Executive summary

Progressive communications service providers (CSPs) are increasingly aware of the demand to transform into digital service providers (DSPs), driven by competitive pressures and the need to adopt tools and solutions to support new digital services and operate as efficiently as web-scale companies. As with all transformations, the implementation of new technology is only part of the process; to be successful, the scope must include staff, leadership and business processes. Two key drivers of the transformation to a DSP are the desire to share knowledge from all aspects of the business to improve current processes (by applying better data-driven decisions) and the need to create revenue streams from new services.

Big data solutions provide a strong technical catalyst for a business transformation. New solutions are significantly lower in cost, provide much greater scalability and have the flexibility to consolidate many data types. The process is still challenging, however, with large data volumes requiring considerable data storage, computer power and analysis. One critical element of the transformation to a DSP is to know what business “use cases” need to be supported by the big data analytics platform, and therefore what data sets and solutions are needed to support them.

One example of a successful transformation is provided by China Unicom Sichuan (CUS), whose Big Data Centre (BDC) platform solution is based on a pre-defined convergent data model. This platform can consolidate all the company data needed to support the broad range of business analyses required by different internal departments, as well as supporting external infrastructure services for CUS’s business customers. The data model enables a significant reduction in raw data needed to be stored on the BDC platform by providing only the data needed to support common business analyses requirements. Additional benefits of the data model are that it:

- Simplifies raw data into metrics which non-technical business staff can understand, enabling staff without deep technical knowledge to perform data analysis
- Improves the performance of the BDC platform by ensuring that data sets are stored and indexed in the way that they are most likely to be used, thus avoiding the need for time-consuming compilation of data sets from multiple data sources.

Unless a CSP’s transition into a DSP includes the transformation of its core systems, it will be unable to compete with web-scale internet providers, which already provide highly competitive offerings very efficiently. Big data analytics solutions and knowledge sharing are at the heart of successful transformation projects. By adopting the same technologies and architectures as web-scale providers, CSPs can benefit from the same big data analytics solutions that they need to compete with web-scale providers.
Building the digital service provider around a big data analytics platform

Communications service provider (CSP) margins are under increasing pressure as demands are made on them to provide new services, faster and at a higher quality. Subscribers are more demanding, better informed and have many alternatives to CSP offerings. The resulting squeeze on CSP margins is being felt most acutely where mobile penetration is highest and revenue growth is reliant on an increase in usage by individual subscribers.

![Figure 1: Profit squeeze at CSPs is driving the need for transformation to DSPs [Source: Analysys Mason, 2016]](image)

Progressive CSPs have reacted to market pressures by implementing projects to support their transformation into digital service providers (DSPs). These projects address the challenges that CSPs face on two fronts, by creating new revenues and reducing costs (through the optimization of processes to reduce operational or capital expenditure). To be successful, a transformation project requires more than just the development and installation of new systems: it also requires the CSP to change various aspects of its business.

A CSP needs to develop a common set of values that are understood and shared by all its employees. These are outlined in Figure 2 below, which shows the eight areas involved in a transformation.

A strong leadership style is critical in supporting the transformation of the CSP’s business, and management needs to provide a strong lead by supporting a clear strategy that staff can execute. The transition to a DSP requires these non-technical aspects to be supported by new tools and processes. New business processes are needed as part of all transformations, and it is critical to have the right data available at the right time to enable the optimal processes to be executed.
Where possible, staff skills need to be enhanced, as a DSP relies on its staff being able to make rapid and highly effective decisions. DSP staff who are required to make business decisions must have access to self-service tools so that they can access data from across the business.

New systems (including the big data analytics platform) are central to every successful CSP-to-DSP transformation, as they enable a CSP to compete more effectively against nimbler web-scale companies. In addition, where new services are being developed, such as those based on “big data as a service” (BDaaS), additional systems are needed to support their creation.

As CSPs move into becoming DSPs their capabilities need to be compared less against other CSPs and more against providers of digital services, including web-scale companies. This is because systems and processes which are appropriate when providing communications services are not optimal when providing digital services: the mechanisms used to deliver services through physical stores or call centers are less suitable for digital delivery channels such as self-service apps or online portals. CSPs must therefore act more like web-scale providers (by reacting quickly, providing highly-automated timely decisions and having the ability to support new business models).

