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WIRELESS COMMUNICATIONS FOR BUSINESS

# Doing the shopping

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KENWOOD  
Listen to the Future



# Doing the shopping

Richard Lambley joins the crowds at a large shopping mall in Norwich, where a recent upgrade to digital communications has brought improved radio coverage throughout the site and access to a wealth of new functionality

In Norwich's Chapelfield shopping centre, the January sales are in full swing. With 17 cafés and restaurants and 80 shops, including a department store on three levels, Chapelfield is one of the East of England's busiest indoor shopping malls, located in one of Britain's most competitive retail environments. A short walk away is another major shopping centre, Castle Mall, as is the city's marketplace, with the largest six-days-a-week open-air market in England.

Helping to keep trade running smoothly at Chapelfield is a new on-site two-way radiocommunications system for the centre's staff, one of the first digital systems of its kind. With a base station and 50 handportable radios supplied on a long-term contract by Hire Radio, the system has recently replaced analogue radios supplied by another company at the time of the centre's opening in 2005.

Phil Blenkhorn, of Hire Radio, tells me about the location and its radio requirements as he walks me there through the marketplace and

*Above: the Chapelfield shopping centre hosts a large department store, 80 shops and more than two dozen eating places*

the picturesque lanes surrounding it. Chapelfield, he says, is built on the site of a chocolate factory (once owned by the local firm Caley's – later absorbed into Rowntree and then Nestlé) and its geography presents some challenging problems of radio coverage. "You've actually got five levels", he explains. "There's two-and-a-half retailing levels. The top one is food retailing, a food court. And there are two main retailing levels and two layers of car parking underneath that. It's in an L shape, which is another complication. Some of it is outdoors as well."

This layout caused trouble for the designers of the earlier radio system, which achieved no better than 75 per cent coverage of the floor-space, despite the use of a complex, three-way antenna network.

The job of the radio system, Phil emphasizes, is to assure the safe and efficient operation of the shopping centre itself. It provides communications for the management company's staff, plus separate channels for use by the county fire service in event of any incident within the centre. It is not a 'shopwatch' scheme for relaying crime alerts – although Phil points out that Chapelfield's retailers can subscribe to a city-

wide shopwatch scheme operated in Norwich by another arm of his business, ShopSafe. That system, linking retailers with CCTV control rooms and local police, also serves Castle Mall and the city's main shopping streets, from a site at the city's Debenhams department store.

## Needs of the business

"It's important to have a radio system that *functions* here, because it's a communications tool", says Davina Tanner, Chapelfield's general manager, in the centre's management suite. "It's not just for the security team, it's for the customer service and a cleaning team. As a team, we communicate on the needs of the business, so it's hugely important.

"From the health and safety point of view, if you've got a cleaner and they trip over or fall over or are taken ill, the fact that they've got that communication tool to get back to the control room is hugely important. So for the team to work together as a team, to communicate is probably the most important thing that we do within the centre."

Unlike the earlier Castle Mall development, which was fitted with a 'leaky feeder' indoor radio distribution network, Chapelfield was initially



served by antennas mounted around the roof of the building, pointing in from outside. Hire Radio's new digital system still uses antenna distribution, but in a simpler form. Phil Blenkhorn pins the blame for the disappointing performance of the original installation on its sheer complexity. "They put in this very complex antenna system and then patched three or four channels into it", he says. "It had three antennas all around, in theory working into the building from three areas."

Besides the centre's private channels, the system also has to carry two fire service channels – one for general communication, the other for use with breathing apparatus – so that if an incident occurs, firecrew can move in and immediately communicate. These are common fire channels, available also via dedicated base stations at other important locations, including Castle Mall and Norwich Airport.

"Altogether they've got three channels in Chapelfield and two fire channels", Phil continues. "Now if you imagine, having put this very expensive antenna system in, you then have to patch all those five channels on to that very expensive antenna system. Not only have you got a relatively inefficient antenna system with all sorts of null points, potentially, you've then got a relatively poorly engineered (as it turned out) combining system and amplifiers. If you put these three antennas around, with all the combining that is going on, you've potentially got *lots* of null points."

