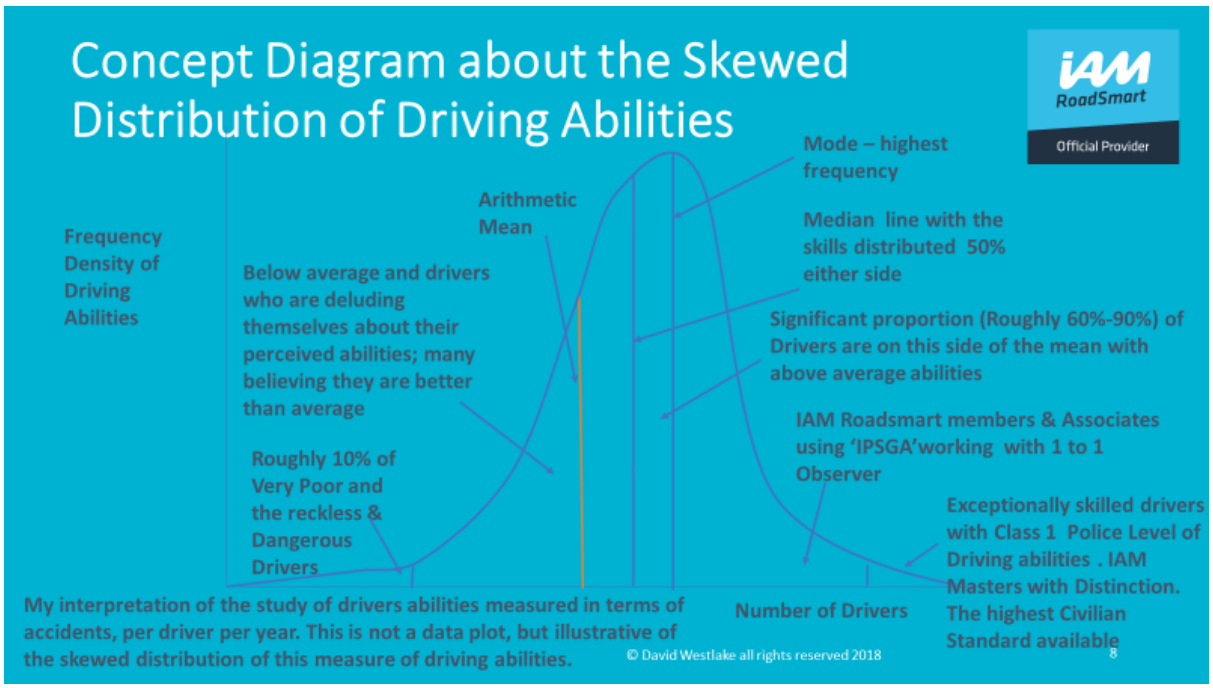
‘Errors in Roadcraft’

This article originated from my talk in November 2018 to the Gloucestershire IAM RoadSmart Group. The audience included our Group President, Management Committee, Regional Examiners, Observers and members from nearby groups. Both our new CEO Mike Quinton and Richard Gladman, Head of Standards accepted our Group Chairman’s invitation to attend. The talk initially identified ‘the good, the bad and the ugly’ about driving abilities. Next it identified the root cause of driving errors and then investigated various Roadcraft techniques. It included visual evidence about what could be achieved. This study uses the trusted method of investigating a hypothesis about the root cause of the problem of inadequate driving skills and then justifying if there is or is not reasonable evidence available that a satisfactory solution is to be found.

Brief overview study of the Frequency Distribution of Driving Skills

The autumn 2018 IAM RoadSmart magazine (page 66) contained a question from Mike Quinton asking Richard Gladman if there was any evidence our IAM RoadSmart Advance Driving Programmes could be shown to have made a positive impact on road safety. Richard’s article advised it’s impossible to say how many accidents had been avoided - and lives saved – thanks to the actions or reactions to advanced drivers and riders. It’s difficult to argue with this view.

However, results interpreted from academic research studies conducted by many others, including work at Brunel University [Stanton et al, 2007] and the Institute of Transport Economics, Norway [Elvik, 2013], provide a plausible answer to this question about the positive impact of advanced driving.



The multifaceted statistics illustrated both the positively skewed distribution of driving abilities when measured in terms of accidents, per driver per year and the positive impact of teaching the IAM RoadSmart's IPSGA method of car control.

