mAutomotive

# Connected Cars: Business Model Innovation



# 1. Executive summary

### Time to re-assess

To fully capture the opportunities presented by evolving consumer demand and technological advancements, automakers and mobile operators need to re-evaluate the business models for connected car services.

As existing business models for telematics and infotainment services have had limited success, service providers need to reassess basic strategic questions on who are the target customers, what value they derive from these services and how to seamlessly deliver these services as demands evolve.

The connected car market is inherently complex and is still building its baseline, requiring that business model innovations iteratively configure supply, delivery channels and bundling of different services. These new business models need to be supported by strategic partnerships between mobile operators and automakers.

The overall seamlessness of the consumer experience and, hence, the utilisation of connected car services depends in part on the effectiveness of the underlying connectivity solutions. To enable flexibility and innovation in business models, both automakers and operators have a vested interest in ensuring that multiple viable connectivity solutions continue to evolve.

### Harnessing key enablers

Significant, time sensitive opportunities exist for realising the trends in innovation underway in the automotive sector. To deploy new business models, service providers need to harness key enablers, such as mobile operators' existing charging and billing mechanisms. In order to succeed, these models must leverage third party players, as well as mechanisms such as incremental payments, advertising and/or the monetisation of customer data.

The growing importance of these enablers means mobile operators have a greater opportunity than ever to participate in the connected car value chain. Automakers and operators need to co-operate early in the service definition process to ensure that operators' full technological capabilities are exploited. To meet automakers' requirements, these capabilities must be across regions, if not global.

More specifically, mobile operators could help boost demand for telematics and infotainment services through:

- Support for the definition and deployment of more innovative business models (including charging capabilities, revenue and cost sharing mechanisms).
- More active involvement in the design and deployment of specific services.
- Optimisation of connectivity solutions for embedded, tethering and smart phone integration.
- Adoption of business models that encourage an "everything connected" philosophy.

### Future trends

Finally, this document concludes by highlighting a series of key questions that both mobile operators and automakers need to consider. These include:

- How will the evolution of consumer electronic services drive connected car demand and utilisation?
- How can new technological developments, such as cloud computing, ubiquitous connectivity and HTML5, enable a new generation of connected car services?
- How may we begin to explore those opportunities today so they are integrated into the automotive product planning process in a timely manner?

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# 2. Introduction

This public GSMA discussion document examines the basic constructs of business models for telematics and in-car infotainment services and highlights some of the emerging trends, which are set to impact connected car business models. The document discusses the importance of strategic positioning, as well as the elements of the value proposition for connected car services. It also examines how connectivity impacts and feeds into the process of developing viable business models.

It is clear that multiple actors will be required to realise the opportunity to deliver connected car services. Furthermore, connected car value chains are going to evolve quickly – so the opportunities that exist today may not be around in the medium term.

This document seeks to provoke dialogue across operators and automakers on how to meet evolving consumer demand and to enable successful business models. To this end, it also proposes some key recommendations for the future development of business models for connected car services, as well as priorities for cooperation across operators and automakers. These recommendations range from how to overcome existing obstacles to the development of direct support for service deployment.

This discussion document is aimed at:

- Product planning executives, telematics, innovation and technical experts from automakers.
- Business development executives, embedded mobile specialists, and technical experts from mobile operators.

The document is also relevant for the other actors in the value-chain, which often play intermediary roles between the mobile operators and automakers in the development of these services.

## 2.1 Historical context of connected car services

Connected car services first emerged in the mid-1990s, with a focus on technology-driven embedded telematics capabilities. Many automakers provided first generation telematics services but few were successful and remained over time. The successful pioneers of connected car services varied across geographies (see Figure 1).

**Figure 1: Regional Launches of Telematics Deployment**

| US 1996-2006 | Japan 1999-2005 | Europe 1999-2003 | China 2009-2010 |
|---|---|---|---|
| General Motors<br>Onstar<br>Ford Sync<br>BMW<br>Mercedes | Toyota<br>Nissan<br>Honda | BMW<br>Volvo<br>Peugeot | Toyota<br>General Motors<br>Nissan<br>Roewe |

The business models which supported these services tended to focus on providing telematics (safety and security) and navigation capabilities through either:

- Upfront payments for services – valid for the lifetime of the vehicle or through the first owner.
- Subscription fees for services after an initial free trial.

These models were designed to make it simple to purchase services at the dealerships, while also minimising the number of transactions involved in the management of the services. These services were deployed primarily as differentiators for high-end car models, but also trickled through to mass-market models. The business models, however, had mixed success, with regional and cultural differences, and re-subscription rates often lower than expected.

# 3. Developing business models for connected car services

This chapter reviews the importance of strategic positioning in the definition of business models and how different automakers approach this positioning. It then explores the first strategic elements of the value proposition for connected car services, including:

- Understanding the customers' needs;
- Defining the appropriate services;
- Balancing value, cost and pricing for services.

## 3.1 Strategic positioning

When defining business models for telematics and infotainment services, automakers address a series of over-arching strategic questions, such as:

- What is my overall mission?
- What is my strategic motivation for telematics?
- Are these services a differentiator for my brand, a marketing feature, a stand-alone profit centre, a "must-have" baseline for doing business, or part of a legislative mandate?

The answers to these questions have implications for all the successive value-proposition decisions, including how the service offering should be tailored and its associated business models.

In a particularly distinctive manner, some automakers are broadening their overall mission to go beyond the production of vehicles to become "mobility providers". This change in mission clearly has implications for the strategic motivation for in-car services and the overall business model. For example, Peugeot's original strategic position was that telematics are an integral part of its core offering, so it provided these services for free for the lifetime of the vehicle. Volvo, on the other hand, views connected car services as a way to enhance and strengthen its core offering and believes that consumers should pay an upfront cost for connected car services for the first owner. These strategic decisions have influenced the types of services offered, the connectivity means employed, and the business models deployed.

Companies in many different business sectors re-define their core mission. For example, Apple re-defined itself when it moved from offering a simple portable media player in 2001 to providing a seamless music experience in 2003, which brought together the device with the online digital music store. This value proposition further evolved when Apple launched the iPhone in 2007, followed by the App Store.

Considering "what if" questions to contemplate the "impossible" can foster innovation on the strategic definition of the mission and the associated business models used.

These strategic principles then shape the creation of the **value proposition,** the appropriate **business model** and the **value chain** to deliver the services. These strategic decisions can vary across the same brand, by region or by model.

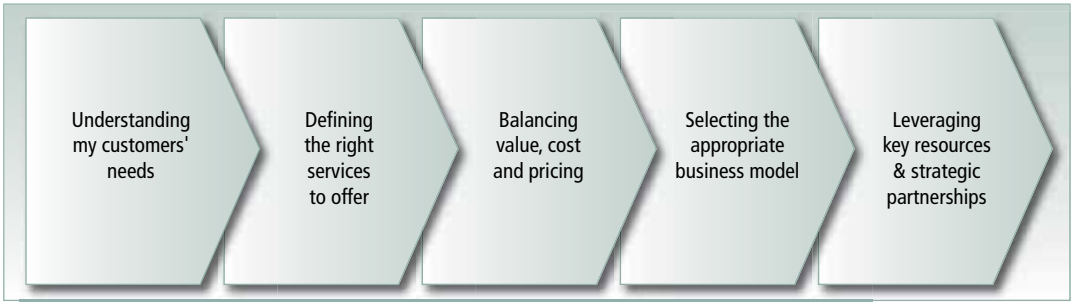
### 3.2 Defining the value proposition

After the overall strategic motivation for telematics has been defined, the next step is the iterative process of defining the value-proposition. Automakers need to drill down on the value-proposition for individual services, in order to help define the potential palette of business models (and these choices may vary across model types of the same brand with a different approach for luxury models versus entry-level models).

The definition of the value proposition begins with a profound understanding of customer expectations and needs, so as to target the connected car services to those needs. The hypothetical list of services then has to be assessed, balancing the value, cost and pricing of the individual elements of the potential service bundle. The company can then configure an appropriate business model, including additional revenue streams, where necessary, through the analysis of these different considerations. Finally, implementation of the business model will depend on harnessing the appropriate resources and strategic partnerships (see Figure 2).

The component decisions for the definition of the value-proposition are not new; however, the driving factor of customer demands and experiences for connected services are dramatically evolving; hence, actors have returned to basic processes for the evaluation and configuration of business models to reflect this very different context.

**Figure 2: Defining the Value Proposition**



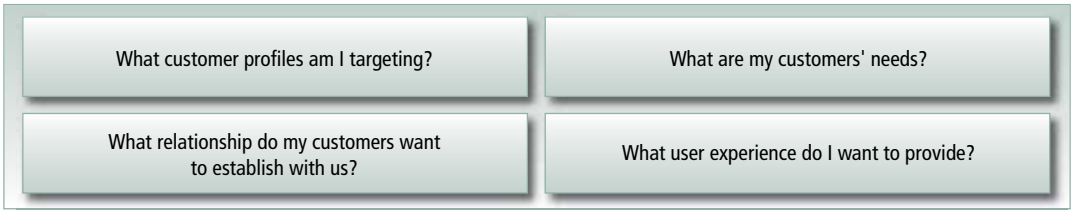

#### 3.2.1 Understanding Customer Needs

The process of defining which customers you are targeting can stimulate innovation in your business model, especially as a combination of customer targets may lead to the development of an entirely new product and service offering underpinned by a new kind of business model. Furthermore, the inclusion of non-traditional customers (such as insurance companies, utility companies for charging infrastructure, etc.) in the definition of the value proposition will radically change the final result.

In the past, much of the value proposition of telematics and infotainment services was driven by technological capabilities and what the automaker believed it could sell to its customers. Today, the focus is on the problems that in-car services can solve for customers – and this approach radically changes the type of value proposition an automaker offers.

