



VRITTI

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Blurbo

I am delighted to share the inaugural issue of our quarterly customer newsletter 'Vritti'. Vritti, literally "whirlpool" in Sanskrit, seems to resonate well with the constant innovation and disruption we see in the mobile financial landscape today.

We felt that a dedicated newsletter would be an ideal vehicle to share our analysis of the latest trends, deep dive into a technology that is gaining momentum, understand the forces disrupting the industry and present our insights from the over 50 markets that we operate in today.

In this issue, we present to you the major disruptions that mobility has caused in the financial space, an analysis on the impact of Android Pay on mobile wallets, a demystification of "the Cloud" and a look at the impact that mobility has had on the transportation industry.

We are eager for any feedback pertaining to possible topics we could cover or any inputs and comments. You can share your feedback at vritti@mahindracomviva.com

Happy reading!

Srinivas Nidugondi

SVP and Head of Mobile Financial Solutions
at Mahindra Comviva



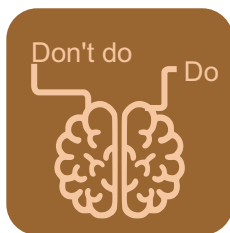
Ripe *for* Disruption?



The mobile has changed the life of every consumer, for the better. We have looked here at disruptions that the mobile triggered in the financial services industry across the globe in the recent years.

by **Srinivas Nidugondi**

There are two impulses in a human mind – one which says ‘DO’ and the other that says ‘DO NOT’. The mind weighs the good and the bad and uses an inbuilt scoring model which factors in one’s risk appetite to finally make a decision. Everything we do or do not gives rise to a parallel universe. When we do something that changes the way of life, we have caused a disruption. Not only is the immediate impact profound but it also gets attributed as a state in chaos theory giving birth to a chain of events that creates a new history. Spare a minute to think about what the world would be like if we hadn’t invented fire, wheels or for that matter a mobile phone.



When Graham Bell invented the telephone (s)he most certainly had not envisioned the universe as it is today, thanks to the mobile phone. That’s saying something given the visionary (s)he was. The mobile has compressed the camera, GPS, diary, CDs, CD players and many more such objects all in to one compact form that fits in our pocket.

If I were to choose what are the most powerful tools that a mobile offers then I would have to say location,

omnipresent internet followed by a camera. Mobile has changed the way we find places to go to, be it a restaurant or our favorite store and the way we navigate, to such an extent that now I just can’t get lost even when I try. Similarly, having a camera on your person has revolutionized life as we knew it. When I was a kid, my mom used to write letters to tell my grandparents when I took my first step, said my first words and describe every single milestone. Now I take a video of my little angel and WhatsApp it to my 70 year old parents. That’s how much life has changed in the last 15 years. RIP the payphone, the walkman, the bank branch. The bank branch?

While in college, I had to open an account in the bank branch at my campus so that I could keep all my cash there. I used to get a pay order every time I went home during semester breaks for my expenses... Yes I know I am ancient (sigh). Once back I would have to fill up a form, stand in queue to deposit the DD in my account and when I wanted to get money out ... well fill up a form and stand in queue again. Further, I had something called a passbook which maintained a record of the exact amount in my account so I had to ensure it is kept up



to date too. What it took to do that ... voila ... stand in queue again. This process of filling up a form and standing in queue used to repeat itself many times over since given my limited resources in terms of moolah, I wanted to ensure that the balance in my leather wallet didn't spark a spending spree. So, what better than keep it all in the bank where it is safe? If my money ran out, dad had to wire money from my hometown and it took almost a week to reach me. The train journey to college took lesser time than that.

Well, all of us quadragenarians would remember many such nostalgic moments. However, the good old days are gone. The good new days are here.

The mobile has changed life for good for every possible rung of the pyramid. We have looked here at disruptions that the mobile triggered across the globe in the recent years.

Beyond banking the unbanked

The emerging economies have a lot to offer if one starts researching "mobile first" and "mobile only" initiatives that have been successful. mPesa is most probably the most famous example. With the limited financial infrastructure available in the country, Safaricom offered a person means

to transfer money through his mobile phone. The offering was invaluable because it allowed transactions 24x7 and the recipient received the money instantly, something which the banks couldn't offer at the time. However, all of us have read about the success of mPesa and analysis of why it succeeded. So I won't harp on that. What I would like to draw your attention to would be the impact that this service has had beyond banking the unbanked.

I refer to a study published by the IRIS Centre, University of Maryland and funded by the Bill & Melinda Gates Foundation in July 2011 called 'Water Delivery through Payment Platform – M-PESA Pushes the Rural Frontier'. The IRIS centre conducted a study from April to June of 2010 in Katitika, Kenya. Katitika is one of many small villages in the Eastern Province of Kenya, almost four hours drive from Nairobi. The region is prone to poor rainfall and faced severe water shortage following the two year long draught ending in 2009. The water project, run by Grundfos Lifelink was the first of 40 such water projects in Kenya that provide clean, hygienic water in rural areas.



The project nicknamed maji ya compiuta or "Computer Walet" was launched in 2009 as a collaboration between mPesa and Grundfos. It allows villagers to put money in their water cards through an mPesa account. The owner of the account and the water card need not be the same thus allowing anyone to send what is termed "water money" through their mPesa account. Given the lack of electricity in the village in 2010, rare few had a mobile phone. However, the few that did recharged the water cards for the others in the village. Some of the benefits that the study outlines are as follows:

Reduction in corruption: In many villages where cash was used instead of water cards, the water supervisors would charge a premium rate from villagers. Thus, mobile money made clean water affordable for a larger number of people and individuals could buy more water.

Banking water money: Since the water money cannot be withdrawn or cashed out, loading the money into the cards implied that the money had to be used for buying clean water. This ensured that the villagers did not spend the cash that was meant for buying water on other expenses.