In my own interpretation of the evidence, these results all tend to illustrate the important work of organisations like ours, RoSPA, Gov't agencies, road traffic engineers and many Police Roadcraft trained ADI's too. The skewed distribution also tends to indicate the significant proportion of poor and dangerous drivers.

The talk included brief video examples of advanced driving from the training DVD's of my ADI, ex Hendon Class1 Police Driving Instructor and Examiner Chris Gilbert, with his kind permission (www.driving4tomorrow.com). I am indebted to his help, encouragement and support for all the Police Roadcraft Advanced Driving techniques taught to me in our 1 to 1 training sessions.

What is the root cause of 'Errors in Roadcraft'?

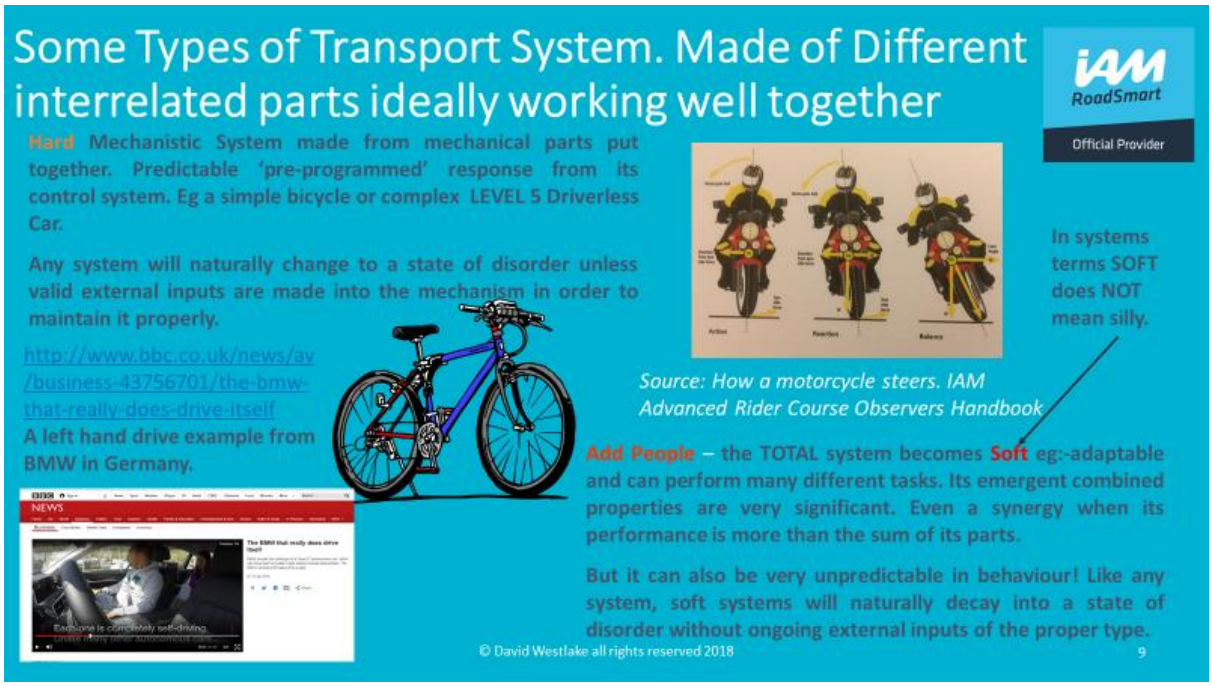
A former Chief Examiner of the I.A.M. described "…driving a vehicle as a problem solving activity, and the four key skills of driving – concentration, observation, anticipation and planning – are intellectual skills that we co-ordinate with our handling skills to deal with the problems that confront us on the road……". (Lunn 1996, IAM Magazine page 25-26). Mistakes occur in this 'problem solving activity' for many reasons but are chiefly due to driver error. Why is this so?

Implications about different types of Systems and The System of Car Control

The Police System of Car Control and IAM RoadSmart's 'IPSGA' both relies on taking, using and giving information. This is dependent upon effective vision scans. Processing the information is the core of the Driving Control Process, itself a very complex subject. By leaving out unnecessary detail, the essential problems can be investigated. This is done by applying an analytical technique engineers use called 'systems theory'.