Part of this customer profiling involves defining the user experience that the automaker ultimately wants to provide (see Figure 3). For instance, BMW has a strategic principle of ensuring a seamless user experience with advanced technologies for its core regional markets, while also providing tethered solutions for connectivity in non-core markets.

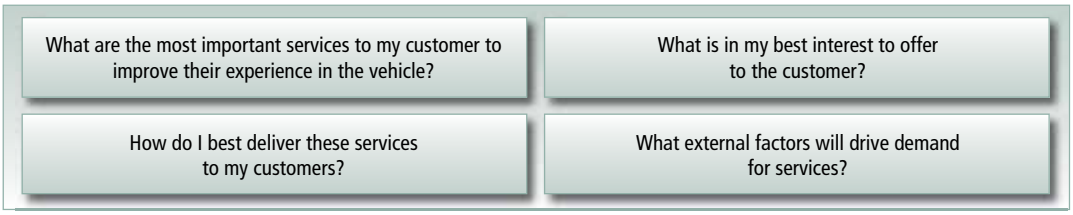
**Figure 3: Understanding My Customers' Needs**




### 3.2.2 Defining the right services to offer

The range of telematics and infotainment services deployed today is growing and is expected to further diversify, as high-bandwidth connectivity becomes more widely available. This array of services highlights the increasing importance being placed by automakers and consumers on convenience and productivity within the vehicle, in addition to the more advanced navigation and telematics applications.

**Figure 4: Defining the Right Services to Offer**




#### Which services?

Consumer expectations have changed dramatically since the advent of telematics and infotainment services. Now, people look to be continuously connected to their work and social spheres. The evolutions in the consumer electronics, app stores, social networking, and gaming domains have come to change the daily routines and relationships with "Being Connected". These developments are having a dramatic influence on both the importance and type of connected car services that customers demand.

On the other hand, some services, such as remote diagnostics, have a direct benefit for the automakers, as well as the vehicle owner. For this reason, all automakers offering connected car services generally prioritise remote diagnostics.

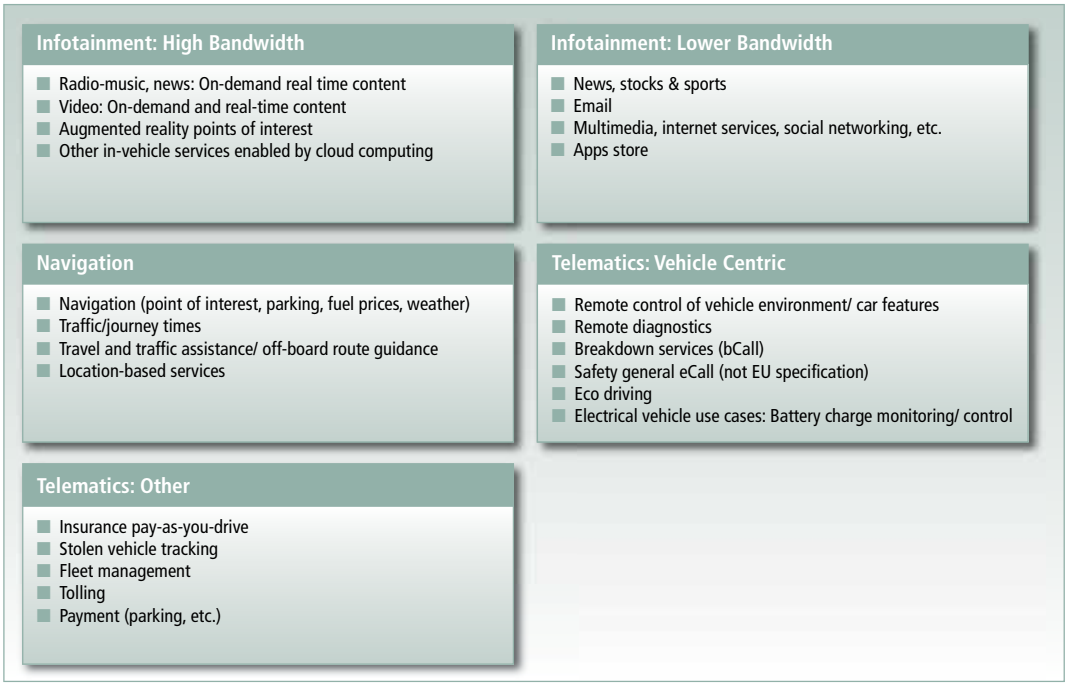
#### Tailoring and delivering services

The question of how best to offer these services to customers is a very hotly debated topic in the automotive sector. The mechanism for selecting in-car services starts in the dealership at the point of sale and, historically, it has been difficult to make changes to these service configurations post sale.

However, the deployment of the concept of app stores to the automaker environment radically changes this paradigm. Customers could customise the services and their features during the lifetime of their vehicle through such an app store. Whilst a number of automakers already offer apps to their customers, none of them is currently offering a true app store. The available apps are either already built into the car or they are updated over-the-air or by a USB memory stick. It is also a binary process – the customer can either accept (and update their car with the available new apps) or they can decline the update. The customer cannot pick and choose which apps they want from a list. This situation will change when Renault launches its R-Link system at the end of 2012. It is promising a true app store experience, with at least 50 apps available at launch.

The deployment of app stores, while providing a new mechanism for evolving and tailoring services to customers during the lifetime of vehicle use, is complicated by the need to attract developers to create compelling new automotive services on proprietary platforms. As you generally have to have a large and active customer base to attract developers, the automaker can become trapped in a "chicken or egg situation" in which it has few apps and, therefore, few customer downloads. Furthermore, automakers have to address how to deliver and manage after-sales support to these services.

**Figure 5: The Range of Principle Telematics and Infotainment Services**




### Further service evolution

In addition to the fairly standard in-car services listed in Figure 5, an array of additional service areas, which are related to connecting cars to their broader mobility ecosystem, have emerged including:

- Vehicle to vehicle services.
- Infrastructure to vehicle services.
- Infrastructure to infrastructure services.
- Integrated transport planning (e.g. the interface between the personal vehicle and other transport modes for journey planning, reservation services and ticketing).

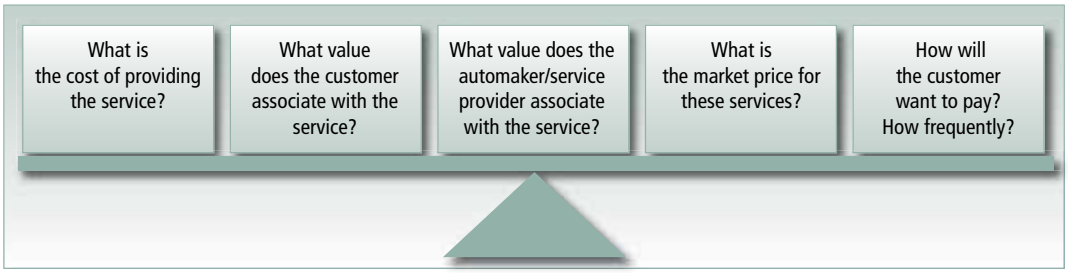
An extraordinary range of future opportunities emerge for new connected car services, based upon the above evolutions integrating cars into their broader mobility ecosystem.

### 3.2.3 Balancing value, cost and pricing for services

Each service has to be critically analysed to determine:

- The cost of providing the service.
- The value attributable to the service by the different beneficiaries.
- The final acceptable market price to the customer.
- The desired means for charging & billing.

**Figure 6: Balancing Value, Cost and Pricing**




A failure to appropriately answer the questions (set out in Figure 6), based upon a profound misunderstanding of the different values that beneficiaries attribute to services, is the root (and at times fatale) cause of the significant misalignments between cost, value and pricing for a number of connected car services.

#### Costs

The cost of providing the services is often quite distinct from their perceived value by beneficiaries and from their potential market price.

Automakers have a long tradition of ensuring cost reductions in vehicle production, as a critical component for reaching an appropriate market price. The development of connected car services, however, has more options given the opportunity to leverage both:

- additional beneficiaries for services (to offset costs for specific services in which they have an interest – such as insurance).
- new multi-brand services , which increase the volumes (and hence reduce the service costs per consumer – such as enhanced branded services for navigation or infotainment (e.g. Pandora).

Many automakers are examining today how to leverage these opportunities, while ensuring a complete-brand experience that does not duplicate specialised successful services.

### Value

The business model for telematics and infotainment services clearly must balance the actual cost (and the pricing) of the service with the value created in the eyes of the customer. The bundling of services can provide opportunities for addressing new services with low marginal costs, but with large perceived value.

Examples of consumer value categories include:

- **Convenience**
- **Savings**
- **Peace of mind**
- **Must haves**

Automakers also need to consider the total potential value of different categories of services, such as remote diagnostics, which provide both a mechanism for lowering the cost of maintenance and increasing loyalty for maintenance services.

The eCall concept in Europe (i.e. an upcoming mandate to provide automatic emergency calls in the event of a vehicle accident) is an example of a service, which is perceived by consumers and automakers to deliver insufficient value to justify the cost of providing the service. Nonetheless, the embedded hardware used to deliver eCall (a sunk cost) could be leveraged for the development of other services, which cumulatively can provide the additional value (and hence relative revenue) needed to offset the basic costs.

### Pricing

Pricing for in-car services has traditionally been fixed at the point of sale and for the lifetime of the vehicle. These pricing strategies clearly must reflect the market and intrinsically the inherent value consumers associate with the service.

Nonetheless, service providers are exploring different means to manage pricing mechanisms (in particular, promotional offers, incremental pricing) so as to help achieve the right balance between value, cost and price. App stores are set to be the primary means of delivering different and evolving pricing for services.

