

Selling Electronic Tagging To The Healthcare Sector

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Selling Wireless Tagging To The Healthcare Sector

Even though the Internet has had a radical impact on organisations in both the private and public sectors, state owned health providers have been slow to take on board Internet and Web based technology. Now they are desperately trying to catch up – in fact, in the UK, a large part of the NHS's National Programme for IT (NPFIT) is based on Web technology. However, just as health providers are coming to grips with this technology a new generation of Internet solutions is emerging. Today, the World Wide Web is primarily a network of content – in the future it will increasingly become a network of 'things'.

The traditional image of the Internet is of a person using a browser to locate linked pages of information that a publisher, or another individual, has uploaded onto a server. The 'Internet of things' does away with the person at each end of the network connection. Instead, devices publish information that is read by other devices. These devices are typically small radio tags, tag readers and computers. The only time a person needs to interact with this network is when the proximity of a tag to a tag reader, or the actual location of a tagged item, indicates that a pre-defined procedure is not being adhered to.

Given the cost savings and increases in operational efficiency it could yield, selling the Internet of things to the healthcare sector should be relatively straightforward. However, while the healthcare sector found it difficult to resist the advance of the Internet of content, it is better positioned to fend off the invasion of an army of devices that communicate with each other.

In the case of the Internet of content, patients forced the pace of change. They used the Internet to research their illnesses and afflictions and to form 'user groups' for a range of previously undiagnosed or untreatable diseases. This alone radically altered the relationship between doctor and patient. Failure on the part of the healthcare sector to embrace this new technology would have seen a gradual erosion of the status and influence of medical practitioners.

The Internet of things is not a technology the patient can take with them onto a hospital ward. While it would, in many cases, make hospitals safer and more efficient, it would represent, for the clinician and other hospital staff, an unacceptable change in working practices. The challenge for the wireless technology vendor is to overcome resistance to these changes. In this report we describe scenarios where the Internet of things can increase the safety and efficiency of healthcare providers and reduce the cost of treating the patient. We suggest strategies that vendors can adopt to reduce resistance to tagging technology and we profile vendors who have found potential routes into the healthcare market.

At A Glance

Whereas the Internet of content is widely used throughout the healthcare sector, hospitals are being slow to adopt an 'Internet of things' made up of wireless tags and scanners.

There is a widely held belief that healthcare is difficult to automate and that wireless tagging is an unacceptable intrusion into the privacy of both the patient and the clinician.

Vendors must prove to the healthcare sector that, just like workers in the manufacturing and financial services sectors, clinicians carry out a large number of routine tasks that are relatively simple to automate. Also that rather than intrude on their privacy, wireless tagging can alert clinicians to potential errors before they come to the attention of line managers.

In this report we describe scenarios where an Internet of things would increase efficiency, increase safety and reduce costs. We suggest strategies that can be adopted to reduce resistance to tagging technology. We also profile: Zebra, Intel, Ubisense, Ekahau, Plastic Logic and J-Squared.

Introduction – Equivalence

'Healthcare is not like the motor industry – treating people is far more complex than building cars and cannot be automated.' This is the key plank in the defence of clinicians who see further automation of their working practices as a threat rather than an opportunity. In this report we will argue that, while it would be impossible to turn a hospital into something resembling a modern automobile assembly plant, there are key patient-facing processes within a health provider's organisation that could be fully or partially automated. Furthermore these processes have equivalents in industry and commerce that either have been, or are in the process of being, automated.

Within a hospital there are a number of processes carried out by clinicians and support workers that could be fully or partially automated.

When Henry Ford automated the assembly of the automobile his aim was not to build automobiles without the need for any human intervention, but to use existing technology to ensure repetitive tasks were carried out more efficiently and eliminate altogether tasks, such as the movement of materials by hand, that were deemed unnecessary.

The mistake some researchers make when developing technology for the healthcare sector is to take one giant leap and attempt to turn hospitals into the equivalent of a modern automobile assembly hall manned entirely by robots. Networking vendors have even been known to promote their healthcare business units by supporting trials of remote surgery by robots. While these trials grab headlines, the end result is often counterproductive as it merely serves to reinforce the view of clinicians that their jobs, unlike those of workers in the manufacturing or financial services sector, cannot be automated.

A more practical approach is to identify elements of a clinician's job that have equivalents in other industries and determine how these elements could be automated.

