Biometric authentication begins to gain momentum

Population-scale implementations of biometric authentication have so far remained elusive, says John Elliott at Consult Hyperion. *Although some exciting developments are currently underway in access control and ePassports, is this technology ready to support payments?*

To date, the worldwide adoption of biometrics has generally been quite slow. This has been due to a number of factors, including the poor performance of the first biometric systems, over-confident claims by technology vendors regarding the capabilities that biometric solutions can deliver, concerns about privacy if biometrics are stored in centralised databases by governments and/or companies, and an overall lack of a business case for biometrics to uniquely solve problems that other technologies are already addressing successfully.

Having said that, biometrics is now gaining some traction in certain applications, particularly access control. The use of biometrics in corporate physical access control, for example, is already making it possible for employees to access a building or a restricted area securely, using their unique biometric data.

Similarly, logical access control applications can now enable employees and/or consumers to securely access their PCs, laptops and mobile phones using their unique biometric data. For consumers, this technology is typically located within the consumer device, in order to eliminate the need for a service provider to manage any enrolment procedures or other lifecycle management functions.

The application that has gained the greatest traction globally, however, is the electronic passport or ePassport, with the latest figures now showing that there are currently more than 100 countries issuing ePassports at a rate of 100 million books per year[1]. A high degree of interoperability has been achieved in this area through widespread standardisation of the technology and processes involved. As such, each of these ePassports simply need to contain a chip that stores a photographic image of the passport holder, so that biometric authentication can be carried out at a nation's border control points quickly and effectively.

Biometrics for payments: Finding the balance

Biometric technology needs to achieve an optimum balance between security, convenience and transaction speed for a wide range of applications that require user verification or identification. The balance between these competing factors is especially important for payment applications, where cardholder convenience needs to be balanced against risk management and transaction speed at a point of sale.

The factors that influence this balance are numerous, but typically include the choice of the biometric technology itself, the number of authentication factors, whether the authentication is performed server-side or client-side, and the number of users.

Although a 'trade-off' may ultimately be required in some of these areas, it is still possible to achieve a balance that is acceptable to all sides. In fact, most of the current research into consumer reactions to biometric approaches has been consistently positive across many

European markets. In particular, there appears to be a general perception that biometrics offer added security as well as convenience[2].

A global perspective

At the moment, population-scale retail biometric payment application is yet to be deployed anywhere in the world. Between 2005 and 2007, there was a well-funded biometric payment application in the US called “Pay By Touch” that reached approximately 6 million enrolled users.

This scheme is no longer operational, reportedly due to the supplier of the biometric solution going into administration and not as a result of the performance of the biometric technology itself (which used fingerprints). The same system was trialled in the UK at the Co-Op, and there are currently trials of other finger biometric technologies in retail stores across Europe.

For example, the Metro Group Future Store Initiative in Germany aims to drive forward the modernisation process in the retail sector and develop practical concepts suited for use in the retailing of the future. The central platform of the Metro Group Future Store Initiative is “Real Future Store” in Tönisvorst, which opened in May 2008. (“Real” is Metro Group’s hypermarket format). In this hypermarket of the future, each partner is able to test new technologies and concepts under real-life conditions and develop them further until market maturity.

On a selling space of approximately 8,600 square meters, the partners of the Metro Group Future Store Initiative are testing new concepts and technologies that will provide customers with an even more convenient, exciting and informative shopping experience in the future. Here, customers can pay by fingerprint by registering at the Future Store Information Counter. They simply need to place the finger or thumb on a checkout fitted with a special reading device.

Neither signatures nor PIN numbers are needed, nor do customers need to search for change. Instead, customers simply have to register once for the “Payeasy” payment scheme: one finger is simply scanned three times during the registration process, and then the system creates a template from the scans. This is a number code that encrypts the characteristics of the fingerprint. The template authenticates the customer’s identity when paying by fingerprint. It is transferred with the customer’s details in encrypted form to easycash, a partner of the Metro Group Future Store Initiative. There, a "Payeasy" identifier is created, with which the direct debit is carried out.