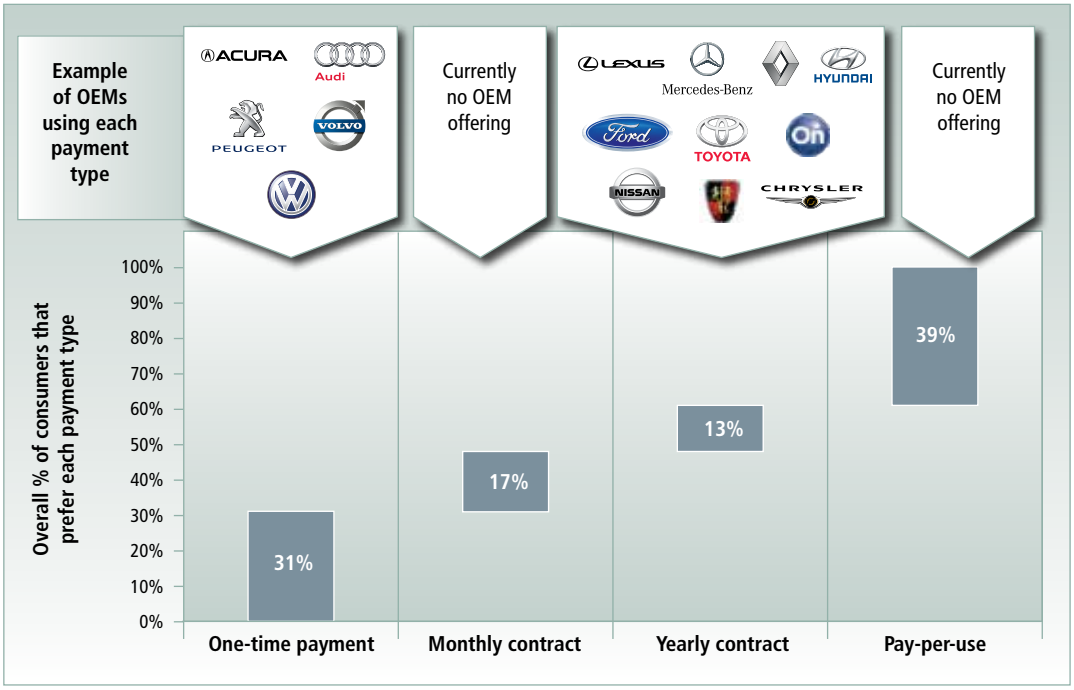
### Charging principles

It is not solely the price of a service which impacts the willingness to pay for services, but also the ease of payment and the size of the individual charges. The transaction process needs to be simple, avoid extensive interaction and generally not result in an additional bill. For consumers, the addition of another regular bill appears to represent an undesirable commitment and hassle that they would like to avoid. The success and failure of connected services in other sectors have shown the importance of convenience and the appreciation for micropayments, as well as the ability to trial services before commitment.

Consumer research confirms these trends also apply to telematics services globally with most people declaring a preference for pay-per-use models (see Figure 7). This preference runs counter to the historical models for telematics and infotainment services, which rely on long-term upfront payments and subscriptions.[1]

1 There is often a difference between declared value and actual behaviour of consumers. Even real-time traffic services, which are generally declared as being rated very valuable by end users, actually have relatively low re-subscription rates (often below 20%). This contrast between declared value and real behaviour could be due to many factors. Consumer research has struggled for a means to distinguish between declared values and actual consumer behaviour.

**Figure 7: Declared Preferences of Consumers for Charging Models for Telematics (SBD, 2011)**




## Chapter conclusion

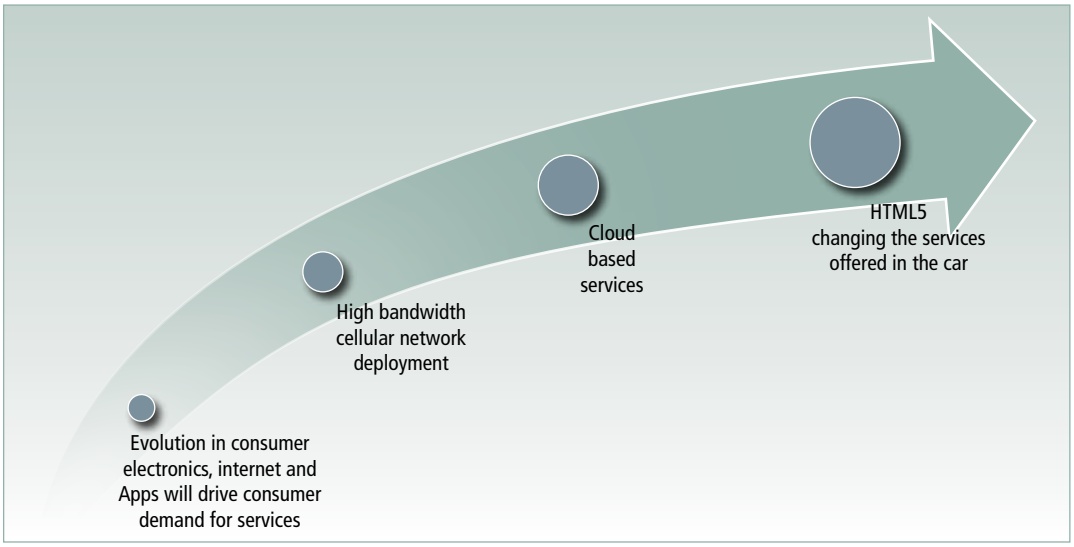
The questions around the value proposition highlight the critical importance of re-evaluating basic strategies for connected car services (including who are the target customers and what value they derive from your services). The inherent complexity in defining winning solutions requires an iterative approach to creating a service bundle which reflects the mission and desired strategic positioning of the automaker.

# 4. Evolution of consumer demand & technology

This chapter identifies a series of potent technological developments, together with evolutions in consumer expectations from the consumer electronics sector, which are set to revolutionise the landscape for connected car services.

A number of factors are affecting the evolution of in-vehicle services, both in terms of type of services and in terms of speed of evolution. These factors include the evolution of adjacent industries and the technological developments enabling new services (see Figure 8).

**Figure 8: Factors Driving evolution of In-Vehicle Services**




Developments in adjacent industries – including demand for services in the consumer electronics sector – are likely to greatly inspire the types of in-car services requested by vehicle owners. For example, automakers' customers are likely to want to access the growing volume of travel-related user-generated digital content, including maps and points of interest.

This consumer demand is met with potent emerging technologies, which enable service development including cloud-based platforms, high bandwidth cellular networks and HTML5 for the development of new services using browser-based apps (instead of proprietary automaker platforms).

The widespread deployment of high bandwidth cellular services will open up new opportunities for the provision of multimedia infotainment, which has seen limited deployments to-date. Analysts expect these kinds of services to blossom, initially in North America and developed Asia, as HSPA+ and LTE network deployments increase.

### Chapter conclusion

Emerging technologies and the evolution of adjacent industries rapidly alter the potential service types that can be offered in the automotive context, as well as lowering the barriers to service development and deployment. As these developments originate from adjacent sectors, they are likely to dramatically impact consumer demand for ubiquitous solutions and services – unleashing the real potential of "everything connected, all the time". All of these developments have significant implications for connected car services – both in the configuration of business models for individual services and in the strategic partnerships necessary to deliver on the opportunities presented.

# 5. Selecting the appropriate business model

This chapter outlines the emerging business model categories, their alignment with specific telematics services and examples of different applied business models. It explores the different approaches for managing revenue streams for connected car services. Despite the prolific discussions on new business models in the connected car sector, the more innovative business models have relatively few live applied examples, highlighting the window of opportunity that exists today.

In the quest to define the most appropriate value proposition, the final configuration of the business model requires broad consideration of:

- The role of additional actors.
- The potential bundling of services.
- The willingness to pay for services, mechanisms for charging and frequency of payments.
- The right connectivity solution (which relates back to the desired user experience, costs for service provision, etc.); this topic is developed in detail the following chapter.

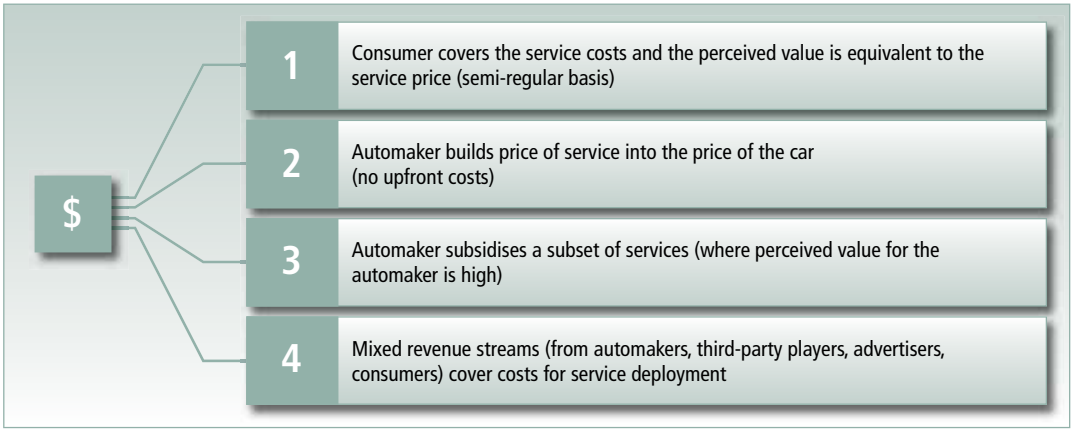
**Figure 9: Selecting the Appropriate Business Model**


## 5.1 Role of additional actors

Historically, telematics and infotainment services have focused only on two primary stakeholders in the definition of the business models: the automaker and the final customer. Today, this approach has broadened to accommodate increased demand for new more-sophisticated (non-core automotive) services, particularly since appropriate mechanisms now exist for managing different revenue streams.

There are essentially four potential revenue streams to underpin the deployment of telematics and infotainment services (see Figure 10). These different solutions could be employed in tandem to optimise the market appeal of the services and to keep the final service prices competitive. Historically, the first three options were used by automakers while, today, third party players are playing a more significant role in the direct definition and provision of new connected car services.