Applications

Automating Support Services

Recently two large organisations faced not dissimilar problems. Both McDonald's, the chain of fast food restaurants, and the NHS, the UK's state owned healthcare provider, experienced a fall in the standard of cleanliness. For McDonald's this resulted in adverse publicity and a decline in sales. The NHS also found that its failure to keep its premises clean was attracting adverse comment from the media – especially after a lack of cleanliness was identified as a possible cause of the rise in MRSA, an infection that is proving resistant to most antibiotics.

Large organisations often sustain significant damage to their reputations due to relatively minor errors by members of staff.

The way organisations deal with these problems differs markedly.

Both organisations acted quickly to reassure the public, but they took radically different steps. The NHS reverted to a regime that was in place in hospitals during the middle part of the last century.

The lack of cleanliness of hospital wards has been blamed on a failure to supervise the staff provided by contract cleaning companies. It was decided that, in the future, matrons, who manage wards, would oversee cleaning by contractors just as, in times past, they oversaw the work of hospital auxiliary staff. In an attempt to arrest the spread of infections, matrons will also ensure that nurses wash their hands between attending to patients.

Reinstating working practices that are over two decades old is unlikely to solve problems experienced by a rapidly evolving organisation.

McDonald's have taken a different approach. They are deploying wireless enabled hand held devices that are used by members of restaurant staff who undertake a regular 'walk through' of the restaurant's dining areas, kitchen and rest rooms. If the member of staff continually fails to use the device to scan barcodes located in key areas the device communicates the omissions to a manager located in a central office.

Providing hospital staff with tags would ease the pressure on matrons (or ward managers). Current wireless technology has a resolution high enough (as low as 150 mm) to enable a location system to check that a nurse visited a hand washing station before attending to a patient. The technology could be used to ascertain whether members of the cleaning staff have covered the entire ward, and could be supplemented with a McDonald's style walkthrough monitor.

However, wireless vendors will find it difficult to get health providers to accept wireless technology as a solution to their cleaning problem. McDonald's customers had been put off from eating at the restaurant and its shareholders were unhappy with the resulting fall in profits and sold their stock. The company had to act quickly and put in place procedures that would improve the image of the McDonald's brand quickly but without eroding profit margins.

Customers of the NHS had little choice over where they were treated, and even though, in theory, they were shareholders as well as customers of the healthcare provider they could only exert pressure on the organisation through the government. When that pressure was exerted a relatively well-funded NHS came up with a labour intensive solution rather than solving the problem by using technology.

There is a range of other application areas where wireless tagging could be used to automate support services within a hospital. Medical instruments, and even patients, can be tagged and automatically tracked while in an operating theatre. This would increase the efficiency of operating theatres and enable the speedy location of instruments that have been used on patients subsequently found to be suffering from prion related diseases. Wireless vendor Ekakau has already installed a pilot system in a UK hospital, and the Brady Corporation (www.bradycorp.com) have produced wireless tags that can withstand sterilisation within an autoclave.

Tagging of patients and medical instruments will reduce errors and increase the efficiency of workflow in operating theatres. It will also enable hospitals to trace instruments used on patients with prion related diseases.

Automating Patient Contact

IT vendors have already made significant inroads into the automated drug dispensing market with networked medicine trolleys and dispensing systems that use barcode scanners.

But barcode scanning is likely to be superseded, in some cases before it is deployed, by dispensing systems based on RFID technology. Dispensing drugs is a complex procedure – one that is prone to error. By tagging the patient, the nurse and the drugs it would be possible to eliminate most dispensing errors. It would also be possible to detect departures from established procedures and treatment regimes before a patient comes to harm. These systems could also alert a clinician to a mismatch between the patient's blood group and the blood that is being administered during a transfusion.

Barcode based tracking systems are likely to be overtaken, in some cases before they are deployed, by dispensing systems based on RFID technology.

In the US, health providers have been forced to compensate patients who suffered injury due to wrongly prescribed medicines or because a surgeon operated on them while under the influence of drugs taken from the hospital's pharmacy department. This has encouraged US health providers to invest in automated dispensing systems and tagging technology to monitor the use of medicines throughout the care process. The US Food and Drug Administration (FDA) wants to see RFID labelling used throughout the drug supply chain by 2007. While this initiative is mainly aimed at the retail sector it will also encourage the use of RFID technology within healthcare establishments.

There is an absence of similar drivers in markets outside of the US. However, the increasing automation of hospital information systems (HIS) will drive the demand for dispensing systems that pass information back to inventory control applications and automatically update patient records. Cost control will be a factor here as automation would both speed up, and deskill, the dispensing process.

Beyond dispensing, there are other applications involving patient contact that would benefit from the support of wireless tagging technology. One example is location wireless monitoring and tagging systems that measure post-surgery contact between the nurse and the patient and ensure the patient is given the exercises they need to help them recover.