In a DSP, each process, interaction and event is logged in a shared knowledge resource. The DSP can use this resource to optimize internal processes and create a valuable data asset that could be exploited outside of the DSP (to monetize customer data, for example). The transformation to a DSP inevitably requires a CSP to enhance its data platforms to support the new systems and processes and thus compete with other DSPs.

The highly competitive nature of web-scale companies drives the need to adopt data technologies that can capture, store and analyze data at scale, to provide high-quality and timely information across the DSP. The critical first step in the process is to create a shared knowledge resource that can be used across the enterprise, giving each department or business function the best possible data to work with. By contrast, traditional data technologies are expensive, with data being siloed for a specific use and stored to support each application.
The concept of a shared knowledge resource is not new, as enterprise data warehouses (EDWs) have been in existence for some time. However, there are four aspects in which development of a big data analytics platform using today’s technology differs from an EDW:

- The cost of building is significantly lower when using Hadoop and other low-cost and open-source components
- The ability to store all data types at scale without first having to create a strict data schema means it is easy to consolidate data
- The openness of the technology has encouraged multiple vendors to adopt it widely, and incorporate it into many applications and analytics tools
- The development of simpler, more user-friendly self-service analytics and business intelligence tools means that data can be used by a wide range of skilled business users, rather than being limited to specialist data scientists.

A CSP which aspires to become a DSP must adopt the same data-driven approach that web-scale companies have used, with a shared big data analytics platform playing a central role in its transformation. For example, Hadoop is already in widespread use among web-scale organizations and is central to their strategies.

A transformation project to a DSP takes current “siloed” applications, tools and data and creates a shared, single platform that rationalizes the tools and processes used, as depicted in Figure 3. The big data analytics platform can then be used to support new services for business partners that use the data, tools or infrastructure in the platform, as well as to improve internal processes.

*Figure 3: The big data analytics platform supports services for new partners [Source: Analysys Mason, 2016]*
Business drivers for establishing a big data analytics platform

DSP transformation projects are justified either by increases in revenue or by cost savings that can be made through operational improvements. A big data analytics platform provides support or enables both growth and operational improvement for a CSP.

As shown in Figure 4 below, the drivers for digital transformation fall into two categories:

- internal drivers focus on improving current processes
- external drivers represent entirely new services for the DSP.

All eight types of driver are discussed in more detail below.

*Figure 4: There are significant drivers for digital transformation, both internal and external [Source: Analysys Mason, 2016]*

**Internal drivers**

**Improvements in demand** are the most significant justification for moving to a big data analytics platform. The new platform provides better customer insights to enable more targeted offers to be delivered, which generates higher offer take-up and increased ARPU for current customers, as well as attracting new ones. Key ways in which the platform can generate demand are:

- The ability to create a 360-degree view of each customer by consolidating data from multiple data sources and across multiple channels
- The ability to map and analyze every customer journey, to provide a consistent approach for prompting and guiding customers into the most likely purchasing scenarios
- The use of micro segmentation and personalization to provide context-aware marketing capability
• The automated testing and refinement of campaigns to optimize yields based on offer take-up results.

**Customer experience improvements** are associated with reduced churn for CSPs. If CSPs can understand and model the impact of each event on every customer, they can manage those customer experiences. To understand each customer requires the massing of data at scale and being able to act on it through each interaction that a CSP has with the customer throughout the customer’s service life.

**Internal drivers**

The justification for a digital transformation might be to improve current working methods, or to save money through more efficient processes and asset utilization. A big data analytics platform provides data insights, based on which decisions can be made more efficiently. In particular, the justification is possible through:

• A reduction in the cost of the platform, compared to older technologies. This enables some or all of the existing data to transferred to the new platform, or allows the life of the current technology to be extended by moving some data from the older technology
• A reduction in the time taken to develop data insights, enabling more processes to be performed in near real time, and allowing better decisions to be made. The duration of large batch processes can be shortened from days to hours, and from hours to minutes, giving a CSP more timely insights, or providing it with better data with which to make decisions.
• The scale of the platform, which enables mass analysis of complete data sets to be performed. For example, it is possible to work on complete subscriber bases, and thus provide more exact insights for process improvement (rather than resorting to sampling or other techniques).