Because of signal phasing and cancellation between the antennas, he says, radio users could find themselves in full view of an antenna and yet their radio would fail to work. "They could go to their information desk and get no communication at all", he says. "But they could walk ten yards away and it *would* work."

## Disappearing into a wet slab

Also contributing to the poor radio penetration, in Phil's opinion, was the placement of the original antennas. "They put antennas on top of huge concrete slabs", he says. "If you put a downtilt antenna, it has got to see somewhere to go. If you are going to give it a nice wet, concrete slab, it is just going to hit the concrete slab and disappear."

So when Davina Tanner took up her post as manager last year, her priorities for the system were twofold: to overcome these coverage problems and also to cut costs. For although the original system was hired, she considered the charges quite high. "When this started, we were in the height of recession and all retailers and all site owners and managers generally were being asked to trim 10 or 20 per cent off their budgets", Phil Blenkhorn recalls. "So we approached it from a view which said, let's start with a completely clean sheet; what can

*Opened in 2005 on a site once occupied by a chocolate factory, Chapelfield is one of Norwich's main shopping destinations*

we achieve? It was really a case of surveying the building to see how close we could get with a simple antenna system. OK, it's still downtilt, but how can we get it in the right location?

"So we surveyed the whole building and found the optimum location for the antenna. Percentages are always difficult, but my perception is that we went from something like, on a good day, 75 per cent coverage to probably 95 per cent coverage, just by engineering the antenna solution – just from propagation from a single site."

This single site was found in the crook of the L-shaped building, from where Hire Radio's antennas can see both ways along the mall. Mounted on masts above the atrium roof, they look through the skylights and from there the signals tunnel down to both sales floors via the wells which connect them. "The sales floors are open", Phil continues. "The biggest problem you've got is hitting the car parking floors underneath. But if you can choose areas where there are already wells going through to the car parks, then UHF is pretty good at finding its way down. So just by a good choice of location, we, I think, we certainly got up to a good 95 per cent."

## Getting into a bad area

The radios supplied by Hire Radio are Kenwood Nexedge handportables. These have the advantage that they can communicate in either digital or analogue mode, which allows easy and flexible upgrading for radio users who have existing analogue systems. But although the plan was to operate them in digital mode, the team tested radio coverage in analogue too, with the fire service in mind.

"Obviously, if there is a fire here and the fire service come in and their lads can't communicate, then we have