Systems can be classified into subtypes by applying defined technical terms. For purposes of this study two sub classes are defined. Hard, meaning mechanistic with a preprogrammed response like a pocket calculator, motorcycle, or fully autonomous Level 5 driverless car. For a 'left hand drive' working example of a functional prototype see https://www.bbc.co.uk/news/av/business-43756701/the-bmw-that-really-does-drive-itself and Soft, meaning flexible and adaptable like a human being. Soft does NOT mean silly or stupid. Adding people makes a hard system soft in aggregate. Its combined emergent properties can be very significant, producing a performance synergy greater than the sum of its

parts. Adding people, however, can also make its response unpredictable in behaviour.



Any system, whether with or without humans involved, will naturally go into a state of disorder over time. It's obeying the Laws of Physics. This is the core of the whole problem. The system requires valid inputs to offset this degradation. Both Hard systems (cars) and soft systems (drivers) need regular maintenance.

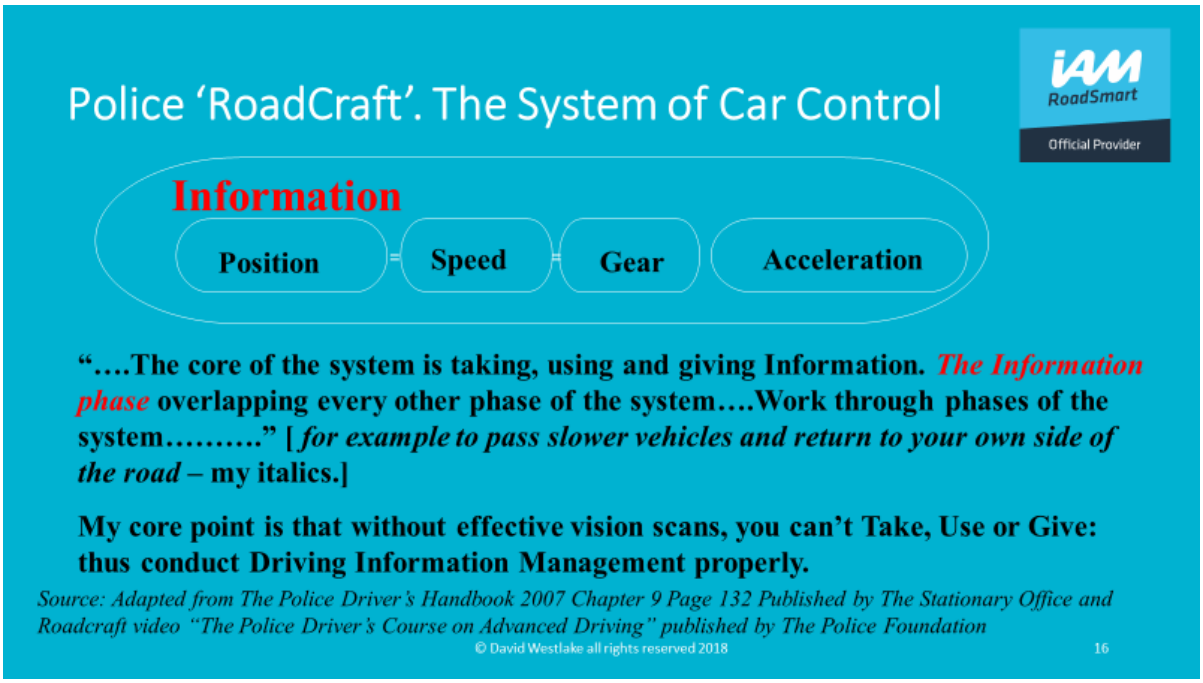
Many drivers can't or don't even want to recognise any natural decline in their skill level including adopting unwittingly many bad driving habits. This natural phenomenon means our driving will degrade unless we undergo effective ongoing training throughout our career in order to maintain adequate performance. This problem can affect drivers of any gender, age and ability.

My argument is the above poor human driving performance issues can be resolved. In explaining my argument, some more Systems Theory and Roadcraft's techniques are both next briefly described. Then Roadcraft's core features and my systems theory findings are merged into one working diagram.

Investigations for my own academic research papers about 'Driving Information Management' strongly supports application of 'the Police System of Car Control'. This belief equally applies to its full equivalent, the IAM RoadSmart's 'IPSGA' method. In colloquial terms they are both two sides of the same coin.

The System of Car Control effectively applies our working memory to best effect, developing full situational awareness. Deploying the system properly processes information rapidly and validly, putting the driver into the correct position, speed and gear at all times.

If vision scans and concentration break down and the Police or IAM RoadSmart System of Car Control is not followed fully, the driving process naturally degrades, becomes unstable and is likely to lead to accidents.



