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Executive Briefing

O2 UK: DRIVING CUSTOMER-CENTRICITY IN NETWORK ANALYTICS

We explore the qualitative impact of advanced analytics on telcos looking to take a customer-centric view of their operations. We also quantify the returns for operators who choose to invest.

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Preface

The document has been prepared by independent research firm STL Partners and commissioned by Dell Technologies and Intel. It is based on STL Partners' continuous research programme into the future telecoms operator and how to get there.

The document includes a case study developed with O2 (Telefónica UK), a Dell customer. Mentions, allusions and use of data provided by specific companies or products in this document are intended to allow us to illustrate market evolution and do not constitute endorsements or product/service recommendations.

About Dell, Cardinality and Intel

O2 (Telefónica UK) worked with Dell Technologies to deploy a data analytics platform based on a reference architecture provided by Dell/Cardinality alongside its existing IT network infrastructure. This architecture is based on a foundation of Intel Xeon processors that offer a highly scalable compute platform capable of handling future analytics requirements. This includes:

- Support for in-memory databases for faster data access via Intel Optane DC persistent memory
- Improved AI Inferencing with Intel Deep Learning Boost with VNNI
- Enhanced network security and throughput via Intel QuickAssist Technology for accelerating encryption and compression functions.

This provides investment protection for organisations as they scale out the architecture to gain insights from a wider variety of data sources and introduce new analytics techniques into their operations.

The case for analytics

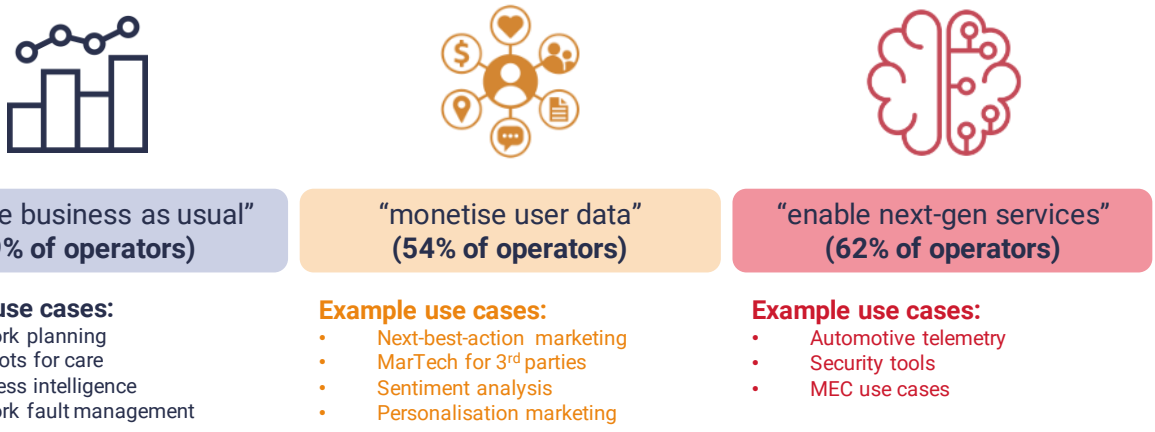
Data has become currency, and telcos know it

At STL Partners we have written extensively about our view that we are entering a new age of telecommunications, dubbed the Coordination Age[1]. Reflecting the evolving needs of humanity, we have already seen a shift in emphasis in communications technology. In the Communications Age (from c. 1850's) the focus was on enabling human-to-human communication across geographies, and in the Information Age (from the 1990's onwards) the focus was on human-to-machine type communications: the Internet and everything it enables. Now, this is beginning to change once again, towards enabling machines to talk to other machines, and the automated flow of information across organisations and ecosystems.

This is not a straightforward transformation. Collaboration and coordination in this way can only occur if we can find effective ways to collect, manage, analyse, and share machine data, such that it becomes useful – and relevant to the needs of the humans that the machines ultimately serve. This is a clear opportunity for the telecoms industry, which already connects organisations and ecosystems together and is therefore in a strong position to play a coordinating role.

Moreover, telecoms operators have reams of their own data – about customers, equipment, network events, etc. We have previously published research[2] about how telecoms operators worldwide plan to make use of data to support a broad spectrum of use cases. As shown in Figure 1, practically all operators see data as key to "improving business as usual" – driving efficiency and experience across core networking services.

Figure 1: The opportunity areas for telcos in advanced analytics



[1] See The Coordination Age: A third age of telecoms
[2] See Telecoms Data Analytics – Where's the real value? and Telco AI: how to organise and partner for maximum success

Source: STL Partners

Our view is that leveraging data to improve core connectivity services is important but is just the first step on telcos' evolutionary journey into the Coordination Age. Over time, it may become possible to aggregate telcos' data with that of other partners in a coordinated ecosystem which will open up a whole new level. Telco networks will be a key enabler of this.

But data is useless without the ability to analyse it

The truth is that most telecoms operators are far from being able to do much of this. While most of them generate vast quantities of data – from customers and networking equipment – this data is not useful in and of itself.

Consider, for example, the diagnostic and telemetric data produced by equipment across a telecoms network. On the face of it, this data should allow the operator to monitor the performance of its network at both a granular and high level and use that information to drive efficiencies across its business. The reality is much more complicated. The data being generated comes from equipment produced by different manufacturers for different purposes, and as such is often presented in a variety of formats which do not translate to each other. Much of the information held is also sensitive, confidential, or held in business unit siloes (often due to internal bureaucracy) - it is therefore not able to be shared freely even within organisations.

Capabilities must be put in place so that the *information* held within the data is released and put to good use. We need the ability to:

- Coordinate/translate across multiple types of device and data formats to ensure that granular data is accessible at the "right time"
- Build dashboards and high-level or 360-degree views of assets and organisations in a unified and easily accessible platform
- Facilitate secure but straightforward access to data, through simple permissioning, in order to enable intra- and inter-organisational sharing

Luckily for telecoms operators, a broad selection of tools exist to do this without requiring armies of data scientists, not least basic extract-transform-load (ETL) and extract-load-transform (ELT) systems. By investing in these types of capabilities, operators can begin to successfully develop and deploy more innovative use cases within the opportunity areas laid out in Figure 1.