Reduction in water borne disease: Given the increased access to safe and clean drinking water resulted in lower rates of water borne diseases.

This is just one example of how mobile money has changed life across Kenya. Beyond such social projects, mobile money often extends itself into the paradigm of micro financing allowing the poor to earn interest on their deposits or get loans when needed.

The mobile POS

Sometimes we narrow our definition of users to mean consumers only. We completely forget that there are many others such as merchants, the operations team running the system or the revenue assurance team trying to make money. When we remember these forgotten users, we find many unmet needs which are a breeding ground for disruption. In the payments world, the acquiring business had for years lived a mundane life with no one focusing on how they could turn things over their head till square came up with the mobile POS.

What the mobile POS offered was just two simple things

1. Convert your mobile to a payment acceptance terminal
2. Take your payment register along with you wherever your business goes

It's not that the POS industry did not think of mobility. They did create a POS terminal that works on mobile data and can be carried around. What linking of a smart device like the mobile with the dongle did was that it created a one stop shop for the merchant whereby (s)he could accept payment and access various value added services all in one smart phone application. Let's look at some of the examples of how mobile POS has made life easier for the user.

In multiple countries including Hong Kong and India, insurance service providers now allows instant issuance of insurance at the doorstep. The insurance agent is equipped with a tablet and a mobile POS dongle. Once the various options are presented and the customer selects the insurance (s)he would like to buy, the agent uses an application to fill up the customer details and takes pictures of all the documents required for processing the insurance. The customer's presents his card and on successful

payment, the insurance policy is activated in real time. A process which earlier used to take up anywhere between 5-8 working days now takes 10-15 minutes to complete. Further, by integrating with sales tools like salesforce.com, the application can provide real time data to the agent on his target, actual sales, %age of target achieved all in real time too. It also allows the agent to view all his transactions on a rich interface with support for visual tools such as graphs.

In another case, for an eCommerce vendor, the delivery partner is able to chalk out an optimum route for delivery and can navigate to the destination all through his mobile POS app which is integrated with the order management backend. It allows real time payments to be made to the merchant account as well as update the delivery status instantaneously.



While each of these could exist in isolation as separate applications on the mobile phone, the integrated mobile POS app creates an unparalleled value proposition for the merchant and that is the power of mobile.

Remote Deposit Capture

Remote deposit capture or RDC was first introduced in 2003. While many countries have enabled interbank settlement of checks through RDC, a few have embraced it as a way for consumers to deposit their checks through their mobile banking application. Over time the number of checks that are submitted have reduced. However by leveraging the mobile camera, banks have made it truly convenient for consumers to get funds instantaneously by depositing a check in real time.



Biometrics and financial services



Since Apple Pay, biometric based authentication and authorization is gaining wide acceptance. There are many initiatives we see today which look to ride on biometrics for authenticating the user and in some cases for authorizing transactions. Not only has Apple Pay triggered

inclusion of biometric sensors and software in other mobile phones, but it has also triggered a change in strategy where more and more financial institutions are considering biometric as a reliable means to authenticate the user.

There are multiple ways in which financial service providers are looking to leverage biometrics. From facial recognition software for mobile phones, retina scanning, voice biometric to linking point of sale terminals to biometric readers, we will definitely see higher adoption in the coming years.

Contextual Interactions

Every customer is unique. Gone are the days where customers used to belong to segments. For any product offering today, the segment size is one. The parameters to segment have gone beyond demography by multitudes – location, basket of goods, RFM analysis, social profile, channel analytics, websites visited, yada yada yada. Data scientists are the flavor of the day as businesses are trying to translate the complex human decision making to an algorithm that can tell them what to sell to whom and when. Mobile has allowed businesses to create a customized experience for each customer.

PayPal has leveraged BLE to provide such an experience for their merchants as well as customers. When a PayPal customer walks into a partner merchant store, the beacon detects the location and automatically checks the customer into the store. Once checked in, PayPal allows the customer to make a hands free payment. They do this by pushing the customer profile which includes a picture on the POS for the merchant to map a bill to the customer. That's it. The customer just picks up what (s)he wants and walks away, the merchant doesn't need to swipe a card and spends the minutes saved on serving another customer.

In Conclusion

What I have covered above is just a few cases of how the mobile phone has changed the way people interact with financial service providers and how they consume financial services. There are many more such innovations which are in the works right now.

I started this article by looking at a personal experience from my past and I will end with predicting a possible (not probable) experience that I foresee in my future.

My daughter who goes to college in another country wants to go for an expedition with friends. I'm driving my car when she makes a call asking for money. I answer using my car control. My mobile OS which is monitoring the call detects a keyword – send money – and prompts 'Srinivas, would you like to send money to Sravya?' I say 'Yes' and it redirects me to my banking app where the payee details are already pre-populated to the caller's identity i.e. my daughter's account details and the amount as requested by her during the call. The application requests authorization, I speak my password which the bank validates along with a voice biometric authentication and transfers the money to my daughter in real time. And all this while along with the voice commands, I am busy cautioning my daughter on how she should carry warm clothes and ensure that she calls me every day to let me know where she is and that she should carry a first aid kit just in case.

We are building our future today.

About the author - Srinivas has over 18 years of experience in various industries including financial services, payments and commerce in a variety of business and product related roles and most recently with a specific focus on enabling banking, payments and related services through digital channels. At Mahindra Comviva he heads the mobile financial Solutions business unit, which currently has over 120 deployments globally, providing services for more than 750 million consumers and processing over 35 billion USD in payment flows.

Webinar

The Trends Poising Mobile Payments for Success

Will 2015 prove to be the year of mobile payments' tipping point? Watch an engaging digital discussion between world's leading expert on payments innovation and MPD CEO Karen Webster and head of Mobile Financial Solutions at Mahindra Comviva Srinivas Nidugondi, to examine the major trends shaping mobile payments' growth, the top ways to address the security and privacy concern, and the key ingredients for concocting the ideal integrated wallet.



