6. Personal Safety



Individuals have always turned to the latest technology to ensure their personal safety. In the 1850s, Edwin Holmes invented and installed the first electromechanical alarm system: when a door or window was opened, it released a spring, closing an electrical circuit and sounding the alarm, originally a gong or bell. In 1905, the American Telephone & Telegraph Company bought the Holmes Burglar Alarm business, for the first time linking alarms to emergency call systems that summoned police officers and firefighters to respond to emergencies.

Today burglar alarms in some developed nations are affordable and commonplace. In 2006, for example, 25 percent of homes in

the United States had burglar alarms and 20 percent featured monitored alarms.[1] Takeup of burglar alarms has been slower in Europe, where less than 3 percent of residences have an electronic security system.[2] But information technology (IT) has permitted the introduction of new types of sensors and more opportunities for monitoring, helping make homes more secure than ever.

Moreover, as described below, IT's impact on burglar alarm systems only scratches the surface of how IT contributes to individuals' personal safety. IT contributes to individuals' personal safety by:

- securing homes from crime and other hazards
- reducing auto theft
- protecting individuals in their homes and elsewhere
- avoiding loss
- making vehicles safer
- preventing accidents
- responding to emergencies

Securing Homes from Crime and Other Hazards

Property crime in developed countries is declining, and the use of burglar alarms and other crime-stopping technology is credited, at least in part, with this trend.[3] Although entryways are most often secured by contact alarms that rely on the same basic concept invented in the 19th century of forming circuits to trigger alerts, security companies' toolkits have expanded in recent years to include a variety of new technologies.

Among the security technologies that incorporate IT are motion detectors, which are now often included as a part of standard home security packages, such as ADT's Safewatch QuickConnect System. Motion sensors trigger an alert whenever they detect motion, often used internally as a secondary layer of protection in case someone is able to circumvent door and window alarms. In addition to detecting motion, some sensors can also detect body heat, like the Brink's Dual Technology Motion Detector. Brink's also offers another advanced sensor that can detect the sound of breaking glass, helping overcome a key limitation of most window contact alarms, which go off only when a window is actually opened.

One important impact of IT in the security realm is allowing homeowners and security professionals to easily integrate multiple sensors into a single managed security system. Many modern security systems offer some form of Internet interface that gives homeowners the ability from any computer to turn systems on and off, see the current status of alarms, review through their history, and arrange for custom alerts to be sent via e-mail, short message service (SMS) text message, or automated phone call. Thus, for example, InGrid Home Security offers a system with magnetic contact alarms that install with peel-and-stick simplicity, boast an up to 10-year battery life, and form a unique two-way wireless grid to communicate with each other and notify both homeowner and monitoring center when an entry is breached or a sensor is not working. Many security systems come with remote controls that allow homeowners to arm and disarm alarm systems in the same way as locking and unlocking a car, eliminating the need to dash inside the home and enter a code to activate the alarm.

The challenge with monitored burglar alarms is that between 94 percent to 98 percent of all alarm calls to police are false—and every time police respond to a false alarm, both time and money are wasted.[4] The problem of false alarms is so rampant that it has forced police departments to start charging homeowners a fee for false alarms to offset costs.

IT has permitted the introduction of new types of sensors and more opportunities for monitoring, helping make homes more secure than ever.

Though most consumer camera security systems allow for remote access to video and event-driven notification and recording, a limitation of such systems is that the cameras are rarely monitored 24/7; hence,

houses are left houses unguarded during times when homeowners are unavailable to respond to alerts.

The ability to use video security systems has long been limited by the lack of sufficient connectivity. Whereas basic alarms need only a phone line, video realistically requires broadband—the more, the better in fact, to allow a higher quality of video to be delivered. With the growing availability of high-speed broadband Internet access, monitored video is finally becoming a feasible option. Event-driven remote video monitoring services such as GOSN's SafetyBlanket protect homes by establishing a motion-sensitive zone around the house that when breached turns on lights and triggers an alert sent to the monitoring center. The system operates much like a traditional security service; however, by using remote monitoring, the control center can see what is happening and verify whether or not the alert warrants the response of the authorities, saving everyone the time, expense, and hassle of false alarms.

