

Mobile Big Data and Analytics

The opportunity for
MNOs

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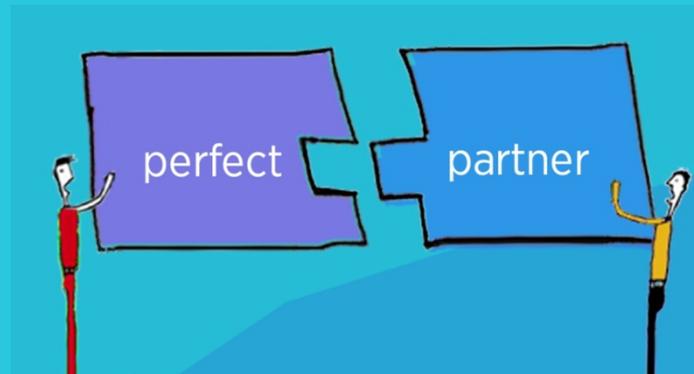


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1 Overview

This report seeks to introduce the potential for Mobile Network Operators to profit from Big Data services, providing an overview of both the manner in which such technology can be applied internally, and the potential services that could be offered to customers, how they might be packaged, the size of the market, and the capabilities required to deliver such services. It advances a view about the nature of the benefits to be obtained, the customer propositions required and the likely value chain in a commercially sustainable business model.

How MNOs address this market opportunity is the subject of this report, which concludes with a series of recommendations for MNOs that want to maximise their revenues from this area.

2 Introduction

2.1 Background to the Report

Mobile Network Operators (MNOs) possess vast quantities of valuable data which, when analysed, can provide deep insight into customer behaviour, service consumption and, uniquely for MNOs, their spatial and temporal context. This data, and the analytics needed to refine it for the purpose of delivering customer insight, offers the MNO the opportunity to both improve internal efficiency and participate in a large and fast-growing market, which has the potential to deliver great value both to society in general and to the individual.

This report therefore examines the way in which the MNO can capitalise on this opportunity, and seeks to answer questions including the underlying need, potential services that could be offered, the external customer proposition along with the capabilities and partnering approach that would be required.

2.2 Report Content

This report covers the following areas:

- The nature of MNO Big Data and the data sources that could be employed;
- The potential for internal and customer-facing Big Data solutions;
- The scale of the financial opportunity for Big Data;
- The internal capabilities required;
- The proposition structure and position in the value chain required to implement a successful customer solution.

3 The New Oil of Business

Collecting information, analysing and contextualising it, then using it to draw conclusions and make predictions is nothing new. The insight market, and the services enabled by deep insight, is growing very rapidly, with the potential for delivering great value both to society and the individual. Peter Sondergaard of Gartner summarised the opportunity succinctly as:

Information is the oil of the 21st century, and analytics is the combustion engine.

However the scale and speed at which this can now be done with today's technology is teaching us far more about ourselves and our human behaviour – both collectively and down at the individual level – opening up new opportunities for Mobile Network Operators with their unique ability to contextualise behaviour based on analysing customer use, together with attributes such as spatial and temporal patterns. MNOs can learn where and when their customers go, whom they know and when they interact with them, who they are and what they like. This presents a considerable opportunity to the MNO both for internal CRM and marketing purposes – such as identifying patterns that may predict propensity to churn or offer up-sell opportunities – as well as the potential to package and sell this information, providing privacy is respected, to third parties.

In the last twenty years consumers have become grown used to companies such as retailers collecting large amounts of information about them through loyalty schemes. The MNO can dramatically increase the richness and extent of this data. Building on aggregated and individual historic sales data, businesses are increasingly supplementing their knowledge through a whole range of new data sets ranging from context to social media content and even weather. The ability to analyse all this data in real-time through machine-driven learning is giving businesses an unprecedented opportunity to offer tailor-made services, both online and offline. The academic Scott Golder of Cornell University described the transformative nature of Big Data as follows:

Disciplines are revolutionized by the development of novel tools: the telescope for astronomers, the microscope for biologists, the particle accelerator for physicists, and brain imaging for cognitive psychologists. Big Data is a high-powered lens into the details of human behaviour and social interaction that may prove to be equally transformative.

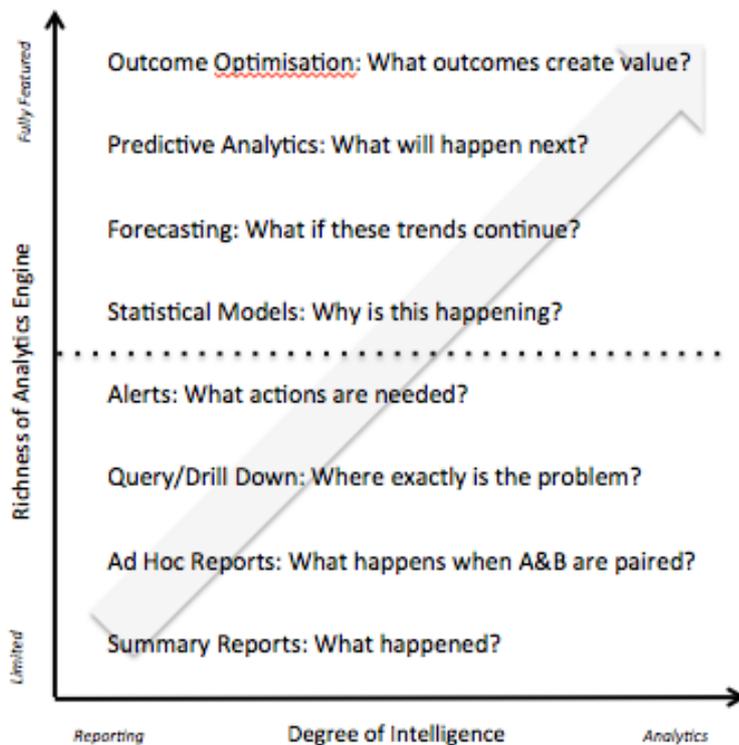
Big Data presents a huge opportunity to the MNO both for internal use and as a business-to-business proposition. The ability to capture and measure the interactions that mobile users have with the network, understanding location, mobility, time, service activity and undertaking analytics such as cross-matching with known customer attributes such as age and gender creates a highly

valuable data-set. Customer insight is therefore not only an internal resource for better CRM: it is a highly valuable asset for the MNO which will become ever more important as services such as Mobile Advertising and Mobile Identity continue to develop.