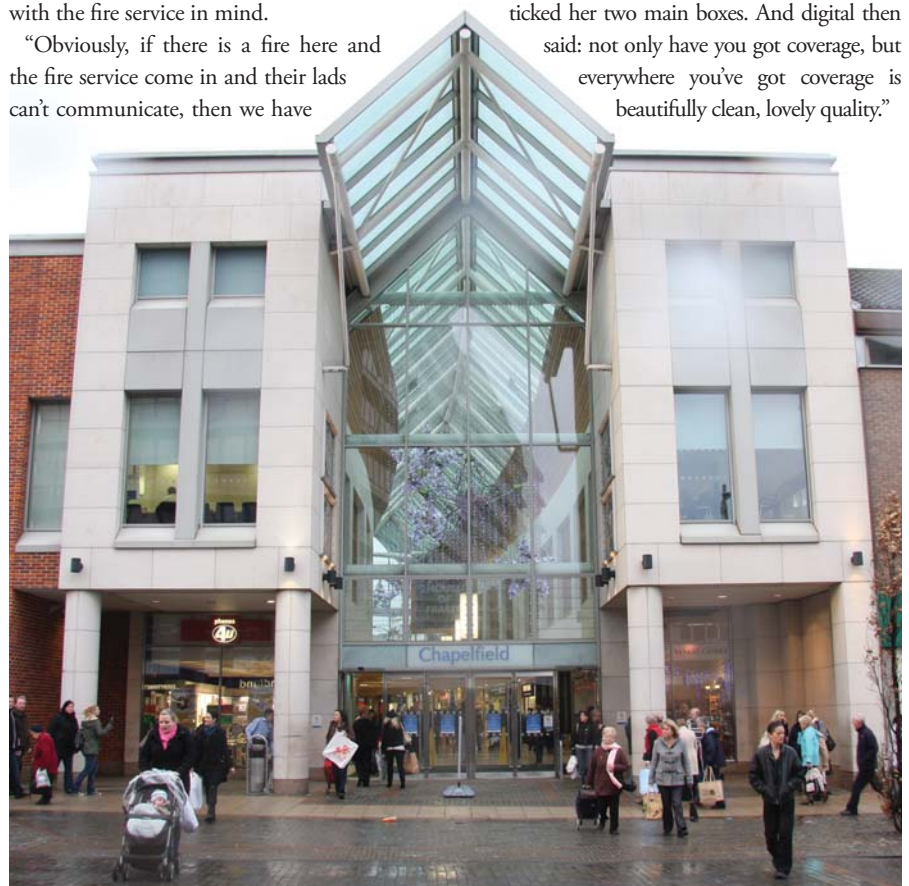
a human life issue", Phil explains. But coverage testing in digital mode alone can be misleading, he adds, because there is no warning that a weak signal is about to fail until the very last moment. "With analogue, you can hear it disappearing, so you know you're coming to a bad area, and you can then know that that's an area to go and have a look at.

"Kenwood have got a little signal strength meter on their display, so we can actually have a pretty good clue that it's going to fall off a cliff. But one of the nice things about digital is that if you've got the footprint, then anywhere within the footprint is going to be a good quality signal."

Having selected an antenna location capable of delivering good coverage throughout the Chapelfield development, Hire Radio was able to propose a very simple antenna system – a separate mast and antenna for each of the five radio channels, avoiding the need for any combiners. "It allowed us to engineer more cheaply from a propagation point of view, so it allowed us then to look at the costings", continues Phil Blenkhorn. "A huge amount of cost in their original system was built into the infrastructure. Primarily, we didn't have these hugely complex amplifiers, racks of equipment and the like."

## A commitment to save money

By doing away with complexity, Phil was able to promise Davina Tanner a sizeable reduction in her monthly outgoings. "We committed with her that we were going to save a significant sum of money, so she kind of hit the two things on the head there – a coverage improvement and a cost saving. It ticked her two main boxes. And digital then said: not only have you got coverage, but everywhere you've got coverage is beautifully clean, lovely quality."



For smooth running and the public's safety, Chapelfield depends critically on its new digital radios, and general manager Davina Tanner values their coverage and clarity. "This Saturday we'll probably have 55-60 000 people through the door", she says. "And when you put that amount of people through one building in one day, you will get accidents; not our fault, but accidents. People feeling ill, people being idiots, antisocial behaviour, shoplifting, lost children, the whole works. So to have a good, functional radio that you can hear clearly is crucial"



### Managing the radio traffic

Though the new radio system has been in operation for only a few months, it is already being used heavily at critical times. "The biggest challenge is managing people, and training", says Davina Tanner, "because the traffic can be a lot when an incident happens.

"We had a big event here in November – a big light switch-on and we had Diversity, the dance group – and we ended up having 8000 people that nobody predicted would turn up, so we were totally caught on the hop! And the traffic going over the radios that night was huge!

"Even though we'd said to everybody 'Can you keep everything to a minimum?', and we've got two channels, it was still busy just because the volume of people."

Davina is planning further training for radio users in the coming weeks. But already a

measure of radio discipline has been imposed by dividing up the traffic. "Channel 1 will be the security channel, the main channel. So if there is (heaven forbid!) a crisis within the centre, Channel 1 is the channel", she explains. "Channel 3 is effectively housekeeping and our car parks. Channel 3 is probably the one where there is the most traffic."