Automating Care

Wireless tagging and location monitoring have a potential role in community care and are already being used in a number of trial systems to support elderly people in their own homes. These systems help elderly people control devices within their home and provide feedback to domiciliary carers or monitoring centres. The microprocessor manufacturer Intel has carried out research in this field and has one of a number of systems being trialled in the US and Europe.

Tagging systems can help elderly people control devices around the house and provide feedback to remotely located carers.

This market, while technically more challenging, may prove easier to break into than the HIS market. Channels into the care market are not dependent on large healthcare programmes but are dominated by smaller players who sell to community healthcare organisations, charities and to the patient or their relatives. A large number of devices are marketed direct to the consumer through retail outlets or magazines. This market will expand as a growing number of elderly people attempt to postpone their relocation into long-term care and use technology to maintain their independence.

Overcoming Resistance To Change

Invasion Of Privacy

A stated objection to the deployment of wireless tagging on hospital wards is that the technology smacks of 'Big Brother' and intrudes on the privacy of hospital staff. It has even been claimed that patients may object to wearing wireless tags due to the association the technology has with the tagging of criminals.

Vendors should make it clear that the primary aim of tagging or location systems is not to enable managers to spy on staff. As with the McDonald's system the ward tracking system would provide a mechanism for the workers themselves to ensure they are adhering to procedures. If a nurse omitted to visit a hand washing station they would be alerted by the system – only if they ignored the machine generated warning would a manager become aware of the departure from procedure.

Here it is worth looking at an equivalent scenario within the manufacturing sector. An aircraft worth several millions of dollars could fail due to faulty workmanship in a single component worth just a few cents. On top of the loss of the aircraft the manufacturer would: bear the cost of grounding similar aircraft, suffer a barrage of negative publicity and lose potential customers. A small mistake by a single employee could result in a loss of earnings exceeding several billion dollars.

Both McDonald's and the NHS have discovered to their cost how mistakes by one or two members of staff can impact on the whole organisation. The aircraft manufacturer avoids this situation by constantly checking the work of employees. Each individual component carries a record of the employees who worked on it at each stage of manufacture. Far from feeling their privacy has been violated, employees are happy not to bear sole responsibility for the integrity of the aircraft and the reputation of the company. While faulty workmanship will earn a rebuke from a quality controller it will not impact on the final product or the whole organisation.

Within the healthcare sector the running of a modern hospital is as much about managing information as it is about carrying out clinical processes. Today the clinician and their support workers are surrounded by systems that make it increasingly easy to trace a mistake back to a particular process or the actions of an individual employee. When electronic patient records are deployed it will be relatively straightforward for a patient, or their relatives, to pinpoint the processes and individuals that contributed to a negative outcome. Groups of patients will be in a position to share this information and generate the sort of negative publicity that has had such a detrimental impact on McDonald's restaurant business. What is missing from the new information driven healthcare system is a mechanism that alerts the clinician to a mistake, or missed procedure, in real time. Such a system, based on wireless tagging, could be sold to the healthcare worker as tool they could use to protect themselves rather than a device that intrudes on their privacy.

At present, all workers, regardless of their status, carry the full responsibility for the impact of their actions on the whole organisation.

Providing the level of monitoring that workers in other sectors are subjected to would free health workers of some of this responsibility and alert them at an early stage to any errors they may have made.

When electronic patient records are deployed it will be relatively straightforward for a patient, or their relatives, to pinpoint the processes and individuals that contributed to a negative outcome.

A wireless tagging system would provide clinicians with the opportunity to rectify an error before the patient came to harm – or at least to demonstrate that they did everything possible to avoid an adverse outcome

Prohibitive Costs

Using current technology, installing a system that coped with item level tagging of consumables and drugs throughout an entire hospital would prove prohibitively expensive. However, tagging patients, clinicians, support workers and major items of equipment would, depending on the application, prove cost effective. As the consumer market takes on board RFID tagging so the cost of tags and readers will fall. Already Nokia are producing a tag reader that can be attached to a mobile handset.

There is, however, a price below which the passive silicon based tag is unlikely to fall, and vendors may wish to consider alternative solutions, such as plastic based devices, for applications that require the tagging of large numbers of low value items.

Inadequate Infrastructure

Low cost devices and wireless networks may facilitate the tagging of every item, clinician and patient on a hospital ward; however, the problem then arises of what to do with the data the system produces. To some extent there is a chicken and egg situation here. Application developers are unwilling to build clinical workflow support tools that handle data from tags until wireless tagging is deployed. At the same time health providers will not deploy wireless tagging if the data produced cannot be fed into hospital information systems (HIS).