Investment will only happen with proof-points

In spite of operators' ambition, there has been reluctance to investing in the basic tools to aid the progression of their analytics strategies.

This is due, at least in part, to the need to build a case for investment. While the case for analytics makes intuitive sense, operators need to quantify the benefits they will realise. They must also balance

the desire to implement innovative use cases with the need for upfront investment and groundwork. To do this, they look for proof points and tangible metrics, which the industry lacks.

Operators tell us that metrics related to analytics solutions are scarce, too high-level, and often too poorly explained to be meaningful. Where metrics do exist, they tend to be poorly sourced figures relating to highly specific case studies – which aren't effectively translated into useable information for other operators.

In this report, we aim to analyse and quantify the benefits of adopting an advanced analytics solution, as well as exploring the rationale and decision-making process for investing in analytics.

We refer to a specific operator case study (network customer experience tracking at O2/Telefónica UK) but seek to lay out the methodology behind the claims we make in an open, understandable fashion. This report is informed by discussions with both the operator and the vendor partner who co-delivered the solution.

The O2 UK example: taking a customer-centric view of network data

O2 UK is the largest mobile network operator in the United Kingdom, with around a 33% market share and c. 30 million wireless subscribers in 2019. The UK mobile market is highly-developed and, as such, highly-competitive, with stable market shares, and average revenues per user (ARPU) which are increasingly under pressure.

Over the years, O2 has invested heavily in its network with the aim of providing a market-leading experience for its subscribers. At the beginning of 2018, the company embarked on a new programme to take this further, by developing a customer-centric view of its network which would allow it to:

1. Bring better and faster decision-making capabilities to C-level strategists…
2. … allowing them to make customer-led (and not engineering-led) decisions…
3. … at the lowest cost possible within existing budget constraints.

The objective was to ensure that every decision O2 makes about its network contributes to its ambition to provide a market-leading experience for its subscribers.

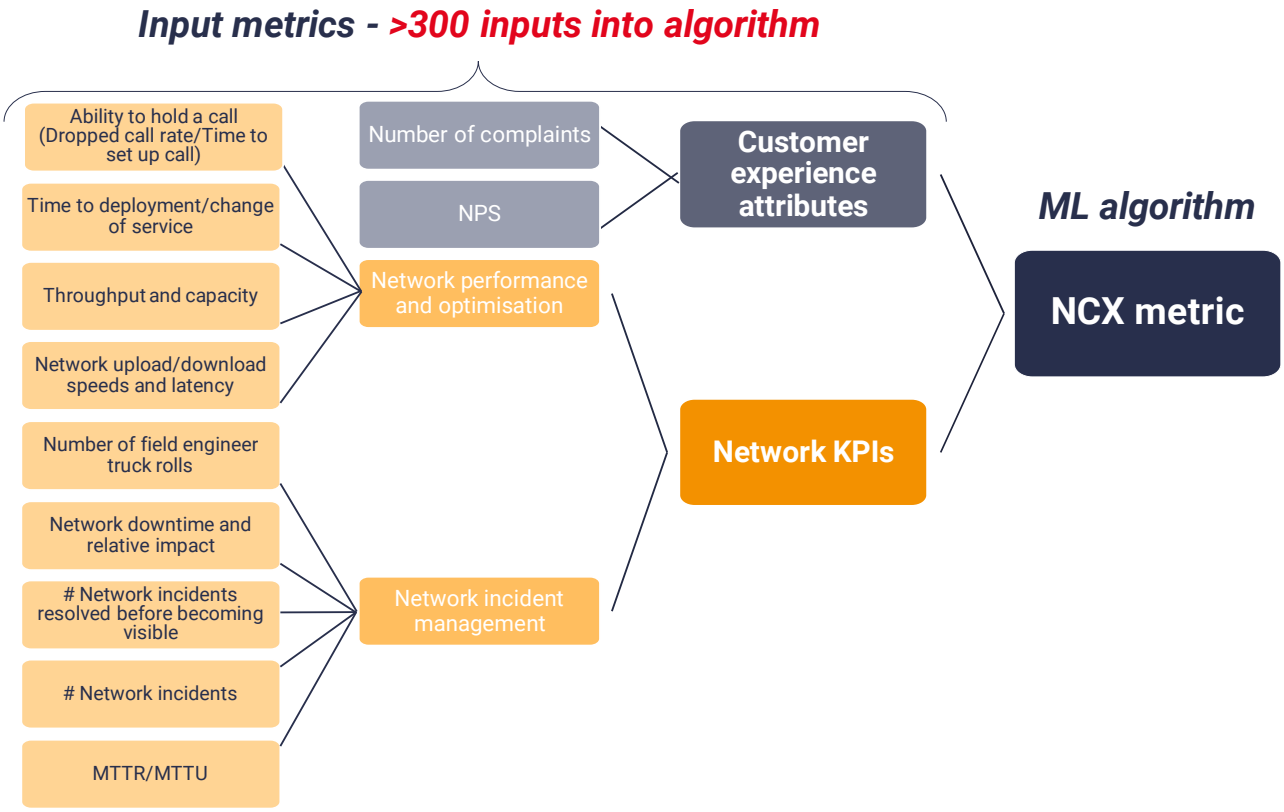
Data was key here. O2 had lots of useful data which held information pointing to its customers' experience – traffic patterns, dropped call logs, fault logs and so on – and was working with over 300 KPIs based on this data to identify where improvements should be made. However, these KPIs were independent of one another, with relations between them poorly defined. Tracking responsibility was divided across different parts of O2's organisation. As such, the company lacked the ability to take an aggregate view of the information and make a measured assumption about a given customer's overall network experience at a given point in time.

NCX: a new metric for customer experience

Work began to develop a new process which took O2 from basic data ingestion towards a single data-driven customer experience metric designed for use across the organisation. This was dubbed **network customer experience (NCX)**, and took the form of a single score out of 100 generated once per day for every O2 consumer subscriber.

The score comes from algorithmic analysis of information generated from hundreds of already existing but previously siloed data sources and key telco KPIs, taking a weighted average of the individual scores. Machine learning techniques and customer surveys are used to identify and prioritise which KPIs most strongly impact customer experience of the network. In particular, NCX brings together traditional customer experience metrics with network operations metrics in a way which had not been possible before (see Figure 2).