However, an additional channel, known as Channel 2, is available at Chapelfield and Phil Blenkhorn plans to bring this into use very shortly by converting the system to trunked operation. On its own, he argues, Channel 2 is of little practical value even during busy periods because users would have to remember to select it manually. But trunking all three channels would bring this resource into use automatically, effectively doubling radio traffic capacity while maintaining the same service quality. At the same time, it would allow Chapelfield to create separate talkgroups to handle particular types of event.

"Part of Davina's decision process with us was that the Kenwood radio has that all built in", he explains. "Not only is it digital, it is also trunking, and the base stations that we have are trunked as well – all have the potential to be trunked. So she doesn't have to go and find a great big lump of budget."

## A choice of standards

The move from analogue to digital was an obvious one because it's a brand new technology, so digital almost selected itself", says Phil Blenkhorn, of Hire Radio. For the Chapelfield system, he offered Davina Tanner a choice of digital radio products from three manufacturers – Icom, Kenwood and Motorola. "We considered all options and she considered them with us, and we had no real axe to grind."

DMR was offered only by Motorola, but 6.25 kHz products were available from both Icom and Kenwood. Either technology might have done the job, but the decision went to 6.25 kHz because it offered the security of dual sourcing. However, Phil quickly adds that he has nothing against Motorola's products. "Wearing my ShopSafe hat, we have probably 50-50 Motorola kit – so I will quite merrily trade with either", he says.

Nevertheless, he points out one other consideration with the DMR route, the ability of a single DMR base station to carry two time-shared voice channels. In a multi-channel radio installation, this can provide a useful cost saving by halving the number of base station systems to buy and install, and would generally be regarded as a big advantage. "But", he points out, "if you lose the base station, you've lost both of those channels.

"Bearing in mind that there's two main Chapelfield channels, if I lost a base station, I've lost both channels and I've got no fallback. So if you've got to put in two base stations, and you're only using half a leg of each anyway, there really isn't any saving in terms of channel spacing."

### Narrow channels

Meanwhile, users of 6.25 kHz equipment can achieve spectrum economies too, by subdividing their standard 12.5 kHz business radio channel to accommodate two 6.25 kHz digital transmissions within it, side by side. This extra-narrowband operation is encouraged by Ofcom in the interest of more intensive use of the spectrum, and Phil plans to make use of it when the Chapelfield 6.25 kHz system is switched over to trunking mode early in 2010. Nonetheless, the system is already operating in extra-narrow mode. "This is running on 6¼, because 6¼ – very narrow – works better than 12½ with digital", Phil declares. "Don't ask me why, because I don't believe it. But it does: 6¼ works better than 12½."

For radio users such as Davina Tanner, the ability to double up her channels in this way amounts to a free bonus from the regulator. "It gives her a huge amount of resource if she needs it in the future, without any great expense", Phil comments.



In the equipment cabin is Phil Blenkhorn of Hire Radio with the five-channel repeater cabinet. This Icom system is a temporary stand-in for Chapelfield's Kenwood Nexedge rack while it is away at Hire Radio's Suffolk headquarters being configured for the change to trunked operation. Compatibility between radios from different manufacturers was an important factor in Chapelfield's decision to choose Nexedge



Up on the roof, Phil Blenkhorn of Hire Radio (left) discusses the antenna system with Kenwood's Andy Dawson. With them is Vanessa Aldred, of Chapelfield, shielding herself from a downpour. The five antennas, one for each radio channel, supply indoor coverage of the building by beaming over the windbreak and in through the skylights. Vanessa's radio is not at risk in this weather, Andy explains later – the IP67-rated Kenwood handportables can withstand a metre depth of water for up to 30 minutes



At present, the system operates in an all-informed group communications mode, but the move to trunking will also introduce facilities such as person-to-person calling – a system function Davina believes could be especially helpful in dealing with a crisis. “The telephone network might be down, and so we might say, ‘Let’s flick to a one-to-one channel’”, she says. “So there are lots of bolt-ons that we can add to it.”

