



MOBILE TRADING COMES OF AGE

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The context

There is now widespread agreement that hedging with futures and options makes hedgers better off. It allows them to make a more rational use of their cashflows; to capture available business opportunities; to avoid disaster scenarios; to concentrate on their core business rather than spend time trying to guess where markets are going; and makes them less risky propositions to financiers and thus more apt to obtain good credit conditions. These benefits should be largest, in relative terms, for those who have the least ability to absorb risk – most notably, the poor. Some studies have found that poor farmers, unable to externalise their risks to hedging or insurance markets, instead adapt their production patterns to reduce their risk exposure, resulting in a decline in average income of at least 20 percent.

Ironically, those who most need to use futures and options have no access to the markets that offer these instruments. In recent years, the international community (particularly UNCTAD and the World Bank) have given increasing attention to this issue, looking for ways to bring futures to the farmgate. The traditional solution is to look for organizations that can aggregate the risk management needs of individual small farmers, notably cooperatives, processors and rural banks, and teach them how to use these tools. But unfortunately, institution-building is a slow and difficult process, and institutions worth strengthening are still relatively scarce on the ground.

Hence, alongside this traditional approach, UNCTAD started to look in 1999 at technological shortcuts. Experience has shown that small farmers and fishermen in developing countries, even if they have only rudimentary reading and writing skills, are willing and able to adopt revolutionary new technologies if they see their benefits. For example, mobile phones are being adopted with gusto in the South Asian countryside, often with one person buying the phone and then renting it out to others in the village. Research has shown that more than half of the resulting phone calls are made to support marketing decisions. Another example: small fishermen in India's southern state of Kerala use mobile phones to call different ports after they have made their nightly catch, and on the basis of the prevailing prices for the types of fish they have caught, decide to land their fish in one port or another. It is easy to envisage how a more interactive tool, such as a web-enhanced mobile phone, could be used to give them even more control over their marketing decisions.

From there, it is not very far to imagining that they can use such tools to order inputs or manage price risks. How far are we from making this a reality? Are the mobile tools already sufficiently developed (in terms of efficiency, robustness and cost), can one envisage easily-usable interfaces, who would be the providers of the services? This paper looks at a piece of this puzzle, namely the development of the tools for mobile trading. UNCTAD will continue working on this and the other parts of the equation, and would welcome interest from the private sector in this regard.

UNCTAD secretariat

Mobile Trading Comes of Age¹

by Julian Roche

Today's question

Four years ago, when mobile trading was discussed, the issue was whether trading equities and derivatives contracts using mobile devices was even technically feasible. Three years ago, the issue was how long it would take to bring to market.² Two years ago, the issue was how expensive such trading would be.³ Last year, debate surrounded which devices, software and companies would be first to market. Today at Burgenstock and around the world we take the technology for granted, we assume that prices for wireless services will continue to fall and that a competitive marketplace in the provision of these services will emerge. The question now is, what will be the market penetration? What percentage of existing contracts will end up being traded on mobile devices?

M-commerce is gaining ground

It is no longer practicable to discuss the use of a particular technology for risk management without placing it in its wider context. The Economist suggested last year that a consensus prediction from market research firms and consultancies would be that the number of mobile internet users will be around one billion in 2005, compared to somewhat over 200m in 2001 and double that in 2002. Millions of SMS⁴ are now sent every day. And let us remember that forecasts during the 1990s have been overtaken by events. What seems certain is that even allowing for the late arrival of the much vaunted new 3G technologies⁵, it will not be long before the number of internet connected mobile devices exceeds that of PCs.⁶

Wireless technology needs a suite of applications, risk management or even equity trading alone cannot sustain it. But in fact, we know that m-commerce as a whole, after a shaky start with WAP (Wireless Application Protocol), is gradually gaining ground. From revenues worldwide of around \$450m in 2001, one consultancy⁷ expects it to reach over \$6bn by 2005, as businesses take an interest in a wide range of mobile, especially location, based services. For example, the development of wireless enterprise applications offers companies the opportunity to supply critical data, currently via a range of different devices such as Internet-enabled smart phones, laptops, and personal digital assistants, to an increasingly mobile workforce.⁸ Wireless devices like mobile phones, PDAs⁹ and laptops are enabling the office worker - when out of the office or working from home - to gain access to emails, personal information like online calendars, task lists and address book services, and to access the corporate intranet and the web. For salespersons, the ability to take a customer order directly and immediately during customer meetings enables quicker and more efficient processing of transactions.¹⁰ The financial services sector, in particular investment banking, is currently the

¹ The findings, interpretations and conclusions are the author's own and should not be attributed to the UNCTAD, its Secretary General, its management or any of its member countries.

