What opportunities does technology offer us?[1]

The workshop highlights the question: *How to attract and retain more young ringers?* They will be the future of the Exercise, and their current numbers are much reduced But is the decline of young ringers 'the problem', or is it a symptom of other underlying problems? So behind that headline lie important issues about more effective use of the human resource that we have, about increasing the quality of performance, and about growing the competence as well as number of ringers (of any age) to create a vibrant sense of community among all ringers, not just a small elite.

What does technology have to do with any of that? Well let's start with the health warning – technology will not 'solve the problem' for us. Technology in ringing is a means to an end, not an end in itself. If technology can provide useful tools, then we should use them, because by doing so we will find that the problems are easier to solve than they would be if we ignored what technology can offer. But we still have to solve the problems.

The first part of this paper describes useful things that technology can or could do for ringing, in particular to enhance the quality and quantity of training and practice opportunities. The second part describes the extent to which we are (or are not) exploiting the technology that is already available. The third part looks briefly at some costs. The fourth part has the questions to be debated at the conference. The fifth lists some facts and figures underlying various statements made in the text, and finally there is a personal statement, showing 'where I am coming from' with technology for ringers.

What would be useful, and is it possible?

1 Tools for enhanced practice

Practice is essential to learning, and we should do all we can to optimise the practice experience to meet the needs of the learner. We should also offer as much of it as possible, while using no more resources than are essential. Technology can help with that.

Ringing simulator

Lack of rope time, and absence of immersion in good ringing are the two factors that most constrain the process of learning to control a bell in rounds or changes. Technology can make good both deficits. The invention of the ringing simulator in the late '70s was probably the biggest potential advance in training this century. It allows a pupil to ring a silenced bell while its sound, and the sound of the other bells ringing perfectly, are generated by the simulator. It provides an ideal environment for a pupil to learn to ring rhythmically, without distractions caused by other ringers' imperfections. It doesn't need a room full of ringers, so much more practice can be provided, and provided at times to suit the pupil.

Bell simulator (aka dumbbell)

Some towers have bells and/or ropes that are not ideal for initial teaching of bell handling. Some towers have a physical environment that isn't conducive to teaching. Some bands could benefit from the flexibility of being able to teach, or give people an experience of, bell handling away from the tower. Technology can help in all these cases by providing a mechanical bell substitute, which has more benign characteristics, which can be located in other places, and which can even be transportable. Such 'bell simulators' are normally (but not always) known as dumbbells, though they are a vast improvement on the 18th century namesakes that allowed the gentry to practice 'The Exercise' at home. The modern version is hung like a bell, and simulates the dynamics of a bell much better. Some people have designed their own, but you don't need to because you can buy one.

Sound control

Most towers are surrounded to some extent by houses, and if their bells are loud enough to fulfil their primary purpose of public ringing, they cannot responsibly be rung regularly for extended periods or at extreme times of day, whereas the ideal training facility would be available whenever required, regardless of how often or at what time of day. Technology can in most towers provide a very effective answer in the form of sound control shutters. Properly designed, they can make ringing almost inaudible outside when closed, but restore normal sound levels when opened for public ringing. With sound control, bells can be usable as long as is required at the times when needed, rather than being constrained to limited periods within tolerated hours.

Sound control can also be achieved by silencing all the bells and using a simulator to generate the sound. This is much less convenient to use, but can be installed where conventional shutters might not be practical, and it is cheaper to install.

2 Tools that give feedback on performance

Feedback is a key element in the process of learning any skill. If you don't know how well you are doing, it is difficult to improve. Feedback on ringing skills can be difficult to give, and it's often not specific enough to be useful. In any case, being 'told' what you are doing is not the same as 'seeing' or 'feeling' what you are actually doing.