In an environment where technological, commercial and regulatory pressures are impacting core MNO revenues, Big Data offers a commercial opportunity with valuable USPs – customer specificity, real and near-real time data - providing a sustainable value-added proposition.

MNOs are already on this road, albeit in a relatively unstructured way at present. In general the services are not being well packaged, nor the true value realised. An example of this would be the provision of real-time anonymised bulk location data to identify traffic problems to Satellite Navigation companies. This has been recognised and monetised but could go much further. The potential for enrichment of MNO data into highly valuable analytics is illustrated below.

Figure 1 **The Path for Big Data with Rich Analytics**



Source: Gartner Analytics SW Overview

So why is MNO data so valuable? There are several very good reasons:

- Data is real or near real-time, validated, geo-spatial and temporal information relating to known individuals;

- Habitual patterns are readily identifiable, enabling prediction and inferred intent;
- Cross-relating network data against static data from CRM systems provides validated socio-demographic profiles;
- Analysis of service data such as browsing activity has the potential to deliver an inferred psychographic profile;
- A relationship exists with the consumer enabling user permission and validation, particularly with the advent of Mobile Identity solutions, where the MNO is the guardian of personal data;
- The sample sizes for analysis – as much as 25% against traditional market research sizes of 5% - is statistically far more accurate.

3.1 Personal Data and Customer trust

Against these major benefits, there must be a word of caution. We are seeing a sharp rise in consumer interest and take-up of privacy related products and services, and there is huge, adverse consumer reaction to perceived breaches of privacy. As personal data is becoming a commonplace source of differentiation for brands, this risk grows, and MNO policy must be to be the trusted guardian of personal data. This doesn't mean locking it up – it means a responsible approach to the way it is used. Market Research company GfK have published some interesting statistics in the last year relating to this, finding that:

- 69% “Find it creepy the way that some companies use information about me” (GfK 2013)
- 90% “Prefer to do business with companies that respect my privacy” (GfK 2014)

However, the willingness to share data in return for genuine value is fuelling the personal data economy. There is a balancing act between providing transparency and control but MNOs must also be mindful of the pitfalls of consumer decision-making in this area. The customer must be able to exercise control through permission and preference management led-approach where any personal data is used that could ever be directly attributable to the individual. Where aggregated data is used, careful positioning and complete anonymisation of the data can mitigate data privacy and brand risks.

3.2 What Types of Data?

The MNO has a vast amount of information about their customers including a wealth of operational and marketing data including:

- Customer: Gender, age, address;
- Purchase history: Tariff, devices, prepay/post-pay, acquisition costs, contract expiry;
- Marketing: Contact history, campaign offers, customer care history;
- Usage: Voice minutes, call duration, messaging, data downloads, browsing.

This information provides the insight for successful CRM activity. However, the data can also be used to provide a deep profile of the individual, from which extremely powerful marketing insight can be derived. There are four key types of data that provide this full profile:

- Socio-demographic: Who you are.
- Behavioural: Where you go and when you do things.
- Psychographic: What you like.
- Social graph: Whom you know.

3.2.1 Socio-Demographic

Socio-demographic data concerns the quantifiable statistics of a given individual or customer segment and is obtained by profiling an MSISDN (or set of MSISDNs) against the data held in the MNO's CRM system. Commonly examined attributes include gender, age, address, pre-pay or post-pay. For example, taking a snapshot of all the MSISDNs visible in a specific location such as a shopping street may reveal insights such as that the average age varies from under 20 in the hour between 8 and 9 am (perhaps due to the proximity of a college) and rises dramatically to 40 with a 65% bias to women after 9.30 as older age groups go shopping. Similarly, service usage patterns can reveal what type of person uses services at different types of day or in which context. This analysis can therefore provide further inferred information on customer profiles as the MNO customer segmentation model will often have a rich profile of needs, attitudes, incomes and so on.

3.2.2 Behavioural

In this context, behavioural data concerns geo-spatial and temporal patterns of activity, so in essence where people go and when they go there. This location based data can reveal the regular patterns associated with daily, weekly, monthly or seasonal events and is useful in a wide range of sectors ranging from transport and traffic planning, such as capacity for public transport at peak times, identifying and mitigating volume-related traffic problems, capacity planning for public events and so on. When cross-referenced with socio-demographic data it can be extremely useful for marketing and advertising. On an individual level – with consumer permission – it can allow highly contextual offers to be made such as discounted coffee before 10am from a vendor placed along the path of a regular journey.

3.2.3 Psychographic

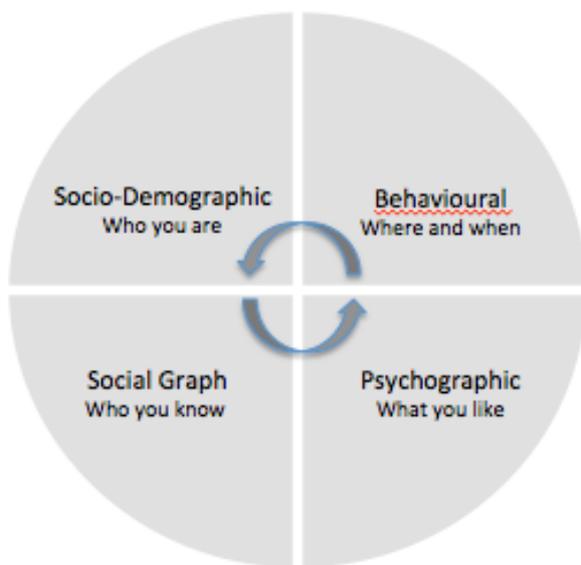
Psychographic data encompasses harder to define information like your personal values and interests. For example, socio-demographic data may tell you gender, age and income, but psychographic data may show you a preference for adventure holidays rather than beach holidays, a compulsion to visit Facebook or Twitter, or a passion for conservation. This data can be useful in building a profile of the person and personalizing marketing messages or specific offers. It can be achieved by looking at user's web-browsing or charitable text-messaging, but must be used cautiously so that it's neither intrusive or, in the findings from GfK "creepy".