One solution is to build small scale closed loop systems that handle the majority of tagging data internally and only communicate with a HIS application when a critical deviation from standard procedures is detected or when a dispensing system needs to update a patient's records. For example a cleaner's support system or a hand washing monitoring application would initially only alert the operator concerned to a deviation from standard procedures – only if the operator failed to remedy the situation would data be passed to the HIS. This means a wireless technology vendor should be able to build a system that is almost free standing.

A second solution – relevant where wireless tagging is not being used in a totally new scenario – would be to build an RFID tagging system onto existing infrastructure. This should be possible in applications such as automated medicine trolleys where companies have already developed supporting infrastructure for barcode-scanning systems. Olympus Osyris is active in this area (see the Wireless Healthcare report 'Large Vendors in the Niche eHealth Market').

As a third option a wireless vendor may wish to enter into alliance with a company that provides HIS technology and then supply their tagging solution as part of a much larger bundle of applications. This is the approach adopted by Precision Dynamics Corporation (PDC) (www.pdcorp.com), a company that produces automatic wristband identification systems. PDC has joined CIMIT's (Centre for Integration of Medicine and Innovative Technology) (www.cimit.org) industry liaison programme. PDC hopes that integrating its systems with HIS applications supplied by other CIMIT members, such as Radianse and GE Healthcare Technologies, will open up the market for its Smart Band RFID wristband system.

There is a price below which a silicon based tag will not fall – regardless of how many are manufactured. This price may be too high for item level labelling of drugs.

To be truly effective a wireless tagging system must link into a health provider's IT infrastructure and be capable of automatically updating patient records.

At the same time it should not overload the HIS applications with irrelevant data.

Wireless vendors will need the cooperation of companies who are already building HIS infrastructure.

Limits Of Current Technology

The range of the current generation of wireless technology is limited and the power requirements of active tags are high. Some systems will not work in cluttered wards or labyrinthine hospital buildings. However, a number of applications, such as wireless enabled dispensing trolleys, only require passive tags and a small envelope within which to work.

Ultra WideBand (UWB) technology may help overcome related problems associated with wireless tagging systems.

Active tags that use Ultra WideBand (UWB) technology and 'sleep' when the wearer is inactive may extend the range and reduce the power requirements of tagging systems.

Moving Beyond The Barcode

Vendors face difficulty when attempting to market RFID based medicine-dispensing systems as, to date, most healthcare providers have yet to deploy systems based on barcode scanning. Within hospitals, as within any large bureaucratic organisation, managers are reluctant to throw away their investment in a new technology. This investment is not only measured in money but also consists of time spent accumulating knowledge. Barcoding of patients and medicines to support automated dispensing of medicine has spawned numerous committees throughout the healthcare industry. People who have attained key positions on these committees are understandably negative towards RFID tagging.

Managers are reluctant to throw away their investment in a new technology, especially if it has yet to be deployed. This investment is not only measured in money but also consists of time spent accumulating knowledge.

Vendors should introduce RFID to healthcare management slowly and emphasise that barcode identification and RFID tagging, in the context of dispensing, are much the same thing. Objections that are relevant to both barcode identification and RFID tagging, such as the difficulty in handling half-used blister packs and pill bottles, should be answered in the context of RFID alone. It should be pointed out that a wireless network would support preloaded, automated pill dispensers similar to those used by elderly people.

Job Losses

Automation by its very nature usually leads to job losses and deskilling of those jobs that remain. Although it seldom appears in the list of objections to new technology, clinicians are concerned that automation will have the same impact on the health sector as it had on manufacturing and financial services.

Clinicians and hospital workers are concerned that automation will have the same impact on the health sector as it had on manufacturing and financial services.

At present, governments are still solving health sector related problems by increasing year on year funding at a rate that, in a majority of cases, exceeds growth in GDP. This is not sustainable in the long term and, at some point (2008 in the case of the UK), funding will once again become an issue for most major health providers.

Using tagging technology to increase the efficiency of workflow and logistics within a hospital would mean fewer support workers were needed to carry out basic tasks. If equipment and consumables were always to hand, fewer staff would be needed to search for them, and the passage of the patient through the care process would be more efficient. If systems such as the one developed by Ekahau prove successful in increasing the efficiency of operating theatres then clinicians should be able to deal with more patients in a given period.