There are similar developments happening outside Europe as well. With 22.5 million accounts, Bradesco is the largest private bank in Brazil, and is currently equipping its machines with biometric technology in order to increase security. Trials started in 2006, and Bradesco was the first bank in the Western hemisphere to adopt biometrics at ATMs.

The “Bradesco Security on Your Hand” biometric reading system, which identifies customers using the vascular pattern of their hands, works in conjunction with more traditional password-based security at the bank’s ATMs. As such, registered account holders no longer need a personal identification number (PIN) when making a transaction at an ATM equipped

with a sensor. In the first quarter of 2010, this technology was available in 13,889 machines and was used up to 57.8 million times.

Understanding the issues related to biometrics

There are currently a number of applications and services that actually lend themselves to the use of biometrics very well. For example, typical generic horizontal applications and vertical markets include solutions for the public sector (such as border control / immigration, national ID cards, e-Government services) as well as private sector initiatives like corporate security, information security, and financial security solutions that cover a combination of physical access, logical access, identity management and surveillance.

Regardless of how and where these solutions are deployed, a number of factors will need to be considered at the outset, including details of the original business case, the cost of implementation and finally customer acceptance. One of the main considerations will be to ensure that any physiological feature that's used to generate the biometric is part of the person and is not easily compromised through theft, collusion (e.g. borrowing a spouse's card), and/or loss.

In addition, different biometric solutions will be useful for different applications, which means that there is no single 'best' biometric. Not all biometrics technologies suit all people, either(for example, 5% to 10% of the general public will have unusable fingerprints due to wear or skin conditions [3]), and privacy concerns will need to be considered in relation to the particular application and even the culture of the country where the technology is being used.

These privacy and data access considerations are important, which mean that key questions needs to be addressed at the outset: who will be able to access this data and why? The sensitivity of the data will also need to be determined, along with any legislative limitations and compliance standards, if user acceptance is to be universally obtained.

In most cases, additional hardware will also be required for biometric authentication systems, and the cost of verification devices (such as terminals, readers, scanners and so on) required for large systems can be significant (e.g. adding finger vein or palm vein sensors to ATMs).

Also, depending upon the application, user co-operation is usually necessary (e.g. when using facial recognition it helps to look at the camera.), which means that user education is often required until users become more familiar with the system.

With these caveats in mind, however, the benefits of biometric technologies are both numerous and well documented, including the most obvious: the biometric characteristics of one individual are very difficult to share with anyone else, which heightens security substantially. Not only that, but biometric solutions also eliminate the need to remember (or worse still, write down) weak passwords and PINs.

Case Study: cashpoint (ATM) machines in Japan use biometric data

The best current example for the use of biometrics technologies for retail financial services is in Japan. Here, there is a deployment by multiple banks that enables financial transactions to be biometrically authenticated at suitably enabled ATMs (55% of ATMs have appropriate readers).

Research suggests there are approximately 4 million consumers using the service with bank-issued cards containing stored biometric data (finger vein or hand vein), which means that biometric customer authentication can now be performed at ATMs by using either a palm vein pattern or finger vein pattern, depending on the bank and ATM supplier. Participants include Japanese Banks across Japan and ATM suppliers including Fujitsu, and Hitachi.

Japan currently has 150 banks with 12,000 branches[4] and over 400 million bank accounts[5]. In 2007, there were 20,000 ATMs equipped with this technology[6], a figure that rose to 80,000 ATMs – being used by 15 million customers – in 2010[7].

The majority of banks are using the finger vein biometric, but Fujitsu still has the most overall users: although Hitachi controls 60% of the ATM share (and Fujitsu just 40%), there are between two and three million people in Japan using Fujitsu's technology, and only one million using Hitachi, according to Fujitsu.

Fujitsu's solution for the Bank of Tokyo-Mitsubishi (BTM) works by having the client register his/her vein pattern data onto a smart card, after which the client can only make a financial transaction once verified by the authentication device at the branch office or ATM[8].

