

# Alternative NFC Form Factors White Paper



## Will they gain market share and how will they impact development of integrated NFC handsets?

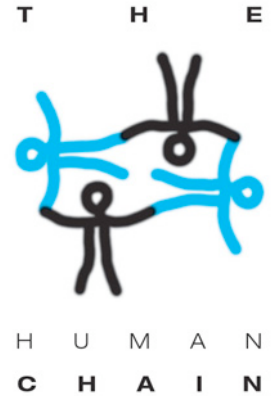
The benefits of integrated Near Field Communications (NFC) functionality in the mobile handset are clear for Mobile Network Operators (MNOs)/network carriers, members of the financial services ecosystem, service providers and end users. A device that combines smart card technology with the addition of a screen, keyboard and 'always on' communications sounds like the nirvana of the financial, transit ticketing and access control worlds.

But there are significant questions that are still un-answered some five or even six years into the development of NFC technologies in mobiles. In the new mobile NFC ecosystem who is going to pay for the increased costs of new handsets and UICC SIM cards? This is a complex ecosystem where new business actors such as Trusted Service Managers (TSMs) and secure domain owners/ managers will require some portion of the revenue, therefore reducing the revenue and profits for existing players.

Another major issue is that the new NFC ecosystem requires a number of existing well-established ecosystems such as mobile, credit/debit card; transit ticketing, loyalty and couponing to come together. These have proven business models, some of which, such as the credit/debit market, are under pressure from new competition, such as web-based service providers and supermarkets as well as increased regulation. Other service providers such as transit ticketing operate on low margins where the business model is further complicated by public subsidies, which can obscure the real costs of operation.

Replacing existing handsets and UICCs with NFC compatible devices raises a number of challenges for MNOs and network carriers. Those who subsidise handsets to any significant degree will incur significant costs when upgrading handsets, only some of which will be off-set by revenue from new contactless and NFC services. Many commentators, industry analysts and eco-system players themselves have overlooked the increased cost of the UICC SIMs in GSM handsets- and the increased cost of lifecycle management. UICC SIMs will provide secure domain areas for NFC cardlets, but will be more complex to manage which will incur extra cost. Current MNO/network carrier over the air (OTA) systems need to be either replaced or upgraded to be capable of supporting this extra lifecycle management requirement.

The complexity of developing and deploying NFC services using integrated NFC mobile handsets have led most industry players to review alternative NFC form factors. These are where NFC contactless technology is provided by another form factor rather than integrated into the mobile handset by the handset manufacturer. These may not provide the same OTA as integrated handset solutions but they could provide contactless functionality potentially sooner, at a lower price point and also facilitating different business models.



There are two main types of alternative NFC device.

- NFC stickers;
- NFC Micro SD (uSD) cards.

### NFC stickers

There are two types of NFC stickers:

- Stand alone (unpowered), also known as NFC Card Emulation stickers
- Those powered with some connectivity to a mobile handset normally via Bluetooth.

#### Stand alone – (unpowered)

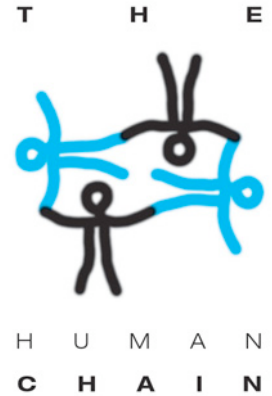
These devices are very thin self-adhesive stickers which are small enough to be placed on a mobile phone or other device. They have similar functionality to existing contactless cards such as prepaid stored value cards.

Early production stickers have come to market already and are being evaluated by banks, loyalty card schemes and transit providers. The intention is that they should work in a similar way to a plastic credit card sized contactless smart card.

These stickers can be produced using standard A1 credit card format production and personalisation techniques. This has significant commercial and technical advantages over other form factors which do not use existing production and distribution methods. This will save start-up costs and be quicker to market compared with other form factors. The stickers can be produced and branded in the same way as a current contactless card either on a backing sheet or a roll. They can then be packaged and distributed in the same way as a current contactless card. These devices are using the same or very similar smart card chip sets and architecture, so are really just alternative form factors of contactless credit, debit, loyalty and gift cards that already exist today.

The production and distribution channels are therefore well known, business models exist and the service providers can use existing routes to market for these new form factors.