Figure 2: NCX takes multiple data sources and makes them one



Source: STL Partners, Telefónica UK

NCX is designed to make it easier to focus resources on the most important issues for O2's customers. It does this by highlighting which areas of network operations are most important to customers and should therefore, when NCX in that area is low, be prioritised in terms of investment – be that network coverage, latency reduction, congestion improvement, or availability. KPIs can be set and adjusted automatically as a result of what is learned, allowing the company to invest in a way that will have maximum impact on customer experience and their perception of the network.

NCX has had positive impact across O2's organisation

O2 feeds the NCX score into three key areas of its operations:

1. **Network operations:** NCX supports O2 in network fault management and network optimisation. Analysis of the scores enables the company to better invest its resources into improved fault detection, faster root-cause identification, smarter dispatch of engineers into the field, and so on.

2. **Network planning and investment efficiency:** O2, like its peers, is under pressure to constrain its capital expenditure – particularly as it looks to roll out 5G. NCX allows the organisation to take a nuanced view of CX across different parts of the network, and determine which should receive investment first to return the biggest possible CX improvement for every dollar spent.

3. **Targeted marketing and customer experience management:** The granular information NCX provides about individual customers allows O2 take a more tailored approach to

communications with its customers. The company has already built rules-based marketing campaigns such that if a customers' NCX changes they will automatically receive an outbound notification. This shift from being reactive to being proactive has the opportunity to significantly change O2's relationship with its customers, creating a "stickier" network, increasing customer retention through churn reduction, and improving potential upsell opportunity.

O2's main objective with the NCX, as stated above, is centred around driving customer centricity – focussing on O2's brand value to customers and cementing its position as the mobile market leader in the UK.

Releasing value required groundwork

NCX wasn't set up overnight – O2 didn't derive value without a certain amount of groundwork. The first step was to build an extract-transform-load (ETL) engine for O2 on a relatively small scale, creating a unified data platform and dashboard which spanned multiple business units and integrated somewhat with existing systems.

The decision was taken to deploy an analytics solution provided by software vendor Cardinality on Dell Technologies infrastructure. A small team within the networks business unit was put to work to identify the technology required and prepare data for ingest and analysis.

Over time, the platform was expanded to ingest a greater variety of data sources and metrics. To date, the use case covers approximately 90% of O2's potential data sources – it is unlikely to reach 100% due to internal compliance and data privacy regulations.

The NCX use case was built on top of this platform. The algorithm used to weight inputs and output required substantial iteration, including substantial analysis of customer survey data, including Net Promoter Scores (NPS). Eventually, O2 reached a stage where NCX score correlates with NPS.

Widespread use of the NCX metric outside of the networking BU came quickly due to C-level support. Marketing functions adopted it within months of its implementation – and the metric is now used by 60-70% of business units. To this extent, NCX has become a unified measure of customers' perception of O2's business.

O2 continues to invest in building out the NCX use case. Future aims are for NCX to become more granular and closer to real-time. This will allow O2 to develop fine-grained automated processes and to more efficiently manage customer experience. Another possibility is to pursue greater segmentation of subscribers, as different network KPIs will impact customer experience differently depending on the individual and the services they purchase. For example, IoT customers will require different prioritised metrics to generate an accurate NCX score compared to an elderly mobile subscriber.

Predicting ROI: applying the O2 model to other operators

It is clear that O2 has had much success with its analytics deployment – but does this translate to other telcos? We set out to model the total cost of ownership (TCO) of a similar platform, and what impact its deployment might have on another operator's business.

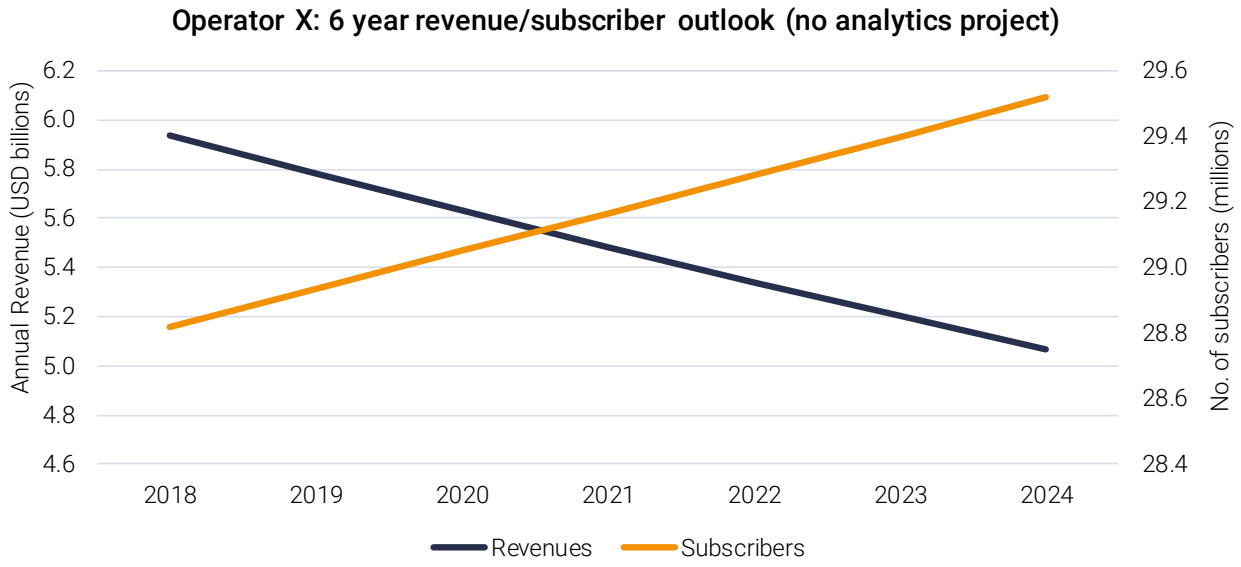
What's the scenario?

Our model considers the expected ROI for "Operator X", a hypothetical telecoms operator offering prepaid and post-paid mobile connectivity.