² Julian Roche, *The global trading village, mutual benefits for the international online trading community and developing countries*, UNCTAD 1999

(http://www.unctad.org/infocomm/comm_docs/docs/meetings/burg/bu00roche.pdf)

³ Julian Roche, *Web to Wap: For a real start of the new millennium*, UNCTAD 2000

(http://www.unctad.org/infocomm/comm_docs/docs/meetings/burg/bu00webwap.pdf)

⁴ SMS stands for Short Message Service – brief text messages that can be sent through internet-enhanced mobile telephones.

⁵ 3G is the generic term for the third generation of cellular mobiles using any CDMA, UMTS, WCDMA i-mode and FOMA technologies.

⁶ *The Economist*, Mobile Internet Survey, 13 October 2001.

⁷ Frost and Sullivan (<http://www.frost.com>)

⁸ Datamonitor estimates that global enterprise investment in mobile field service solutions such as mySAP will total \$220 million by the end of 2002.

⁹ Personal Digital Assistants - wireless devices for keeping calendars, addresses, Web access etc.

¹⁰ In its mCommerce End-User survey: mCommerce trends in Europe 2001, Datamonitor asked 208 enterprises where mobile solutions were most likely to be used; 59% stated that the main users would be the salesforce.

largest sector to adopt these ways of working. Mobile enterprise services will enjoy at least gradual growth in revenues, as voice, video and data communications converge over emerging packetized networks.

Wireless technology is improving

Meanwhile wireless technologies are advancing apace to cope with the widening marketplace. Security over wireless, too, is improving. Most mobile phones in use today are 2G, which can provide limited data services such as text messaging and Wireless Access Protocol (WAP) browsing. WAP has been widely accepted as a failure due to its slow access speed (as low as 9.6 kbps bit rate), limited applications (and no killer applications), and poor handsets. But WAP is already yesterday's technology. Carriers are gradually investing in digital third-generation (3G) networks with their facility to increase data speeds (eventually to 2Mbps and beyond) and widen bandwidth, as well as providing greater compatibility and wider coverage, voice recognition and better handwriting acceptance technologies. These networks are expected to take care of the limitations associated with second-generation (2G network).¹¹ Equally welcome is the Open Mobile Alliance, which aims to grow the market for the entire mobile industry by enabling subscribers to use interoperable mobile services across markets, operators and mobile terminals

Multimedia wireless services, starting with MMS (multimedia messaging services) and interactive gaming, are already viable commercial propositions. Many new wireless networking products and services are becoming available based on technologies such as spread-spectrum radio, infrared, cellular, and satellite. Realizing that "content is king," NTT DoCoMo, which runs iMode, sought out the highest-quality and variety of wireless data services and applications in Japan. DoCoMo's gargantuan subscriber base, dominant market share, and premium brand name made it the partner of choice among content providers. This resulted in a "virtuous" circle: The best content providers were attracted to DoCoMo, DoCoMo became known as having the best mobile content, more cellular subscribers signed on, and the process repeated itself. It's becoming increasingly common for vendors to mobile-enable existing suites of applications.¹²

Mobile computers today often are more capable than last year's home or office desktop computers and workstations, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays. There are more than a handful of mobile device retailers. This consumer pressure in turn will stimulate the market growth of advanced enterprise solutions which in turn will, eventually, drive down costs.