**Figure 10: Potential Revenue Streams for Connected Car Services**

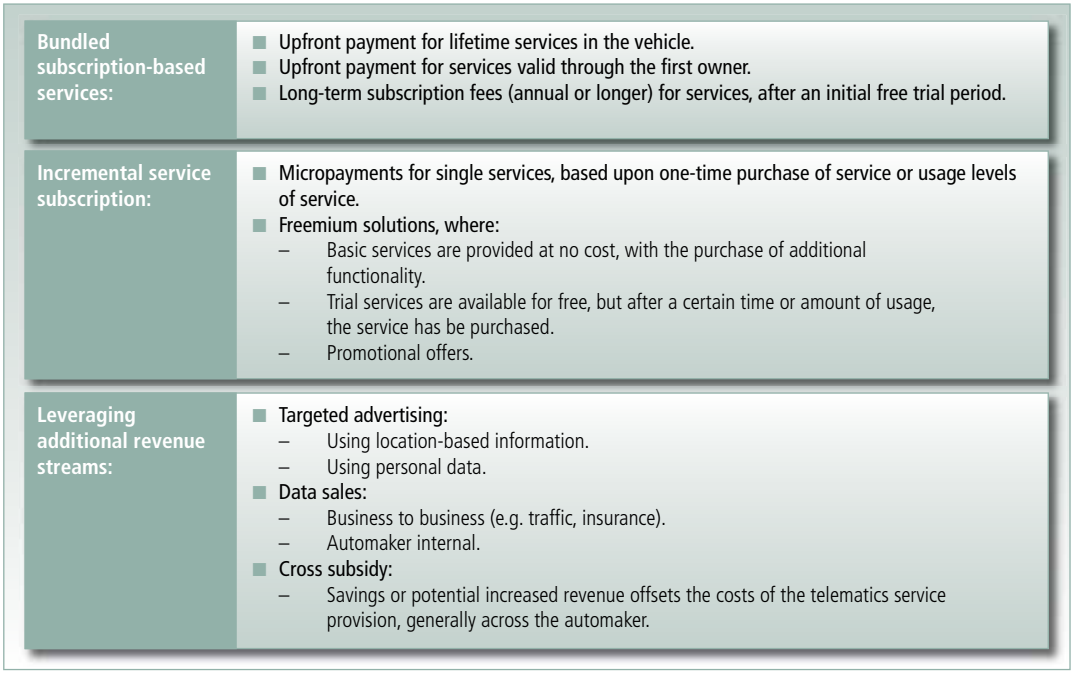


### 5.2 Primary categories of automotive relevant business models

Although the possible configurations and combinations of business models for connected car services are limited only by the imagination of the designer, they typically fall into one of the following broad categories:

- Bundled subscription-based services.
- Incremental service subscription.
- Leveraging advertising, sale of data on travel/usage patterns, and cross-subsidies.

**Figure 11: Business Model Options for Connected Car Services**




### 5.3 Guidelines for mapping specific services to possible business models

When the different above business models are applied to the range of different connected car service possibilities (discussed earlier), distinct trends emerge on appropriate business models for service types. Figure 12: Mapping of Services to Business Models outlines these trends, highlighting potential opportunities, as well as potentially inappropriate models for specific service types.

These models build upon the revenue stream models mentioned in Figure 10: Revenue Streams for Connected Car Services. Note, the combination of who benefits and who pays for services needs to be adapted for both individual and bundled solutions, so as to optimise a tailored, appropriate and sustainable business model. Rarely does one-size-fit-all for both consumer and automaker service demands.

#### Bundled subscription-based services

Bundled subscription-based services - the historical business model of automakers - are ideal for a number of specific telematics services (i.e. vehicle-centric and other types). Generally, these services need to be active without the consumer even noticing; in this way, subscription solutions provide a guarantee of continuity of the service to the automaker (a primary beneficiary) and are less likely to be threatened by an opt-in decision by consumers. These subscriptions are generally considered inappropriate for many high bandwidth services, primarily due to the elasticity of demand and the potential to generate unpredictable and high traffic levels.

### Incremental service subscription

Incremental service subscriptions, on the other hand, provide an ideal mechanism for addressing those services for which consumers are "eager" to opt-in and pay for, given their immediate perceived value (such as infotainment and navigation).

Freemium solutions are generally compelling when a basic "good enough" service can be offered to attract people to the idea of the service and then it can be upgraded to provide increased functionality or quality. The freemium approach can also be "subsidised" by other actors, such as advertisers, offsetting the initial costs for the basic solution. Critical factors in evaluating the freemium approach include: the cost of the service, the churn rate, customer acquisition costs, price of the premium service, and the proportion of premium users.

Incremental service subscriptions can also be used by new players to develop new services, in concert with automakers. However, these services require significant on-going support (billing, marketing, customer support, etc.) to be successful; all the service provision and support aspects tend to be non-core area for automakers and therefore, require involvement of other players in the value chain. Infotainment, tolling and payment services are generally suitable for using micropayments and freemium solutions.

### Leveraging additional revenue streams (targeted advertising, data sales and cross subsidies)

Advertising, selling usage/travel data and cross-subsidies are all potential multiple revenue streams, subsidising the cost of telematics and infotainment services to consumers and lowering the automakers' cost of providing services. Third party players are generally involved to:

- Sell data on travel/usage patterns.
- Cross-subsidise services.

All of these solutions aim to subsidise the end-user price. This approach only works where a different customer segment (a third party) is financing the service and can continually benefit from this approach.

### Data sales

The opportunity for connected car data sales are varied, clearly with the necessity to ensure privacy principles are maintained. Through business-to-business agreements with third parties, there are opportunities to sell data about vehicle movement patterns to companies providing real-time travel information (e.g. selling anonymised floating car data to those developing traffic information), insurance and fleet management services.

The "sale" of data internally within the automaker can also be important to monetise the value of vehicle-centric telematics service data to other automaker divisions.

### Cross-subsidies

Cross-subsidies are based upon monetising general automaker objectives (such as loyalty programmes) to cover the costs of specific service provision. For example, savings in maintenance costs and increased usage of servicing at automaker dealerships can offset the cost of providing the telematics services to the customer. The cross-subsidies model is particularly appropriate for vehicle-centric telematics, electric vehicle services (i.e. these services are considered a must-have in order for the vehicle to be viable even if the individual services do not generate funds), and navigation (given additional benefits from the car vehicle data).

### Advertising

Advertising can also be used to subsidise services to the final customer, in particular for opt-in location-based services that use the customer's personal data. The pros and cons of this option have been hotly debated in the in-vehicle environment, due to concerns about driver distraction, privacy and automakers' desire to ensure a holistic brand experience. Nonetheless, some automakers are testing these services. Advertising is a particularly attractive option for leveraging points of interest and advanced navigation services.

Guidelines, which match the different types of business models to the individual services, are provided in the following table.

## 5.3 Guidelines for mapping specific services to possible business models

**Figure 12: Mapping of Services to Business Models**

Key: Ideal; Acceptable; Barriers to address; Not appropriate

| | | Business Models | | | | | | | | | | | | | Connectivity Options | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Bundled Subscription Based Services | | | | Incremental Service Subscription | | | | Leveraging Advertising, data sales and cross-subsidies | | | | | | | |
| | | | | | | Micro payments | | Freemium | | Targeted Advertising | | Sell data | | Cross subsidy | | | |
| | | Upfront | | Subscription after free period | | Apps (incl. One time in-app purchases) | Content | | | | | | | | | | |
| Services | | Lifetime (depends on connectivity costs) | First owner (give up on second) | OEM owns customer | TSP owns customer (Device Subsidisation for Customer) | Profit share with developer (one time payment for app) | Profit share with provider (based on usage - time using service, not a one off payment) | Based on time (30 days free + then pay) | Based on usage (4 times and then pay) | Using location | Using personal data | B2B (eg traffic, insurance) | OEM internal | E.g. Dealer servicing | Embedded | Tethered | Smartphone Integration |
| Infotainment: High Bandwidth | Radio-Music, News: On-Demand Real Time Content | | | | | | | | | | | | | | | | |
| | Video: On-demand and real-time content | | | | | | | | | | | | | | | | |
| | Augmented reality points of interest | | | | | | | | | | | | | | | | |
| | Other In-Vehicle Services enabled by Cloud Computing | | | | | | | | | | | | | | | | |
| Infotainment: Lower Bandwidth | News, Stocks & sports | | | | | | | | | | | | | | | | |
| | Email | | | | | | | | | | | | | | | | |
| | Multimedia, internet services, social networking, etc. | | | | | | | | | | | | | | | | |
| | Apps store | | | | | | | | | | | | | | | | |
| Navigation | Navigation (point of interest, parking, fuel prices, weather) | | | | | | | | | | | | | | | | |
| | Traffic/journey times | | | | | | | | | | | | | | | | |
| | Travel and Traffic Assistance/ off-board route guidance | | | | | | | | | | | | | | | | |
| | Location based services | | | | | | | | | | | | | | | | |
| Telematics: Vehicle-Centric | Remote Control of Vehicle Environment/ Car Features | | | | | | | | | | | | | | | | |
| | Remote Diagnostics | | | | | | | | | | | | | | | | |
| | Breakdown Services (bCall) | | | | | | | | | | | | | | | | |
| | General eCall (not EU specification) | | | | | | | | | | | | | | | | |
| | Eco driving | | | | | | | | | | | | | | | | |
| | Electrical Vehicle Use Cases: Battery Charge Monitoring/ Control | | | | | | | | | | | | | | | | |
| Telematics: Other | Insurance Pay As You Drive | | | | | | | | | | | | | | | | |
| | Stolen Tracking | | | | | | | | | | | | | | | | |
| | Fleet Management | | | | | | | | | | | | | | | | |
| | Tolling | | | | | | | | | | | | | | | | |
| | Payment (parking, etc.) | | | | | | | | | | | | | | | | |

## 5.4 Examples of different business models for telematics and infotainment services

This is not an exhaustive list of example automotive services on the market, rather a selection to illustrate how different business models are being applied to connected car services.