3.2.4 Social Graph

The social graph depicts the personal relationships of a mobile user and can be thought of as mapping of every individual user, how they're related, along with the pattern of interaction – in other words illustrates interconnections among people, groups and organizations in a social network. Individuals and organizations are nodes on the graph, and analysis can provide useful insight into key social influencers and their relationships, revealing how ideas and information are

spread throughout a network. In mobile terms this is an analysis of A and B party calling behaviour relating to core voice and messaging services. It is well documented that the greater the number of nodes in a network, the disproportionately greater the traffic, and these patterns reveal much when cross-referenced against socio-demographic and behavioural data. This can enable, for example, service offers for key customer segments tailored to their specific calling patterns, or identify the groups or individuals most likely to influence consumer thinking through their social relationships.

Figure 2 **The Four Types of MNO Data**



Source; Piran Partners

3.2.5 Individual or Aggregated?

The data described here can be used either at an individual level or at an aggregated level. Both types are equally useful but are used in different ways.

- Individual data, used internally is the key to making effective personalised offers. This can be contextualised through aggregated data relating to a specific customer segment.
- Aggregated data provides valuable insight into customer patterns and obtaining insight into wider behaviours, interests and needs.

If data is passed to third parties, under any circumstances, it should always be anonymised unless the customer has given specific permission.

3.3 Raw Data Sources

3.3.1 Call Detail Records

Call Detail Records (CDR) feeds may be used to obtain data relating to service usage such as voice, SMS, MMS and mobile data. This allows patterns of use to be identified, and provides the raw data for social graph analysis, or in the case of short-code SMS may reveal content preferences or charitable donations.

3.3.2 Network

Network monitors can be used to filter, aggregate and enrich data from a network probe. This provides feed containing derived insights that can be directly fed into an Enterprise Data Warehouse (EDW) or analytics environment. This can be at an individual or aggregated level, and can provide information such as an event level feed including details of web browsing, application usage and location data. Network probes can provide highly granular data, detailing all activity in the radio and IP network at very low latencies.

Location and time-stamp data are the raw data sources for behavioural analysis, while web-browsing activity can provide the raw data for psychographic analysis.

3.3.3 On Device Software

Software may be installed on devices to provide a data feed, including some unique data not available in the network-based solutions such as application usage, or less frequent but higher accuracy location through GPS. However, this may present logistical and management issues.

3.3.4 Customer Relationship Management System

Socio-demographic data is obtained from the Customer Relationship Management (CRM) system. A rich data set exists for customers, varying according to whether the customer base is pre or post pay, and the legal requirements and KYC (Know Your Customer) rules imposed in different countries in order to acquire mobile service.

3.3.5 OSS/BSS

The Operational Support System (OSS) supporting the back-office activities which provide an MNOs network, provisioning and customer services along with the Business Support System (BSS) providing billing, order management, customer relationship management and call centre automation can provide a rich source of data including top-up transactions, payments, provisioning information, device orders and so on. This data can be analysed for potential triggers such as likelihood to churn or opportunities to sell in a contract to a previously pre-pay only customer, becoming increasingly more effective when cross referenced with other known factors such as socio-demographic or psychographic data.

4 Unlocking the Value in Big Data

Big Data can help MNOs achieve three key objectives:

- Deliver smarter services that generate new sources of revenue;
- Transform operations to achieve business and service excellence;
- Build smarter networks to drive a consistent, high-quality customer experience.

4.1 Big Data Opportunities: Internal and External

The MNO can benefit from Big Data through both internal application and packaging the capability as a new external service offer for their business and wholesale customers. There are two steps in unlocking the value inherent in MNO Big Data.

The first step, which many MNOs have already made, is to develop the capability and apply Big Data internally, allowing the MNO to undertake highly granular targeting of their customer base through building a profile of their individual customers.

The second step is to monetise this capability through development of third party services that either draws in external data for further enrichment of the MNO CRM capability, or to provide Big Data as a service proposition to other companies.

Together, these two steps provide a very powerful opportunity for MNOs. Not only can Big Data enable them to understand customers better and offer timely, relevant services, but introducing this data to specialist third party organisations such as in the CRM, Business Intelligence and Market Research industries has huge benefits to them.

4.1.1 Applying Big Data within the MNO

Improved internal insight can transform operations, deliver higher levels of business and service excellence, and improve the customer experience through smarter networks and new services.

The first step that an MNO should take is to identify the data assets they have, and those that have potential but that they are not leveraging, which may be as little as 10-20% of the potential available to them. The more data available, the better the results, and with machine learning employing specialist algorithms, often running real-time, the results are getting consistently better and more valuable.

Once acquired, this capability enables the MNO to create a comprehensive profile of a customer, a “behavioural DNA” which gives a complete view of that individual. This can then be used for predictive modelling and adaptive contextual marketing through advanced machine learning. Such an approach allows specific offers to make to individuals, tailored to their behaviour, and learns

real-time how the customer reacts. Through an iterative approach, constantly learning and refining the offer, the net incremental revenue can be increased over time, and the likelihood of customer retention improved. The types of query could include:

- Which customers show increasing or decreasing spend? Is there a pattern in demographics or contact history?
- Who are the younger customers with highest digital service use? What is their profile?
- Which customers have the highest and lowest customer lifetime value? Are there markers for this that could predict this?
- Which are the highest value customers whose contracts are about to expire?
- When and where are people making calls? To whom? Does this vary by customer segment? How do call durations vary by demographic?
- What content are customers searching for or downloading?