Prior to the NHS National Programme for IT (NPfIT) the UK government allocated additional funding to reduce hospital waiting lists. A significant amount of this funding was used to increase staffing levels. Today, like many other state run health providers, the NHS is labour intensive, and automating even the most basic tasks would result in large job losses. The healthcare sector, by failing to keep pace with the levels of automation taken on board by the manufacturing and financial services sectors, now faces the pain of taking on four decades of restructuring in five years. The roll out of the NPfIT will eliminate a large number of back office jobs. Further job losses resulting from the automation of hospital wards may prove politically unacceptable.

The state run health sector is labour intensive, and automating even the most basic tasks will result in large job losses.

Unlike manufacturers or financial institutions, the traditional state run health provider operates in a protected market. While low cost travel has enabled some patients to seek treatment abroad, most people find travel at a time of illness is impractical. However, the structure of the modern health service is evolving and an increasing number of services are being purchased from the private sector. Initially only support services, such as cleaning and catering, were purchased from private operators. Today, however, some healthcare trusts buy in clinical services from companies who run private hospitals or provide mobile operating theatres. This is putting clinicians in the same position as support workers. The growth in numbers both of elderly people needing treatment and of young people with lifestyle related diseases means clinicians will always find employment. However, many will find that, in an automated healthcare facility, they are expected to carry out more clinical processes in a day than they are used to.

In the short term, private healthcare companies who provide support and clinical services may show more enthusiasm for wireless tagging systems than the state run operator. In the longer term, however, staff with the state sector may also come to see automation as a means to protect their livelihoods in a more competitive environment.

Routes To The Market

The Indirect Approach

The medical profession could not ignore the Internet of content as patients arrived in consulting rooms clutching print outs of web pages. While the same mechanism is unlikely to drive the adoption of RFID tagging of medicine bottles, or the tagging of clinicians and hospital support staff, vendors should make it clear to the public and government health departments that wireless tagging systems will make a patient's stay in hospital safer and more pleasant. Vendors should also highlight the cost savings a wireless enabled location and walkthrough system would yield. They should highlight the money and disruption that will be saved if MRSA is brought under control.

Vendors should highlight the cost savings a wireless enabled location and walkthrough system would yield. They should highlight the money and disruption that will be saved if MRSA is brought under control.

Vendors should target the organisations that provide support and clinical services to hospitals on the assumption that they may wish to provide a low cost monitoring system as part of their service offering. These companies, unlike the state run health provider, operate in a competitive environment similar to the one that encouraged manufacturing and financial services companies to automate.

Trials And Research

Rather than attack the market head-on, vendors may wish to position their products as aids to operational research rather than operational tools. For example, a research group could use an offline tagging system to develop more efficient working practices and to highlight activities that expose patients to risk, such as omitting to wash hands or falsely dispensing medicines. Such a system would enable the health provider to gain experience with the technology and feel they own, or have some control over, the process logic built into the applications that drive the systems.

A research group could use an offline tagging system to develop more efficient working practices and to highlight activities that expose patients to risk.

Working with tagging technology offline might overcome the aversion clinicians have to automation and the fear that wireless tagging will be used to invade the privacy of health workers.

Finding Partners

To date, the wireless vendors who have been most successful in deploying wireless tagging systems worked with partner organisations that were already well established in the healthcare sector. These partners provided either middleware that supported wireless devices, or application software that provided the business logic and linked wireless devices to the healthcare provider's HIS infrastructure.

Partners can provide the middleware that supports wireless devices, and application software links wireless tagging systems to the healthcare provider's HIS infrastructure.

In the community care market, organisations such as Tunstall provide turnkey systems built out of components from wireless vendors. Such organisations play a role similar to that of specialist integrators in other sectors of the IT industry.

Outside Of The Box

There is a shift in thinking on healthcare towards a regime that places greater emphasis on preventative care and attempts to reduce the amount of care people need later in life. This shift has recently been illustrated by the UK government's white paper on public health. There is a role here for tagging technology: especially in the identification, at the point of sale, of foods that suit the individual's dietary requirements. Tagging systems designed for the retail sector could be used to provide shoppers with a range of healthcare related information. For some vendors this could provide an ideal route into the wireless healthcare market.

Tagging technology could provide information, at the point of sale, on foods and their compatibility with the shopper's dietary requirement. This application could provide the wireless technology vendor with a route into the healthcare market.

Conclusions

The argument that healthcare cannot be automated is weak, as the treatment of a patient is supported by a large number of repetitive tasks and well-defined processes. Private companies within the service and manufacturing sectors have already automated equivalent tasks and processes. Wireless vendors active in the healthcare sector should promote the 'equivalence' of the processes they are attempting to automate.