Android Pay

Another walled garden or
silver lining
for contactless payments



Android Pay undoubtedly is one of the biggest launches in mobile payments this year. Know more about it as we decipher Android Pay, compare it with similar 'Pay' products (read Apple Pay and Samsung Pay) and examine its impact on the market.

by **Bhaskar Chaudhary**

What is Android Pay?

Google made an official announcement on Android Pay in Google I/O 2015 held on Thursday 28 May, 2015. Some of the key highlights reported:

- The new Android Pay API will be an open platform that will allow developers to incorporate payments into their Android apps.
- Customers will be able to pay for things in brick-and-mortar stores via Near Field Communications (NFC) or through apps. Android Pay will work in more than 700,000 store locations, although many of them have long accepted Google Wallet, including McDonald's, Macy's, and Whole Foods.
- The new payments platform will also be integrated into more than 1,000 apps, like Lyft, Domino's, and Etsy.
- Beyond an NFC chip and relatively more current software, Android phones won't need any other hardware to make use of Android Pay.
- Android Pay will be available on all phones running KitKat or higher that also have NFC chips.
- Android Pay will integrate with the operating system's security as well, so users won't have to deal with a separate PIN or password to authenticate payments. With Android M, devices will also be able to support fingerprint reading, so appropriately equipped phones will let users authorize payments with a fingerprint
- Google Wallet will be limited to peer to peer transfers while Android Pay will be used for merchant payments.
- Android Pay will use tokenization to transfer card details from a merchant to a bank based on an open standard that was popularized by Apple Pay last fall and is seen as more secure than other methods of transferring card information.
- Google is working with card networks and issuers to "have them all on board prior to the launch." That's different from Google Wallet's launch four years ago when the company only had a few bank partners, limiting the number of potential customers who could use the service.

How does Android Pay compare with Apple Pay?

Prima facie Android Pay seems to be the next big step towards wider mobile payments acceptance. A deep dive reveals that Google brought on board the same set of partners as Apple. Additionally, from a functionality standpoint, Google chose to mimic the Passbook from Apple and foray into in-app payments just like Apple did with Apple Pay. Below are some highlights on the similarities between the two offerings:

- Android Pay leverages the tokenization solution built by Card Networks that are also powering Apple Pay. Considering that the launch is in USA, it is safe to say that VISA, MasterCard, American Express & Discover would be the partners for Android Pay. For these Token Service Providers, Google becomes the second big & important logo after Apple. This would also mean that this solution technically is replicable in any market that has the presence of these Card Networks & Google/Apple. We might see more such partnerships as the solution gets rolled out in other markets. Example: Interac in Canada & China Union in China.
- Android Pay is working with Payment Processors like Braintree, Stripe, First Data to enable In-App payments which is similar to what Apple does. We might see two variants here as well. One for Play Store & the other for In-App Payments for Physical Goods. The process here would again rely on the digital enablement service of tokenization solution provided by the Card Networks. We might see a different flavor of Processor Integrations than what is there for Apple Pay.

How does Android Pay differ from Apple Pay?

Both Android Pay and Apple Pay enable contactless proximity payments as well as checkout. However, there are some distinct differences in the way Google and Apple have approached mobile payments.

- Since Apple owns the hardware, they have leveraged the embedded secure element, a hardware component of the iPhone, for securely storing its tokens and other sensitive data. Google is relying on the Host Card Emulation, which uses software based secure element launched in Android 4.4 Kitkat which is a part of the operating system.
- In a disconnected mode i.e. when the phone does not have a data connection, devices powered by Android Pay would be able to execute only a limited number of transactions based on the number of offline tokens provisioned on the device. However, in case of Apple Pay such a restriction does not apply.
- For user authentication, Apple rides on biometrics via 'Touch Id' while Google relies on PIN and device unlock pattern. However, Android M will support Fingerprint

Authentication implying that we might see the next series of Nexus phones offering support for biometrics along with OEMs such as Samsung who have announced biometric support for their next series of smartphones such as Samsung S6. Thus Android Pay might be able to offer biometric based authentication which is at par with Apple's Touch Id.

- Apple has declared that it will not be capturing the user's payment data while we feel that Android Pay would heavily leverage data to better target value added services. Given the information available currently, we might see Google launch services such as loyalty and couponing earlier than Apple.

Does Google get a cut on every transaction like Apple?

Apple had negotiated contracts with multiple issuing banks, a first of its kind agreement between an OEM and financial institutions, wherein it charges 15 bps of card processing fee for a card present transaction, a deal which is rumored to have left the banks little choice if any. Apple with its consumer base and existing cards on file registered with iTunes is the only OEM who could have negotiated such a deal. Quoting a former Citibank executive, Tom Noyes,

The Banks hate the Apple Pay deal (NEVER AGAIN). My friends in Mountain View take a meeting with a large bank on Android Pay: "You guys can forget about the Apple Pay deal, it will never happen again; let's start the conversation on what you will PAY for the privilege of having my card in your wallet.

A counter argument in the same report suggests that Google might be able to get a share but it certainly won't be comparable to Apple's. Google can however leverage the data it collects to make up and maybe even surpass more than make up for it by leveraging "BIG DATA".

How does it impact other mobile wallets?

To assess the impact that Android Pay has on other mobile wallets, we need to get a little more clarity on what it entails. However, we have attempted to outline a few key issues that you might want to consider to decide on the next steps.

Is Google planning to front-end mobile proximity payments like Apple unlike its earlier stance of being an ecosystem enabler with HCE ?

