



Researchers at VTI are studying ways to ensure that driver distraction is not a side effect when phones and tablets become part of vehicle HMIs.

Smartphones and tablets are likely to play a large role in HMIs for heavy vehicles—if productivity and safety are not compromised.

by Terry Costlow

The tablets and smartphones that transformed consumer electronics are now poised to enter heavy-duty vehicle markets. They're already becoming part of the maintenance and diagnostic world, while some developers are exploring ways to integrate them into human-machine interfaces (HMIs) for non-safety activities.

It's almost a given that HMIs for off-highway vehicles and trucks will move closer to the management techniques used in tablets and smartphones. The question will be how to get the most from these systems without reducing productivity and safety. Developers are creating strategies and products that borrow from these devices and include them.

"The smartphone experience, including the adoption of touch-screens and like technologies, is affecting the in-vehicle experience," said Christian Reinhard, head of HMI at **Elektrobit**, a **Continental** subsidiary that supplies HMI development software. "Smartphones and tablets are now being used for service/maintenance/system diagnosis. Phone and media integration is also gaining importance."

Common interface for diverse fleets

The ubiquitous portable devices are already being used to help diagnose problems. In-cab displays provide a wealth of diagnostic information,

but issues typically occur outside the cab. Many suppliers are adding Bluetooth or Wi-Fi capabilities to their systems so they can use tablets and phones wherever the problem is located. For example, **Parker Hannifin** uses a Bluetooth modem to communicate with apps that let technicians at the site contact maintenance facilities if they can't resolve an issue.

"It is essential that a service technician be able to walk up to a machine and easily be able to hook into a diagnostic system and either diagnose issues on the spot, or have the ability to connect remotely to engineers at the OEM to resolve more complex issues," said Kirk Lola, business development manager at Parker Hannifin's Electronic Controls Division.

These handheld devices can provide a common interface for companies that have diverse vehicles in their fleets. Most drivers carry phones, so it's sometimes easier to use phones for vehicle tracking and tasks that can be handled during stops than it is to install systems on a range of vehicles.

"Tablets are increasingly used as platforms and on-board user interfaces for less vehicle-dependent services such as fleet management, which usually have to



Consumer and automotive HMI techniques are rapidly moving into commercial vehicles, according to Elektrobit's Christian Reinhard.

be implemented in fleets with different makes and models," said Johan Engstrom, group leader at the **Virginia Tech Transportation Institute (VTI)**. "Smaller devices such as phones and smart watches are used as a user interface while not driving, e.g., for fleet managers and drivers. This trend exists for both vehicle OEMs and third-parties."

These displays can link on-vehicle screens and handheld displays using a number of mirroring and pairing programs that have been developed for cars. **Apple CarPlay**, **Android Auto**, **MirrorLink** and **SmartDevice Link** let users see the same imagery on portables and vehicle displays. Many OEMs have opted to offer multiple options instead of limiting customers. Though there are many options, fleet managers can leverage the versatility of phones and tablets to create a singular look and feel for equipment made by various manufacturers.

"Mirroring enables there to be one single interface—the user's phone or tablet interface—instead of multiple conflicting versions," said Eric Grange, **C&K's** automotive industry market manager. "This is a great benefit, but the challenge is maintaining compatibility for years with the ever-changing technology standards in our devices—and in the way consumers regularly replace them every year or so."

Pairing a safer option?

While several benefits can be gained by coupling vehicle displays and handhelds, there are also challenges. Perhaps the greatest comes in safety. Vehicle HMIs are designed to let

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HMIs get personal

The migration from operator controls to human-machine interfaces (HMIs) brought many benefits, including a growing ability to individualize parameters to improve efficiency. These capabilities let fleet owners create a corporate look and feel while also letting operators create an environment that's customized for them.

"Customers are asking for the more personalization and customization of HMIs," said Kirk Lola, business development manager at **Parker Hannifin Corp.**'s Electronic Controls Division. "This extends from selecting basic parameters like screen colors and language selection, to advanced features such as which apps to run on the displays."

Often, fleet owners want to create a harmonious look and feel for their vehicles. HMI providers are making it easier to let owners and individuals adjust parameters that foster a sense of ownership and improve efficiency.

"Owners have the possibility to integrate their company logo in the boot process of the HMI device so that it will be shown when the machine is being started," said Marc Weissengruber, product marketing manager at **TTControl**. "The flexibility to change parameters of automated functions is an important feature for modern HMIs."