While these NFC stickers provide extended markets for the current sectors served by credit card sized solutions, are they a threat or an opportunity for MNOs/network carriers and other eco system players who are trying to drive Mobile NFC with all its inherent advantages? MNOs/network carriers would have no control or position in the value chain of these devices, unless they wished to actively participate, by distributing and using stickers as a stepping stone to more integrated NFC solutions where they will control more of the value chain and provide increased functionality.



Banks, retailers, transit authorities, ticketing, loyalty card and gift voucher providers would all realise significant business benefits from having both their functionality as well as their brands placed on significant numbers of mobile handsets or PDAs. They would also not have to share revenue with MNO/network carriers unless they actively wanted to engage with them as part of a longer-term strategic play.

There are a number of manufacturers providing stickers that will work with existing point of sale (POS) contactless solutions; Mifare functionality and multi function stickers are also due to become available.

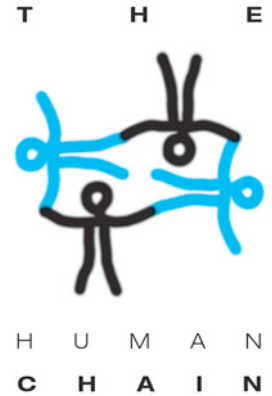
These devices have no connectivity with the mobile handset and could potentially therefore drive alternative business models. At present, all the commercial offerings are pre-paid cards, like gift cards. There is no technical reason why they could not be associated with debit or credit card accounts going forward. The major card scheme operators are being cautious so far in this area and are content to sit back and see how the pre-paid stickers drive demand. This approach is low risk and could lead to significant new revenues, whilst not cannibalising existing product revenue streams as it would target new market segments such as the young, unbanked and so on.

Price point is currently an issue as stickers are more expensive than traditional smart cards, but as volumes increase the price is expected to fall. Volumes have increased greatly during 2009 and therefore during 2010 and 2011 it is expected that the price point will be significantly reduced. Multifunction and Mifare NFC stickers are potentially more expensive than cards with similar functionality, which may limit their early take-up.

Simple pre paid NFC card emulation stickers have significant advantages to going commercial mass market. They can be produced in a known production environment and distributed via an existing and well understood distribution channel. The existing gift card channels are a good example, where these stickers could be sold in volumes, either already set up with some value or ready to be provisioned using existing POS processes. They are simple to use and offer clear branding opportunities to brands that want to 'get on' to the mobile handset or other devices without having the complication of powered stickers or uSD cards, which require connectivity or inserting into the handset.

#### **NFC card emulation stickers (powered) Powered contactless stickers**

These stickers are powered by batteries and are designed to connect to the mobile phone using Bluetooth technology, which is installed in nearly all current GSM and CDMA mobile handsets.



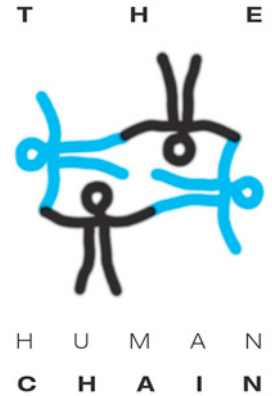
The manufacturers claim that these devices will radically change the contactless world and provide the 'bridge' to fully integrated NFC mobile handsets. But beware technology claims: the linking of the sticker to the Bluetooth radio on the handset has connectivity, set up and battery management issues. As everyone who has ever used a Bluetooth headset will know, it can be simple to pair the device with a mobile handset, but sometimes it can be difficult and not very intuitive. Battery lifecycle management for Bluetooth devices has been an issue in the past and these new powered stickers potentially could have similar issues as they would have to operate in a transmit and receive mode all the time.

Another issue is physical size: the technical challenges of manufacturing stickers of an acceptable depth are significant and currently manufacturers have reduced this to 5-6mm. However doubts remain on the acceptability of cards of this size. The manufacturers say that they expect during 2010 to reduce this to a more acceptable size. But is this an acceptable form factor to attach to your expensive smart phone? It is a simple step to go from an A1 credit card form factor to a very thin (1-2mm) NFC sticker, but moving to a much thicker device may impair the customers' experience of using their handset case, holder, skin or in-car kit.

Battery power may be a problem as the sticker has to be powered to make the NFC sticker 'talk' to readers, tags and POS devices. The power issue has been addressed by using either solar power, – which has its own issues if the sticker is placed on the back of the device and then put in a case, skin or cover – or by taking power from the handset. These issues will be overcome given time, but are significant and technically challenging.