The following three drivers promote operational efficiency when adopting a big data analytics platform:

**Process efficiency** enables a DSP to speed up or provide better outcomes for a given process. The new technology within a big data analytics platform enables large data sets to be analyzed much faster than with older technologies, and so processes can be completed much more quickly. For processes where the time saving is significant, a DSP may consider executing them more often, or may include some additional refinement. So, for example, whereas a CSP might need days to run a data algorithm, a DSP can now do this in a matter of hours, which could provide a huge advantage for processes that need to be run daily.

**Increased agility** is created by having a single platform that can access data from across the enterprise, and a standardized set of tools and models. This means that data analysis can be undertaken swiftly, enabling the development of new insights to support the DSP’s operations.

**Better asset utilization** is made possible through closer management and better usage modelling, enabling capital costs to be deferred or reduced. For example, if timely data is available on the mobile cell sites that are currently under-utilized, this can be used to trigger a short-term campaign to increase network utilization.

**External drivers**

**New XaaS services** can act as a revenue driver, by creating new types of services targeted at businesses. There are three broad areas of XaaS service which the customers of a DSP can choose from:

• A data infrastructure (IaaS), providing storage and computation capacity
- Platform as a Service (PaaS), where a “big data as a service” (BDaaS) platform can give access to analytics tools and data storage for data associated with the use of those tools.
- The use of data infrastructure of the big data analytics platform as part of a hosted “software as a service” (SaaS) offering.

As an increasing number of customers begin to take up these services this can create an eco-system of companies using the platform, and make it possible for them to co-operate with one another. Where these XaaS services are combined with access to data sets this can create a compelling partnership opportunity for companies which are keen to access both elements – the platform and the data held by the DSP. The DSP can enhance the proposition by creating a marketplace where partner organizations can sell their products and services more effectively.

**New business and service models** which require entirely new processes can be developed and supported with a flexible big data analytics platform. The ability to expand the range of data stored in the platform and change the data model means that new service and business models can be supported without having to re-engineer the supporting infrastructure or tools.

**Data monetization** represents a significant new potential source of revenue for DSPs, where access to anonymized, consolidated and encrypted data insights can offered to business partners. Mobile advertising is now a fast-growing market sector, with the ability to target individual customers. Using a big data analytics platform, a DSP can create advertising offers based on analysis of data for individual subscribers. Unlike other mobile advertising platforms, the DSP can supply data regardless of which applications or devices are being used by a subscriber, and it has unique data to offer potential advertisers.

Market insights provide another source of data monetization opportunities for DSPs, as illustrated in Figure 5. The shared knowledge resource is used to support use cases involving subscriber data, though IoT devices also represent potential monetization opportunities.

**Figure 5: Use cases involving data monetisation** [Source: Analysys Mason, 2016]
Steps in a DSP transformation project

Core components of a big data analytics platform

If a DSP transformation project is to be successful, a new big data analytics platform needs to be designed, developed and deployed, in addition to having the right staff, skills, company support and strategy in place. The key components of a big data analytics platform are shown in Figure 6 below.

Figure 6: High-level components of a big data analytics platform [Source: Analysys Mason, 2016]

The platform is based on a flexible data infrastructure which can scale to meet the business needs of the DSP. The platform supports “run-time” production and “offline” development activities. The production platform supports known business requirements where insights have previously been found, the appropriate data loaded and data algorithms created. It provides a stable managed environment which supports business processes in a predictable manner, to ensure they are executed within the expected timeframe and that the insights are delivered in a defined format. The production platform uses the convergent data model to provide a consistent view of data for the applications or business intelligence (BI) tools used by business functions.