In Japan, this technology was rolled out as a reaction to legislation passed in 2006 that made banks liable for withdrawals by criminals using stolen or counterfeit bank card. The Japanese payments market is notable for its high cash usage, making this requirement particularly important. Since first being deployed in Japan in 2006, the solution is now being deployed by a bank in Brazil, along with two trials of biometric technology at ATMs in Poland and Turkey.

Public support for biometric payment applications

According to research conducted in this area, most people seem to be open-minded about the applicability of biometrics in the payments world at some point in the future[9]. Having said that, the majority opinion is that biometrics for payment applications at population-scale is at least five years away, and maybe as many as ten years, with biometrics continuing to be deployed for physical and logical access control in the meantime, and in the public sector for large-scale initiatives like national ID cards.

Most research suggests that consumers are generally well disposed to the use of biometrics for payments, however. One of the most notable is the TNS shopper insights survey [10] from 2008 which found that biometric fingerprint payment was believed to be the most likely innovation in the retail environment by 2015.

For this survey, TNS defined biometric fingerprint payment as “A shopper can pay for purchases by placing his/her finger on a sensor that reads the fingerprint, linking it to the shopper’s bank account or credit card to record the purchase”.

In China, 69% of those questioned said that this kind of technology was appealing and 48% said they were likely to use it. Spain showed similar enthusiasm, with 64% reporting that they found the idea appealing, and 41% saying they were likely to use it. Of all the countries surveyed, it was Germany who seemed least excited, with just 24% saying the idea was appealing, and 10% saying they were likely to use it.

However, unless a business case can be found or a legislative driver (as in Japan) then in the short-to-medium term, payment applications using biometrics will probably remain as a niche solution for certain market segments, and thus remain unconnected and operating only in isolation (e.g. be adopted slowly by banks at ATMs and in selected retail stores).

Merchant acceptance

Unsurprisingly, one of the key considerations for the acceptance of new electronic payment mechanisms at point of sale by merchants is the implementation cost. Any solutions in this area will therefore need to fit within a multi-lane merchant checkout infrastructure and also work with stand-alone single terminals. As such, replacement cycles may well dictate when new services like these can be deployed.

There are also a number of operational costs to consider. For example, the additional servicing or maintenance costs of a new POS peripheral would need to be consistent with the value to the business. Likewise, transaction costs will need to be comparable with existing electronic payment products.

Understandably, merchants are also concerned about an impact that biometric authentication might have on transaction speed. For large merchants in particular, improvements in the overall speed of the checkout process (including the payment transaction)typicallyrelate directly to the store’s overall throughput.

Transaction reliability is often cited as another area of concern for merchants, which means that the equipment used and the network reliability must be of a consistently high standard. Already, reliability issues have been known to inhibit rollout; a significant problem affecting the early-stage rollout of contactless payments in the UK has been the reliability of peripherals attached to small merchant cash registers, for example.

Merchants will also want to have input into settlement terms in order to ensure the timely transfer of funds to merchant accounts, since any additional time delays or liabilities with respect to current card products are unlikely to be acceptable. Lastly, merchants will be very interested to hear about any added value that biometrics can bring, such as any additional benefits that may be realised as part of a biometrics solution, such as personalised coupons or links to loyalty products.

Case study: Poland Cooperative BPS bank

Poland's co-operative BPS SA bank installed the first biometric ATM in Europe at an ATM in Warsaw allowing customers to withdraw money by using their fingerprints along with a PIN number. The project began in Warsaw, with expansion planned for the whole of Poland. BPS Warsaw is the Polish branch of BPS the Belarus Bank.

This project was the first major commitment to institute biometric security standards by a large Western bank [11]. Based on "finger vein" technology developed by Hitachi, the ATM scans the unique network of minute veins in customers' fingertips. Infrared light is passed through the finger to detect a unique pattern of micro-veins beneath the surface, which is then matched with a pre-registered profile to verify an individual's identity [12].

The system works by using the finger vein biometric to replace the ATM card, so that customers withdraw cash with their finger vein image and their PIN. The new biometric machines will also eventually be used to secure the payout of pensions at the end of the month and to guard against fraud such as 'skimming', or the theft of credit card information" [13].