Usability is another challenge. Connecting to a Bluetooth device can sometimes be time-consuming and frustrating. The Bluetooth stickers need to be intuitive and very simple to use or end users will not use them and the take-up will be very limited. The consumer electronics industry has a history of products that have failed to achieve mass adoption because they are not simple or intuitive to use, or require end users to make a major conceptual leap or step in order to use them. Devices and products that are simple to use and offer clear and easy to understand benefits to consumers will gain mass adoption.

The concept of powered NFC stickers which can communicate with nearly 100% of handsets via Bluetooth appears to have huge potential and overcomes some of the problems presented by uSD cards. However, there is no existing production capability or established distribution chain for these devices. The companies trying to bring these products to market are generally small start-ups, some of which are funded by seed capital from major industry ecosystem players such as technology providers, telecoms companies and so on, but which will nevertheless struggle to achieve mass production in a reasonable time scale.



This is a major issue in fast-moving consumer electronics, where the price point is driven by the production costs. While producing small volumes (hundreds of thousands in this market), the manufacturers will struggle to get the unit cost down to a realistic and volume-driving mass adoption point. One of the manufacturers has already stated a retail price point of nearly €20 (US\$30) in the short term dropping to sub €10 (US\$15) in the medium term. Mass adoption seems unlikely at this price point given the competition from unpowered stickers and potentially uSD cards which are aiming for significantly lower price points.

The other business model challenge is establishing channels to market. It is easy to see how unpowered low-cost branded stickers could be sold through existing prepaid gift card channels and gain mass adoption quite quickly. The selling and packaging of more complex NFC powered stickers which are new to the market is more difficult and it is not easy to see the route to market. Significant marketing and promotion would be required to drive sales of these devices through the consumer channel and there is doubt that these start-up manufacturers can provide this.

On a more positive note, service providers, issuing banks, transit providers and others have shown real interest and large scale trials are expected in Western Europe and North America in late 2009.

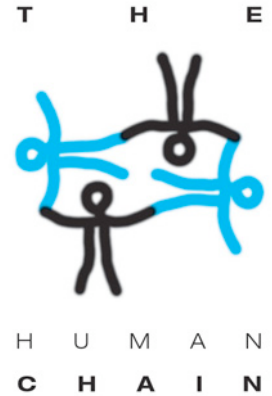
Again, powered NFC stickers with connectivity to the handset though a known and proven technology such as Bluetooth sound great in theory. They would provide an easy way to add feature-rich NFC functionality to the mass of installed mobile handsets on a world-wide basis, but will they? Physical size, complexity to set up and use, battery management and the channels to market are all significant obstacles that need to be overcome to reach critical mass.

### **NFC Micro SD (uSD) Cards**

There are two types of NFC Micro SD (uSD) cards:

- those with an integrated antenna;
- those with a separate external antenna.

Integrated uSD cards are the obvious winner as an alternative NFC form factor for a number of reasons. If they work as claimed, they will have a similar read/write range to integrated NFC handsets and could potentially work in a plug and play mode similar to using a USB stick in a laptop. This would mean that any existing handset with a uSD card slot could be NFC-enabled. It is claimed that with some 70% of the global installed base of smart phones having an uSD slot, these devices have huge potential to lead NFC deployment while integrated handsets come to market and gain penetration, which will take some years. This is especially so given the current economic situation, where handset replacement rates in Western Europe and North America are slowing.



A word of caution should be added here as the technology is nascent. It still has to be proved in both terms of producing such working devices and also their functionality and usability when installed in existing mobile handsets. Will they work as well as existing contactless A1 form factor cards with readers and POS terminals? How will they work with tags and smart posters?

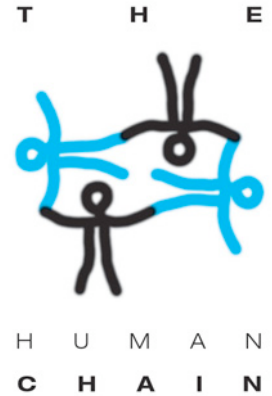
MNOs and network carriers are really interested in this form factor as the mobile handset remains at the centre of the business model. But in some ways it is also a threat as it is not as good for them as it would be if the secure domain was on the UICC SIM (GSM) or built into the handset (CDMA). Using the uSD card as a secure domain also has great appeal to the financial services providers as these devices can be made using existing and secure production processes and can be made tamper-proof. Some of the financial services providers though have a different view of the ecosystem potential from the MNOs/network carriers. They see this form factor as potentially allowing them to drive other business models which are non MNO/network carrier centric and could potentially try to exclude them from the ecosystem.