Operator X had just under 29 million subscribers at the end of 2018, with annual revenues of US$ 6.1bn, representing a monthly average revenue per user (ARPU) of $17.70. This makes it analogous to a leading mobile network operator (MNO) in a competitive Western European market, many of whom have seen ARPUs halve over the past decade.

Based on current growth trends, Operator X will see a small annual growth in subscribers over the next five years (around 0.4% p.a.). This will be counteracted by ARPU falling by 3% p.a. over the same period, resulting in net revenue loss from mobile services – down from $6.1bn to $5.3bn:

Figure 3: Operator X is forecast to lose money despite subscriber growth



Source: STL Partners projections, data representative of leading W.European MNO

Operator X, therefore, is looking to take a similar approach to O2 in deploying data analytics capabilities to better understand its customers' network experience – and take appropriate action.

In order to demonstrate the benefits that deploying the platform would unlock, we have defined three impact scenarios, which we compare to a base case:

1. **Base case:** the platform is deployed, but the operator is unable to leverage analytics insights for any benefit (in essence, it lies unused). This scenario is included for comparison - we assume that Operator X would not follow it in reality.

2. **Low impact:** some mainly siloed use of the platform within teams; limited (e.g. monthly) refinement of the algorithms involved; usage mainly restricted to KPI measurement to inform manual decision-making.

3. **Medium impact:** increased sharing and collaboration across teams; regular (e.g. weekly) refinement of the algorithms; many automated processes and workflows built on top of and feeding into human-defined policies.

4. **High impact:** widespread use and understanding of the platform across and within teams; constant (e.g. daily) refinement and increasing granularity of the algorithms; many automated processes and workflows built on top, involving some level of machine-defined policies.

Detailed assumptions cover the impact that the platform would have on various metrics, including Operator X's ability to use the data to improve retention abilities, reduce the cost of retaining individual customers, reduce churn rates, and increase the number of customers that are upsold to higher revenue plans. In turn, we model the impact on the operator's revenue and cost base.

What resources are required?

For the sake of simplicity, we assume that Operator X deploys a data analytics platform analogous to the Dell Technologies/Cardinality solution used by O2, alongside its existing networking and IT infrastructure.

The hypothetical platform is based on a reference architecture provided by Dell Technologies and software partner Cardinality, on a foundation of Intel Xeon processors. Dell/Cardinality provide a reference architecture outlining the quantity of various nodes and switches required to support the solution. This has four main components:

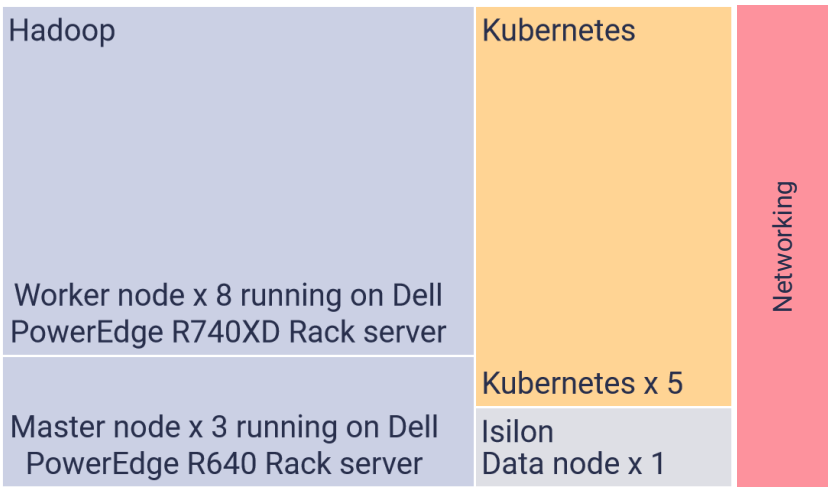
1. Data analytics software platform (in this instance Cardinality's Perception Platform running on Kubernetes)

2. Computing hardware (Dell PowerEdge rack servers running Hadoop for big data processing and analysis purposes)

3. Networking hardware (Dell switches to interface with the operator's network)

4. Data storage hardware (Dell Isilon arrays)

Figure 4: Dell Technologies/Cardinality reference architecture



Architecture BOM

Cluster	Unit	Quantity
Hadoop	Master node	3
Hadoop	Worker	8
Kubernetes	Kubernetes	5
Isilon	Data	1
Networking	Dell Z9100-ON switch	1
Networking	Dell S3048-ON switch	2
Networking	Dell S5148F-ON switch	2

Source: Dell Technologies/Cardinality, STL Partners representation

We use this to calculate, at a granular level, the total cost of ownership of the hardware and software deployed by Operator X. In total, this is just under **$4.5m over a 6-year period** (assuming no discounts). This number accounts for growth in the infrastructure to accommodate growth in data ingested (both organic growth in data created, and inorganic growth in the proportion of that data ingested), as well as the life cycles for the various components and licences required.

Furthermore, this estimation anticipates that the operator will scale its deployments of Kubernetes, Hadoop, and storage nodes over time. This equates to the operator allowing the Perception Platform to ingest and analyse more data (Kubernetes), the operator increasing their in-house access, analysis, and use of the information (Hadoop), as well as storing a greater quantity of data (potentially for longer periods of time due to compliance regulations).[3]

Given the way the reference architecture has been built, with storage and compute separated, the operator could choose to scale any combination of infrastructure (e.g. increasing storage and in-house analysis but not the Perception Platform's ingest). This allows the operator to tailor the platform to its specific needs and existing infrastructure, reducing costs for scaling the use case. This cost reduction could be up to c. $0.5 million in savings across the 6-year period that we have modelled.

What benefits would be seen?

Our findings show that Operator X could expect a significant return on the $4.5m investment, but that this varies broadly depending on the level of impact realised.

[3] We estimate raw data is likely to be stored for 4-6 weeks with cleaned and aggregated data insights potentially for much longer. The roll out of 5G is likely to increase the requirements for data storage in advanced analytics solutions, with the main impact being on additional TBs required from the Isilon storage units.

The high and medium impact scenarios that we model return positive net present value (NPV) and pay back within two years. However, if Operator X makes limited use of the platform, as in the low impact scenario, it is less likely to justify the initial outlay.