Video

Controlling a bell involves many parts of the body to co-ordinate a complex blend of rapid, accurate movements, many of which are performed at the sub-conscious level. Indeed to become proficient, most of them must become 'automatic'. One of the problems when teaching bell control is to detect embryonic inappropriate actions and to encourage the pupil to change them, which can be hard if the pupil is unaware of them. A video recording allows a pupil to 'see' what he or she does with hands, arms and body, but may well be unaware of while ringing. 50 years ago all we had was a large mirror, which couldn't show a side view, and could be a distraction while ringing. Now it is easy to record and play back video from all angles, and even to show detail in slow motion.

[1] Written for session at the workshop *'Change Ringing for the Future* – Wellesbourne on 12th November 2011.

Listening aids

The ability to hear, and correct, tiny deviations in striking is a core ringing skill, but it's hard to teach because you can't get into the pupil's head. Some of us were lucky to develop the skill without being taught, but many ringers fail to do so, and are doomed to a life of poor striking (though they not be aware how poor), unless they give up.

Technology in the form of software and CDs can provide tools that allow listening skills to be assessed separately, and hence developed rather than neglected.

Strikeometer

Good striking is only possible if each ringer strikes well, but many ringers have little idea of how good or bad their individual performance is. Regular, objective, impartial, feedback would have a much bigger effect on performance than the occasional well-meaning exhortation. Modern ringing simulators like Abel provide feedback on striking, but the biggest benefit would come from having it while ringing with other ringers. A few towers had a strikeometer in the 1980s, but the clappers had to be 'wired' to detect the impact. Richard Grimmett's team recently developed HawkEar , which can take its input from a microphone, to judge the National 12-bell contest. Their current priority is to support judges of high quality 12-bell ringing, but the intention is to make a more generally usable tool available in the future, which would be very useful.

Pullometer

Bell control depends critically on accurate, sensitive and timely variation of the force on the moving rope. It is easy to apply too much or too little, for too long or too short a time, or at the wrong time, and many ringers do, especially inexperienced ones. A good instructor may sense what is wrong, but it's hard for a pupil to translate 'too hard' or 'too soon' into the physical action. Showing the force that the pupil is actually applying would help, especially with the ability to compare it with what an experienced ringer does. The idea of a pullometer was mooted 20 years ago, but despite some experiments ringing while standing on bathroom scales, nothing is yet available for widespread use. It would be a valuable tool if it were.

3 Communications technology

We are surrounded by digital communication tools, which many societies and some towers already use, with e-mail and websites to communicate with their ringers. Even so, there are many ringers who do not feel well integrated into the ringing community. Could we make better use of technology to bind ringers together in a common cause.

A few groups use the tools to project an image of ringing to the general public, but there is scope to do a lot more of this, which would help to raise the profile of ringing with the public, and create a more favourable climate for recruitment based on reality rather than myth.

Take up

Technology is only useful if it is used. Much of this technology is already available, but its take up has been quite limited, for example:

Simulators have been available for 35 years, but mostly they were ignored, and are still only fitted in around 1 in 20 towers (see tables below), many of which probably don't use them as teaching tools. Compare that with private use, where something like 1 in 8 ringers has some sort of simulation software on a desktop or mobile device. Why are our towers so much more conservative than individual ringers?

- Many people were taught to ring visually, and those who have since developed reasonable rhythm and listening skills, may still see ringing as an inherently visual activity. To them, ringing with no ropes to watch is at best an irrelevant gimmick, and at worst something that might undermine the band's perception of their own skills.
- Ringing with a simulator is a solo activity – people have to wait their turn – which seems inefficient compared with traditional training, and deters using it as a group activity. That's easy to overcome by installing more simulators, but only a tiny handful of towers have. It doesn't cost a lot more once the bells are fitted with sensors. You need more old PCs, and you have to use headphones so each ringer doesn't hear the ringing from the others. But a band or tower captain with inhibitions about a simulator is unlikely to jump at the thought of having several.
- Another problem is 'silent practice' – using a simulator with sensors on all bells as electronic sound control. There is nothing wrong with doing that if you don't have sound control shutters, and it has increased the number of simulators installed, possibly because it is a smaller step from 'normal' ringing. Unfortunately, this use has largely eclipsed the use of a simulator as a training tool in many people's minds. Someone recently told me she didn't know that one person could ring with a simulator – and she was involved with a ringing centre!