The fact that this form factor is built on a well established and customer accepted device is a critical success factor. Adding NFC functionality to a device that is in mass production and distributed through established channels provides real commercial and technical advantages to this NFC alternative form factor. Also, end users are familiar with this form factor, as they already use them in cameras, mobile phones and other consumer electronic devices.

While early development of the NFC functionality in both SD and now uSD cards has been done by either small start-ups or in the R&D divisions of other ecosystem players, the major SD card players are now becoming involved by licensing the technology. Expect to see consolidation in this market place as the technology moves from testing to pre production phases. Other secure domain manufacturers are also involved in developing solutions, as they see the uSD form factor as just another design platform for their existing and well established technologies.

A couple of issues do remain. One is that some of the manufacturers of the devices have a business model that requires the service provider to buy not only the hardware but also some wrap-around managed services to support the device. While this seems an attractive recurring revenue business model for the manufacturers, this is not acceptable to at least the MNOs/network carriers, which have existing systems and processes to support these devices in the handsets and want supply only of the hardware.

uSD cards with integrated antenna which you can plug into your mobile handset or PDA and which work seamlessly is a real market mover provided it works, is simple to set up, use and again comes in at a suitable price point.



Non-integrated uSD cards have an NFC antenna that is separate from the uSD card. These devices are easier to produce and some already exist today, but problems can arise from the antenna being located near to the battery and metal cases used in a number of handsets.

The market for retro or end user fitting of these devices is limited. Over the years a number of technically sound SIM-based solutions with separate external antennas have failed to achieve commercial mass adoption due to being physically difficult to retro fit to existing devices (on the back of the battery, but under the battery cover) and often not robust enough for long term use within a consumer electronics environment. Non-integrated NFC uSD cards will surely suffer the same fate because no MNO/network carrier will support such devices, which require careful installation and will have potential usage issues depending on where the user places the antenna.

But what may be a more attractive business proposition is the use of such separate NFC antenna in newbuild mobile devices such as PDAs or other consumer electronic devices. Some PDA or smartphone type devices have quite large plastic battery covers that are perfect to mount an antenna in. A number of smartphone and PDA manufacturers are currently assessing these solutions .

## Other form factors

There is a wide range of other NFC form factors such as watches, tags, tokens and UICC SIMs with attached antennas and NFC skins - where the NFC functionality is added to the skin on your iPhone or similar device. All of these solutions are technically feasible some already exist in small-scale production formats. All have significant issues to overcome if they are to be commercially deployed in mass markets. Not all of them have clear or well developed business models. Some may become niche solutions within certain specialised sectors, others will fall by the wayside in a very competitive and challenging market, especially if they do not easily fit into existing supply chain models. The realisation of these 'other form factors' is likely to be very complex, costly and potentially very time sensitive. Again, as with all consumer electronics, critical mass is key and it seems that none of these will gain this in a realistic timeframe.

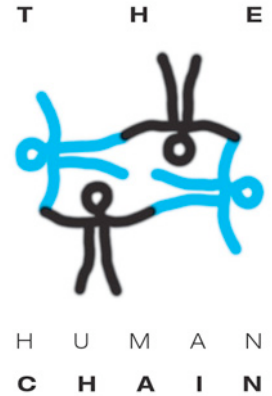
## Conclusion

One needs to be careful!

Is Near Field Communications (NFC) the new Wireless Application Protocol (WAP) classic technology hype in the mobile/wireless world? Maybe, but there are some major differences. Most of the value chain players' business models are under threat in their own well-defined markets.

Alternative NFC form factors have the potential to make major plays in the new NFC ecosystem while handset vendors and their B2B customers find common commercial ground, sort the new and complex ecosystem and bring NFC handsets to market.

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Unpowered NFC stickers have potential as they are simple to produce, use existing technology and can use established channels to market. Their limited functionality and lack of wireless connectivity may be issues affecting mass take-up, but they are cheap and functional. Integrated NFC uSDs also have real potential; they are based on an existing well accepted consumer electronics form factor and should provide a very similar user experience to an integrated NFC handset. Time to market and price point could be issues though.

Powered Bluetooth stickers have perhaps too many challenges to be seen as potential mass deployment products. NFC uSD cards with separate antennas again may have niche markets, but may not reach real volume mass.

The big question is, will these alternative form factors build the market for integrated handsets or disaggregate an already fragmented market?

## Contact

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