The ability to alter parameters is expanding. Design teams are letting operators alter more features and functions to suit their tastes and requirements. A few are also trying out voice technology, though many observers don't think voice usage in commercial vehicles will match the popularity seen in passenger cars.

"Sections of the HMI that can be altered are screen/display language, metric vs. imperial units and derived information, brightness of the display, configuration of hard keys/button and personalized menus with frequently used functions," said Christian Reinhard, head of HMI at **Elektrobit**, a **Continental** subsidiary that supplies HMI development software. "The primary approach is shortcuts via hard keys. What's new on the scene are the first adoptions/evaluations of natural-language speech dialog systems (voice recognition) for operating."

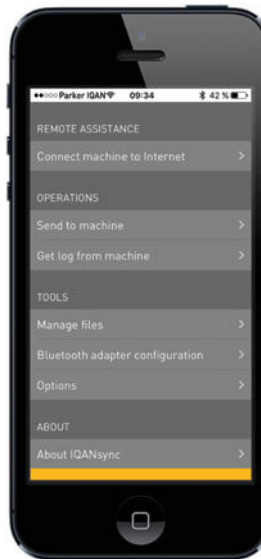
Changing parameters can be a boon for productivity. Operators can adjust operating modes as they go from coarse work to finer finishing modes, for example. They can also make adjustments for personal work styles.

"An example is the reactivity of an implement like a blade to the movement of the joystick by the operator," Weissengruber said. "By changing the relevant parameter the operator can adapt the behavior of the blade to his personal preferences."

As HMIs evolve, adjusting these settings will become even simpler. Before too long, an operator's particular parameters will be set when he or she logs in or even carries a personalized key fob. This approach may become more popular in environments where vehicles are shared.

"When the operator logs into the machine by either a PIN code, or RFID dongle, the machine would automatically recall their predefined settings and parameters," Lola said. "Once the operator logs in, this can define the machine operating state such as advanced or training mode, and also bring up their predefined settings so they can return to the same machine parameters they left on the machine."

Terry Costlow



The iPhone is now an option for performing diagnostics on vehicles that use Parker Hannifin's systems.



Bluetooth is Parker's technology of choice for linking phones and tablets to vehicle networks when troubleshooting is needed.

operators observe information on displays without diverting their attention from the tasks of vehicle control. That's not a consideration for most app developers.

"Currently, our customers are skeptical about mirroring because safety-relevant data is shown and should not be influenced by mirroring smartphone/tablet HMIs," Reinhard said.

The **National Highway Traffic Safety Administration** (NHTSA) is attempting to help HMI developers resolve this problem. In November 2016, NHTSA proposed guidelines for developing a driver mode that's simplified so it's safer to display on vehicle screens. The program aims to reduce distraction without sacrificing the capabilities of phones and tablets.

"It may be more appropriate to talk about pairing, as the information displayed in the vehicle HMI usually does not exactly mirror that of the portable device," Engstrom said. "The HMIs of the portable device and its applications are typically not designed for use while driving. Thus, a key benefit of pairing is



TTControls' displays let users alter colors and even use company logos as start screens.

improved usability while driving and reduced distraction potential. NHTSA recently released their Phase II Driver Distraction Guidelines for portable and aftermarket devices, where their key focus is on promoting pairing.”

Regardless of how these voluntary NHTSA guidelines impact HMIs, there are a number of mandatory requirements that will influence design programs. In commercial trucks, driver monitoring is a key regulation, while insurance requirements for monitoring impact some off-highway fleets. That’s forcing OEMs to devise strategies that give fleet owners the ability to implement programs that give them the best features of installed HMIs and handheld devices.

“Regulations on electronic logging devices and non-handheld device (Bluetooth) usage, which is much more strict for professional drivers than light-vehicle drivers as well as insurance incentives for in-vehicle monitoring systems, lead OEMs to want to provide very specific HMI tools for their customers/drivers,” said Andrew Krum, senior research associate at VTTI. “However, fleets and owner-operators also want the freedom to implement their own in-vehicle technology that is modular and aftermarket. Therefore, OEMs are



Passwords and RFID connections can be used to program Parker’s HMIs with personal data.

focusing their interface development towards tools that support vehicle-centric functions like diagnostics and fuel efficiency. These are functions they know their customers need and functions no one knows better than themselves.” ■

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