In the past, security systems relied solely on telephone lines to facilitate monitoring, but today cellular and broadband connections are providing alternatives that help provide reliable, always-on monitoring. High-speed Internet connections also offer the opportunity for home security systems to use video. Although business-class video systems can still be expensive, the falling cost of digital cameras, electronics, and storage makes installing remote video monitoring an affordable possibility. Equipping a house with video can be as basic as a single webcam connected to a computer equipped with low-cost software or as complex as a system with multiple cameras that feed into an onsite dedicated digital video recorder. Video is almost always available to watch live and on-demand over the Internet from any computer or even on a cell phone; and homeowners can use a service to archive video feeds offsite to obtain greater security and scalability for video data storage.

The use of a security camera, in addition to serving as a visible deterrent to intruders, offers homeowners the chance of catching a glimpse of someone breaking into a house, which may be valuable evidence when it comes to identifying and persecuting criminals. Today's digital cameras require minimal effort to install. WiLife, for example, makes a line of digital cameras that automatically create an in-home network over the home's power lines and allow remote monitoring without installing additional wiring. These cameras also can contain a variety of features such as motion detection capabilities and wireless connectivity, and night-vision. Thus, for example, users can equip a WiLife camera with an illuminator kit that emits a light that is invisible to the human eye but can be seen by the camera, allowing the camera to see in the dark at a cost much lower than buying a traditional dedicated night-vision camera. Video security systems can also include innovative features like no-show alerts. These systems allow users to set alerts for times when motion is expected, such as kids arriving home from school. If the system does not detect any motion during that predetermined time period, then it will notify the homeowner.

In addition to detecting intruders, alarm systems can detect other hazards in the home, including fire, leaks, mold, gas, and carbon monoxide. Whereas carbon monoxide alarms help keep people safe in the house, the other alarms and the use of video cameras enable homeowners to keep tabs on their property while away—a capability that can be especially vital to owners of vacation properties because what may start as a small incident, like a burst water pipe, can grow into something significant (e.g., transitioning from water damage to the dreaded mold) if left unaddressed over the many months that these buildings often remain vacant.

Reducing Auto Theft

Often the biggest ticket property crime for individuals involves auto theft. Every year, millions of motor vehicles are stolen worldwide, resulting in billions of dollars in losses.[5] In 2006, in the United States alone, there were 1.2 million motor vehicle thefts. IT-powered solutions, however, are helping to reduce this problem.[6]

Perhaps the most effective car security devices are those that make cars intelligent and start only for their owner, thereby stopping thieves from stealing the vehicle in the first place. Currently, for example, owners can equip their vehicle with aftermarket devices to use biometrics, such as their fingerprint, as the key to unlock their car or start the ignition. More

common are offerings like the Power Lock, which allows a vehicle to start only when the driver has a wireless transponder on their keychain or touches an electronic access key to a reader installed in the dashboard.

Another innovative example comes from Auto-txt, which combines the ability to disable vehicles with another ability—namely, remote monitoring, the second major category of auto theft prevention technologies. To use Auto-txt, an owner installs a device on the vehicle to authenticate the driver through a software application running on any Bluetooth device a driver may have, like a cell phone. If someone tries driving the vehicle without disarming it, an alert will be sent to a response center that will call the vehicle's owner to confirm the vehicle's status and, when necessary, disable the vehicle remotely.

Although the technologies just described can help stop auto theft, systems like those offered by LoJack can help recover stolen vehicles. To use LoJack, a technician installs a small, hidden radio transceiver on the vehicle. If an owner reports a LoJack-protected vehicle as stolen, then when police enter the crime report into the state police crime computer, they will discover the LoJack number. Using this number, the police can remotely activate the unit on the car, thereby leading the authorities to its exact location. In some states, car insurances companies offer discounts of up to 35 percent to cars equipped with such systems.[7]

Protecting Individuals in Their Homes and Elsewhere

The tale of how IT is making people more secure has many more chapters beyond stopping bad guys from stealing things. In fact, many of the same or analogous technologies employed for that purpose can be utilized to monitor other situations where keeping an eye on things remotely can help keep people and places safe.

Home medical alert systems can help protect individuals in the home. Services like ADT's Companion Service provide a base station that doubles as a phone, as well as a wristband, pendant, or stationary personal help button that when pushed sends an alert to a special monitoring center staffed by people who have been trained to deal with senior citizens sensitively. Such services enable individuals in poor health to gain a new level of protection in case they can not get to a phone during a medical emergency. Technologies such as QuietCare's home medical alert system provide additional benefits. Using wireless activity sensors placed throughout a home, this medical alert system can track a home occupant's movements, upload that information over a phone line to a remote computer, identify normal movement patterns, and then send an alert if it detects a significant change in the occupant's behavior. This system helps identify both abrupt and acute changes and long-term and subtle conditions. Targeted primarily for adults with age-related limitations, QuietCare is allowing individuals to live at home on their own longer while also providing peace of mind that they are safe.