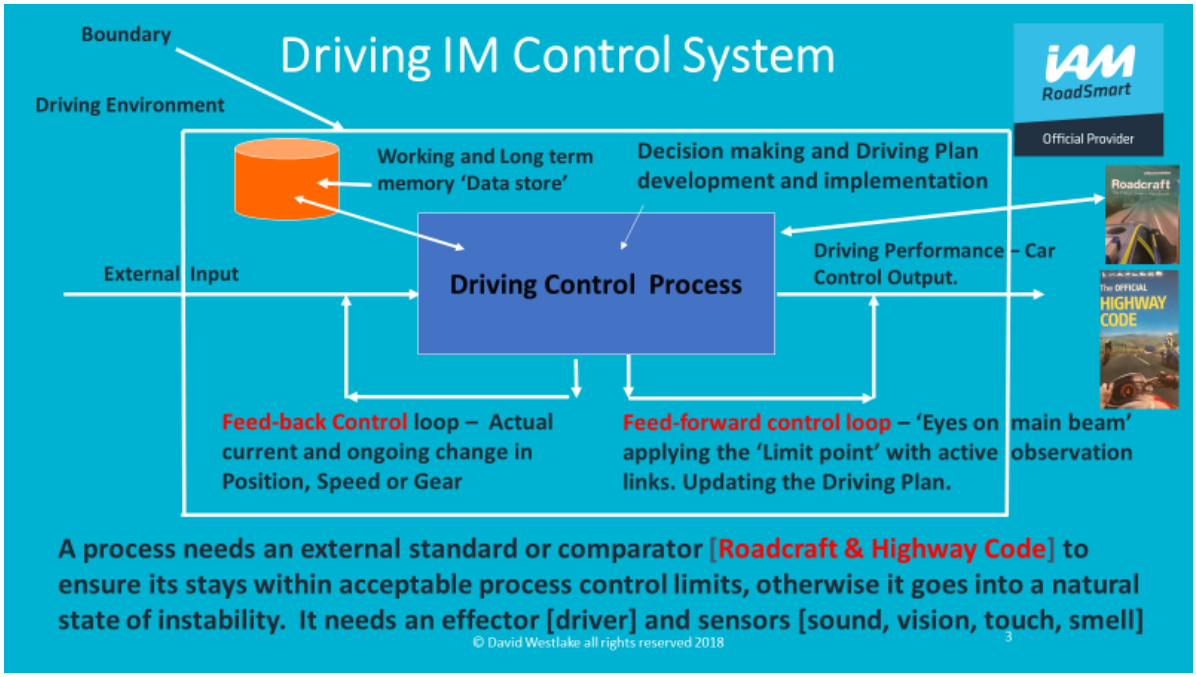
Applying the system well develops, then implements and continually adjusts as required, a safe and effective driving plan (for how etc see below), combining both car control and hazard perception skills, using 'eyes on main beam', the limit point, observation links et al to cornering, overtaking and so on, thus achieving a safe progressive drive in all circumstances.

The context of how, when, where and why this is done needs explaining by applying 'system theory' where the system boundary is drawn to meet our needs. In this case it's the vehicle's bodywork. Outside the system boundary is the complex ever changing 'driving environment'.

There are external inputs and outputs across the system boundary into and out of the Driving Control Process which is executed by the driver, as shown on the diagram below.

Systems have control loops to make them function. The feedback control loop changes the vehicle's current position, speed and gear. The feed forward control loop implementing the driving plan will be particularly prone to making the process unstable unless some external standard is used as a reference comparison. This a very important point about driving skills education.

This external reference standard [Roadcraft and its practical application, Highway Code, IAM Roadsmart Training Handbooks] must be maintained and kept up to date. Roadcraft's text and diagrams are revised and updated about every 5 years by the Police Foundation's Supervisory Board and its Expert Practitioners Group. My ADI Chris Gilbert is a member. Our IAM RoadSmart training handbooks are similarly updated by our Head of Standards.



As a further 'External Standard', a fully adequate 'on-road' presence of Class 1 level Road Traffic Policing is also required. Road traffic police numbers are on the decline. Road Traffic Police 'on-road' presence is an integral part of driver education. The 'halo-effect' on motorists in the proximity of a well driven Police Car illustrates this external standard in operation. Anecdotal evidence from senior members of the Police Service claim 'on road' camera surveillance, 'speed traps', Bus Lane cameras and 'dash-cam' evidence is proving a very poor substitute in this respect.