Many of the stated arguments against the use of automated processes within the healthcare sector arise from the fear that, when the government cuts public spending, these processes will be used to deskill jobs and reduce manning levels. Wireless vendors should target organisations that provide support services for the healthcare sector, as they will be more likely to automate clinical and support processes.

Radio tagging systems could improve the management of a healthcare establishment without the need for an increase in manpower. However, this technology has acquired the 'Big Brother' label. Vendors should promote the benefits of tagging technology for the clinician. Patient tagging systems that reduce the risk of a medicine or treatment being wrongly administered would provide a clinician with a degree of protection – making the user aware of a potential mistake without alerting a line manager.

Ultra WideBand (UWB) based tagging and location systems could provide comprehensive coverage of healthcare establishments without the need for high-powered transmitters. Systems also exist that extend battery life by putting tags into a sleep mode when the wearer is inactive.

RFID made from low cost materials, such as plastic, will enable individual packs of tablets to be tagged. Even so, vendors will need to work hard to convince the healthcare sector that dispensing medicines can be automated. They will also need to solve the problem of how to monitor partially used blister packs.

Users within the healthcare sector have invested substantial time and effort in barcode based identification systems – many of which have yet to be deployed. They may, therefore, be reluctant to return to the bottom of the learning curve with RFID technology. Where possible, vendors should merge their barcode and RFID solutions and present the healthcare sector with a seamless transition from one technology to another.

A number of vendors are developing wireless tagging and location technology that could be used to support elderly people who wish to postpone a move into residential care. There exist a number of established routes into the market for this type of technology.

Private companies within the service and manufacturing sectors have already automated equivalent tasks and processes to those carried out manually by workers in the healthcare sector.

Wireless vendors should target organisations that provide support services for the healthcare sector, as these will be more likely to automate clinical and support processes.

Patient tagging systems that reduce the risk of a medicine or treatment being wrongly administered will provide the clinician with a degree of protection.

Technology exists that extends battery life and reduces the power requirements of tagging systems.

Vendors may need to reduce the cost of tags to the point where each pill within a blister pack can be identified.

Vendors should merge their barcode and RFID solutions and present the healthcare sector with a seamless transition from one technology to another.

There is a growing market for technology that enables elderly people to remain in their own homes as long as possible.

Vendor Profiles And Analysis

Ekahau



Ekahau At A Glance

Ekahau is a Wi-Fi networking specialist that has developed a location based application for use in the healthcare sector. The company's products have been used in a trial at Birmingham Heartlands and Solihull NHS Trust where the locations of patients, clinicians and key equipment in an operating room are monitored.

www.ekahau.com

Ekahau targets hospitals with a wireless real-time tracking solution that the company claims synchronises workflows, reduces equipment inventories, and increases patient throughput. Ekahau also claims that its Wi-Fi based tagging system improves quality of care, staff satisfaction and safety. Birmingham Heartlands and Solihull NHS Trust have installed a system based on Ekahau's Positioning Engine software and T101 Wi-Fi tags. The system is being used as part of a trial to assess the feasibility of using patient tracking in operating theatres. To build this system Ekahau teamed up with Daconi Wireless, who supplied the Wi-Fi middleware, and Intelligent Medical Microsystems, who provided the application software.

Ekahau claim that a medium-sized hospital could see the tracking system pay for itself within four to five months. According to the company, savings come from more effective staff utilisation, decreased equipment inventories, and a reduced requirement for equipment roundups. Ekahau also point to what are, for state owned health providers, non-financial benefits such as more effective patient handling and shortened hospital waiting lists.



Ekahau wireless tags.

Analysis

Ekahau have managed to find a route into the NHS, albeit on a trial basis, at a time when the health provider is concentrating on the deployment of key applications such as ebooking and electronic patient records. If the trial is successful, and Birmingham Heartlands and Solihull NHS Trust can demonstrate that the equipment has increased the efficiency and safety of its operating theatre, Ekahau and its partners will face a new challenge. The consortium will need to sell the system to the Local Service Providers (LSPs), who are responsible for implementing the National Health Service's IT infrastructure. This may prove difficult in the short term while LSPs are fully employed implementing existing applications. However, if the trial system is successful, the management of the NHS's National Programme for IT (NPFIT) may wish to include the technology in one of the additional bundles of applications it is planning to add to the programme.