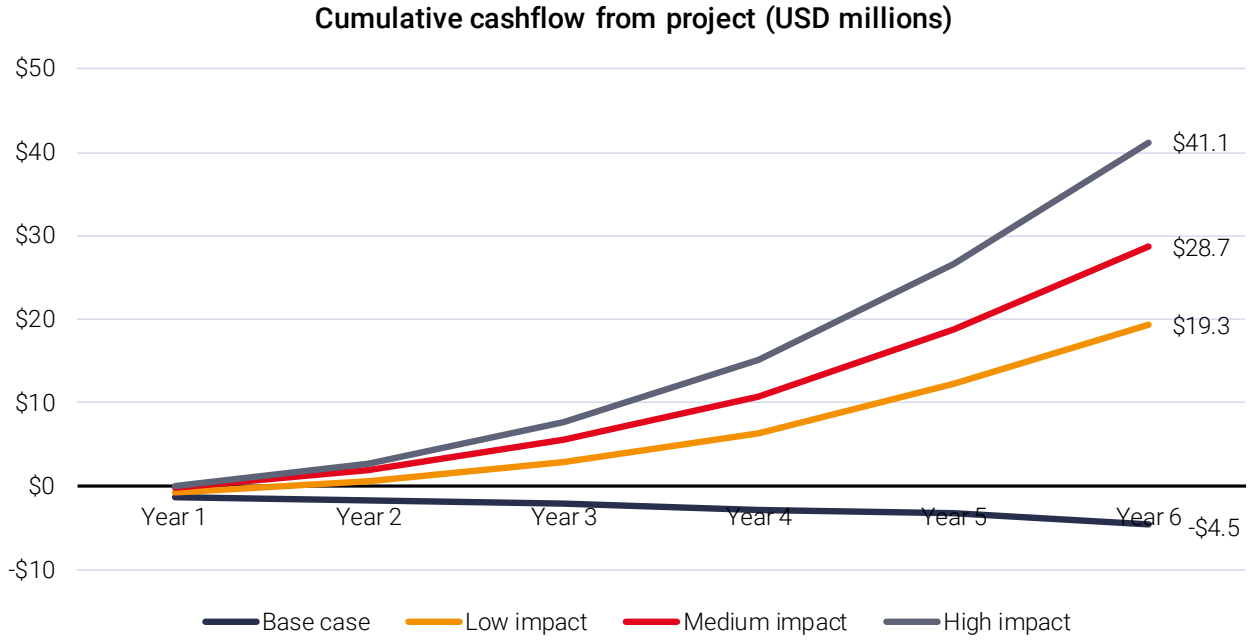
Figure 5: Returns from analytics project depend on ability to realise impact (1)

Operator X: Analytics platform net present value and payback

	NPV (Year 6)	Payback (years)
Base case	-$0.83	N/A
Low impact	$0.63	2
Medium impact	$1.38	2
High impact	$1.98	2

Source: STL Partners projections, data representative of leading W.European MNO. Discount rate 10%

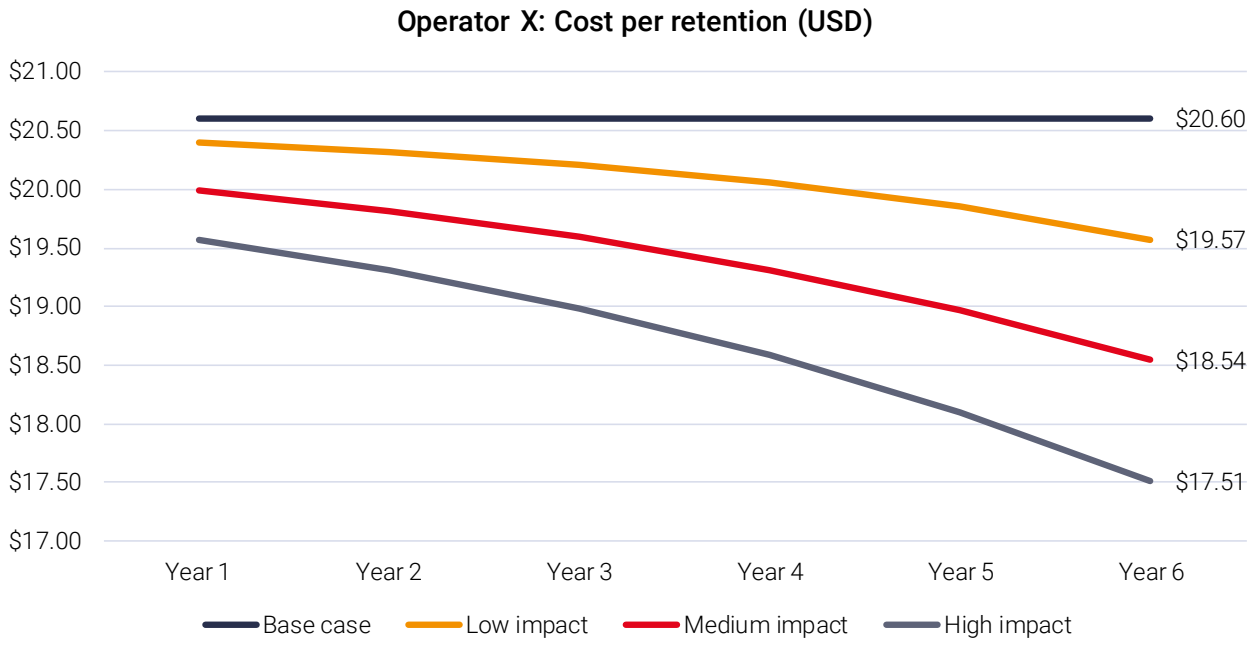
Figure 6: Returns from analytics project depend on ability to realise impact (2)



Source: STL Partners projections, data representative of leading W.European MNO

The most attractive element of the investment is the impact on subscriber retention costs (SRC). In all three scenarios, Operator X's average cost of retaining a customer ("churn management") is reduced over the base case, by up to 15%.