This knowledge can then also be used to enhance existing products and services, for example contextualising and personalising them to the end-user to make the user experience more intuitive. Furthermore, this approach will enable intelligent differentiation and provide the foundation for the development of innovative new products and services, in this way both growing core revenues and unlocking new revenue opportunities. The more robust the customer profile, the more impact the analytical models will have.

4.1.2 Big Data Analytics Tools

MNO product portfolios are often very complex, as evidenced by the mix of current and legacy tariffs, 3G/4G options, device options, content package, data bundle and so on.

This creates a real challenge for sales and customer service teams when attempting to up-sell the customer or obtain a new contract. There is a risk that the salesperson will promote the devices, tariffs or services that they prefer, not that the customer might really need.

Big Data techniques that take into account customer behaviour based on statistical techniques will deliver better results overall. Examples of statistical techniques commonly used are:

- Next best activity predictive methodologies. These compute the conditional probabilities of what a customer is likely to be most inclined to purchase next based on historical purchasing history and insight from customers with a similar profile.
- Neural networks. This methodology uses non-linear statistical modelling and cross-correlates this with simple “signal functions” in multilayer networks. Complex relationships between different input variables can be captured.
- Random forests. This combines many decision trees to form a “forest” of data, the synthesis of which delivers better predictive power than any single tree.
- Marketing mix modelling. This approach uses historical data from sales, marketing spend and

external economic factors and quantifies the impact of marketing spend by channel on sales. This technique uses analysis of the correlation between sales volumes, revenues, or value produced and different marketing approaches, taking into account competitive forces and external factors. The objective is to optimise their marketing activity and media budgets, and reveal the return on investment from different approaches.

4.1.3 Big Data as an External Proposition

Just as the mix of internal data types when combined can create a “behavioural DNA” of a customer, this approach can also be combined with third party data both to improve MNO insight as well as to re-package and sell on.

Big Data as a proposition can form a useful addition to an existing portfolio of service offers, either as a wholesale offer, or packaged for direct resale to specific sectors. It is a strategically significant play, and MNOs can take advantage of a strong position in the value chain.

Therefore, a potentially important and valuable benefit is to provide the MNO with a new value-adding revenue stream in the fast-growing Information Services market. For instance, the MNO could provide more insightful business intelligence to corporate customers and leverage the data generated within the network to enable analytics to be conducted for any customer. This is now explored in greater detail.

5 Market Potential

The overall market size for Big Data is huge, although market definitions and estimates vary. McKinsey, for example, estimates that the market is worth as much as €440 billion globally.

For the forward-looking MNO, there is a share of this revenue that is now becoming accessible. Until recently, the attention of the “Big Data” industry has been on the mining of internet data, but with the growing proliferation of smartphones and the role they play in our daily lifestyles the focus is switching to mobile data. The MNO is therefore now extremely well placed in the value chain.

5.1 Enterprise Software Spending

There is a lot to play for in this market. Gartner reported in 2013 (Enterprise Software Markets Report) that worldwide enterprise software spending was due to reach \$304Bn, with double-digit growth in some markets:

- Enterprise Resource Planning (ERP) spending worldwide is projected to grow from €19Bn in 2013 to €25Bn in 2017, attaining a CAGR in the forecast period 2012 – 2017 of 7%.
- Business Intelligence (BI) worldwide is projected to grow from €10Bn in 2013 to €13.5Bn in 2017, attaining a CAGR in the forecast period 2012 – 2017 of 7.3%.
- Supply Chain Management (SCM) worldwide is projected to grow from €6.7Bn in 2013 to €10Bn in 2017, attaining a CAGR in the forecast period 2012 – 2017 of 10.4%.
- Data Integration Tools and Data Quality Tools worldwide are projected to grow from €2.9Bn in 2013 to €4.4 in 2017, attaining a CAGR in the forecast period 2012 – 2017 of 10.3%.
- Global Market Research turnover exceeds €28.4Bn, representing a year-to-year increase of 3.2% and 0.7% after inflation. Fast-growing emerging markets buoyed the global market research industry and countered losses and sluggish performances elsewhere in 2012. (Source: ESOMAR / KPMG Global Market research 2013).

Figure 3 **Growth in CRM and Business Intelligence Revenues**

	2013	2014	2015	2016	2017
CRM	€15,180	€17,436	€20,102	€23,162	€25,081
Business Intelligence	€10,277	€11,039	€11,842	€12,704	€13,615

Source: Gartner Forecast, Enterprise Software Markets Worldwide 2013

5.1.1 Trends in Business Intelligence, Analytics and CRM

Against the context of this fast growing market, there are a number of clear trends that will influence and shape the market over the coming 2-3 years.

- As early as 2015, the majority of BI vendors will make data discovery their prime BI platform offering, shifting BI emphasis from reporting-centric to analysis-centric. Most companies will shift their future investment away from IT-developed reporting solutions toward business user led analysis solutions, and IT will focus much of its effort on data modelling and governance.
- More than 50% of analytics implementations in 2017 will make use of event data streams generated from instrumented machines, applications and/or individuals. This goes beyond traditional and mainstream BI to a breed of machine learning technologies capable of producing autonomous insights and inferences quickly.
- Analytic applications offered by software vendors in 2017 will be indistinguishable from analytic applications offered by service providers. Service providers are seeking to turn custom project work and domain expertise into repeatable solutions that can be adopted by other organizations more easily.
- SaaS (Software as a Service) has huge traction. For example, the CRM market is set to growing even more rapidly with Gartner predicting revenues of €26 Bn by 2017. Increasingly, this is becoming SaaS-based, with such service offers passing 40% of all CRM software sold in 2012 worldwide. Gartner states that they are seeing their enterprise clients seek out easy-to-deploy CRM systems, and that SaaS-based CRM systems are delivering net-new applications that deliver complementary functionality not possible with legacy and previous-generation CRM platforms.
- Despite the strong interest in BI and analytics, confusion around Big Data is inhibiting spending on BI and analytics software. Until 2016, service providers will garner business by closing the gap between available Big Data technology and business cases. As Big Data matures and more packaged intellectual property is available, Big Data analytics will become more relevant, mainstream and, ultimately, hugely disruptive.