IT can also provide a means for protecting individuals receiving care from others, including older adults living in long-term care centers, patients in mental hospitals, and young children in daycare. Even though many institutional facilities offer safe environments, the unfortunate reality is that abuse and neglect is found in some settings. One tool to reduce such incidents is technologies such as Web-enabled cameras, which help individuals keep tabs on loved ones. Families can use password-protected websites not just to check in on their family member's well-being but also to monitor the care the family members is receiving. Remote monitoring is even filling a niche for tech-savvy pet lovers. Some cameras are now being marketed as perfect for watching pets while away from home, helping their owners make sure they are eating and moving around.

Parents also use IT to more easily monitor the safety of their children, including children with disabilities. Child locator devices allow parents to put a small tag on their child (or their child's clothing) to electronically monitor the child's location without having to be physically tethered to them. Such devices can alert parents if their child has left their proximity and help locate a child who is unresponsive to verbal requests. Such devices can also be valuable to guardians and caretakers of individuals with Alzheimer's disease.

IT can also be used by parents and guardians to help monitor the safety of their wards outside the

home. GPS-enabled cell phones, for example, come in a variety of formats, including kid-friendly designs. Using built-in GPS capabilities, parents can access an online interface to locate their kids at any time. Other devices, such as the Wherify GPS Child Locator Watch build on this concept. This child-size watch uses GPS so parents can know where their kids are at all times. Additionally, the parents can set alerts to watch certain areas so that if their kid does not show up at a specified location, such as the field for soccer practice, an alert will be sent. Whether it is someone old, someone young, or something furry, IT is empowering people to monitor the status of those that are important to them and in so doing help ensure their safety.

Avoiding Loss

IT can help reduce the chance of losing things—from mundane items (like a TV remote control) to essential items (like a set of keys) to vitally important items (like a handheld glucose meter) and increase the odds of finding lost items quickly.

Losing something is an information failure. To help make things that have been lost easier to find, a variety of solutions offer the ability to attach radio-frequency-emitting tags that communicate with a handheld device. Using these tags, a lost item can be found quickly either by activating an audio alarm on the thing that is lost or by following visual cues on the handheld device that can point the user in the right direction.

RFID tags can help prevent loss. RFID tags are similar to radio-frequency-emitting tags but do not necessarily continuously emit signals: Passive RFID tags are simple integrated circuits that lie dormant until in the presence of an antenna that reads information; and active RFID tags contain an internal power source that allows them to send out signals to a receiver. A prime example of how the use of RFID can prevent loss can be found in the 2009 Ford F-150, which will feature a system designed to help owners never leave a worksite without all their tools. To accomplish this, truck owners will attach RFID tags to their tools, which are read by the RFID antennas built into the truck, and a real-time inventory can be accessed through a touchscreen display in the dashboard. If the truck senses that all of the tools are not on board, then it will notify the driver.

RFID can be used for everything from keyless locks and safes to garage doors that will only open for authorized cars without the need to push a button.

The future of RFID extends far beyond preventing loss. This technology can be used for everything from keyless locks and safes to garage doors that will only open for authorized cars without the need to push a button. RFID can be used to create computers that turn on only in the presence of the appropriate RFID tag or pet doors that respond to a specific pet collar. The possibilities for using RFID are limitless.

The final point to touch on in the realm of preventing and recovering from loss is the loss of one's self. Getting lost is not only frustrating; it can also be potentially be dangerous, leading people into bad neighborhoods or down unsafe roads. The good news is that IT is helping to solve this problem. From simply having a cell phone on hand to call for directions to having a dedicated GPS unit in the car that can give directions for finding the intended destination, using IT no one ever has to be lost again.