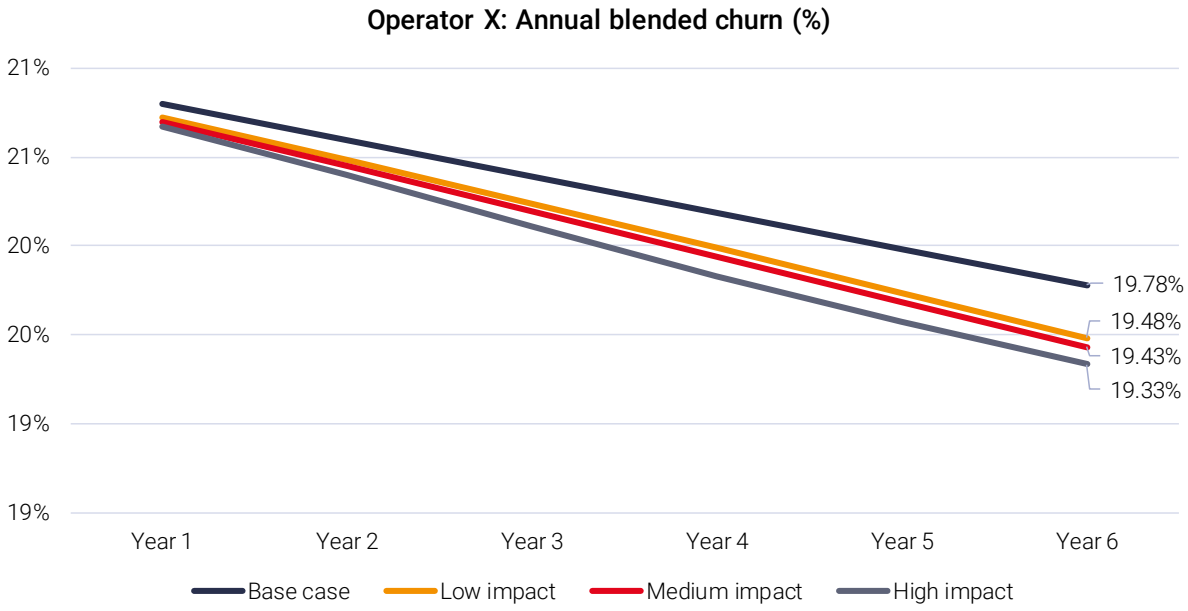
Figure 7: Analytics project can lead to a 15% decrease in cost of retaining subscribers



Source: STL Partners projections, data representative of leading W.European MNO

Operator X will also see a reduction in churn attributed to the analytics project. It must be noted, however, that churn falls even under the base case, due to the operator's existing marketing and churn management activities. The scenarios modelled do have a net positive impact, but it is relatively small. This reflects the fact that operators in developed markets tend to have already invested heavily in churn reduction, such as in customer lifetime value models and automated marketing emails when customers are reaching the end of their contract.

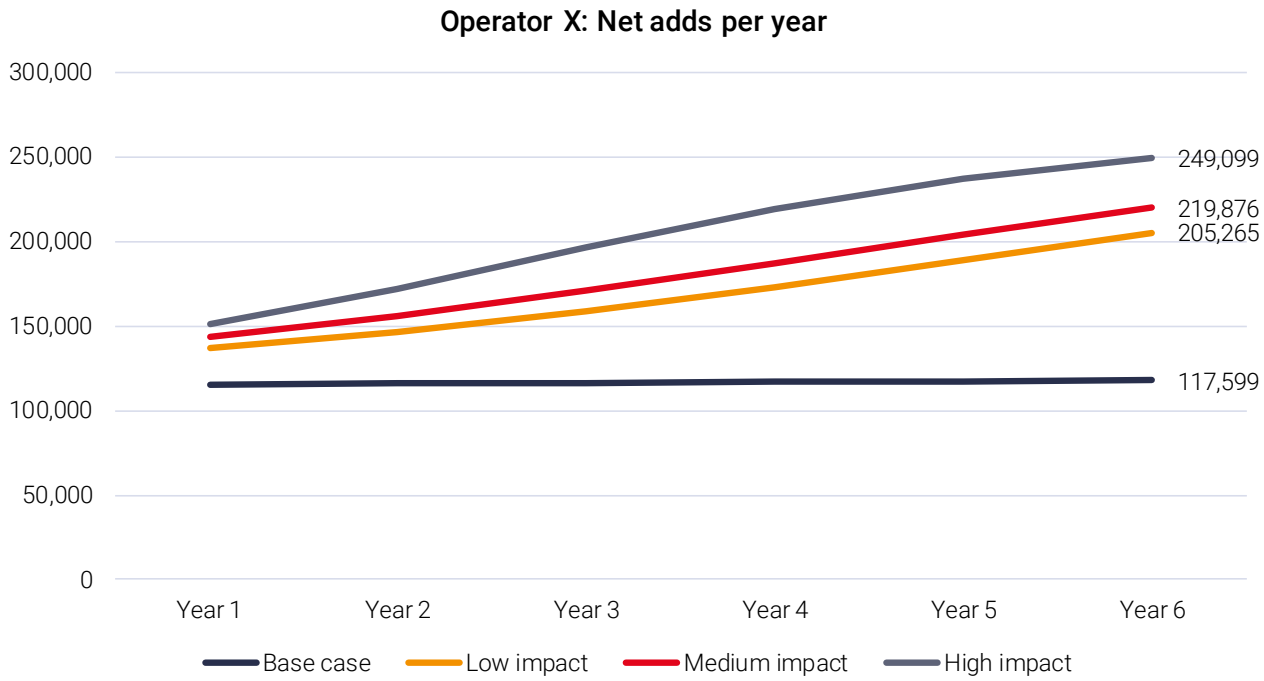
Figure 8: Analytics project makes a minimal contribute to churn reduction



Source: STL Partners projections, data representative of leading W.European MNO

Though this is a small impact to churn, Operator X *can* still expect an increase in the number of subscribers, as shown in Figure 9. Some of this is organic growth, as captured in the base case, but by Year 6, the high impact scenario shows net additions of over 130,000 per year more than the base case, mostly due to improved ability to attract and retain customers:

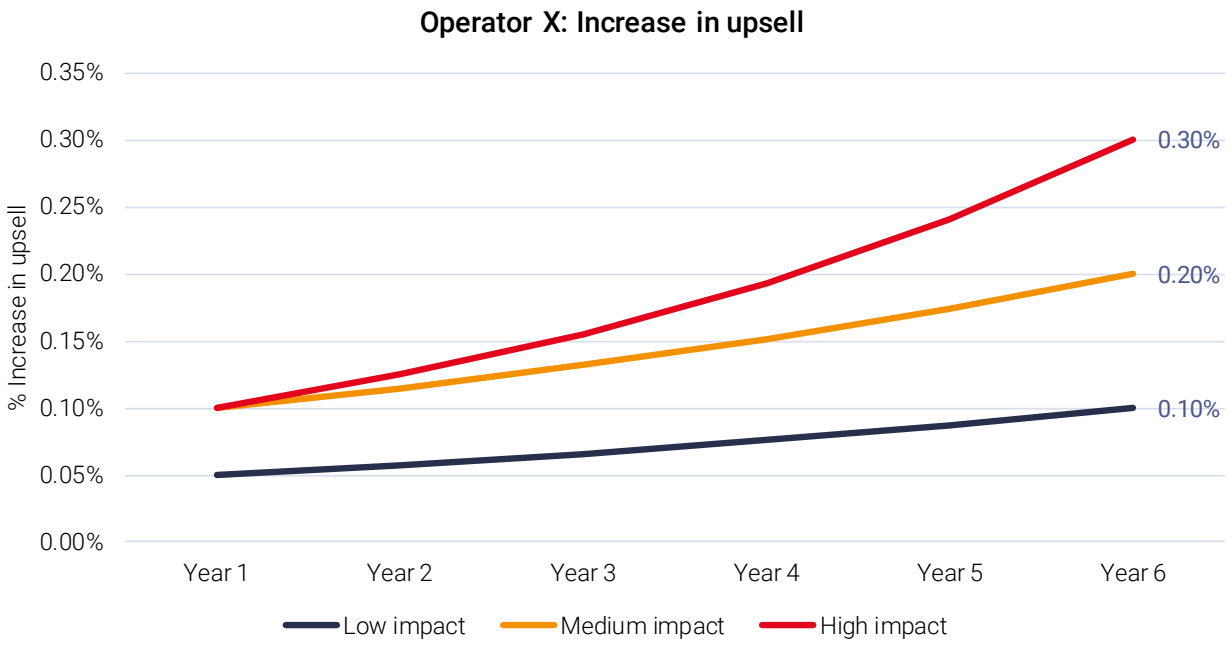
Figure 9: Analytics project increases net adds



Source: STL Partners projections, data representative of leading W.European MNO

Through more tailored and proactive marketing efforts, the operator can expect a very small increase in success upselling customers onto higher revenue plans, particularly in the high and medium impacts scenarios:

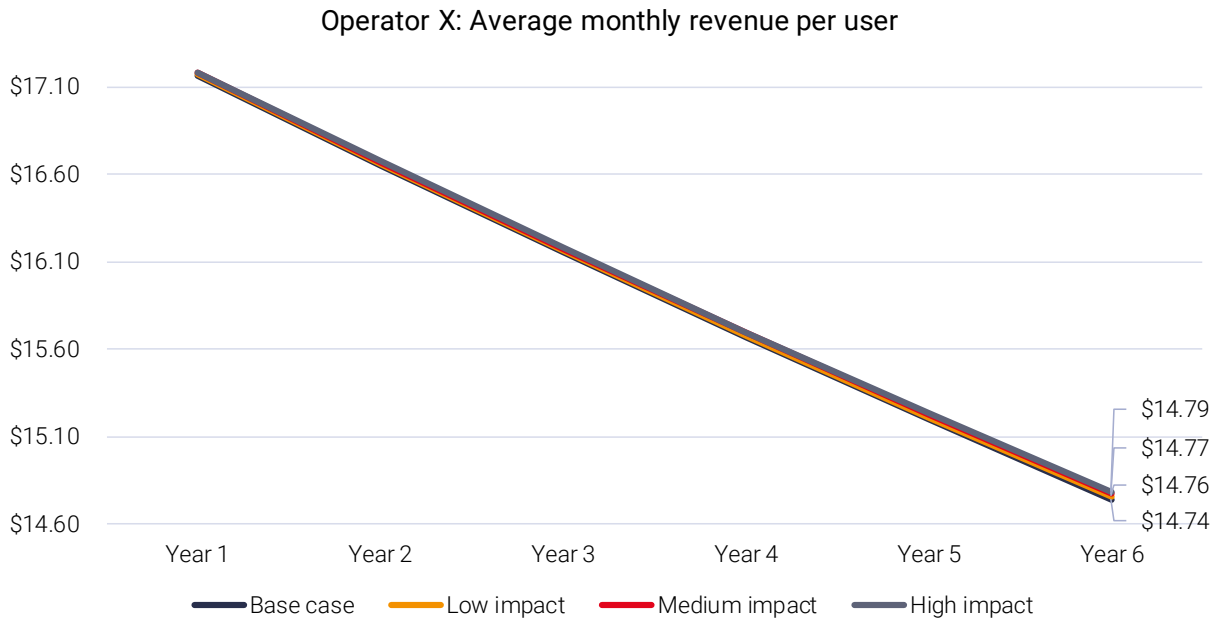
Figure 10: Analytics project will make a small contribution to upsell success rates



Source: STL Partners projections, data representative of leading W.European MNO

This uplift could reasonably be expected to lead to an uplift in ARPUs – but unfortunately, we find that it is not enough to counter decline. In Figure 11 we see that, in all cases, ARPU falls by roughly $2.50 over the 6-year period. The difference between the base case and high impact is small enough as to be insignificant.