A lot of reports suggest that Android Pay leveraging HCE & tokenization would be a Google Mandatory Service (GMS) in Android M which would be part of the OS and the same would not be exposed to third party applications. This would mean that any device running Android M would only have one way of doing mobile payments and that would be using Android Pay. Other applications would not have access to the all-important NFC Controller on the device

thereby making it unlikely that any other mobile wallet could offer NFC payments. However, this seems most likely to be the case in USA. Banks in other regions might restrict access to their cards for Android Pay (we are waiting to see deals that Apple can get in Canada and UK)

What about regions other than USA ?

Markets outside the USA do not have distinct issuing and acquiring entities. Most banks sell cards as much as acquire merchants. This along with other factors mentioned below will impact the adoption and business model -

- Regulatory hurdles make the model unviable. E.g. European Council caps the interchange on debit and credit card transactions at 0.2% and 0.3% of the transaction value.
- Apple Pay and Android Pay come pre-integrated the tokenization platforms of schemes such as American Express, MasterCard(MDES) and Visa(VTS) making it mandatory for MDES and VTS to be available in the country.
- Presence of Contactless acceptance is poor to non-existent in many countries.

Are we saying that Banks will not be able to launch their own wallet even if they have their own tokenization solution?

- This can be a likely case if Android Pay for HCE is a GMS not exposed to third party applications.

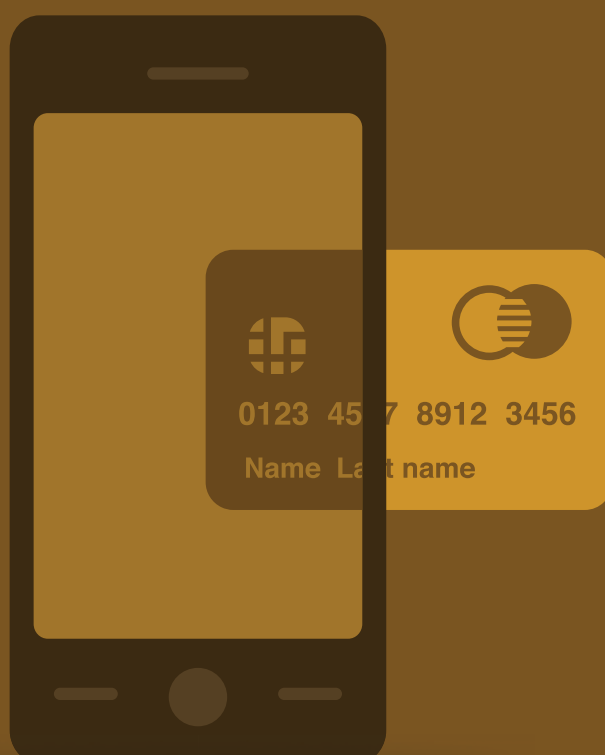
What about telco?

- In USA, MNOs have more or less ceded the mobile payment space given that HCE has made them irrelevant in the NFC ecosystem. Apple has closed its ecosystem for payments to telco. Google ecosystem still has a tiny window of opportunity but with a lot of conditions. Android Pay solution seems to be banking on software security for securing the tokens. Use of hybrid solutions marrying software capabilities like White Box Cryptography with MNO assets like SIM Cards, Mobile Connect to establish user identity or become the second factor of authentication for payments as well as location detection can further fortify the solution.

What about OEMs in Android ecosystem like Samsung & what happens to their initiatives like Samsung Pay ?

- Android Pay would be the only way to leverage NFC payments on Android devices if Android Pay for HCE is a GMS not exposed to Third Party Apps unless an OEM gets an exclusive arrangement with Google which is highly unlikely.
- Samsung Pay solution in USA powered by LoopPay still would be able to operate as it is not leveraging NFC.
- OEMs can also help Google further fortify Android Pay through biometrics leveraging hardware as well as software Secure Element.

About the author - Bhaskar Chaudhary is a Product Manager at Mahindra Comviva managing mobility Wallet. He is an avid follower of Mobile Payments & loves the pace at which this space keeps getting disrupted.



Demystifying the Cloud



Curious about the 'Cloud' and what it means for our businesses. Here is some interesting history that will help demystify the whole shebang

by Vamsi Madhav

By now, you know enough about this bright, mysterious, magical, ethereally-named invention called the Cloud.

Simplicity is the ultimate sophistication, said Da Vinci. He would have therefore heartily endorsed the name. The "Cloud" is at once the simplest name that you could think of - everyone knows what a cloud is, right? - to what clearly is arguably the most sophisticated technological advance as of now. So sophisticated that I have up until now found it easier to ignore what is inside the cloud, stay within the warm-and-fuzzy zone (Oh, it is in the cloud.....er...wherever that is.. somewhere up there...I guess) and regurgitate corporate buzz words such as "on-demand, scalable, dynamic" whenever needed.

So, if you want to continue staying in that zone, stop reading.

But for those of you that want to get de-clouded somewhat, here is some interesting piece of history that will help demystify the whole shebang.

Disclaimer: None of this is original. I got all of this from the internet, which, by the way, is in the....yes, CLOUD. In the

interest of simplification, references to dates and events is indicative and not necessarily legally accurate.

To begin with, understand this: Man is a social animal. And what such animals do, apparently, is do two contradictory things: one, they like to share - ideas, thoughts, pictures. We also know this all too well now. How this led to the birth of the cloud as we know it today is something we will come back to a little later - let us park this thought for now.

But the other is, they like to fight amongst themselves for resources. What that does further is force the brighter social animals to figure out a way of helping everyone share the resources. This social survival trait is the genesis of a natural lifecycle of every innovation/discovery worth its dollar - from Innovation to Utility. I am told that it took electricity eighty years, from the early 1800s to the last decade of that century, to traverse this cycle. Some genius discovered electricity, yet another figured out its uses, someone else created the "grid" to produce and distribute. Today, we are all beneficiaries of that journey - we plug into sockets and bingo, consume electricity as a service. Likewise, with the telephone.