The local broadband wireless Web is currently being built around a technology known as Wi-Fi, or 802.11b, the potential of which is easy to underestimate. Wi-Fi is making it possible to create virtual neighbourhoods. Internet service providers are facing up to the fact that multiple users are piggybacking on a single subscription. The hardware may be there, but easily accessible networks connected to the Internet are still rare (one exception is Starbucks in the USA, which has decided to provide such networks in its coffeeshops). Many wireless players already incorporate Wi-Fi into their networks so they can provide customers both coverage and speed - even if as yet not both at the same time.¹³ Reasonably high-speed local area wireless networks are now available with speeds of 1-2 megabits per second or more, and wide-area wireless networks are available that provide metropolitan or even nationwide service. However, wireless networks have as yet severe limitations by comparison to typical wired networks, including higher error rates, lower bandwidths, non-uniform transmission characteristics, increased usage costs, greater susceptibility to interference and eavesdropping, and higher variability of performance. These are yet to be overcome.

¹¹ Mainly its slowness, and lack of interoperability between the European-based GSM network and the US-based CDMA network.

¹² For example Microsoft Exchange and Lotus Notes; and more substantive benefits are accruing from providing extended access to core enterprise applications, such as CRM and ERP systems.

¹³ The idea is that you would use a Wi-Fi LAN when one is available and migrate to the slower wide-area networks (WANs) upon which 3G is based when that is the only network available.

In terms of hardware, mobile computing devices such as laptop and palmtop computers are already widely available at much more affordable prices. The multinational manufacturers – Sony, Toshiba, and Palm, Casio and Compaq/Hewlett-Packard - are household names in almost every country in the world, and competition is fierce. But while they provide more functions than before¹⁴, they are still coming in at around US\$1000, which is still far too much for developing countries.

That is not the end of the hardware story by any means. 3G arrived late, and still has many limitations. One can particularly note their short battery lifetime¹⁵, the limited display capabilities of existing mobile devices (due to the small screen size), and their insufficient processing power, memory capacity and input capabilities. Still, it will not be long before the number of Internet-connected mobile phones exceeds the number of Internet connected PCs. "One way or another, phones will become the predominant means of access to the Internet."¹⁶ Prices have fallen dramatically even from last year. Technological innovations surely presage more, such as more devices with thin-film liquid crystal displays showing high resolution colour. Yet the heart of the market beats fastest for devices that cost \$200 or less, analysts say. The mobile phone has already progressed in OECD countries from luxury item to virtual necessity, with sales dwarfing those of PDAs. Pre-paid phones, which can be replenished with vouchers on sale at newsagents and corner shops, are commonplace. In Asia they are looking forward urgently to one single handheld device that could contain varying combination of cellular phone, digital video-cam, computer, digital diary, credit card, cash card, and of course MP3. *The time is fast coming when an Internet-capable mobile phone will be no rarer, no more valuable, no more expensive and just as reliable as a basic financial calculator.*

Coming to a phone near you...

Besides the early examples mentioned above, analysts are predicting a whole host of new applications for the wireless Internet and m-commerce, especially localised content for individual use, utilising data mining to make query results available to mobile users linked to GPS (Global Positioning System) satellites. PDAs already can download MP3 music and play 3D games. The key to all these applications is personalisation, so that the information filtered to the user is tailored to his particular needs, preferences and circumstances, hence increasing his productivity and facilitating management of personal time. Consultants Ovum believe that the mobile LBS (Location-Based Solutions) market will be worth US\$20bn by 2006.¹⁷ The following applications that we can probably expect in the near future¹⁸, illustrate this point:

- Checking traffic conditions from home and on the road to help plan route and allocate traveling time; alerting the driver if there is an accident, and suggesting an alternate route.
- Directory services - enhanced wireless devices will allow users to find the nearest theatre, buy the tickets electronically, and download e-tickets at the theatre.
- Booking travel reservation on-line - booking a tour, checking on scheduled flights to make sure they are on time, checking itinerary, changing flight plans if a connection is missed and booking a hotel.
- News - all types of information for various purposes, for example, business managers looking for the latest information about their companies, and stock traders checking news developments that might affect their portfolios.

¹⁴ Contemporary PDAs such as the Handspring Trio feature a choice between graffiti and keyboard inputs, have web surfing ability, video and audio capability, e-mail and SMS.

¹⁵ Even the best lithium-ion rechargeable batteries currently provide only 2.5 hrs talk time.