Making Vehicles Safer

IT has its greatest impact on safety when technology gets smart and gains the ability to size up situations and pursue actions on its own in order to save people from harm and prevent accidents without human intervention. Smart technologies can make dangerous situations safer by automatically sensing dangers and taking action to prevent harm. Many of these innovations can be seen in automobiles because vehicles are using IT to become more aware of their

surroundings. Vehicles with collision mitigation can use radar or Wi-Fi and GPS to detect the proximity of other cars and then employ anticipatory braking, either a slight jolt as a warning or the beginnings of a full stop. Volvo's City Safety system even uses a computerized steering-control system so that the car can turn to avoid an accident when braking. Other innovations include vehicles that trigger an alert when they sense another vehicle is in the blind spot when changing lanes and vehicles that sound an alarm when they start to drift out of their lane. Some cars utilize radar to measure the distance between its rear and whatever is behind it. Others now feature cameras that actually show what is behind the vehicle on a screen in the dashboard. So in addition to improving the safety of highway driving, IT can help prevent the often minor, though sometimes serious, accidents from backing up improperly.

Engineers are also making the roads safer by using IT to design vehicles that prevent accidents from reckless driving. A feature known as electronic stability control, for example, manipulates a vehicle's brakes and throttle, and soon steering, in order to keep the vehicle from spinning out on sharp curves or during sudden maneuvers. A feature known as rollover protection uses gyroscopic sensors to gauge when a quick turn threatens to roll over a top-heavy sports utility vehicle, deploying the countermeasures of enhanced traction, stability controls, and pulsing brakes to prevent this from happening.

Even when technologies cannot prevent an accident, some technologies can help keep an eye out for passengers during and after an incident. Smart airbags, for example, know if someone is sitting in the passenger seat and can sense the size of that occupant in order to deploy airbags in the most effective way possible. Some airbags can even gauge the severity of an accident as it is happening and inflate more for worse accidents and less for those that are less severe.

The best thing about the advances of IT in cars is that the majority of the new technologies do what they do without the driver's input. Cars are becoming smart enough to transform awareness into action in an effort to keep passengers safe.

Preventing Accidents

IT is being integrated into every facet of life through smart technologies in an effort to improve personal safety and prevent accidents. Take the SawStop for example. Touted as the "world's safest table saw," it includes an electronic detection system that runs an electrical signal onto the blade. When the blade then hits flesh, the saw registers a drop in that signal and triggers a fast-acting brake that prevents the user from getting cut. Taking something dangerous like a saw and making it smart is now helping save fingers and other appendages from unintended cuts and amputations. There are also ground fault circuit interrupters like the ShockBuster that prevent accidental electrocution. Plug this product into the wall outlet, then plug in whatever electrical appliance is needed. Now, whenever a ground fault is detected, be it from a frayed wire or contact between electronics and water, it will automatically shut off power to the device. Some homes are now being built with these types of outlets right from the start, removing the need to buy additional hardware. Furthermore, the future points to a day where these capabilities are manufactured into every device, thereby dramatically lessening the danger of having things like hair dryers near bathtubs.

As local governments and utility companies amass more GIS data on underground pipes and cabling, workers will be able to use GPS-enabled equipment to avoid potential hazards.

IT is also helping reduce accidents caused from damaging underground hazardous liquid and gas pipelines. The United States has more than 2 million miles of onshore oil and natural gas pipelines, operated by roughly 3,000 companies.[8] Unmapped pipelines can cause significant financial and health risks to construction crews or others who might unknowingly dig into them. Companies like ViaLogy are using remote sensors and geographic informa-

tion system (GIS) analytics to create digital pipeline maps.[9] In addition, the U.S. Department of Transportation produces a searchable online public map of gas transmission pipelines and hazardous liquid trunklines.[10] Because digital images are produced and updated to the maps in real time, these maps are far more accurate and efficient than their paper ancestors. In the near future, as local governments and utility companies amass more GIS data on underground pipes and cabling, workers will be able to use GPS-enabled equipment to avoid potential hazards. Already companies like SmartFleet use GPS technology to help workers in remote oilfields avoid terrain that is unsafe for construction equipment.[11]

IT can even make devices that are known to be dangerous if put into the wrong hands, such as guns, safer through technologies that lock out unauthorized users and help prevent accidents. These include products like the Speed Release Gun Lock, which allows a gun owner to lock down the trigger with a secret code stored in the device. Also available are biometric gun safes that use fingerprints as keys. And in the future, fingerprint and palmprint recognition will be built into the gun itself, helping ensure that it only works for the person or people authorized to use it.