**Figure 13: Example Use Cases of Service Based Business Models (Source: SBD 2012)**

Key
- Specific Automotive Relevant Service Examples per Business Model Type
- No Automotive Examples Available Yet
- Proposed Automotive Services
- Car Centric Mobile Ads

| | | Bundled Subscription Based Services | | | | | | Incremental Service Subscription | | | | | Leveraging Advertising, data sales and cross-subsidies | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | All in one | | | | | | Micro payments | | | Freemium | | Targeted Advertising | | Sell data | | Cross subsidy |
| | | Upfront | | | Subscription after free period | | | Apps (incl. One time in-app purchases) | | Content | | | | | | | |
| Services | | Lifetime | | First owner (give up on second) | OEM owns customer | | TSP owns customer | Profit share with developer (one time payment for app) | | Profit share with provider (based on usage) | Based on time | Based on usage | Using location | Using personal data | B2B (eg traffic, insurance) | OEM internal | E.g. Dealer servicing |
| OEM | | Peugeot | Toyota | Volvo | BMW | Peugeot | | Navigon | Renault | | Smart | | Peugeot & Navteq | | GM | BMW | Honda |
| Name of Example Service | | Connect | Touch and Go | OnCall | Assist | Connect App | Hughes (concept) | Navigation | R-Link (2012 Launch) | Amazon Kindle | Smart Drive | | N/A | | OnStar | TeleService | Link-up Free |
| Infotainment: High Bandwidth | Radio-Music, News: On-Demand Real Time Content | | | | | | | | TBC | | ■ | | | | | | |
| | Video: On-demand and real-time content | | | | | | | | | | | | | | | | |
| | Augmented reality points of interest | | | | | | | | | | | | | | | | |
| | Other In-Vehicle Services enabled by Cloud Computing | | | | | | | | TBC | | | | | | | | |
| Infotainment: Lower Bandwidth | News, Stocks & sports | | | | | | | | TBC | | | | | | ■ | | |
| | Email | | | | | | | | | | | | | | | | |
| | Multimedia, internet services, social networking, etc. | | | | | | | | TBC | | | | | | | | |
| | Apps store | | | | | | | | ■ | | | | | | | | |
| Navigation | Navigation (point of interest, parking, fuel prices, weather) | | ■ | | | ■ | | ■ | ■ | | ■ | | | | ■ | | ■ |
| | Traffic/journey times | | | | ■ | ■ | | ■ | ■ | | ■ | | | | | | ■ |
| | Travel and Traffic Assistance/ off-board route guidance | | | | | ■ | | | | | | | | | | | ■ |
| | Location based services | | | | | | | | | | | | | | | | |
| Telematics: Vehicle-Centric | Remote Control of Vehicle Environment/ Car Features | | | ■ | ■ | | | | | | | | | | ■ | | |
| | Remote Diagnostics | | | | ■ | | | | | | | | | | ■ | ■ | |
| | Breakdown Services (bCall) | ■ | | ■ | ■ | | | | | | ■ | | | | ■ | | |
| | General eCall (not EU specification) | ■ | | ■ | ■ | | | | | | | | | | ■ | | |
| | Eco driving | | | | | | | | | | | | | | | | |
| | Electrical Vehicle Use Cases: Battery Charge Monitoring/ Control | | | | | | | | | | ■ | | | | ■ | | |
| Telematics: Other | Insurance Pay As You Drive | | | | | | | | | | | | | | | | |
| | Stolen Tracking | | | ■ | | | | | | | | | | | ■ | | |
| | Fleet Management | ■ | | | | | | | | | | | | | ■ | | |
| | Tolling | | | | | | | | | | | | | | | | |
| | Payment (parking, etc.) | | | | | | | | | | | | | | | | |
| Connectivity | | Embedded | Tethered | Embedded | Embedded | USB modem | Embedded | App on Smartphone | Embedded | Embedded | Smartphone integration | | App on Smartphone | | Embedded | Embedded | USB modem |
| Who pays for connectivity? | | OEM | Customer | OEM | OEM | OEM | TSP | Customer | TBC | Content Provider | Customer | | Customer | | OEM | OEM | OEM |
| Is the connectivity payment visible to customer? | | No | Yes | No | No | No | No | Yes | TBC | No | Yes | | Yes | | No | No | No |
| Connectivity payment method by customer | | N/A | Mobile phone bill | N/A | N/A | N/A | N/A | Mobile phone bill | TBC | N/A | Mobile phone bill | | Mobile phone bill | | N/A | N/A | N/A |
| Cost | Initial purchase price | €290 | €550 | €820 | From €820 | €490 | N/A | €90 | TBC | €99 | €419 | | N/A | | Free | From €820 | Free |
| | Free period | Lifetime | Lifetime | 2 years | 6 months | 1 year | N/A | Lifetime | TBC | Lifetime | Lifetime | | N/A | | 6 months | 6 months | 1 year |
| | Annual subscription | N/A | N/A | TBC | €175 | €150 | N/A | N/A | TBC | N/A | N/A | | N/A | | €199 | €175 | N/A |
| | Other payments | N/A | Customer's data plan | N/A | N/A | N/A | N/A | In-app purchases (eg Traffic = €20) | TBC | eBook purchases | Premium features after 30 days (€30) | | N/A | | N/A | N/A | Services are free if car serviced by official dealer |

### Subscription-based service examples

In the past, most automakers offering telematics and infotainment services have sought significant commitments in term of service subscriptions (both in terms of price and duration of the service). Some subscription services have offered a free trial and then focused on securing re-subscriptions. Re-subscription rates, however, have often been relatively low (for example, TomTom re-subscription rates for live traffic services are around 20%). These low rates have triggered service providers to re-visit their subscription business models (including the charging mechanisms and the connectivity models used).

One innovative concept, which has not yet been demonstrated as being successful, is the provision of the telematics and infotainment services by a third party directly to the customer. This third party subsidises the hardware costs of the connectivity in exchange for a direct customer relationship. This is similar to the approach used by mobile operators to provide smartphones. However, many automakers are sceptical of "renouncing" their ownership of the customer for this subsidy.

### Incremental service subscription examples

The widespread success of app stores in the smartphone and tablet sectors is driving the use of incremental service subscriptions as a business model in many sectors. This approach, which initially was used for very specific services, such as gaming, has now been expanded to most internet service areas (even department stores have dedicated apps). A number of automakers, including Renault with its R-Link app store (2012), have announced their intention to launch automotive app stores.

Incremental service subscription, underpinned by micropayments for the service purchase, is an important model for the automotive sector (even if full-scale "automotive app stores" have not yet been deployed). This model is attractive because it does not inherently require a long-term commitment and enables the personalisation of services for the customer.

Moreover, the micropayment portion of this model allows for "lower" prices for customers to try services and then add-on to the functionality, as desired. In the end, the cumulative price of all the service options can actually aggregate to similar or greater revenues than those generated by subscription-based models. For example, Navigon's navigation app, enables buyers to enhance the basic map data by opting-in for traffic information, 3D panorama view, truck navigation and guides. The configurable solutions are priced from the entry-level solution of €90 to close to €300 (comparable to some automaker subscription navigation services).

The concept of selling services based upon incremental content purchases was pioneered by the Amazon Kindle e-reader. The low-price tag for the device (which is subsidised) is offset by revenues from the incremental purchase of books (with "unlimited" connectivity bundled into the cost of the book purchase). The TomTom HD Traffic service – where the annual subscription rate includes real-time information and navigation (independent of connectivity) – also uses this bundling approach. This business model subsidies the cost of the hardware to the consumer, as the device generates additional floating car data, which then improves the quality of the traffic service.

### Freemium

In the automotive sector, freemium solutions tend to be based on the provision of fully-functional navigation services (e.g. Smart Drive) for a limited free trial period, which then require a full subscription. These services do not modify the functionality available in the free trial period (in contrast to other industries' freemium solutions, such as upgradeable video games). Some automotive services are offered completely free, such as remote diagnostics and eCall services; with the cost of the service provision offset by the sale of the other services, which have low marginal costs but can command better market prices from end users.

### Leveraging advertising, data sales and cross-subsidy examples

These business models are being rolled-out in adjacent industries and are potentially viable for in-car services, but few examples exist in the automotive sector.

### Advertising

The provision of targeted advertising, based upon location or user profiles, is a way to subsidise additional services. Currently, coupon advertising is used in navigation services (for example with McDonalds and Navteq or Groupon), providing direct measurable results. For advertising to be successful, however, a number of conditions need to be met:

- Large scale numbers are required.
- Driver distraction issues have to be carefully managed.
- Automakers need to be comfortable with respect to the alignment of the advertisements and their brands.

No automaker has adopted an advertising-based business model to date, although some (such as Peugeot) are experimenting with location-based marketing apps for smartphones that are intended to guide potential customers towards nearby dealerships.

The first step towards in-car advertising is based upon the in-car search & navigation facility. Many automakers are now offering these searches in conjunction with Google, but the eventual revenue share for automakers when advertising is successful (if GPS proves that the vehicle visited a search result from the navigation system) is not clear. Nonetheless, speculation exists that Google is charging advertisers more, when proven results are demonstrable.

### Data sales

GM is one of the first automakers to incorporate business-to-business revenues within its telematics business model. As a first step, it is working with GM's in-house finance division, GMAC, to provide OnStar customers with a potential insurance discount, if they agree for their mileage to be shared with GMAC insurance. In this case, it is likely that GMAC makes some kind of internal payment to OnStar in exchange for receiving the data on the vehicle's movement patterns.

### Cross-subsidy

The Honda Link-Up-Free Service in Japan provides services, content, a USB modem and a 3G connection for free, if customers have periodic maintenance and automobile safety inspection in a Honda dealer.