The tables also include dumbbells (or 'bell simulators'), where the balance between teaching and private use is reversed. It is not known how many 'heavyweight' dumbbells there are, since most are locally built one-offs, but there is information for the supply of lighter devices (see footnotes for working definitions).

Tables 1 & 2 (based on limited information) summarise what is known about simulators, simulation software and dumbbells, and should give a rough feel for the scale of their take-up.

Table 2 shows uptake of the two CDs for teaching listening. It's not known how many were bought for personal use and how many for tower use. The table makes the assumption that it is half and half, but it seems likely that more were bought for personal use than for tower use, so the first column is pessimistic and the second is optimistic.

We could look at what inhibits the take up of the other tools as well, but I won't do that here.

	Uptake estimate (out of 5500 towers)	Approx number	Basis
Towers with ringing simulator	1 in 20 towers	~300	Bagley supplied sensor sets / Dove ringable towers with 5+ bells
Towers using simulator as training tool	1 in 50 towers??	~80	Guess, since many are just used for 'silent practice' (~10% have fewer than all bells fitted)
Towers with multiple simulators	1 in 600 towers (1 in 30 of those with simulator)	9	Bagley
'Heavyweight'[2] dumbbells	Unknown	Some	*(Mostly one-offs, so no overall sources of information)*
Single 'mid-range'[3] dumbbells for teaching	1 in 200 towers	~25+	Saxilby simulators, estimate
Mini[4] dumbbells for teaching	1 in 1400 towers	~4	Norris, estimate

Table 1: Estimated uptake of simulators and dumbbells for teaching by towers

	Uptake estimate (out of 39,000 ringers)	Approx number	Basis
Personal (desktop) simulator software	1 in 8 ringers	~4,800	Abel (Win), Mabel, Mobel / Ringing Trends best estimate
Single 'mid-range' dumbbells for home use	1 in 1500 ringers	~25+	Saxilby simulators, estimate
Mini dumbbells for home use	1 in 1500 ringers	~25	Norris, estimate

Table 2: Estimated uptake of simulator software and mini dumbbells for home use by individuals

	Uptake estimate (out of 39,000 ringers)	Uptake estimate (out of 5500 towers)	Number sold	Basis
Listen to Ringing	1 in 100 ringers*	1 in 14 towers*	745	1995 – 2010
Listen to Ringing – Live	1 in 130 ringers*	1 in 18 towers*	603	1997 – 2010

*Table 3: Sales of listening CDs (* Assuming 50% for personal use and 50% for tower use)*

Cost

Cost may affect take up. Ringers get their performance equipment 'free' and traditionally have invested very little if any money in training equipment. From that baseline, anything that costs more than a few pounds seems a lot, even when it is a tiny fraction of the cost of the ringing installation.

Simulator

Taking the simulator as an example. You can install a basic simulator for around £100. That will rise to around £400 - £500 if you want sensors on all bells. To add a second simulator you will spend another £100 or so for three sets of cordless headphones (one for each pupil and one for the instructor). To go to four simulators, you need to add the same again (but using IR or RF headphones, whichever you didn't use for the first two). You can use cheaper headphones if the pupils are near enough to the simulators to plug in directly (like Worcester), but then the instructor can't eavesdrop unless you install some sort of junction boxes.

The key message is that you can get several independent simulators for under £1000 (assuming free old computers). That allows serious training with several pupils at once, and provides some spare capacity to give ringers who are no longer 'pupils' the opportunity to enhance their rhythm and listening skills. Table 4 shows typical costs.

Dumbbell

A dumbbell (or 'bell simulator') with a fair sized wheel and realistic dynamics also costs well under £1000. A mini dumbbell costs not much less. Table 5 shows typical costs.