Intel's PROACT



Like Microsoft, Intel is constantly looking for applications for its technology outside of the PC industry. In part, this is the thinking behind the development, by Intel Research of Seattle, of the Probabilistic Activity Toolkit (PROACT). The toolkit provides a human computer interface, built onto an RFID platform, that enables people to interact with an 'Internet of things'. In this case the things are devices – everything from TVs and HiFis to cookers and kettles. PROACT is supported by an RFID scanning device built into a glove. The scanner interacts with tags on items and devices in the user's home and, via software running on a wearable computer, controls these appliances or warns the wearer if an item they are about to pick up is hot. One of the applications Intel has identified for this technology is supporting elderly people who wish to remain in their own homes rather than move into long-term care.

PROACT At A Glance

Intel is a major semiconductor manufacturer that designs and build microcomputers for PCs. The company is carrying out research into an RFID based system that enables a person to interact with tag items in their home via an advanced human computer interface supported by an RFID scanning system built into a glove.

www.intel.com



The PROACT data glove.

Analysis

PROACT is an interesting piece of research that is, in its present form, a long way from full commercial deployment. The glove itself is bulky and is unlikely to aid an elderly person who is suffering from a loss of manual dexterity. However, simpler versions of this technology have already been deployed in sheltered accommodation for the elderly in the UK. In its present form, PROACT may find an application within research programmes that assess the impact of a range of diseases on a person's ability to carry out everyday tasks. Obviously Intel regard PROACT as something more than a tool to help the elderly and the disabled and would like to see the technology used as an interface for a wide range of devices used in the home. If it does gain widespread acceptance, economies of scale should lower the cost of hardware and provide the care industry with a low cost aid for the elderly.

Ubisense



Ubisense At A Glance

Ubisense have developed an Ultra-WideBand (UWB) tagging system that can be used to track people and objects within hospitals. The technology is being used in trials, and licences for radio frequency spectrum allocation have been applied for.

www.ubisense.net

Ubisense’s wireless tracking system is based on a network of sensors that can be installed and connected into a building’s existing network. The sensors use Ultra WideBand (UWB) radio technology to detect and react to ‘Ubitags’. Power consumption is kept to a minimum by decreasing the updates from the tag during periods of inactivity. The battery life for the tag – which is the size of a credit card – is between one and five years, depending on how active the wearer is within the environment being monitored. Ubisense claim the system provides a resolution of 15 cm with a reliability level of 95%.

The sensors send the Ubitag location information to the Ubisense software platform, which creates a detailed, real-time view of the environment. The data captured from tags can be used by a range of software programs to monitor and log the activity of the wearer. In a healthcare scenario the system could be used to check a clinician’s proximity to a patient during dispensation of medicine, the coverage of a hospital ward by cleaning staff or whether a nurse has used a hand washing station between interactions with different patients.



Ubitags

Analysis

Ubisense have two key advantages over other companies in the wireless tag tracking and location market. First, their tags require relatively little power and, second, the system provides comprehensive coverage at a high resolution. Trials currently underway should confirm whether the Ubitag system meets the stated performance levels in a working environment. Once the company has been awarded a radio frequency licence it then faces the challenge of getting healthcare workers to wear tags. This may prove relatively easy for trials or operational research but less straightforward if the plan is to use tagging to continually monitor working practices.

Zebra



Zebra is using its relatively strong presence in the barcode scanning market to develop new and innovative applications for RFID tagging. The company has recently gained FDA approval for its SurgiChip RFID 'smart' label that travels with the patient into the operating theatre to help prevent errors occurring during surgery.

The SurgiChip can be programmed for use in a range of surgical procedures. During the pre-admissions process, the patient's identification, surgical site and surgical information are encoded and printed onto a SurgiChip smart label. Once programmed and printed, the RFID chip in the smart label is scanned with a desktop RFID reader and the patient confirms the information prior to its being placed in their file. On the day of surgery, the SurgiChip is scanned again and the information is approved by the patient prior to sedation. The SurgiChip is then applied to the part of the body where the incision is to be made. Zebra claim that the patient's participation will help to ensure that errors will be avoided.

Once the patient is in the operating theatre, the surgical team scans the SurgiChip again to ensure the smart label matches the patient's chart and ID wristband. Only then does the surgical procedure commence.



Patient tagging.

Zebra At A Glance

Zebra is a barcode identification vendor that is attempting to migrate its users within the healthcare sector to RFID based solutions. It has recently received FDA approval for a tagging solution that can be used to provide medical staff with patient data prior to, and during, surgical procedures.

www.zebra.com

Analysis

The SurgiChip should help Zebra differentiate itself from other vendors who are adding RFID tagging to their barcode based healthcare solutions. In the US it is relatively easy to determine the number of people who die or are injured as the result of misprescribed medicines or other administrative errors. In the UK and Europe detailed figures are less readily available. This may change as health providers upgrade their IT infrastructure with technology that detects medical errors at an early stage.