## Chapter conclusion

Although business model innovation for connected car services is under way, our analysis of business model types and implementations in the automotive sector to date highlight that significant opportunities remain unrealised. The full potential of new business models (in particular, leveraging third party players and incremental payments, advertising, sale of data, etc.) depends upon a series of enablers (including charging and payment mechanisms). These enablers, while technologically possible, have not been deployed in a widespread manner. This is partly due to a lack of transparency on the explicit sectorial requirements, as well as the need for other actors to be strategically involved in the design of the solutions.

# 6. Connectivity: part of the business model equation

This chapter explores the strategic trade-off that automakers have to make to provide connectivity for connected car services, while providing guidelines on how to match connectivity options to the different connected car services. The chapter also discusses forecasts for the adoption of these connectivity solutions, as well as considerations for their deployment.

Connectivity decisions are an important factor in determining the value proposition and the supporting business model for connected car services. The connectivity solutions for in-vehicle services include:

- **Embedded:** Both the connectivity (modem and UICC) and the intelligence is built directly into the vehicle.
- **Tethered:** The intelligence remains embedded in the vehicle while the connectivity is provided through either an:
  - Embedded Modem with a customer's SIM.
  - External Modem using the customer's mobile device via a USB cable, Bluetooth profiles (DUN/PAN, SPP/HFP),[2] or WiFi USB key tethering.
- **Integrated:** Connectivity is based upon integration between the vehicle and the owner's handset, in which all communication modules, the UICC and the intelligence remain on the handset. However, the human machine interface (HMI) generally remains in the vehicle (but not always).

**Figure 14: Comparing Different Types of Car Connectivity**

| | Embedded | Tethered | Integrated |
|---|---|---|---|
| Modem | Embedded | Brought-in | Brought-in |
| UICC ("SIM") | Embedded | Embedded/Brought-in | Brought-in |
| Intelligence/ Applications | Embedded | Embedded | Brought-in |
| User Interface | Vehicle HMI | Vehicle HMI | Projection of handset interface on vehicle display OR Remains directly on handset |

## 6.1 Selecting a connectivity solution

Determining the most appropriate connectivity option to support the selected business model depends on a number of factors including:

- Strategic trade-offs.
- Time-to-market considerations.
- Service delivery needs.

2 USB cable – A wired solution that connects the phone to a USB connection in the car

BT DUN (Dial-Up Networking) – A Bluetooth profile that allows a device to use the phone to make a data connection.

BT PAN (Personal Area Networking) – A Bluetooth profile that allows one or more connected devices to share the phone's connection to the internet

BT SAP (SIM Access Profile) – A Bluetooth profile that makes a temporary copy of the SIM credentials from one device to another (e.g. copy the SIM from a handset to an embedded modem in a car).

BT SPP (Serial Port Profile) – A solution that uses compatible apps, on the phone and in the car, to by-pass tethering restrictions. Data is downloaded from the internet to the app on the phone, from where it is side-loaded to the car using SPP.

BT HFP (Hands Free Profile) – This profile is used to enable a voice call that the car can then use to transfer very small amounts of data using in-band modem technology (data-over-voice).

WiFi – The car is able to connect to the internet over WiFi if the phone is put into a portable hotspot mode.

### 6.1.1 Strategic considerations driving automakers' connectivity decisions

An automaker's decision on connectivity depends on the answers to a range of questions, including:

- How can the automaker provide connected services which guarantee the service quality and user experience that its customers demand at the lowest possible cost?
- What services are in the automakers' direct interest? Are the associated data costs predicable?
- What services are highly unpredictable in terms of use and require high bandwidth?
- How does the automaker leverage the information and services that customers already enjoy on their phone?
- How does the automaker avoid recreating existing user services and applications?
- How does the automaker future-proof its solutions?

The answers to these questions depend upon brand positioning, customer base, regional and cultural issues. Historically, many telematics and infotainment services have been provided by embedded modules with the automaker covering the costs of the connectivity (i.e. it was built into the subscription service model). This approach has been appropriate for those services requiring low-bandwidth, with stable usage and in which automakers have a direct interest in the service existence (remote diagnostics).

Today, there are a much greater and diversified supply of potential services, characterised by:

- High bandwidth requirements.
- Potentially frequent use.
- Highly-elastic demand (i.e. unpredictable use and costs).
- Direct interest to the consumer (as opposed to the automaker).

As the range of services has broadened, the question of how to cover connectivity costs has become quite critical for automakers. In fact, the embedded model, which provides a more seamless user experience, has been now accompanied with tethering and smartphone integration approaches.

Automakers tend to be quite risk adverse, particularly with regards to how they provide connectivity solutions:

- Automakers seek to avoid unpredictable connectivity costs for subscription based services or all-inclusive services where connectivity variations are not supported by the current business model.
- Automakers are also hesitant to invest in expensive intelligence for tethered or even smartphone integration solutions where the guarantee of a "seamless" or even functioning user experience is at risk.

Is this aversion to risk an opportunity for operators to further revolutionise the business model for connected car services?

### 6.1.2 Time to market considerations

The decision on connectivity solutions is further complicated by the fact that automakers have lengthy product planning timelines (product planning lifecycle for automotive is 3 to 5 years; and, the vehicles have an average lifetime of 7 to 10 years). These lifecycles mean that connectivity decisions need to be future-proof and to be able to support future service evolution.

An example to reduce the time to market decision on connectivity has been developed by Audi, i.e. Audi's new modular "replaceable" infotainment unit, which allows Audi to determine the most appropriate module relatively late in the production process[3].

### 6.1.3 Service delivery needs: matching use cases to connectivity

A single vehicle or brand may use a range of connectivity options. The appropriateness of the different connectivity solution varies by service:

- Infotainment services can be offered by all connectivity options. Tethering and smartphone integration have the advantage of providing lower-cost solutions with frequent technology upgrades (as handsets are replaced). These solutions are considered particularly important as different regions roll out the widespread mobile broadband coverage needed for high bandwidth infotainment services. Embedded solutions provide a seamless user experience, but involve a higher hardware cost and support for split service-based/end user charging to provide automakers with flexible charging options for these elastic demand services.
- Navigation services are easily provided by all connectivity options.
- Telematics (vehicle-centric services) are ideally provided by embedded solutions, but some can also be provided reasonably through tethering or smartphone integration. However, some services, such as stolen vehicle tracking, insurance, fleet management, tolling or eCall, do not lend themselves readily to tethering or smartphone integration.

3 http://telematicsnews.info/2012/01/10/audi-debuts-new-modular-replaceable-infotainment-unit_j3104/

**Figure 15: Matching Connectivity to Telematics & Infotainment Services**

| Services | | Connectivity Options: Embedded | Tethered | Smartphone Integration |
|---|---|---|---|---|
| Infotainment: High Bandwidth | Radio-Music, News: On-Demand Real Time Content | Barriers to address | Ideal | Ideal |
| | Video: On-demand and real-time content | Barriers to address | Ideal | Ideal |
| | Augmented reality points of interest | Barriers to address | Ideal | Ideal |
| | Other In-Vehicle Services enabled by Cloud Computing | Barriers to address | Ideal | Ideal |
| Infotainment: Lower Bandwidth | News, Stocks & sports | Ideal | Ideal | Ideal |
| | Email | Acceptable | Acceptable | Ideal |
| | Multimedia, internet services, social networking, etc. | Barriers to address | Ideal | Ideal |
| | Apps store | Ideal | Ideal | Ideal |
| Navigation | Navigation (point of interest, parking, fuel prices, weather) | Acceptable | Ideal | Ideal |
| | Traffic/journey times | Acceptable | Ideal | Ideal |
| | Travel and Traffic Assistance/ off-board route guidance | Acceptable | Ideal | Ideal |
| | Location based services | Acceptable | Ideal | Ideal |
| Telematics: Vehicle-Centric | Remote Control of Vehicle Environment/ Car Features | Ideal | Acceptable | Acceptable |
| | Remote Diagnostics | Ideal | Acceptable | Acceptable |
| | Breakdown Services (bCall) | Ideal | Acceptable | Acceptable |
| | General eCall (not EU specification) | Ideal | Not appropriate | Not appropriate |
| | Eco driving | Ideal | Acceptable | Acceptable |
| | Electrical Vehicle Use Cases: Battery Charge Monitoring/ Control | Ideal | Acceptable | Acceptable |
| Telematics: Other | Insurance Pay As You Drive | Ideal | Not appropriate | Not appropriate |
| | Stolen Tracking | Ideal | Not appropriate | Not appropriate |
| | Fleet Management | Ideal | Not appropriate | Not appropriate |
| | Tolling | Ideal | Not appropriate | Not appropriate |
| | Payment (parking, etc.) | Ideal | Ideal | Ideal |

Key: Ideal | Acceptable | Barriers to address | Not appropriate

## 6.2 Forecasts for connectivity options in the automotive sector

The GSMA published report ***2025 Every Car Connected: Forecasting the Growth and Opportunity*** highlights the increasing use of all connectivity options and the likely dominance of embedded solutions in the long term for telematics and infotainment services. Embedded connectivity offers the best means to guarantee positive user experiences and manage driver distraction issues.

The speed of this evolution depends on:

- Legally mandated telematics solutions resulting in the fitting of embedded connectivity in new vehicles. Legislation is planned in Europe, Brazil and Russia, while other geographies are also potential candidates for legislative mandates in the longer term (e.g. China and India).
- Defining an appropriate business model for the provision of connectivity to the car, addressing shared data plans over multiple devices (so consumers do not need an additional contract for car connectivity) and solutions for split service charging and end user billing (so as to support charging of bundled connectivity with services).
- Deployment of web-based apps (HTML5), cloud-based services, and ubiquitous high bandwidth network coverage. These developments will drive more sophisticated service deployments, and remove some of the proprietary platform issues that exist today.

By 2022, both tethering and smartphone integration are likely to decline in importance in North America and Europe, as embedded solutions become the preferred connectivity solution.