6 Market Sectors for MNO Big Data

Big Data as a business-to-business proposition must clearly take into account both the core needs of the target customer, and the main challenges that they face.

6.1 Business Customer Needs

For MNOs themselves, Enterprise customers, and third party organisations such as CRM, Business Intelligence or Market Research companies there is an over-arching need for marketing activities that can be more targeted, direct and personalised. This directly addresses two core needs sets: to increase revenue through better products, services and customer relationships, and to decrease costs through improved internal efficiencies.

- Increased revenues. Big Data can deliver increased revenues alongside decreased costs, and through better insight enable businesses to develop products and services that are better suited to customer needs. More time is spent effectively communicating with the customer. This leads to increased brand engagement, competitive advantage and usage, and therefore to increased revenue.
- Decreased costs. Increased efficiency is achieved through improved utilization of advertising spend and tightly focussed marketing activity, leading to decreased costs.

Furthermore, improved customer insight enables better product and service innovation, and therefore a more sustainable business in the long term.

6.2 Sector Use Cases

There are a wide range of use cases where the unique properties of an MNO Big Data proposition can meet customer needs extremely effectively. A few examples, described by market sector, are outlined below.

6.2.1 Mobile Services

MNOs and Telecoms Service Providers need to understand when, where and how customers are using their services. Monitoring usage patterns for specific mobile services enables these businesses to understand when and where services are used, the frequency, any regional increase or decrease and identifying patterns in order to tailor marketing or predict network load.

6.2.2 Financial Services

Fraud prevention is a major need in the banking and payments industry. The ability to add location to banking transaction data can be extremely useful in both predicting patterns that may lead to fraud, and through co-location data relating to specific transactions such as an ATM withdrawal or overseas transaction. On this latter point, if achieved in real-time, the banking industry could decline potentially fraudulent transactions and invalidate bank cards.

Risk mitigation and effective pricing is vital in the insurance industry. Location data and patterns of movement, including inferred average speeds, can be extremely useful in Usage Based Insurance (UBI) for vehicles. At present this is achieved through “black-box” devices, but could be provided by MNOs with much lower equipment and fitting costs to the insurer.

6.2.3 Retail

Footfall is of huge interest in the retail sector. Visitors to a retail outlet or shopping centre can be profiled to understand data such as the catchment area, distance travelled, socio-demographic profile, dwell times, or services developed that include real-time monitoring of user context to deliver the right offer at the right time via solutions such as smart couponing.

6.2.4 Transport

Understanding movement of people and predicting their requirements is critical in transport and city planning. Similar to retail, the geo-spatial behaviour of people is extremely valuable to transport and city planners in allocating resource and ensuring sufficient capacity, scheduling public transport and so on. While it has long been possible to monitor vehicular traffic, pedestrian flows are harder to measure and this could now be successfully achieved.

6.2.5 Healthcare

Deep insight into the spread of disease is essential in preventative medicine and extremely valuable as a way to ensure effective targeting of limited resources. Understanding travel patterns for at-risk groups in order to predict patterns of disease spread such as predicting flu hotspots, targeting prevention messages and delivering more efficient allocation of healthcare.

6.2.6 Enterprise

Enterprise Resource Planning is widely used to achieve greater efficiency in large organisations. Analysing employee patterns of movement between offices or field team geo-spatial behaviour could improve, for example, field-based employee territory planning, thereby improving workforce efficiency. This data could feed into ERP software as a valuable additional dimension.

6.2.7 Media

Key to successful content provision is the ability to meet customer interests with a high quality of service. Determining media consumption patterns and demographics such as streamed music or video whilst on the move in order to predict network load and provide consumption data to, for example, radio stations or other streaming services.

A further example is profiling psychographic data against behavioural and socio-demographic data to improve insight into what content a particular customer segment is interested in, and where and when they consume that content. This then allows the provider to greatly improve content relevance.

6.2.8 Marketing and Advertising

Uppermost in the advertiser’s mind is who the target customer is, where they are, and when they may be most responsive. Understanding the response patterns for a text campaign, enabling the

customer profile, location, time of response and so on to be understood would be hugely valuable. This can inform more tightly targeted campaigns both by segment and location.

If the socio-demographic profile of the people in a specific location at a specific time is known, then advertising can reflect the needs of the group. This may change over the course of a day or at the weekends, so for example retail advertising could be dynamic.

6.3 Customer Privacy and Permissions

While the needs described here are predominantly business-related, the needs of the end user customer must always be taken into account, and privacy, control over personal data and the granting of permission for its use are paramount. Extreme care must be taken vis-à-vis these customer needs and the legal requirements for data protection, permissions and privacy. As this varies from country to country, the local legal team in each MNO should be consulted.

This, however, need not be an impediment and privacy and brand risk mitigation can be achieved through both legal and technical means. Some general guidelines for good practice in this regard are listed.

6.3.1 Legal Conditions for Data Use

Policies that must be applied include:

- Where an individual's personal data is being shared, permission must be obtained;
- When using aggregated data no attempt to identify people in a data set must be made, whether using this data set or in combination with any other;
- Data must never be shared with third party organisations without express permission;
- If wholesaling data to third party organisations or sharing for the purpose of enrichment with other data sources any breach of the license arrangement must result in the termination of the service and potentially seeking punitive compensatory damages.

6.3.2 Technical Solutions to Obfuscate Individual Data

Solutions that can be applied include:

- Batch data handling and aggregations to a 15minute boundary;
- Wide location boundaries such as a defined minimum area or a postal code area;
- Never under a unit batch size of 100 MSISDNs;
- Time or usage based DRM controls on data supplied to third parties so that it cannot be stored long term;
- Data enrichment and analytics undertaken by the MNO with no detail provided.