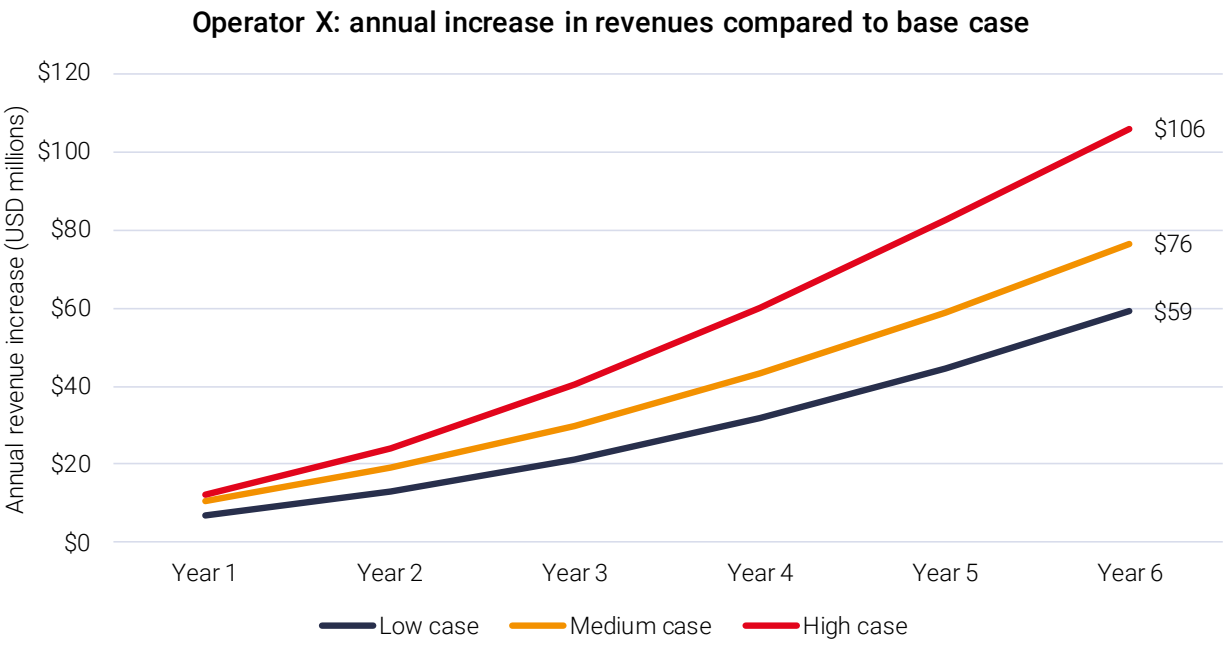
Figure 11: Analytics project will not reverse ARPU decline



Source: STL Partners projections, data representative of leading W.European MNO

Although the impact to both churn and upsell are relatively small individually, given the operator's profile, they do still have a significant impact on revenues. Operator X could expect a revenue uplift over the base case of up to $106 million in the high case in Year 6.

Figure 12: Analytics project delivers significant uplift in revenues



Source: STL Partners projections, data representative of leading W.European MNO

How will the benefits change for different operator types?

Operator X, as stated, is representative of a leading mobile network operator (MNO) in a competitive Western European market. For operators in different markets, an advanced analytics platform will have a different impact on revenue and costs. We have run some sensitivity analysis to compare – for this we have assumed the number of subscribers and the TCO of the platform is the same as for operator X. We have also assumed operating margins are equivalent to operator X. The two sensitivity scenarios are:

1. Scenario Y where the operator has a blended annual churn rate of 50% in year one with ARPUs of $3. Cost per acquisition is c. $18 per subscriber.

2. Scenario Z where the operator has a blended annual churn rate of 10% in year one with ARPUs of $40. Cost per acquisition is c. $240 per subscriber.

Figure 13: Analytics delivers significant uplift in revenues regardless of market and operator type

Operator X in scenario Y: Analytics platform net present value and payback

	NPV (Year 6)	Payback (years)
Base case	-$0.83	N/A
Low impact	$2.20	2
Medium impact	$3.22	2
High impact	$4.68	<1

Source: STL Partners projections, discount rate 10%

Operator X in scenario Z: Analytics platform net present value and payback

	NPV (Year 6)	Payback (years)
Base case	-$0.83	N/A
Low impact	$0.72	2
Medium impact	$1.94	<1
High impact	$2.37	<1

Source: STL Partners projections, discount rate 10%

In both cases the advanced analytics platform continues to deliver a positive NPV in year 6 in all but the low impact case. For an operator with blended annual churn as high as 50% (scenario Y) we predict that the platform should have a much larger impact on churn, up to a c. 8% reduction. This is evidence that even operators in very different markets and with different profiles to Operator X should consider implementing an advanced analytics solution.

Conclusions: analytics is worth the investment

Our modelling shows that for an operator in a developed market, the case for implementing advanced data analytics capabilities is strong. So long as the operator takes steps to ensure that analytics platforms are used for more than creation of dashboards, they can expect significant return on investment, from both revenue uplift and cost reductions.

If operators push for widespread use and understanding of the analytics platform across and within teams, take steps to ensure that the underlying algorithms are kept fresh and relevant, and are open to building automated capabilities on top, they will unlock maximum benefit.

The time is also ripe to invest in analytics, such as the platform and the NCX metric developed by O2. With the move to 5G around the corner for many operators, understanding more about their customers and driving efficiencies in network operations and planning will help operators develop and implement a winning 5G strategy. It will help to unlock some of the value 5G can bring to customers as well as balance investment in network capex with impact of network roll-out. This is essential in the move to 5G as operators, who invest a lot in in their networks and the building of "moats", will need to balance network capex with investment in service innovation.[4]

Focus on basics first, and build from there

Our "high impact" scenario assumes that telcos are deploying cutting-edge technology beyond basic ETL and analytics capabilities. This includes machine learning and artificial intelligence to automate aspects of the process.

Of course, ML and AI require resource and expertise beyond many operators' current capabilities. We believe that this should not hold operators back – much value can be derived in the short term from more simple analytics and the transformation of traditional business processes, as outlined in our "medium impact" scenario.

O2's success was born from a focus on basic ETL capabilities first, which were used as a springboard towards the NCX initiative. But NCX is just one of many potential applications for O2's data platform – possibilities for extension are potentially limitless. Other operators looking to successfully implement data analytics initiatives within their organisations should take key learnings from O2's example.

[4] For more information, see Why CFOs must start to drive telecoms business model change

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