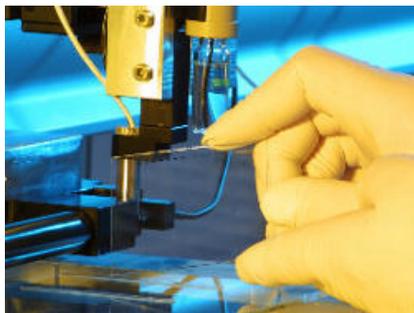
In the US the market for Zebra's healthcare related technology is likely to be driven by the health provider's fear of being sued by patients. However, in Europe litigation is less of a problem and Zebra may have to sell their technology on the basis that it improves workflow and deskills a range of tasks presently carried out manually on hospital wards and in operating theatres.

Plastic Logic



Plastic Logic is a spin out from Cambridge University's Cavendish Laboratory and is currently refining technology, developed jointly with Dow Chemicals and Seiko-Epson, that enables logic circuits to be printed on substrates other than silicon.

The company does not intend to build the devices itself but is assembling an inventory of intellectual property rights that it can license to manufacturers. Plastic Logic claims that its technology already supports simple document identification applications and that eventually it will be possible to print devices onto rolls of materials – for example labels for medicine bottles and covers for drug blister packs.



Logic printed onto a range of substrates other than silicon.

Plastic Logic At A Glance

Plastic Logic has refined technology originally developed by Cambridge University, Dow Chemicals and Seiko-Epson that enables semiconductor logic to be printed on a wide range of materials, including plastic. Theoretically this technology could provide a low cost alternative to silicon based RFID tags.

www.plasticlogic.com

Analysis

Plastic Logic markets its new microprocessor concept as 'disruptive technology' – which means the company will have to overcome the scepticism of potential users and fight off competition from vendors whose market is being disrupted. However, there should be no shortage of customers – tag manufacturers rather than end users – who are willing to experiment with the technology.

There is a lower limit to the cost of a silicon based RFID tag. However, a tag that could, in theory, be printed onto plastic that could then be used as a label for a medicine bottle or a seal for a blister pack would not cost a great deal more than a conventional label. This will be an important selling point within the healthcare sector where governments are trying to drive down the cost of drugs.

RFID tagging is just one of a number of applications Plastic Logic has identified to date, and there is a limit to the amount of time and effort it can devote to promoting this particular vertical market for its technology. What is needed is a third party that is able to demonstrate that Plastic Logic's technology can be used in applications beyond printed ID tags on documents. If it is robust enough for the packaging industry then low cost tags for medicine bottles may erode health providers' resistance to the idea of using RFID as a platform for automated dispensing trolleys.

J-Squared

J-Squared has developed GPS based technology that uses a network of repeaters to increase the accuracy with which people and objects can be located within buildings.

The company also designed APL (Automatic Person Location) systems that are based on modified speaker microphones – the type used in police radios – fitted with GPS devices. This system worked well in the open within rural and semi-urban areas, but the accuracy degraded and on occasions the fix was lost in dense 'urban canyons' and within buildings.

To overcome the problem, J-Squared developed the GIPS (Global Indoor Positioning System) system. This recreates a constellation of satellites within a building, seamlessly handing over to the satellites seen outside the building. The company claims the accuracy of the GIPS system is better than that of standard high sensitivity systems. The GIPS system also works in screened buildings and tunnels where normal GPS signals are absent.

J-Squared's APL system has also been fitted with switch inputs, one of which is a tilt switch to send telemetry to the dispatcher whenever the microphone stops moving in a horizontal position for a programmable length of time. If the wearer lies down and is motionless, a 'man down' sensor triggers an alarm message that relays the wearer's position to a control centre.

The company has applied for a patent for its GIPS system.



Automatic person location embedded in a radio.

J-Squared At A Glance

J-Squared is a small company (four employees) that uses GPS technology to enhance existing wireless applications.

The company has patented 'man down' detection technology that could also be used to monitor elderly people in their own homes.

www.jsquared.co.uk

Analysis

The key selling point of J-Squared's technology is that it operates inside buildings. This feature makes the company's automated person location system particularly suitable for tracking medical staff within hospitals. The 'man down' technology could be adapted to monitor elderly people in their own homes. J-Squared will need help from development partners if it is to break into these markets. The patenting of the technology that supports its Global Indoor Positioning System will strengthen the company's hand when negotiating with potential partners.

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