¹⁶ *The Economist*, *ibid.* Nokia, Sony-Ericsson, Samsung, Motorola, Alcatel, Sendo, Siemens and Panasonic all make Internet capable mobile phones. And they are much cheaper than PDAs, with two year plans for GPRS mobile phones now available for less than US\$150.

¹⁷ Other estimates are lower – for example, WBCS believes it will be 5.2 billion US\$. But still, close to 300 million people would use location-based services (http://corporate.ismap.com/index.php3?h=lbs_market).

¹⁸ PricewaterhouseCoopers report, *Technology Forecast 2001-2003*

- Transactions - electronic wallets that contain personal particulars such as IDs and bank cards
- The whole concept of hot versus fixed work space will once again come under review, especially in high rental economies.
- M2MWireless technology is already managing data transmission and connection to the Internet. So it makes sense to put it to work in machines. The M2M business is in a phase of fast growth and M2M solutions are fast becoming a part of many companies' everyday life. Applications can be found in almost any segment or environment – for example cargo tracking, a use of especial potential importance for the risk management and insurance of the future.

Mobile financial services

In the USA, brokerage firms like Fidelity and TD Waterhouse already provide a wireless internet service, so that their customers receive real-time quotes, quote lists, market updates, news and other extensive research.¹⁹ Applications such as access to real-time equity information for traders on the floor are driving mobile middleware vendors' sales. Professional services companies are also investing in mobile middleware as opportunity costs revolve around a connected remote workforce. In this sector, vendors are receiving most success in deploying applications such as mobile email and personal information management functions (PIM). Wireless financial services are not confined to the USA, either: DBS Bank in Singapore offers a wireless application WAP service which allows account holders to perform a range of financial transactions on their mobile. Credit card giants Visa, MasterCard and American Express have joined forces to form the Mobile Payment Forum. The forum will work on creating technical standards for mobile e-commerce to authenticate cardholder identities and provide a secure way for consumers to make purchases from their mobile phones, personal digital assistants and other devices. One of the primary goals of the new nonprofit group will be to standardize payment features and promote secure m-commerce for an industry that is still in its infancy.

Yet it would also be wrong to exaggerate the extent of current Wireless Internet penetration in financial markets, especially outside the USA, developed Asia and Europe. Take Argentina as an example. Banks in Argentina, as elsewhere, are trying to stimulate WAP use further by allowing their customers to access their own services through it. Although access over Wireless Local Loop (WLL) was introduced into Argentina in 1999, and Argentine cellular service providers are now offering Wireless Application Protocol (WAP), by April 2002 they had reportedly attracted only 10,000 users thus far, according to Telecom Argentina.²⁰

User requirements for mobile trading systems

The companies producing mobile trading systems themselves recognise that just because something is possible it is desirable. For mobile trading systems to succeed commercially, these companies must ensure that mobile trading is creating real value to real people willing to pay real money. Currently, their best view is that although mobile hand-held trading terminals will never be the main way of trading for most traders (with the exception of floor traders and brokers in the remaining open outcry markets of the world), the flexibility and ability to be in permanent contact with the markets even when on the move and to be able to react and place transactions immediately without delay or uncertainty is likely to appeal to a large and increasing number of traders.

One old hand of the LIFFE market mentioned that over black Monday way back in 1987 he lost £55,000 in 5 minutes simply by having to leave the markets for that time without any ability to overview and manage his positions. It does not take many such stories, particularly

¹⁹ TD Waterhouse customers can check account information, order status and place equity orders. Note also MidCast, by HillCast Technologies, a streaming real-time financial application for Java-enabled devices producing financial data as quotes, details, charts and graphs. MidCast maintains the user's choices and preferences in the device and in the MidCast Server as well as allowing for interactive personalization.

²⁰ Quoted by US Department of Commerce, April 2002

in these volatile times to feel that having the option to take the markets with you is an option you do not want to be without. Mitigating this loss by 50% he would have paid for 20 years of rental as well as the purchase of the device in just five minutes.