Over the past half-a-century, the same story has been playing out for this invention called "computing", which loosely put, is the interplay between man's ability to articulate logical steps to solve problems (programming) and a hunk of electronics (processor, memory, network, storage). The birth of something called a microprocessor brought this interplay to concrete fruition.

1961

A clairvoyant John McCarthy, in 1961, declared that this thing called "computing" was a "resource" that ought to be available to mankind in general and not just to scientific geeks. He therefore saw it going down the same invention-to-utility path. In the last fifty years, the likes of IBM, Microsoft, Apple, Oracle, Google, Sales force and Amazon (amongst a whole host of others) have played pivotal roles in paving this path.

It started with the geeks in scientific organizations in the US demanding more and more computing resources - i.e. processor time to carry out their algorithms, storage for data, et al. In the 60s, IBM and a few others built large cabinets that housed processors and memory - these are aptly called mainframes - and provided monitors to connect to these frames - called terminals. By virtue of the size and the cost, these were necessarily centralized resources. In other words, it was a socially shared resource.

Which naturally led to a fight over the usage of it. Someone had to figure out an equitable way of time-sharing the usage of this resource - the processor and the memory. IBM peered deep into the interplay between the program that contains instructions and the underlying hardware, into something called the Operating System. The operating system is what communicates a programmer's instructions (the program) to the underlying electronics. Up until then, programmers had to write their programs and then submit them to a single, central operating system. This would then, in batch, sequential mode, communicate them to the electronics for execution. IBM figured that if they gave every user their own Operating System, it would lead to some degree of parallelising of the till-then-sequential execution.

1972

In 1972, IBM released the first stable version of CP/CMS - an operating system that every user could own a copy of. This is considered as the birth of what is now called "virtualization" - loosely translated, letting every user feel he "virtually" has his own computing resource when reality was otherwise.

You see where this is going - the social gene kicking in, to govern sharing. Everyone gets his own toy, do not fight. So what, if it is only virtual and there is really only ONE big toy.

1979

In 1979, Microsoft decided to go literal and not virtual. Everyone COULD have their own toy - the Personal Computer. Every desktop had its own electronics, its own operating system. Every user could compute, so what if he was not a scientist. He could write, add up numbers, play games (remember that scene in the movie Jobs where Steve Jobs gets his geek friend to create the PACMAN game), do everything.....**well, almost.**

The more computing became ubiquitous, the more the demands on it. We all need more processing power, more storage.

And a lot of it, due to the other social trait - the need to share.

1989

In 1989, Tim Berners-Lee gave shape to the internet. The grid was born. Sharing via computing now had a physical basis - the web. Every computer could now be connected to every other computer, anywhere in the world. Anything created on one computer could potentially be shared, viewed, edited by someone else on some other computer. Suddenly, mankind's propensity to create increased manifold. And so did the tools to create - user-friendly software programs, myriad programming languages, multiple operating systems et al. With this explosion came friction of interaction. I speak Greek, you German - how do we still be part of the same union? Political pun intended.

Unless someone did something to reduce the friction, effective sharing - that natural social trait - would be hampered and threatened.

It was time for someone to again look at the interplay between elements that made up computing resources - end-user programs (loosely called software), programming languages and developer toolkits (loosely called the platform), the operating system and the underlying hardware electronics (loosely called the infrastructure).

1994

In 1994, the Java language and more importantly a new computing layer called the Java Virtual Machine was born. Call this virtualization 2.0. What this told every end-user is - create your stuff in Java and forget about interaction with underlying layers, namely the operating system and therefore further the electronics. It will work.

Suddenly everyone could create software, release it to the grid (the web), and watch it getting consumed by millions other connected to the grid. JohnMcCarthy's prophesy was coming true.

Except - the demand for computing resources continued exploding relentlessly.

For two reasons:

One, companies started investing heavily in converting their manual business processes to web-based software. That meant more processing power, more storage. As software became the backbone of every business, the need to deal with demand peaks meant investing in a high-capacity, highly-available in-house computing stack. Businesses started investing in data centres that promised high-performance, security and business continuity for their software store-fronts. But it came at the cost of inefficiency. You look at a big box sitting in your data centre that you know will be used to its capacity only on Christmas eve and will remain largely idle the rest of the year - you start hating the box. You cannot live with it, yet you cannot make do without it as Christmas Eve is big business time.

Second, the developer ecosystem exploded thanks to the sharing trait playing out peculiarly strongly in the software world, with a whole host of "open-source software" and API-access provided by the bigger players such as Amazon, Google. Creativity had no bounds but came with a cost. More software programmes meant more demand for underlying infrastructure (processing power, storage), a lot of which under-utilized for large periods of time and therefore expensive for startups.

Unless someone did something to reduce this economic friction, business itself would be hampered. With it, would come crashing the commercial basis of the new digital social gathering that is the web.

1999

In 1999, Salesforce.com told businesses they no longer need invest in infrastructure for their CRM software. They could just pay for usage of the highly configurable salesforce.com CRM. It would appear to each business to be its own secure CRM, yet would not reside in the business's data centre. It would reside in a data centre that salesforce.com would pay for. What was better, they could pay based on actual usage. If business was relatively idle during a few months of the year, the expense towards using the software would also be relatively lesser.

Thus was born the tipping point for the Software-as-a-service industry. End-user programs now had entered the utility phase of the innovation-to-utility lifecycle. Business and consumers that USED software for their needs could now pay for only as much as they consume.

2006

In the spring of 2006, Amazon told developers they could consume storage space housed in Amazon's data centres, to host their software programmes. Interestingly, developers could pay only for as much storage was used and WHENEVER they used it.