This is a substantially more reliable technique than using fingerprints, since Hitachi's tests indicate there is a one in a million false acceptance rate — a figure that's equivalent to iris scanning, which is generally regarded as the most secure biometric method of authentication. Also, unlike fingerprints, which leave a trace and can be potentially reproduced, finger veins are impossible to replicate, because they are beneath the surface of the skin[14].

As of May 2010, one biometric machine was operating in Poland, though BPS plans to deploy three or four more of the ATMs in Warsaw before year's end. About 200 more will be deployed across a network of 350 bank branches there in coming years [15].

In Poland, banks have a responsibility to perform various social functions like dispensing welfare checks and pensions. These cause long queues at the cashier and many people find it inconvenient and even debilitating[16].

Looking to the future: key market drivers and barriers

There are a number of clear drivers that are helping to encourage the uptake of biometric technology for payments, including positive consumer acceptance and reduced reliance on PINs and other more easily compromised verification information. In addition, the increased speed of cardholder verification during a transaction is now seen to offer benefits to specific merchant categories, as well as an additional cardholder verification method for enrolled customers.

On the other hand, there are some barriers as well. Within the banking sector, there is still a lack of a clear business need for biometric authentication, coupled with a well-established (and successful) solution that uses face-to-face payments controlled by EMV and PIN in order to fight fraud. Most people seem to believe that EMV has been quite successful in this

regard, and that biometric technology will therefore find it difficult to displace Chip and PIN based on its fraud prevention credentials alone. However, there could be some middle ground here, since biometrics could perhaps be used in conjunction with Chip and PIN as a secondary authentication factor.

The banking sector is also acutely aware that fallback transactions and legacy infrastructure will still need to be supported (requiring card issuance), even after biometric controls have been put in place. Likewise, the reliability of 'contact' biometric sensors in relatively harsh retail operating environments – as well as a lack of interoperability between deployed solutions – also remain contentious issues.

For all of these reasons, it seems that the business case for biometric payment applications is weak in comparison to Chip and PIN. Having said that, this perspective on the business case may be different for Europe compared to other regions and emerging economies, partly because attitudes to biometrics in Europe include a perception of it being for police use, whereas in Pakistan and Africa, for example, it's often perceived as a benefit to be able to prove one's identity when obtaining money. Regardless, the lack of a clear business case for biometrics in payment applications is currently one of the main barriers to its widespread adoption.

---

[1] http://www.secureidnews.com/tag/Border_Control/page/2
[2] http://authentec.com/News/ViewNews/tabid/473/ArticleId/196/Survey-U-S-Cell-Phone-Users-Want-M-3Commerce-and-Biometric-Protection.aspx
[3] http://www.healthcaretechnologyonline.com/article.mvc/Are-Biometrics-The-Key-To-Health-IT-Security-0001
[4] http://www.thecityuk.com/media/2372/IFSL_Banking_2010.pdf
[5] http://www.bis.org/statistics/payment_stats.htm
[6] http://www.businessweek.com/globalbiz/content/feb2007/gb20070206_099354.htm
[7] http://edition.cnn.com/2010/WORLD/europe/07/05/first.biometric.atm.europe
[8] http://www.fujitsu.com/global/casestudies/WWW2_casestudy_BTM.html
[9] http://www.tnsglobal.com/_assets/files/TNS_Market_Research_Shopper_Insights_2008.pdf
[10] http://www.tnsglobal.com/_assets/files/TNS_Market_Research_Shopper_Insights_2008.pdf
[11] http://www.montrealgazette.com/Poland+first+Europe+have+biometric+bank+machines/3014181/story.html
[12] http://www.montrealgazette.com/Poland+first+Europe+have+biometric+bank+machines/3014181/story.html
[13] http://www.montrealgazette.com/Poland+first+Europe+have+biometric+bank+machines/3014181/story.html
[14] http://www.cnn.com/2010/WORLD/europe/07/05/first.biometric.atm.europe/
[15] http://www.popsci.com/technology/article/2010-05/poland-installs-europes-first-biometric-fingerprint-scanning-atm-machines
[16] http://www.montrealgazette.com/Poland+first+Europe+have+biometric+bank+machines/3014181/story.html