7 Packaging a Big Data Proposition

7.1 Strong USPs for the MNO

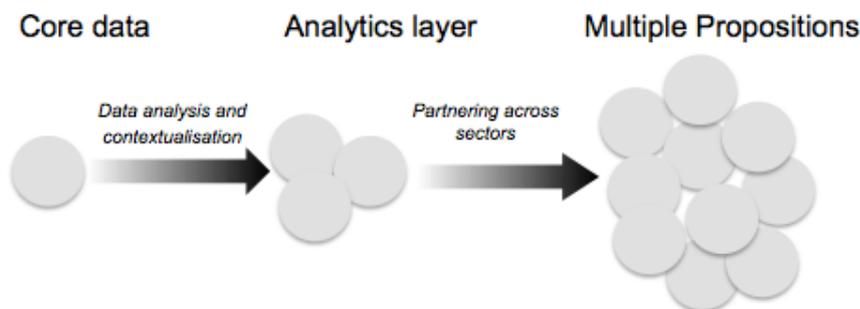
When considering the proposition, partnering offers an attractive route to enter the market, leveraging strong, highly valuable USPs.

Four unique dimensions make the tailored data very valuable:

- Customer context;
- Customer specificity and highly granular detail where required;
- Near real-time data, and real-time where possible;
- A high degree of accuracy through huge sample sizes for aggregated data.

The value to the customer is highest where the insight is unavailable elsewhere. When applied to different industry sectors, the same data can generate many new business opportunities for the MNO and its partners.

Figure 4 Multiple Propositions Through Smart Partnering



Source: Piran Partners

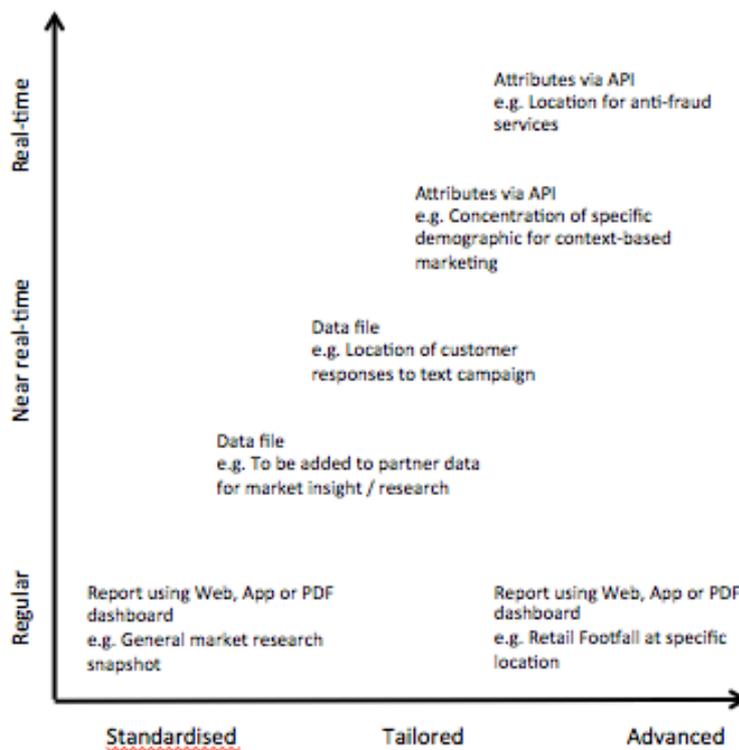
7.2 How Should Services be Packaged?

Customer needs in this regard will vary according to business requirements. The two key dimensions to be considered are timeliness and degree of customisation of the data.

- **Timeliness:** Some customers may require only a monthly regular data feed or report, while others will need near real-time (using flat file transfer) or real time service (using an API), depending on the purpose to which the data is being put. Real-time data will be both the most challenging to deliver and may have most value as it allows contextualisation. There are three classes of time to be considered: Regular, Near Real-Time, and Real-Time.
- **Customisation:** While a basic report may be fairly straightforward, the more valuable data may be heavily cross-correlated with either MNO or third party data. There is a clear relationship

with timeliness as well: more advanced solutions are likely to be required in near real-time or real-time.

Figure 5 **Service Delivery Approach**



Source: Piran Partners

When these two dimensions are combined a logical service delivery framework can be discerned. A tiered service level approach across these two dimensions is therefore envisaged to create packaged solutions. Three classes of service level (customisation) are envisaged: Basic, Tailored and Advanced

7.2.1 Basic Reporting

Customer insight delivered on a single chosen dimension at an aggregated, anonymised level, including:

- Context of the device or service usage for a group such as when and where a specific service tends to be used;
- Socio-demographic profile of a group on dimensions such as age, gender, average income;
- Service type usage patterns;

- Device make, model, operating systems used by a specific group.

7.2.2 Tailored to Customer Requirements

An extension of the basic service level:

- Cross-referencing of data across multiple dimensions such as service usage and socio-demographic group;
- The ability for a third party to submit a set of MSISDNs for analysis, such as time or location of service use.

This service level would deliver rich insight through more complex combinations of the data.

7.2.3 Advanced and Integrated Solutions

A sophisticated approach using a machine learning approach, providing:

- The ability to draw tailored insights drawing on all dimensions, and provided in a format agreed with the client for a target user group, to deliver precision insights;
- The ability to provide insights in real time via an API through alerts and notifications. This would include predictive and trigger analytics such as predicting take-up of a specific service based on behavioural or socio-demographic combinations;
- Customised reporting against customer supplied or 3rd party data as required to reveal, for example, the socio-demographic and psychographic profile of respondents to an FMCG text-in competition;
- Provision of access tracking and analysis services for user location and movement in order to understand patterns of behaviour either at an aggregated level or by a unique user group, in order to understand behavioural and movement pattern alongside journey demographics;
- Real-time attribute provision via an API to feed into Mobile Identity type services such as co-location of mobile and bank transaction, thereby reducing fraudulent transactions.