### 6.2.1 Trends affecting embedded connectivity

Historically, consumers have sought broadband connectivity at home, but as the number of connected devices blossoms, they are also looking for mobile broadband services. To meet this demand, mobile operators are evolving their tariff plans. Operators are moving away from all-inclusive data plans to tiered data pricing plans. Furthermore, some operators have said they will offer pooled data plans for multiple devices, which could also influence the telematics and infotainment services landscape (e.g. if the vehicle becomes one of a series of connected devices).

Tariff plan diversification is also underway– some operators are offering to provide the connectivity for new devices without a contract, so consumers can enjoy the services at different data tier levels on a monthly basis. All of these developments have ramifications for the viability of embedded connectivity solutions for connected car services.

### 6.2.2 Optimising embedded connectivity models

The primary considerations for the deployment of embedded connectivity for telematics and infotainment services are:

- The achievement of a critical mass in connected car services, in order to create interest from the developer community.
- The high quality consumer experiences associated with embedded services.
- The need for connectivity hardware solutions to be future-proofed, during the lifetime of the vehicle in a timely and cost-effective manner.
- The charging and billing capabilities (split service-based charging/end-user billing) to differentiate service beneficiaries and to enable bundled service and connectivity costs.
- The deployment of connectivity business models, which encourage everything to be connected.

### 6.2.3 Why is tethering significant?

- Tethering service revenues for telematics and smart & vehicles are set to grow from currently negligible amounts to $909 million by 2016, according to Juniper research 2012[4]. Nonetheless, existing tethering problems (of varying nature) do not guarantee a seamless experience for consumers. Therefore, even if automakers develop services to be supported by this connectivity, it is possible that the services will not actually work. This problem is significant for automakers and, importantly, could dissuade consumers from using connected car services in general. Negative experiences are likely to lead to consumer frustration and result in their switching off of the services.
- For all these reasons, resolving tethering issues is an investment in the future because:
  - it is a primary method for ensuring connectivity in mass market vehicles today.
  - only if people use the services, will the services generate revenue.
  - once the services work, consumers will ask that services be delivered via embedded connectivity as well.
  - tethering will focus on infotainment solutions where more revenue opportunities exist for the whole value chain (compared with vehicle-centric telematics) and, hence, a tangible incentive for all.

## Chapter conclusion

Connectivity solutions are clearly instrumental to the overall seamlessness of the consumer experience and, hence, the use of connected car services. For this reason, both automakers and operators have a vested interest that:

- Multiple connectivity solutions need to be successful to allow flexibility in business models in the short term;
- Connectivity technology enablers support the diversification of the business models.

Automakers and operators also need to consider which enablers should be jointly specified and developed so as to provide the "missing" link for business models for connected car services.

4 www.juniperresearch.com/reports/telematics_&_smart_vehicles

# 7. Leveraging key resources and strategic partnerships

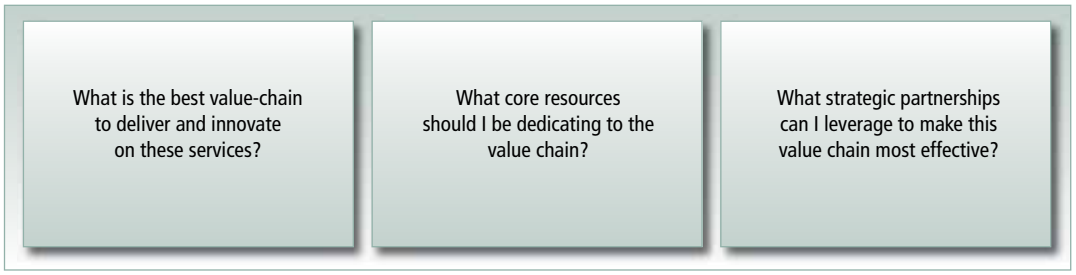
This chapter explores the importance of strategic partnerships for the deployment of emerging services and their associated business models. It focuses on the operator assets and the opportunities they provide for the deployment of connected car services. A number of core operator competencies, that are considered 'business as usual' for existing mobile customers, are specific requirements to support telematics and infotainment services for the automotive industry.

Traditionally, automakers have sought to own the overall service development process and the customer. This approach has been difficult to maintain given that the provision of services is not historically a core competence for automakers; and, in fact, few automakers have had great success in developing sustainable business models for these services. Automakers need to reflect on how to leverage the involvement of key resources so as to meet consumer service demand. The provision of more non-automaker core services (including infotainment) will require the support of additional value-chain actors, including the tier-one automotive suppliers, mobile operators, telematics service providers, insurers and content providers.

The involvement of these actors will be required to:

- Increase service development.
- Develop revenue and cost sharing mechanisms.
- Monitor the performance of services (and the eventual effect on behaviour).

**Figure 16: Leveraging Key Resources and Strategic Partnerships**




Each of the value-chain members will look to stretch their reach for service development and provision, either through organic growth or acquisitions. This competition will be particularly fierce for the "new" competencies related to the cloud, apps stores, apps development, and middleware.

The contributions of the value-chain actors have to be coordinated and managed, so as to improve delivery timelines. The historic approach of automakers dominating the entire value-chain, even for non-core automotive areas, should be re-evaluated so that the more agile service-provision actors in the value-chain can leverage their core services, resulting in a more efficient time-to-market. The added complexity of the value-chain, albeit a challenge, will represent a fundamental opportunity for strategic alliances and delivering on consumer demands.

## 7.1 What do operators bring to the table?

The development of robust and sustainable automotive business models for existing and emerging telematics and infotainment services will require the involvement of additional parties, including mobile operators, for service deployment. A number of core operator competencies that are considered 'business as usual' for existing mobile customers, are seen as specific requirements to support telematics and infotainment services for the automotive industry. Therefore, operators and automakers need to collaborate closely on strategy and tailored business models for in-car connectivity.

### 7.1.1 Operator presence: past and current

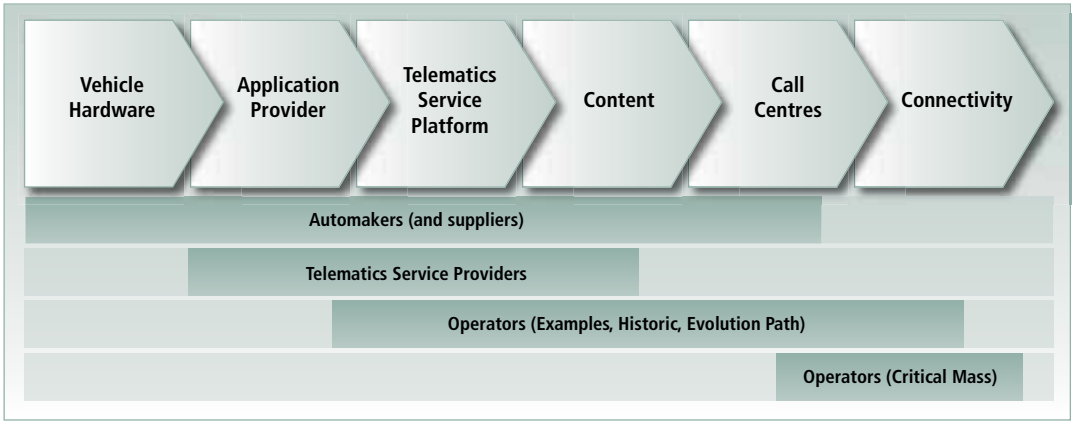
The value chain for telematics and infotainment services is elaborate and continues to grow, with the inclusion of new players. Mobile operators have been involved since the very beginning, providing connectivity, but some pioneers have also ventured into supporting the provision of services (as telematics service providers, offering call centres, content and voice calls). The success of these efforts has varied greatly, but some automakers perceived that operators did not have the commitment to meet the sector-specific requirements.

Today, multiple opportunities exist for operators to play a more incisive role in the provision of telematics and infotainment services, given important changes in the overall context:

- Automakers need to cooperate with more stakeholders to provide successful services, which are generally much closer to those in the consumer electronics and handset markets.
- Operators have developed tailored approaches to the delivery of machine-to-machine services in general and to the automotive sector, in particular. This change in approach includes:
  - an appreciation of the market potential,
  - the recognition that data ARPU (average revenue per user) has begun to exceed voice ARPU,
  - the subsequent definition of appropriate metrics to measure "success" in this sector, which are significantly different from those in the consumer mobile phone market.

However, today the presence of operators across the value chain is limited to very specific examples generally focused on the telematics service provider platform (explained below) and content services. In some developing telematics markets, such as China, operators are providing telematics service platforms, content and call-centres (in addition to connectivity).

**Figure 17. Simplified Value Chain for Connected Car Services**



### 7.1.2 Leverage points for operators

Operators have core competences, which are extremely relevant and necessary for the deployment of telematics and infotainment services. These competencies complement core automaker areas, providing expertise in service enablement and support (which automakers are not traditionally well-positioned to address).