So it is likely that mobile trading will be taken up by a range of market participants, notably:

- Traders and brokers who are not purely desk-bound. This would include amongst others:
 - all traders that are currently still trading in open outcry exchanges
 - those that also have managerial responsibilities
 - traders working from home
 - exporters, farmers, processors and others tied to non-trading desk environments
- Traders and brokers who want to be able to have access to markets on the move, such as:
 - When commuting to work
 - When visiting clients
 - When out to lunch
 - When on holiday
- Traders and brokers who want the insurance of an alternative trading terminal in case their main terminal breaks down

These represent a diverse and numerous community, within which the availability of what is sometimes called Martini Trading (Anywhere – Anytime – Anyplace) will become much more expected and traders and brokers will be able to develop a new, much more effective way of working around that capability. All these individuals, typically professionals and very serious “semi-professionals” traders, brokers or other capital market professionals, need to remain in contact with the markets at all times and to be able to react quickly to new information. Their requirements are that:

- Fast access to a comprehensive range of market data
- Simple, familiar and secure data input
- Reliability
- Back-up trading capability exists in the case where the platform is either not able to communicate or unavailable for other reasons
- Seamless transfer to Wi-Fi or other low-cost communication when possible

Can these needs be met? Those most likely to want and require mobile trading are also likely to be the most demanding of customers in terms of speed, functionality, reliability and service. A mobile trading system for this community needs to have the following characteristics as a minimum requirement

- Offer true real time prices with no delay compared to trading room systems
- Enable single or two click trading with the option of confirmation windows to minimise the increased risk of data entry error due to the small screen size
- Provide for professional traders an interface which is consistent with that of the trading room system to enable full fast and accurate trading without a long learning curve
- Provides the trader with additional features to cope with the reduced bandwidth and still often unreliable connectivity associated with mobile communication
- Provide quick and easy alternatives to execute trades or amend trades in case the mobile device cannot trade

Trading is a highly volatile activity with one missed trade being worth many thousands if not millions of pounds. The price of even information systems such as the mini-Reuters indicates that being in contact with the markets at all times is worth paying for and that therefore the ability to act on such information would be even more valuable. Financial institutions are therefore already looking to adopt wireless trading as a means to increase revenues, improve

productivity and reduce costs. Decision makers in these institutions recognise that their fund managers are often on the road and would prefer to be in continuous touch with the markets at the same time. Sadly also, 9/11 also showed the importance of mobility and flexibility and provided a major impetus to wireless trading. As with most m-commerce applications, success lies in being able to integrate wireless data solutions into readily usable and affordable packages. This is the case for the professional trader trading millions for either hedge funds or other financial institutions as well as the professional or semi-professional independent trader.

The only category left out of this analysis are the peripheral traders, such as farmers or exporters, the very people most likely to benefit from mobile trading in the long term, who may need only to make occasional trades. For them, cost and ease of access will be the deciding characteristics of systems they choose to access. Their trading systems are likely to come packaged with other mobile applications, such as crop insurance or weather information, as well as the familiar suites of office and leisure products and services.

Mobile trading systems

A decade ago only a top of the line Sun Workstation on a 100 Mbit Local Area Network or its equivalent would have been regarded as the minimum IT even for the lowest level of traders. Even today this is the reality for many traders in many trading rooms and these traders are effectively shackled to their trading desk for 9 hours a day barely able, or daring, to leave in case something happens. However, trading and trading tools are evolving rapidly to take advantage in the growth of electronic trading, the emergence of new electronic exchanges and the improvement of the capabilities of hardware and communication technology as well as the development of increasingly sophisticated software.

The range of mobile trading tools that have been launched have often failed to deliver on all these points. This was unfortunately the case with first generation WAP applications which are cumbersome, slow and unfamiliar to the traders or user. Functional trading tools were not possible due to the limitations of the devices and communications until the last 6 to 12 months. PatSystems until recently produced a fully functional trading system on a large screen Hand-Held device. Although these were very useful in the pits of floor based exchanges, they were heavy and suffered from many defects such as: short battery life, poor screen visibility, high cost, heavy weight and fragile construction. They therefore only appealed to the dedicated professional trader who needed to be in contact with other markets. Mobile devices have also both more fragile and less reliably connected to the Exchanges than desk-bound terminals which means that should the device become disconnected, forgotten, low on power or unable to trade for a variety of other reasons a back-up trading route has needed to be immediately available.