As electronics get smaller, more powerful, and less expensive, IT is going to be more pervasive and embedded in more devices. Many of the new devices will be equipped with sensors to detect dangerous situations and take proactive steps to help keep people safe. Thus, for example, smart pill bottles will remind patients to take their pills with dynamically updated electronic displays. They will register when a patient misses a dosage or is taking too much and wirelessly notify their doctor. They will know when they are running low and automatically order refills with the pharmacy. All with the intent of making sure patients, especially those with chronic conditions that need regular medication, avoid the needless complications associated with irregular dosages. Trials with different versions of the smart pill bottle concept are under way, and concepts that will make use of technologies like e-paper as they mature are being designed.

Food labels will know when items have passed their expiration dates, and smart refrigerators will alert individuals when food has been sitting on the shelf a suspiciously long time. Technologies such as smart milk cartons will know when their contents have soured, and smart cans will sense the presence of unwanted contents like botulism.[12] Already more advanced food labeling is used in Japan, where DoCoMo Sentsu and the Marine Fishery Systems Association worked together to create a 2D barcode system for labeling fish. Using this system, consumers can scan the fish with their cell phones in order to learn where and when a fish was caught and even details such as what fishery or which boat caught the fish.[13]

When shifting circumstances can result in accidents, sensors and alarms can be used to monitor and alert users to dangerous conditions so that they may avoid them. As people continue to rely more heavily on IT, solutions like those described above will introduce new opportunities for IT to be used to help prevent accidents and keep people safe.

Responding to Emergencies

Despite all of the innovations that help keep people safe, there will always be emergencies. Even the smartest cars cannot avoid every accident, and the most secure, well-monitored homes cannot stop everything bad that might happen. Here too the rise of IT is helping individuals get help to resolve emergency situations with as little loss as possible.

Individuals can use in-vehicle IT to get assistance faster during an emergency. Following an accident, networked services such as BMW Assist and GM OnStar enable calls for help to be made from inside the car. They feature GPS capabilities that can guide emergency response teams, which is critical given the ease with which one can get lost while driving. Next-generation versions of this technology promise to deliver additional information automatically, like informing first responders about the nature of the crash, the point of impact, which seats were occupied, and which airbags deployed. This information can then be passed on to emergency rooms so that they can begin preparations to accept injured passengers, ultimately helping improve the medical care received following an accident.[14]

In fact, much of this information is currently available but the problem is getting the relevant

pieces of information automatically to first responders. Currently, 911 responders have to make multiple calls to track down logistical information such as emergency airlift and hospital surgical team availability. Automatically linking the relevant parties in an emergency can significantly cut down on response time and save lives. Furthermore, new systems are being developed that combined multiple sources of information to create an "injury algorithm" that predicts the probability of risk. For example, computers can combine data from a crash showing how fast a car decelerated and whether or not the airbag was deployed with electronic medical data on the victim to forecast the expected severity of injury. This information can then be passed on to emergency rooms so that they can begin preparations to accept injured passengers, ultimately helping improve the medical care received following an accident.[15]

IT is also helping private organizations communicate with their community during an emergency. For example, some universities have implemented IT systems that can notify their entire student and teacher populations via text messages sent to cell phones to stay inside during an emergency situation, such as a school shooting. Though not yet universally deployed, these systems hold great potential for helping keep emergencies contained and not allow them to devolve into chaos.

Even when the use of IT cannot prevent emergencies, it can play a significant role in helping manage an emergency once it is already happened. (For more information, see Chapter 13: Public Safety.)

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To learn more or to download a copy of the complete report, please visit the Information Technology and Innovation Foundation online at www.innovationpolicy.org.

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ITIF is a non-profit, non-partisan public policy think tank committed to articulating and advancing a pro-productivity, pro-innovation and pro-technology public policy agenda internationally, in Washington DC and in the states. Recognizing the vital role of technology in ensuring American prosperity, ITIF focuses on innovation, productivity, and digital economy issues.

Technological innovation, particularly in information technology, is at the heart of America's growing economic prosperity. Crafting effective policies that boost innovation and encourage the widespread "digitization" of the economy is critical to ensuring robust economic growth and a higher standard of living. However, as in any new and changing situation, policymakers have varied awareness of what is needed and what will work. In some cases legislators have responded to new and complex technology policy issues with solutions more suited for the old economy. And as the innovation economy has become increasingly important, opposition to it from special interests has grown. Finally, the excitement that the press, pundits and decision makers showed toward the information technology (IT) revolution in the 1990s has all too often been replaced with an attitude of "IT doesn't matter." It is time to set the record straight—IT is still the key driver of productivity and innovation.

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