7.2.4 Service Delivery Options

Delivery method may vary by customer or market. As noted, cloud-based services are gaining a large share of the CRM market and could be viewed as an appropriate delivery mechanism.

However, the following options could be delivered according to the customer requirement and type of package. These would include:

- One-off reports in hard copy such as PDF;
- Data extract via flat file;
- Cloud-based service through a dashboard (PC/web or App);
- API Integration.

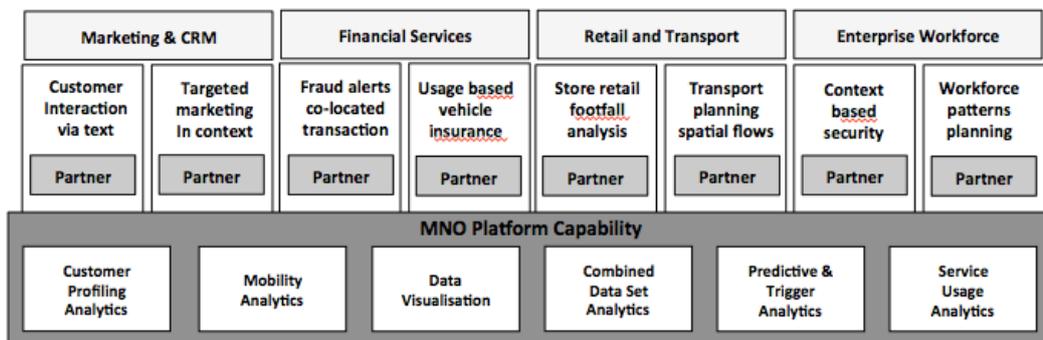
7.3 Offering Sector Specific Propositions

Once developed, an analytics capability can be deployed many times to deliver propositions by sector. The potential use cases outlined in this report offer considerable potential, but if these are to be successfully exploited without developing or acquiring sector specific expertise which may be prohibitive, a partnering approach would provide the solution.

Cost-effective partnering with sector specific organisations in order to gain the expertise, reach and other rich data sources that they possess is likely to deliver the best return on investment.

Taking the use cases previously outlined, the respective potential propositions could be delivered as illustrated below:

Figure 6 Illustrative Sector Specific Propositions Using Partnering Approach



Source: Piran Partners

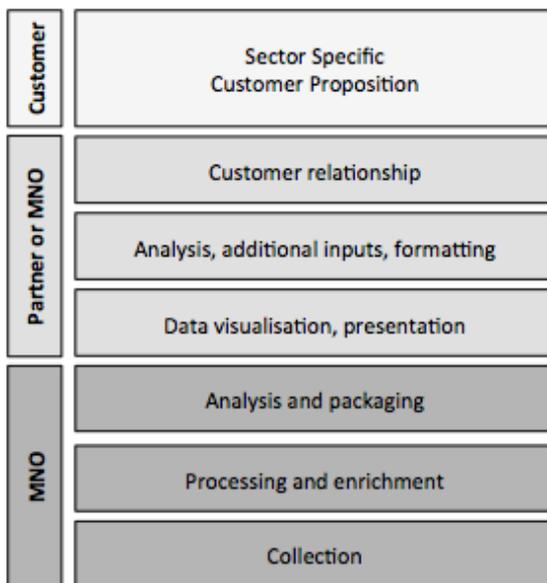
The partners may be global or local depending on market requirements. Once the underlying use case is well understood the most appropriate partner can be selected, if necessary.

8 Value Chain

8.1 MNO Position in the Value Chain

As described above, a sector specific partner could, in many cases, provide a fast route to market with rich data sets, expertise and a ready customer base. This would allow the MNO to concentrate on maximising the value from the unique data being generated through customer activity. Taking such a partnership approach for analysis, presentation and route-to-market will enable both the partner and MNO to quickly address multiple verticals whilst the MNO retains control over the core data, processing, enrichment, and analysis. This approach therefore leverages the sales channel, brings credibility to the proposition and protects the MNO position in the value chain.

Figure 7 Illustrative Value Chain



Source: Piran Partners

8.2 Partnering

The approach described in this report envisages partnering with companies that can add value, strengthening the MNO proposition. These will range from a loose-coupled wholesale arrangement through to close-coupled partnering to deliver a specific sector solution.

For companies providing Market Research or Business Intelligence, core data has generally been obtained through historical analysis, quantitative and qualitative research. There is some predictive analysis, for example in propensity for a specific target customer group to adopt certain types of

service. Adding the rich data that an MNO can bring adds a multi-dimensional and highly objective approach that can significantly improve the insight derived from primary data.

The selection of a partner will vary my market and sector, and some partners will be able to address multiple sectors. Given that the MNO can bring socio-demographic, behavioural, psychographic and social graph data this is extremely powerful. The MNO can add further value to this through undertaking:

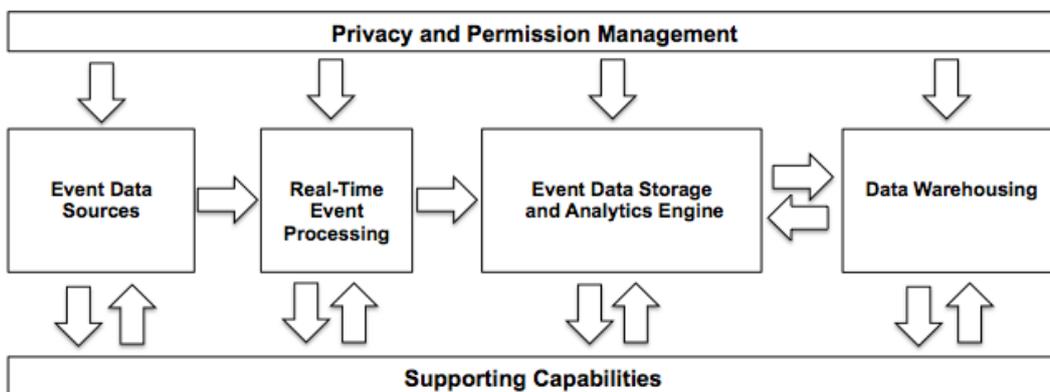
- Analysis of combined data sets such as the cross-correlation between customer profile, mobility and service;
- Undertake predictive and trigger analytics using machine learning to predict propensity to behave in a specific manner;
- Deliver reporting tools such as graphical data visualisation of patterns or trends.