But both the quality, robustness, battery life – a whole day - and screen visibility of the new devices make them a truly suitable trading device. And although mobile phones are still unreliable, new mobile modems at least give sufficient bandwidth to be able to provide a reasonable number of real time prices on the move. 3G Mobile network as well as very cost effective wireless LANs and other new protocols now make trading on mobile devices viable.

Future Dynamics and PatSystems are the two companies which already have seized the lead in making available a commercially available mobile risk management solution, called Pocket Crossfire and H-Trader respectively They both run on a Compaq iPAQ hand-held PC. Both systems provide completely mobile real-time access to the world's leading exchanges, on a handheld Pocket PC using Windows CE. They combine the benefits of leading-edge software with the convenience and flexibility of a wireless handheld PC. According to Steve Chivers, Vice President of Future Dynamics: "If you get your technical architecture right from the beginning, it's easy to add different favours of front-end without trying to squeeze your desktop application onto different platforms using expensive hardware and tools".²¹

²¹ *Derivatives & Risk Technology*, Vol. 9 No. 15, 13 July 2001.

The systems are wireless versions of trading front ends, and use the same pre trade risk management and global order book as the desktop and web versions of the product. All orders entered via the mobile device are also subject to pre trade risk management. This may be limit based (i.e. clip size & position) or cash based (i.e. cash v margin requirements) or a combination of the two. Using H-Trader it is possible for a broker to see a customer's order flow, as well as see where the markets are and the velocity of trading, no matter where they are.²² H-Trader also has built-in email capability. A trader can subscribe to an email based system, or build one themselves that sends out email signals, and execute the orders themselves. Or, working with a broker specializing in systems trading, the trader could monitor the account and the trades the broker was working and had executing while following some trading system. This is real-time information and the ability to monitor trades. It is real-time information about the status of an account, the trading being done and the market, as well as providing necessary risk management.

Features of mobile trading systems

Mobile trading systems allow clearing firms to take advantage of their floor presence while maintaining quick and efficient electronic access to the exchanges worldwide. The attractive features of even currently available systems are:

- 'Real-time' trade executions with global exchanges such as GLOBEX 2, LIFFE, EUREX and MATIF (Euronext)
- Futures, options and equities can be traded from the same screen.
- Multiple trading ways on multiple markets from a single screen:
 - One or two click Market orders
 - One or two click Limit orders
 - Ticket based order entry
 - Two click order amendments
- The ability to select different accounts for review with two clicks. This is ideal for brokers and Head of Desks
- Instantaneous protection with the possibility to enter an automatic stop-loss order at a predefined level simultaneously with an order to ensure should anything happen to the connectivity or the device there is no possibility of massive loss. Stop-loss orders can be entered automatically after limit orders.
- Relevant real-time market information such as market prices, order flow and market depth from global exchanges
- Global real-time order book, position and P&L information
- Current cash and position risk management
- Reduced bandwidth utilisation to cope with the still limited bandwidth available over most mobile telephone network
- High level of encryption to ensure that all data is secure over any network
- Highly visible screen under all lighting conditions
- Screens specially designed to make the most of their small size but also to replicate the format and functionality of the compatible desktop system
- There is even a choice of connectivity including wired/wireless LAN, dial-up modem and broadband. Pre-trade risk management on all orders. Integration with the rest of the trading application suite providing a range of alternative trading routes should the mobile device not be able to connect or trade.

Mobile trading has begun

Since June 2001 Cunningham Commodities, Inc. has been using Pocketcrossfire on the floor of the CBOT. It's a start. Bill Cunningham, President of Cunningham Commodities, Inc, said that "Pocketcrossfire brings the screen into the pit, and the handheld device adds another flexible tool for my traders." One trader using an iPAQ generated 7% of the total daily volume

²² Future Dynamics also has a wireless version of its post trade risk management system, Rollcage, so that traders receive alerts on their iPAQs when pre-defined warning thresholds and limits are breached. H-Trader has a similar procedure to use to the company's J-Trader PC interface.

on the T-bond contract through Pocket Crossfire. Cunningham stated that Pocketcrossfire, in addition to the web-based Crossfire system, has dramatically increased the time his traders spend trading electronically.

