

# Upwardly mobile

WITH A MODERN GRAPHICAL USER INTERFACE IN THEIR CAB, INDUSTRIAL VEHICLE OPERATORS CAN ENJOY THE SAME EXCITING USER EXPERIENCE AS THEY GET WITH THEIR SMARTPHONES

RIGHT: Display technology and sharp interaction design is a means for vehicle OEMs to improve human-machine interaction and strengthen brand identity

Industrial vehicles have been fitted with in-cab displays for many years. These displays started out as simple, text-based solutions, but have now moved towards full-colour, high-resolution graphical offerings. The automotive business has pushed both display and computing technologies so that users can now enjoy industrial-grade components, proven for heavy-duty use, at the same cost as the simplistic display solutions introduced in the 1990s.

The human-machine interaction in an industrial vehicle cannot be realised solely with a touchscreen display. For work-mode controls, users need panels, armrests with joysticks, switches and keypads to interact efficiently and ergonomically. However, graphical displays that offer sharp designs can add tremendous value when it comes to providing operator feedback, improving usability and managing the vehicle for higher utilisation and up-time.

Cab-space is often a challenge, especially when you consider that you have to include one display for the engine and transmission gauges, one for the hydraulics/pneumatic/electrical controls, one for the rear-view camera, and additional displays and control panels for other subsystems. By using a multifunctional display computer device, interaction with subsystems can be achieved through one single – or at least fewer – devices. Besides the obvious cost savings, this also enables manufacturers to create an integrated, user-friendly interaction system for the whole vehicle.

The use of the right software helps to create functionality and user value. However, when compared with other industries, the industrial vehicle sector is lagging in this area. The upside in this situation is that OEMs have untapped potential for innovation and brand enhancement. With consumers expecting a brand to be all-encompassing, a well-designed graphical user interface (GUI)



should reflect both the brand's visual appearance and the behaviour of the rest of the vehicle. The graphical user interface should act as a means of strengthening the manufacturer's brand, so the underlying platforms therefore need to be well thought through and adaptable.

### Powerful platforms

In terms of cost, the infotainment computing platforms developed for the automotive business are very attractive for industrial vehicle applications. They are also designed for low power. They run either a Linux or Windows operating system – these powerful systems can be combined with independent software tools, such as Qt and .NET.

With these tools, OEMs leverage the advanced technology in mobile phones and

consumer computing products. Solutions for the industrial vehicle market can be built based on the technical development in these other segments, whose use of these tools has resulted in rich user-interface component libraries. With these ready-made components, the industrial vehicle market is able to create high-quality user interaction systems tools that look far superior to what the sector has previously experienced.

For GUI systems, these tools have proven very efficient. A project manager for the design of a forestry machine system explains: "With these tools we were able to satisfy every requirement as set up by the interaction and ergonomics designer – and in shorter time than before!" The tools offer an efficient software environment, saving development costs and enabling short time-to-market.

Safety will become a very hot topic in the years ahead. In parallel to adopting the above technologies for GUI design, CrossControl has prepared the display product platforms so that the operator interaction can have the same safety level as the embedded safety functions.

A common view is that the safety function only needs to cover the sensor-controller-actuator loop. However, this would imply a very limited scope for display applications – for example, not showing any information used by the operator to make critical decisions. When an operator of a machine with a safety-relevant control system acts on information on a computer display, that display also becomes safety-relevant; a failure in the information displayed may lead to a hazardous situation.

With safety-enabled HMI solutions there is also the possibility to perform safety-critical controls from the display device, simplifying the system solution.

### Good opportunities

The increased use of interaction through GUIs and touchscreens introduces both opportunities and challenges. One big advantage lies in how the different controls can be located – you don't have to compromise as to which controls require a primary location, therefore enabling the designer to place all functions in the same, easy-to-reach position. This also means that the GUI is extremely flexible and it can change to adapt to the situation.

The introduction of graphical displays and touchscreens does not eliminate the fact that an operator's focus should remain on his main task. It is important to avoid the distractions that may come from an overload of unnecessary information and tasks. However, if the system is properly designed, the user interface should present only the relevant information in a given situation. This eliminates distraction and lowers the user's cognitive load.

When the graphical user interface reflects the vehicle brand, it integrates better with the rest of the driver's environment – this provides a more seamless blend between the different subsystems. This reduces confusion with regards to how the controls are operated as all vehicles and subsystems of the brand look and behave coherently.

The increased use of touchscreens in more and more products is helping to establish a recognised set of style guides and behavioural rules. With the market's rather conservative view on vehicle interfaces, it is going to be interesting to see the impact of these standards on future vehicle interface design. **IVT**

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ABOVE: CrossControl's range of display computers are designed to facilitate integrated and user-friendly HMI systems with appealing graphical design

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