Where new insights need to be investigated or developed, the development platform is used. It enables data scientists and skilled data miners to create new algorithms, compile ad-hoc reports and edit the data model if necessary. The less predictable nature of the queries and workloads placed on the underlying data infrastructure can be managed without impacting the production platform. Once the investigations have been completed, it may be appropriate to incorporate the changes into the production platform (or they may be discarded if only required for an ad-hoc report). The DSP will support a framework of analytics tools in the development platform so that insights can be developed from the raw data that have been requested by business functions.

The convergent data model is a critical part of the Big Data Analytics platform. It serves two key functions – reducing the volume of raw data that needs to be retained, and providing a data set which business users can understand and analyses. In addition, the model ensures that related dataset relationships can be optimized for fast data queries and
provides a consistent interface for BI or visualization tools to work with, along with APIs or other systems using the underlying data.

Figure 7 below outlines how a Big Data Analytics platform is used to support business needs and develop new insights. The process generates new algorithms and identifies what underlying data needs to be loaded onto the Big Data Analytics Platform. Where data is not currently located in the convergent data model, it may be extended to include it.

The convergent data model provides a consistent representation of more-complex underlying stored raw data. It provides users with business-oriented data that they can use and refine to create new data insights. The convergent data model provides a simple interface that can overcome inconsistencies in data (e.g. where different network vendors report data in different formats). Where data investigations uncover the need for data that is not currently included in the model it can be updated.

The data governance platform ensures data quality, consistency and performs maintenance tasks. Governance must also consider the way in which data is stored, to ensure it can be recovered in the event of failure involving data storage or other elements of the infrastructure. In addition, the governance function must ensure that the use of personal data complies with regulations on data privacy.

“Big-bang” or “step-by-step” implementation

A DSP transformation project can be undertaken in one of two ways – either implementing everything at the same time (“big-bang”) or incrementally migrating legacy approaches to the new platform (“step-by-step”), as shown in Figure 8.
All mature CSPs will already have a data infrastructure in place, and will have associated analytics tools. However, costs will have prohibited the sharing of all data and most data will still be stored in siloed data infrastructures. Typically, there are significant challenges associated with a legacy platform: for example, it may be unable to support new business requirements or its costs may simply be too high compared to those of newer technology. In many cases CSPs do not have a single enterprise-wide platform for analytics; instead, analytics are carried out by individual departments, each with its own “siloed” approach to tools and solutions.

Moving over to a single new big data analytics platform and transferring all the processes and data over from older systems in one go represents a significant undertaking. The alternative approach of setting up a single enterprise platform and then incrementally populating it with data offers the optimal chance of success, rather than building additional complexity into legacy systems.

However, there are several issues associated with the step-by-step approach, which involves running the legacy and new platforms in parallel:

- There are incremental costs associated with managing two systems
- There will be more than one system “data of record”
- Cost savings may not be realized while maintaining the legacy systems
- Users must continue using dual systems, which creates processes which are even more complex
- The internal transformation message becomes eroded.

Ideally, therefore, the transformation needs to be closer to a big-bang approach, where there is a rapid transition from older systems to the new. This enables skilled data scientist resources to be used across the enterprise and have ready access to knowledge that is presented through a common business-oriented data model.
Case study: China Unicom Sichuan’s (CUS) Big Data Centre

China Unicom Sichuan (CUS) has embarked on a digital transformation project that aims to optimise internal processes within the company and support the development of new data services for use by external business partners. The company reports that the digital transformation is reducing operational costs and improving the customer experience for subscribers to CUS services. In the first phase of the transformation CUS built a “Big Data Centre”. The next phase was to start using the Big Data Centre to optimize internal processes, and the last phase will be to generate revenue from new services based on the platform.

The drivers for digital transformation

CUS has described the Big Data Centre as one of its most important assets, based on a philosophy it terms “Three plus one”. The three core resources are the network, their channel partners and the subscribers, while the fourth component, the Big Data Centre, provides the ability to optimize and maximise the utilization of each of these core resources. The Big Data Centre provides a centralized knowledge and analytics platform that is flexible enough to support CUS’s many different internal business processes across the three resource areas, as well as being a key component in the creation of new external services in future. Because CUS has adopted a centralized approach to knowledge sharing throughout the company and has provided a set of tools for finding and using the valuable insights which are held within the Big Data Centre, it is able to deliver the transformation needed to compete as a DSP.