Phil comments: “We can effectively trunk six radio channels here for the same costs that they are paying for three at the moment. So we have a huge potential resource here. A six-channel trunk would allow Davina almost to throw her telephone system away.”

## Filling in a hole

Further enhancements of the system will be possible, including new functions such as

Chapelfield security patrol officer Vanessa Aldred demonstrates her digital radio. “With the new system, the reception is far, far superior”, she says. “There were blank spots, but with the new system it’s a lot less, and it’s in very specific situations.” With discreet accessories such as Vanessa’s tieclip microphone and (inset) earpiece, Chapelfield staff can present themselves to the public as wardens rather than guards. “The in-ear earpieces are better than the old D-ring ones”, she comments. “We need it to be lightweight and out of the way, because if there is a fire alarm or first aid event or something like that and we have to start running, the last thing you want is leads flying about all over the place!”

alarms and ‘man down’ alerting. But already steps have been taken to address the new installation’s main weakness – the five per cent of the building not adequately served by the central antenna. This is a concern because of fire service and its reliance on analogue radio for local coverage at the scene of an incident.

The area at issue is the lower car-parking floor, at the base of the building. Hire Radio’s solution is to install a secondary antenna underground, tapping off a small share of the power from the main system. “What you have got then is this lower floor buried with a nice concrete floor above it, so we can create a cell underneath without getting any phasing problems”, says Phil. “So this will maintain its single site integrity. Effectively we’ll then have 100 per cent coverage.”

## The right choice

To begin with, the digital radio system was deliberately kept simple to allow the staff time to become accustomed to it. Even so, taking on something radically new just as the busy Christmas trading period was beginning might have been a significant risk for Davina Tanner. But she says: “When you make a decision to go with a supplier, you weigh all those things up, and you have to have confidence with who you are dealing with. I was confident, but I was aware (I’m a realist) that it wasn’t going to be perfect, because any system is going to have teething problems.

“Overall, touch wood, what teething problems we’ve had have been quite minor and insignificant and they have been resolved very quickly. So I think that comes down to confidence in your supplier. It comes back to making the right choice in the very beginning. We had lots of meetings, lots of discussions.... and we had lots of testing here. We gave everybody a good opportunity to voice any concerns and to smooth out any kind of bumpy edges.

“I think it has lived up to my expectations – but there’s *more* to come from it. I would say this time next year the system will have really bedded in and we will get the real, full value from it.”



## Shopwatch: a matter of identity



Supporting analogue, digital and digital trunked operation, a Nexedge radio by Kenwood. Chapelfield has 50 of these for use by security and housekeeping staff

The Norwich shopwatch network operated by ShopSafe, Hire Radio’s sister company, introduced digital operation in December – using the same Kenwood Nexedge handportable chosen by Chapelfield. This choice was driven by a convenient software capability of the radio.

A main function of the ShopSafe scheme is that when someone makes a radio call, other radios on the system will display the caller’s identity. “Now that meant that every radio had to carry a whole load of information”, Phil Blenkhorn explains. “And there was a huge pressure on us to keep all that information up to date.”

But with the Kenwood radios, each handset can be made to send out its identity as a message. “So if we put on a completely new store, which happens in retail, every radio is automatically updated – so everybody knows what’s happening.”

With this capability, the radios can be enabled to work both on the shopping centre’s internal system and on the city-wide ShopSafe network.

Already showing the way is the city’s large Debenhams store, which, besides playing host to Norwich’s ShopSafe base station, has its own analogue radio system. “They have a couple of ShopSafe radios which are now digital, so those radios have to be able to integrate both the ShopSafe digital network and their own in-house analogue network”, says Phil.

A migration to digital is already being prepared by ShopSafe for another major retailing centre in Norwich, The Mall. For financial reasons the changeover will not be made all in one go, and the centre will operate in mixed analogue and digital modes for some time, taking advantage of the Nexedge radios’ dual-mode capability. “So we have a very, very nice migration path”, Phil observes. “We don’t have to go and buy a different product again.”



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