Sound control

Sound control shutters are more expensive than simulators, and the difference in tower layout makes it impossible to generalise. Inflating the 1982 quotes that we received (before deciding to do it ourselves) it could cost several thousand pounds today. But having lived with the convenience of extremely effective sound control for 30 years, I would hate to revert to having to use tied bells and

2 Devices whose weight and hanging resemble tower bells
3 Devices weighing less than a typical tower bell, but whose handling dynamics still closely resembling a normal tower bell
4 Devices much lighter than a typical tower bell, with distinctly different handling dynamics

electronic sound for normal practice. At 9.30 or later on a Monday evening, I don't want to climb the tower and unsilence 8 bells, while everyone else heads for the pub.

Video

A video camera can cost well under £100. Most come with small built-in screens, or you can use an old TV to view the result. And there must be lots of Camcorders lying around unused, so you could try asking for one on FreeCycle. CDs or software to practice listening skills cost a few pounds, and players are readily available. With tools like this, surely cost can't be the main barrier.

Simulator capability	Cost (approx)	Assumes
Single simulator (with sensor on one bell)	£100	Sensor, cables, interface, software (+free old computer)
Single simulator (with sensors on all bells)	£400 - £500	Sensors, multi-way interface, cables, software (+free old computer)
Two simulators (with sensors on all bells)	£500 - £600	Add to above: 3 cordless headphones (IR or RF) (+ another free computer)
Four simulators (with sensors on all bells)	£600 - £700	Add to above: 3 more cordless headphones (RF or IR) (+another free computer)

Table 4: Order of cost to install tower based simulators

Dumbbell (bell simulator)	Cost (approx)	Includes
'Saxilby Simulator' (Horrocks)	£750	Complete with sensor and cable ready to plug into a PC
'Wombel' frame (Horrocks)	£800	Free-standing frame for above if required
Mini dumbbell (Norris)	£140	Complete with sensor and cable ready to plug into a PC

Table 5: Order of cost for dumbbells

Personal perspective

I've used a simulator in the tower for over 20 years (initially my own, and in due course the tower's. My pupils rang Rounds with it as soon as they could control the speed of a bell – well before ringing with other ringers. Three years ago we invested in two simulators with sensors on all bells, and we will soon upgrade to three.

I've used video on courses for 20 years, but not (yet) routinely in training. I have used my phone to snatch video clips, but the small screen can only show gross problems.

I've run listening courses for over 20 years, using software I developed, and I developed the CC listening courses I also produced the CC listening tapes/CDs..

I designed and built a counter-rotating dumbbell nearly 20 years ago, mainly for my own pleasure, but it has been to many courses, with over 300 names in the 'visitors book'.

My final year university project was a crude attempt to detect the strike times from recorded ringing, ie the first stage of a potential strikeometer. 30 years later my son did a more substantial final year project on this. I have always supported anyone working on the strikeometer concept. When/if one becomes available, I will encourage my band to use it, so we can work to improve our striking.

I did the bathroom scales experiment in the mid '90s, and set about connecting a set of scales to a computer display as a pullometer, but I never finished the project. I once tried to interest a university research department in developing a pullometer, but I had no takers. If a pullometer were available, I would certainly use it when teaching.

I have promoted the provision and use of e-mail services to improve communication at all levels from my tower to CC committees. Within small groups it works well, and in larger groups it can help members to feel less detached.

In 2005 I developed a tower website intended to help inform the public about ringing. It has been praised by ringers and non-ringers alike

My earliest use of 'technology' was in my teens. Instead of tying on the rope extension to permit tolling from below, we joined the ropes with a streamlined metal bullet, which also made it possible to ring the bell full circle from downstairs. We realised that it should be possible to ring by rhythm and listening alone (long before simulators had been thought of. Ringing by ear was easy, but rope handling was a challenge, especially since it fell next to the font. But we thrived on challenges and trying to find ways to do things better. Fifty years on, I would like today's teenagers to feel the same excitement about ringing that we did then.

In summary, I use technology whenever it can give useful benefits and I am willing to help and encourage anyone to develop potentially useful tools that do not yet exist.