At a more modest level in and around exchanges themselves, there are several other systems in use. For example, MetaFrame's ability to deploy any application to any device made it possible for AOT (Australia's major provider of internet-based trading services) to deploy its custom trading application instantly to thirty traders on Hitachi Windows CE-based handheld devices. "MetaFrame enables AOT traders to gain access to up-to-the-second information on market news and prices from wherever they are on the trading floor, and gives them the ability to buy stocks and options electronically," commented AOT. "Our wireless implementation has enabled 'click to shoot trading' - the ability to make a trade or gain market information at the click of a button - and as a result the company has seen a 300% improvement in the speed of trading."²³ Brokers have long believed that handhelds are well suited to pit traders wanting to trade other markets. They are quicker and more reliable than running over to a phone on the floor and calling in an order.

Future developments

Industry observers feel that wireless Internet access has great promise in the future, given the relatively low PC penetration rate and the rapid growth in cellular telephones in developing countries worldwide. The Economist suggested last year that "The Internet's mobile offshoot will turn out to be an entirely new medium...accessible to people beyond the reach of today's Internet, notably those in the developing world, because it will not require complex and costly PCs". Patrick Young of Capital Markets Revolution fame goes so far as to suggest: "The 21st century will see the explosion of mobile connectivity permitting practitioners and indeed even markets to be entirely flexible in their choice of domicile - whether a fixed position or indeed a constantly changing one". Whether or not these predictions come to pass will depend on the ability of wireless handset providers to boost the capabilities of these devices and to bring their cost down to an affordable level. This story is very reminiscent of the spread of television fifty years ago, or indeed of telephones a century ago. Unit costs can only fall with widespread use. But what now seems very likely is that mobile trading will be one of the suite of services delivered to a wide range of users by tomorrow's mobile internet.

How would it work in practice? Leading brokers could take the floor routing system from systems providers to add to the electronic market. This capability could be used to both link to Exchanges worldwide and also to brokers' desks enabling them to provide proprietary markets and trading capability globally. Brokers will then will need to acquire either portable computers or other hand held devices on which the software can run and find a network that would link them with their clients and onwards to the exchanges. If an immediate fill (in less than a second) is not of the essence but 1 to 5 second is adequate – as it would normally be for hedging - the basic Internet over mobile phones would be acceptable even in Sub-Saharan Africa. The set up costs would be minimal. In later applications brokers could add matching engines to automate the trading of specific products through mobile trading.

What would this enable? As the cost of this technology falls, futures can really be brought to the farmgate, potentially packaged along with crop information, fertiliser purchasing and crop yield insurance. The prospect for widespread immediate and cost-effective management of price risk broadens: not just in developed countries but in the countries of sub-Saharan Africa, less developed Asia and South America where the consequences of unmanaged price risk are most damaging to farmers' incomes and livelihoods. As UNCTAD has argued, mobile portals for farmers, exporters and local brokers in commodities represent a unique opportunity for leveling the commercial opportunities between developing countries and their customers in the developed world. The main hurdles will be organisational and managerial, which international agencies can play a significant role in overcoming.

Tomorrow's questions

²³ Citrix case studies – AOT, <http://www.citrix.com/press/news/profiles/AOT.htm>.

So what will we be asking about mobile trading next year, and in the years to come? Some possible questions are:

- Will mobile trading remain the prerogative of professional traders, or will it, like Internet trading, become an investment tool of the general public?
- What role will exchanges eventually take in adopting mobile solutions for their members?
- What technical innovations will be next for products such as H-Trader and Pocket Crossfire – in particular, can we expect to see them available on Internet-capable mobile phones?
- Will mobile trading help to empower those in developing countries who do not have access to the fixed Internet?
- Will the dispersion of mobile technology and wireless access to trading result in a change in trading patterns, and even the introduction of new contracts and types of contracts?
- Will the mobile internet result in the packaging of trading applications along with other products and services?

The next few years will see the answers to these and other practical questions about just how much wireless trading will change the equities and derivative markets.