Conclusions

With ongoing training and maintenance, when applying correctly the techniques shown on the above diagram, a human/vehicle system can produce a performance synergy. The result is greater than the sum of the parts. It's called Advanced Driving. The empirical beneficial evidence proves my hypothesis. QED.

Implications: 1) The need for further work

The evidence suggests that both IAM RoadSmart and the UK Government need to make some changes in their approach to driver education. IAM RoadSmart's marketing focus on appealing to our human vanity about advanced driving skills

needs altering in emphasis. The approach of successive Governments that rely increasingly on speed cameras and radar speed traps as 'punishment', need amending as well. Our driving skills decline is a natural phenomenon. Explaining this does not absolve us from dealing with it. Quite the reverse; it's vital to develop and improve our driving skills. This can be achieved with explanation and encouragement. IAM RoadSmart's marketing-mix needs subtly modifying, to improve its message by explaining the 'necessity' of taking vital care of our loved ones by maintaining and improving our driving skills, to keep us out of trouble.

As a communication tool we need a functional IAM RoadSmart 'App' that can download onto 'smartphones' to attract and interact much more with the younger generation. IAM RoadSmart must lobby Parliament in general and our Government in particular about the vital need for a much more visible and frequent 'on road' presence of Class 1 Road Traffic Police.

Impications:2) There is no 'magic cure' plausibly available from technology

If we don't all maintain and improve our human driving skills, searching for a 'magic cure', society will create further driving problems for itself by prematurely trusting driverless car technology. The recent UK Government announcement permitting more 'live road' Research and Development trials so the UK becomes the world leader in the technology by 2021 is highly questionable on driver safety and accident prevention grounds.

Managing the transition period from semi to fully autonomous cars is difficult with already known issues. Recent research shows a human driver cannot take back control in time when errors occur. It's also likely the predictable 'pre-programmed' response of the driverless vehicle could be abused and exploited by ill-disciplined or poor human drivers.

One suggestion to overcome transition problems is moving very quickly from where we are now, rapidly truncating the remaining intermediate levels, moving straight through to Level 5 fully autonomous cars. The development period from where we are now to the final fully functional autonomous vehicle should not be truncated as there is still a lot of research and development work to do.

There are surely sufficient proving tracks, research proving grounds, Forestry Commission Roads and military terrain training grounds that could be hired or made accessible to ensure proper development for all types of road, weather, terrain and traffic conditions before use on 'live roads'?

The problem is we are only at the functional prototype Level 5 Driverless car stage that is far from proficient in all types of road traffic conditions. Much work is being and still has to be done to make such autonomous vehicle technology reliable. Based on the evidence about its development progress available so far, it will take much longer than many people would like to think, to have a significantly positive impact on the UK's driving standards. This is because even after this development period is over eventually making them acceptably effective in all types of road traffic conditions, maybe even with 'all-weather' 'all-terrain' capability, sufficiently reliable self-autonomous vehicles will be still in the minority on the UK's roads for many years to come.

For a good non-mathematical explanation of the current issues about algorithms employing probabilities, the etthics and the technological limitations that confront driverless vehicle development, see Hanna Fry: 'Hello World', Chapter: 'Cars' p113-140. Pub. Penguin Random House 2018.

The emphasis needs to be on maintaining our human driving standards properly, applying the Information Phase of the "Take, Use, Give" in the system of car control and careful management of the feed-forward system driving plan implementation control loop described above. This is particularly important because it has been found the more 'driver – assist' technologies are installed into cars or commercial aircraft for example, the less skilful the human pilot or driver tends to become as the handling skills atrophy over time through lack of use. Effective ongoing training offsets this decline in skills.

Recommended further Reading

More insight about 'Driving Information Management' issues for both human drivers and autonomous cognitive machine technologies, including investigating the 'moral dilemma' about how difficult it is for the latter to make very difficult choices, is available on our Gloucestershire Group website. Viz:-

See https://www.IAM RoadSmart.com/groups/gam/group-newsletters.

David Westlake.

IAM RoadSmart Master's Driver with Distinction.

MSc, C.Eng.(Retired) M.I.Mech.E; M.I. Engineering & Technology.

Retired lecturer, School of Computing, Edinburgh Napier University,

Vice Chairman, Gloucestershire Group.

IAM Member since 1966.