Later that year, Amazon started offering processing power on the same model. These were called Amazon S3 and Amazon EC2, collectively as Amazon Web Services.

Thus was born the Infrastructure-as-a-service industry. Creators and buyers of software could now pay for only as much processing power and storage space as they consumed.

How did Salesforce and Amazon do what they did?

By again taking a closer look at the elements that made up computing resources - end-user programs (loosely called software), programming languages and developer toolkits (loosely called the platform), the operating system and the underlying hardware electronics (loosely called the infrastructure).

Salesforce focused on the **platform** - they figured out that to provide software as a utility, it had to be created in a manner where multiple tenants (businesses that used the software) could use the same piece of software at the same time. Further, changes to the software had to be made quickly, yet securely, based on different tenants' needs. To achieve this, some of the extreme power of a language like Java had to be compromised. These design considerations merited the creation of a new programming language (Apex) suited for multi-tenant business applications and a development toolkit, together called the Force.com platform.

Amazon focused on the **infrastructure** - they figured out that to provide infrastructure as a utility, they needed to look at the layer that helps the operating system communicate with the processor/storage. This layer was called the Supervisor code. Multiple companies, including VMWare and Microsoft, had over the years built code that helped multiple operating systems communicate with the same piece of underlying infrastructure - in a sense, similar to the IBM CP/CMS approach mentioned above. This came to be known as Hypervisor code. Amazon used the hypervisor infrastructure to help multiple computers / operating systems connect to the same underlying processor and storage. This effectively allows creation of what may be called "virtual machines" - users tend to think they virtually have a whole machine. Reality is different.

2007

In 2007, Salesforce opened up its Force.com Platform as a service, to help developers use the platform (programming language, force.com application servers, deployment and testing tools) to build new plug-ins into salesforce CRM. They also announced that the force.com PaaS could be hosted on Amazon Web Services (AWS).

Around the same time, VMWare announced the launch of a Virtual Machine Manager, which aims to really simplify administrative activities around the creation and destruction of the "virtual machines" mentioned above. This apparently has led to the tipping point for the Infrastructure-as-a-service business. On-demand creation of virtual machines has become simple and automated.

So, what is the point of all this, for you and us - creators and buyers of enterprise software and underlying

infrastructure?

The point for you is this: A network of interconnected computing resources can and should be treated as a single resource shared by multiple users (software programs) and paid for based on consumption. This network is the CLOUD. Enabling the creation of and the usage of such a network - the CLOUD - makes perfect business sense. If you do it yourself and own this network, it is your PRIVATE CLOUD. If you use, over the internet, what Amazon (or any of its competitors) has done with its data centres, you are using a PUBLIC CLOUD. You could also use both - with your private cloud as the primary network and a public cloud as a backup. That would be using a HYBRID CLOUD.

To build such a network, you will need to invest in tools such as the VMWare Virtual Machine Manager to help your

network administrators dynamically create and destroy virtual machines. You will also need to get your software vendors to build their applications (the software) in a manner where the linkages to infrastructure (processor and storage used by the application) can be changed at run-time or near run-time. Finally, you will need to invest in tools that help deploy and test such software on the virtual machines you create.

An obvious benefit of all this is: you reduce idle time of your infrastructure AND you improve your resilience to local infrastructure failures - a storage goes kaput, you can quickly switch your software application to using another storage unit somewhere else.

The point for us is: We, as creators of software, need to build applications that are cloud-ready.

About the author - Vamsi Madhav heads Product Management at Mahindra Comviva, for its Mobile Financial Solutions Product Unit. He does not like to be reminded that he has wisdom of over fifteen years in building and managing enterprise software products, mostly for financial institutions. He would much rather go back to school and learn afresh about this whole new world in the cloud!



TRAVEL GOES MOBILE



Mobility touches multiple aspects of our lives and transportation is one of them. Discover how transportation companies globally are exploiting the power of mobility to deliver a richer travel experience across air, rail and road.

by Mohit Bhargava

Transportation is the center of the world! It is the glue of our daily lives. When it goes well, we don't see it. When it goes wrong, it negatively colors our day, makes us feel angry and impotent, curtails our possibilities. — Robin Chase, CEO, Buzzcar

Traveling is indispensable part of our everyday routine. To meet our daily objectives, we travel miles, be it on an airplane, a train, a tram, a bus or a taxi. The services provided by transport companies are so integrated in our daily lives that we usually take them for granted. Interestingly, they only come to our attention, when we encounter a glitch in the service! Needless to say, technology plays a vital role in ensuring that we don't face such hurdles in a service which as critical as commuting. Today, technology megatrends such as mobility and internet are being leveraged to the fullest to deliver an optimal travel experience. In case you aren't convinced, consider these examples-tapping a NFC mobile or a wristband to pay for a train or bus, booking a cab via your mobile, receiving contextual offers in an airport's shopping lounge via Bluetooth, the list is endless, as is the potential of technology in making a customer's experience a memorable one. This article examines how transportation companies across the world are leveraging the power of the mobile device to deliver a richer consumer experience.

Air Travel

Never before has the consumer been as important as it is today. With globalization and the internet opening up their eyes to the multitudes of possibilities, the consumer is becoming more and more demanding. Keeping this in mind, the airline industry is pulling out all the stops to ensure that they provide customers with a memorable experience every time they fly. To meet the expectations of the tech-savvy generation, airlines are thinking out of box to deliver a digital customer experience. Multiple airlines like Japan Airlines, American Airlines, Delta Airlines and Air France are working to leverage the potential of the mobile handset and technologies like NFC and BLE to revolutionize the complete air travel experience, from booking a ticket to boarding the flight. Their aim is to enhance the passengers' convenience and make their journey seamless and enjoyable.