The Big Data Centre is used to optimize network deployment. This involves not only using network data to influence network build-out, but also incorporating data on subscriber behavior and the location of sales channel partners in specific places to optimize revenue opportunities. The Big Data Centre has enabled CUS to compare the performance of different channel partners in detail, and understand which of them deliver the highest margins. Through improved decision making, based on data insight, CUS can focus resources on the channels from which it generates the best returns. The primary use of the Big Data Centre has been for ‘precision marketing’. CUS’s marketing staff are able to create highly targeted campaigns, based on subscriber behavior data, network data, customer care and top-up data. These focused marketing offers have resulted in higher take-up of services.

The implementation challenge

The initial phases of work to transform CUS’s old data analytics platform into the new Big Data Centre were not without their challenges. A single uniform data set had to be created by consolidating different data sets from seven domains of the company, including BSS, OSS, financial system, MSS systems and other back- and front-end systems. This involved handling huge volumes of data, in many different formats. The raw data associated with each of CUS’s operational systems remains in the associated application data stores, but is partially replicated in the Big Data Centre where needed, to support its analysis and the identification of business use cases. This means that data is stored in the Big Data Centre only once it has been identified as being needed to support a business requirement. The efficient consolidation of huge volumes of data has required careful management, to keep the Big Data Centre at manageable scale.

CUS has worked closely with Huawei on the creation and delivery of the Big Data Centre. Figure 9 outlines the main components of the solution.
In addition to the data volume challenge, it was essential for CUS to rationalize the raw data and provide clear and consistent meta-data information, or develop a convergent data model in order to minimise the need to use raw data, integrate data sources or find data relationships each time data is used. The goal was to enable all staff, not just technical staff, to understand and use the data. The development of a consistent convergent data model is therefore a central part of the Big Data Centre. The convergent data model incorporates seven business domains from CUS’s existing operations and has been designed to support the future external monetization phases of the transformation project. The convergent data model is thus a critical success factor for the project.

**Benefits that CUS has seen**

A major benefit that CUS has derived from the two initial phases of the project is a significant improvement in the efficiency of network deployment, though much more precise modelling of network roll-out and optimization. Its ability to conduct highly detailed analysis of sales channels and associated processes has led to a reduction in the cost of using one sales channel from 26% to 16% of revenue. The increasing use of precision marketing has generated significant growth in CUS’s average revenue per subscriber. In addition, CUS’s marketing staff have been able to identify precisely what cross-marketing impact has been achieved through external partnerships, to help them optimize future campaigns.
Summary

Progressive CSPs are increasingly aware of the need to transform into DSPs, driven by competitive pressures and the need to adopt tools and solutions to support new digital services and operate as efficiently as web-scale companies. Two key drivers of such a transformation are the desire to share knowledge drawn from all aspects of the business to improve current processes and enable the creation of revenue streams from new services.

The transformation process is challenging, with considerable resources needed to store and analyze the large volumes of data that are involved. One critical element of the transformation to a DSP is to know what business use cases need to be supported by the big data analytics platform, and therefore what data sets are needed to support them.

As input to this paper, China Unicom Sichuan provided valuable insights into its Big Data Centre solution and transformation project. It adopted Huawei’s convergent data model as part of its platform, and cited this as being central to the overall success of the project. The convergent data model enables a significant reduction in the volume of raw data that must be stored on the platform, as only the data which is required to support business use cases needs to be on the platform. The convergent data model has the benefit of providing data in a format that business users can understand, making it possible for non-technical staff to analyse shared company knowledge. The model also helps to improve the performance of queries, by ensuring that data sets are indexed and collated ready for queries to be executed on them.

China Unicom’s experience demonstrates that if a CSP is to successfully transform itself into a DSP and thrive in today’s highly competitive market, it needs the support of a big data analytics platform.

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