9 Business Requirements

9.1 Technical Capabilities

The building blocks of an analytics capability are described below.

Figure 8 Technical Capability Requirements



Source: Piran Partners

9.1.1 Privacy and Permissions Management

A core principle for the MNO should be to protect customer privacy and guard their personal data. This places the customer in control but importantly provides the basis for trust, and to enable the customer to get value back if they grant the MNO the privilege to use their personal data. It must also have strict guidelines for the use of anonymised, aggregated data, so both ends of the spectrum (fine-grained vs. aggregated) for data are accommodated. A framework to support customer privacy is therefore essential.

This could be delivered through Mobile Identity services providing customer control over their personal data. This should include some basic principles:

- Permission must be granted by the customer before sharing identifiable personal data attributes with any third party;
- Customers must be able to control and manage how their data can be used including the purpose that the data can be used for and how long a third party can retain them;
- Data used for aggregated analysis must be fully anonymised before being loaded into MNO internal systems;
- Data shared with third party organisations must be fully anonymised before leaving MNO jurisdiction and being passed to external third parties.

9.1.2 Data Sources

The capability to collect new event-level data such as browsing behaviour or location must be introduced, as well as lower latency access to pre-existing data types at a finer-grained level. This requires capital expenditure on the hardware and software for network monitors and probes, which will require on-going management in order to provide usable event data. This is a more economical approach than using on-device data sources as these may require licensing per device.

9.1.3 Real Time Event Processing

The processing and prioritisation of event-level data enabling higher-level business events to be identified and passed to other systems is required. This is a Complex Event Processing (CEP) capability for real-time event handling, in order to generate business events that feed into operational systems.

9.1.4 Data Storage, Analytics and Machine Learning

At the core of the approach are the machine learning technologies used to store and generate insight from large data volumes. These should be able to support ad-hoc rapid analytics over large data volumes. The capabilities required are:

Data Storage

- Storage for extremely large volumes of data (billions of records per day);
- Data loading in near real-time;
- Highly scalable;
- Data extraction for aggregation and loading into EDW
- Data extraction for analysis in Analytics/ Machine Learning Engine
- Data extraction for reporting through common software such as Business Objects.

Analytics and Machine Learning Engine

- Must be able to perform advanced analytics of very large volumes of data;
- Rapid delivery (near real-time) of query results;
- Support for ad-hoc data sets;
- Ability to handle simultaneous event and EDW data such as CDRs, CRM data;
- Support feeds to other internal systems and external partners.

9.1.5 Data Warehousing

It may be necessary to extend and integrate pre-existing MNO Data Warehouses in order to support the sharing of common data marts, analytic components or extract processes.

9.1.6 Supporting Capabilities

The supporting capabilities will include:

- Tools for the visualisation and manipulation of data;

- Data virtualisation tools to enable the integration of data stores where required so that they can be queried as if they were a single store;
- New continuous real-time data integration layers may be required between platforms to enable cross-transfer of data between data stores. This would include data extraction, normalisation and anonymisation, prior to loading into the appropriate MNO systems and data stores;
- New categories of data will be required to support the advanced analytics capability including cell ID, device and the ability to import and process third-party data;
- APIs will be required to expose data to external systems. This could support a number of business processes, including exposure the data to third parties to support commercial agreements.

9.2 Commercial Capabilities

In order to maximise MNO return on investment existing capabilities should be used, with this new service line adding to the portfolio of services sold through the Wholesale or Enterprise sales and marketing teams.

9.2.1 Sales and Marketing

The most cost-effective model is to provide the MNO's existing sales team(s) with the tools, training and incentives to market this service. This would be through the Wholesale sales team and the Enterprise sales team. This will include close liaison with partners to promote the service and manage these accounts. If these do not exist, then some resource must be devoted to packaging and selling the service.

9.2.2 Product Management

In order to provide a highly tailored service to customers and partners alike, there will be a requirement to manage the service offers. This will include providing day-to-day liaison on the service, understanding and implementing customer requirements, ensuring SLAs are met and the overall service delivery meets customer expectations. Furthermore, like and product management role, active lifecycle management and evolution of the service offer will be required, influencing both technical development and commercial performance.

10 Recommendations

The opportunity to derive a new revenue stream from Big Data solutions is potentially very significant, but will require some analysis and investment in order to capitalise on this burgeoning market.

Specifically, MNOs should:

- Audit their existing data assets in order to identify those that are not being leveraged;
- Undertake an internal analysis of both the technical and commercial capabilities required to acquire a Big Data capability;
- Establish the extent to which machine-learning analytics capabilities could improve their internal CRM.

Furthermore, the MNO should ask itself whether the commercial opportunity described in this report is appropriate for the MNO's strategic aspirations, and if so, set out a high-level strategy:

- Review the potential in the market that they serve to determine the potential commercial opportunity. This will vary by region or focus for every MNO, for example in the developing world not all the use cases described in this report may be applicable, or the MNO may not have easy reach into specific partners or market sectors;
- Identify and enter into discussion with the key partners and sectors that they address in order to determine the commercial model, value chain and the shape of the proposition;
- Identify the range of use-cases and prioritise these according filters such as the ability to deliver, maturity of the opportunity, time to deliver, revenue potential and return on investment;
- Develop a full business case in order to clearly understand the return on investment specific to the opportunity.



About Piran Partners

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We enable businesses to capitalise on the revenue streams that can be achieved by placing mobile technology and mobility at the heart of your business strategy.

We approach consultancy engagements from a wholly commercial perspective, implementing solutions that solve problems, create deeper customer relationships and drive results through commercial value.

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