Ticket booking

Booking an air ticket is the first step towards simplifying the consumer experience by leveraging mobile technology. Spanish low cost airline Vueling for instance allows a customer to tap a contactless credit card to their NFC phone to populate the card details in the mobile app.

Airlines based in emerging countries are not far behind. To cash in on the high penetration of mobile money, they have enabled payments through mobile money accounts other than support for cards. Airlines such as Kenya Airways, Proflight Zambia and Kam Air amongst others have partnered with operators such as Airtel, MTN and Roshan to accept mobile money for air ticket booking. To avail this facility, customers book a ticket online and use the booking reference number generated on the website to pay using their mobile money service. The e-ticket is sent to the mobile or via email on successful payment.

Check-in and boarding

From the instant that a passenger enters the airport to the time he boards the flight, there are multiple interactions which can be converted to "mobile moments". Passengers with NFC capable handsets can skip check-in queues by tapping their mobile ticket to self check-in and obtain mobile boarding pass. Similarly, at the boarding gate, passengers have to tap their mobile boarding pass to pass through. Post check-in, useful information such as the relevant gate numbers, time remaining for boarding, directions and navigation to the boarding gate can be disseminated through the mobile app. Self service model are very effective especially for time strapped customers. Japan Airlines (JAL) has been using mobile boarding for more than eight years now and has seen significant time savings by enabling NFC based boarding. It took JAL 15 minutes to board a 450 person plane using NFC as opposed to 40 minutes for a 150 seater boarded using traditional on-boarding process¹.

Beyond ticketing and on-boarding, airports are also overhauling the conventional shopping and dining experience to a digital experience for tech-savvy customers. At New York's LaGuardia airport, the food hall is equipped with iPads for browsing menu items and placing orders. Further customers can self-checkout by making a payment with Apple Pay².

The privileges for premium customers extend to access of lounges and priority lanes for security check by simply tapping their phones.



Figure 1: Self check-out terminal at New York's LaGuardia Airport.
Image source: www.digitaltrends.com

In the flight

The digital experience powered by mobility continues within the flight as well. Passengers are now able to pay for in-flight purchase and seat upgrade via mobile. JetBlue has equipped its flight attendants with iPads that accepts cards as well as Apple Pay.

Going beyond payments, the Thales group has unveiled an innovative seating concept that enables business class users to choose the seat configuration, entertainment and services directly on their mobile phone prior to boarding. Once in the plane, the passenger places the NFC-enabled device on the seat receptor to activate their saved settings including loading the movie to the last watched point.



Figure 2: NFC powered in-flight seat from Thales Group
Image source: www.nfcworld.com

Train Travel

As we all know, trains are a country's lifeline and millions of people use them daily to travel. While more customers equal more revenue, it also creates the challenges around scaling processes for fare collection.

To make the process quick and efficient, rail companies are automating the ticketing process by adopting online ticketing, prepaid travel cards and the most recent - mobile ticketing. In many cities, contactless travel cards are used to tap and pay at the turnstile. With growing popularity of mobile payments, rail companies are integrating the travel card with mobile wallet.

EE largest mobile operator in UK facilitates transport payments via its 'Cash on Tap' mobile wallet. This NFC mobile payment service can be used in all major transport systems in London including trains, buses, trams and the tube. Instead of the traditional travel card named Oyster, passengers have to tap their mobile phone on card readers at the source and destination station to make the payment. The mobile wallet has significant tangible benefits for the customer. They do not have to stand in queues to top-up the wallet but can do it using the app anywhere anytime. It also eliminates the problem of card clash - a card clash occurs when the Oyster card and a contactless debit or credit card is placed close together while tapping. The turnstile could not identify which card to debit and often resulted in charging the



¹ <http://www.asmag.com/showpost/14959.aspx>

² <http://www.digitaltrends.com/mobile/otgs-techie-food-hall-at-laguardia-airport-is-one-of-first-to-accept-apple-pay/#/5>

wrong card. This resulted in a cumbersome process where the customer would have to take out the Oyster card to tap. Interestingly, this has also resulted in thousands of cards being dropped at London stations³.

Moving beyond the mobile, Barclay's is offering bPay NFC wristbands for making payments in London Tube and buses. The bands can be recharged online or via a mobile app by any Visa or MasterCard.



Figure 3: Passenger using 'Cash on Tap' app and bPay band for transport payments in London
 Image source: www.engage.com

South Korea is another country which is extensively using NFC for transit payments. Millions in South Korea pay their transit fare using two popular mobile prepaid payment systems T-Money and Cashbee⁴. The mobile wallets can be loaded through vending machines by placing the mobile in the recharge socket and inserting money.



Figure 4: Passenger recharging T-Money mobile wallet at a vending Machine in South Korea
 Image source: www.youtube.com

NFC can also be used for validating digital tickets stored on mobile apps. An interesting example in this regard is that of Caen in France, where passengers can use the mobile ticketing app Twisto for ticket validation in trams and buses. In the near-future we could also see automatic ticket verification solutions where customers won't need to remove their smartphones from their pocket! The 'Future Railway' in UK (a collaboration between the Rail Safety and Standards Board (RSSB) and Network Rail) is piloting BLE

enabled mobile ticketing app. If the pilot is successful, UK rail passengers could soon be able to get their train tickets verified automatically as they walk through fare gates at a station.

Mobile is also being used for information dissemination. OBB, Austria's national rail operator has installed NFC information boards at the stations where passengers can tap their mobile or scan the QR code on the boards to access real-time information about the arrival and departure times of their trains.



Figure 5: Train passenger in Austria getting real-time information from NFC information board
 Image source: www.nfcworld.com, www.tuomi.lu

In all, there is little doubt that NFC, BLE and QR code based train information and ticketing services are making strides in the developed world.

Emerging markets, with their lower penetration of smart phones and technologies such as NFC, have found alternate means to enable digital ticketing.

Bangladesh Railway has partnered with two leading mobile operators in Bangladesh, Grameenphone and Banglalink to offer mobile ticketing. Customers can book intercity train tickets and make payments using the mobile money service offered by the two operators. Considering that the smartphone penetration in Bangladesh is around 5%⁵, the operators has chosen USSD (a feature available on all GSM phones) as the access channel for booking tickets. However, this did not resolve the issues surrounding low technical literacy. Thus the service was introduced through travel agents who assisted customers by booking the tickets on their mobile handset. 85% to 90%⁶ transactions are now agent assisted. The customers receive an e-Ticket number via SMS for travel. Other than queue busting at booking centers, the mobile ticketing has lowered the overall operational cost for Bangladesh Railways by reducing cash handling costs and expenses related to paper invoicing.

In Africa, Camrail has partnered with Orange Money in Cameroon to offer similar mobile ticketing service.

³ <http://www.mirror.co.uk/news/ampp3d/card-clash-making-londoners-panic-5185912>

⁴ <http://www.gsma.com/digitalcommerce/wp-content/uploads/2012/11/Korea-Case-Study-Nov-2012-FINAL.pdf>

⁵ <http://www.telenor.com/wp-content/uploads/2014/06/04-Grameenphone-IFA-presentation-FINAL.pdf>

⁶ Mahindra Comviva internal study

Road Travel

Buses, taxis and local transport provide last mile connectivity, reducing the distance between people, markets and services, enhancing overall economic growth. With number of independent bus operators and cab owners, the market is fragmented and aligning all of them with innovations in transportation is a difficult task. However, the rise of the internet and growing penetration of mobile phones is making modernization in public transportation simpler and faster. Today we see many websites that aggregate tickets from various bus operators and sell online as well as mobile apps that connect drivers with passengers in real time.

The mobile is taking advancements in bus travel a notch ahead. In New Zealand, Snapper Card, a contactless electronic ticketing card has been integrated with NFC mobile wallet Semble. To make bus payments, passengers have to hold their mobile near the Snapper readers at the doors while boarding and de-boarding the bus. The Snapper system uses GPS (Global Positioning System) information to record which stop passenger gets on the bus and where passenger gets off. This information is used to calculate the correct discounted fare for the journey. Interestingly, passengers can pay for up to 5 people from single snapper card. In Hong Kong also the widely used contactless payment service Octopus have launched mobile payments. They provide Octopus Mobile SIM, which can be inserted into NFC enabled mobile phone to pay fare in city buses.

One of the most interesting cases of leveraging the mobile is what RATB is doing to make travel more convenient for the differently-abled. In Bucharest Romania, public transport operator RATB is using BLE and beacons for guiding visually impaired passengers on and off buses so that they do not need a personal assistant. RATB buses are fitted with uniquely identified Beacons. The visually impaired passenger provides route information through a mobile application. As the bus approaches, the beacon on the bus sends a notification to the passenger. The



Figure 6: Beacons being fitted on bus in Bucharest Romania
Image source: www.nfcworld.com

notification is delivered with a specific audio signal and the voice-over application on the mobile reads the notification's text to the user. When the bus arrives at the stop, the Beacon's buzzer will repeatedly broadcast a beep signal alerting the passenger of its arrival. The beep stops once the said passenger has boarded.

In emerging nations as well paying bus fare via the mobile is gaining traction. For short distance travel within the cities, payments mostly happen directly via mobile money accounts during the journey. In Zimbabwe, commuters of local buses known as 'Kombi' can pay the bus fare via EcoCash, the most popular mobile money service in the country. The biggest benefit of mobile payments is the relief from having to keep change.

eManamba, an online company in Kenya allows passengers to enter their travel details and select their seat online to book a bus ticket and pay using their mobile money account. On successful payment, passengers receive a transaction confirmation code via SMS, which they need to enter in the eManamba webpage to receive the ticket by email.

In just short span of five years mobile app based cab services such as Uber, have completely revolutionized the way we book and pay for cabs. Uber leveraged the mobile to seamlessly connect passengers to drivers.



A single stop shop, cab apps allows customers to find nearby cabs, view the progress on a map, see an estimated fare, pay and provide feedback at end of journey and earn reward by referring the service to peers. These apps allow payment through multiple digital channels, the most common being cards. In Honduras however, passengers can pay for Easy Taxi via mobile money service Tigo Money.

Independent cab owners who have not subscribed to the 'Ubers' of the world are also getting creative when it comes to accepting payments by using mobile POS allowing their consumers the freedom of choice to pay by card or cash.

Conclusion

The advent of mobility in transportation is a win-win trend. While for transportation companies, mobility powered solutions have simplified operations and increased productivity, the major beneficiary remains the consumers. Thanks to mobile technology, today consumers are experiencing a faster, convenient and seamless travel experience. But this is just a start. We believe transport companies will keep on exploring applications of mobility in transportation.

"The reality about transportation is that it's future-oriented. If we're planning for what we have, we're behind the curve."

- Anthony Foxx, United States Secretary of Transportation

About the author — Mohit Bhargava has over seven years of work experience in product marketing and research in the telecom domain. At Mahindra Comviva, he is serving as deputy manager in product marketing for the mobile financial solutions portfolio. His areas of function primarily include evangelizing Mahindra Comviva's mobile financial products and their impact on transforming the financial landscape globally.

Transforming Lives in Bangladesh

Bangladesh is one of the most densely populated countries of the world with a population of 158 million. With the growing population establishing affordable means of connectivity between people and generating employment has always been a challenge in Bangladesh. Mahindra Comviva's electronic recharge and prepaid management solution PreTUPS™ powers mobile services for 5 operators in Bangladesh. It not only enables over 120 million mobile subscribers to connect with each other anytime, anywhere but also provides livelihood to millions of merchants retailing airtime.



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