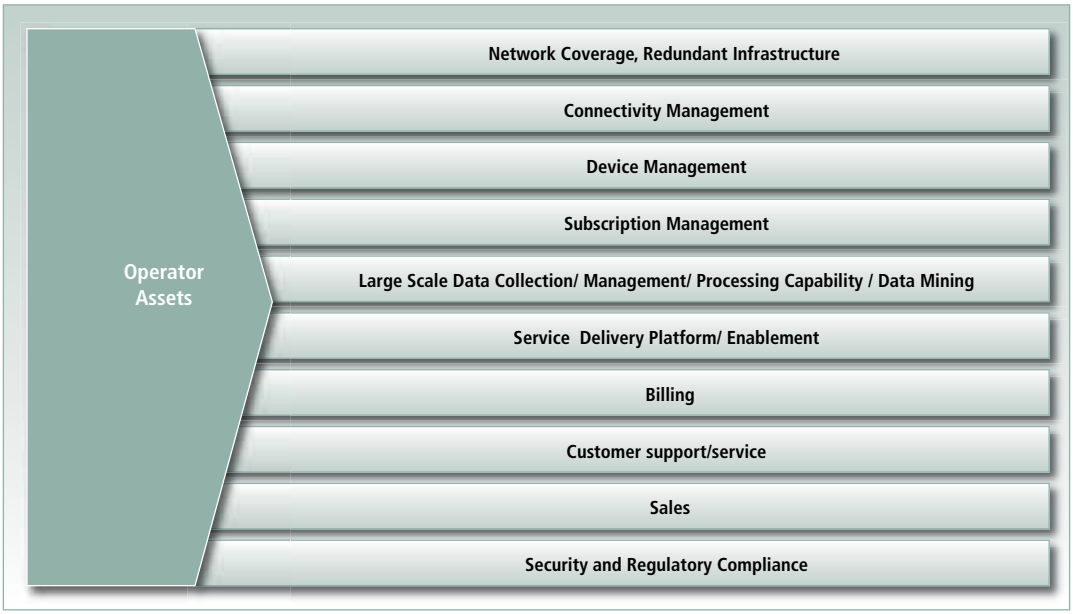
Of all the core competencies that operators bring to the table, a few are especially well suited to meet existing gaps in the value chain, in particular:

- **Critical Enablers:**
  - **Charging & Billing:** The provision of split service-based charging/end-user billing is urgent, if the necessary business models are to be unlocked for telematics and infotainment. These capabilities need to be provided at a regional and, ultimately, at a global level.
  - **Device Management:** Operators widely support the servers that activate upgrades to smartphones' operating systems (OS). This 'device management capability' could be used for similar upgrades to systems implemented in the automotive sector, be that an OS upgrade or an upgrade of a specific application or service. Operators also control the provision of information related to roaming for their installed base of customers, so they can add availability of new networks with which they have agreed roaming partnerships.
  - **Subscription Management:** At the rawest level, subscription management allows operators to activate and deactivate services associated with individual customers' devices, be that for their own purposes or through interaction between customer support systems and the network. Operators can also use information associated with an individual, such as location, to enhance both their own services and those of third-parties. Increasingly, operators are also looking to form relationships with content providers to enable specific content to be made available to their customers under commercial conditions.
- **Telematics Service Provider (TSP) Platform:** This capability is sought by a number of automakers to activate, maintain and upgrade services that either they control or that are defined and implemented by third parties, and also to enrich services with information that is generated from within the mobile operator's network. Operators also support these platforms in the integration of technology. For example, Deutsche Telekom's T-Systems unit has provided a TSP platform to BMW in Europe.
- **Content - Large Scale Data Collection/Data Mining:** Operators manage immense quantities of data on mobile locations, which can be anonymously analysed and mined to provide patterns on locations and traffic. Vodafone, for instance, has worked with TomTom to incorporate anonymous mobile phone data, as a proxy for floating car data, to fortify TomTom's live traffic services.
- **Customer Support/Service:** Operators provide customer support services via call centres and online support. Mobile operators have expertise in being able to provide end users and corporate customers with advice and support on matters relating to both their services and the connected devices. China Unicom provides this support to BMW for its ConnectedDrive telematics services in China.

In addition to these "defined" requirements and roles to support connected car services, there is potential for operators to help automakers harness emerging technology applications, such as:

- App stores. As mentioned earlier, automakers are struggling with how to provide app stores and services supported by the developer community. Many operators also have app stores, which could support the automakers deployment of app stores – either through white label platforms – or through the provision of specific support services to these platforms.
- Cloud services for connected devices. The growth in demand for cloud-based services may present an opportunity for operators to further leverage their capabilities and play a value-added role in the development of connected car services.

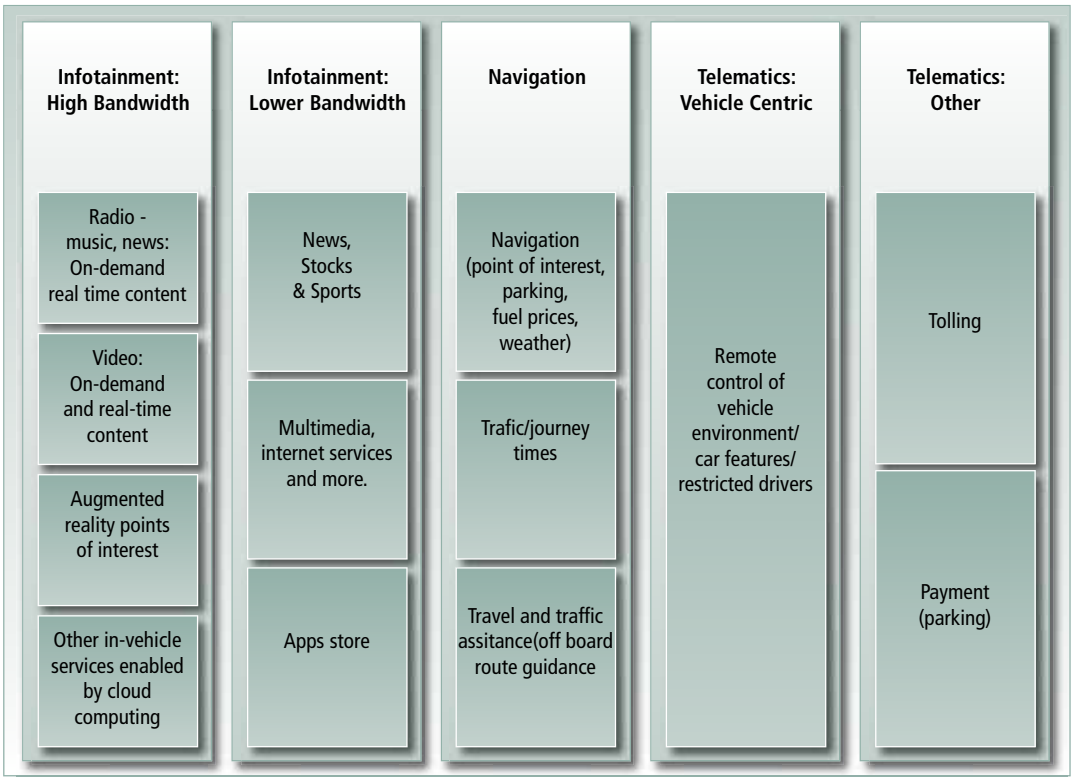
**Figure 18. Mobile Operators' Assets**




### Matching operator assets to specific opportunities at the service level

The opportunity for mobile operators to take on a greater role is particularly strong with relation to specific services, where critical enablers are needed (such as charging & billing), as well as the other core operator competences. Such services include potential pay-per-use services such as infotainment, navigation and some very-specific telematics services (including remote control of vehicle environment, tolling and payment) - see Figure 19.

**Figure 19: Operator Opportunity: Services With Pay Per Use Characteristics**




The mapping of the competencies needed to support these services highlights the primary role of billing & charging, followed closely by service enablement and customer support (see Figure 20).

**Figure 20. Operator Opportunity: Value-Add Opportunities**

| | Potential Operator Value Add Services | | | | |
|---|---|---|---|---|---|
| **Services** | Connectivity | Service Enablement: Application Integration | Content - Data Mining: generation of mobility data | Charging & Billing | Customer Support |
| **Infotainment** | | | | | |
| Radio-Music, News: On-Demand Real Time Content | ■ | ■ | | ■ | ■ |
| Multimedia, internet services and more | ■ | ■ | | ■ | ■ |
| Video: On-demand and real-time content | ■ | ■ | | ■ | ■ |
| Augmented reality points of interest | ■ | ■ | | ■ | ■ |
| Other In-Vehicle Services enabled by Cloud Computing | ■ | ■ | | ■ | ■ |
| News, stocks and sports | ■ | ■ | | ■ | ■ |
| Multimedia, internet services and more | ■ | ■ | | ■ | ■ |
| Apps store | ■ | ■ | | ■ | ■ |
| **Navigation** | | | | | |
| Navigation | ■ | | ■ | ■ | |
| Traffic/journey times | ■ | | ■ | ■ | |
| Travel and traffic assistance | ■ | | ■ | ■ | ■ |
| **Telematics** | | | | | |
| Remote control of vehicle environment | ■ | | | ■ | ■ |
| Tolling | ■ | | ■ | ■ | |
| Payment | ■ | | ■ | ■ | |

■ Opportunity to leverage primary operator asset

### 7.2 Development path for increased operator presence in the telematics and infotainment value-chain

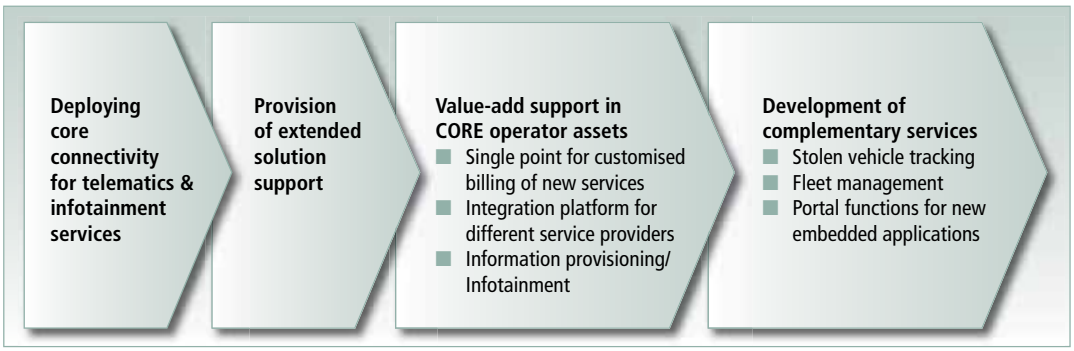
Mobile operators' role in the deployment of telematics and infotainment services needs to evolve progressively.

The first step is for connected car services to be deployed in a widespread manner. Operators and automakers need to cooperate to remove existing obstacles to the fitment of connectivity in vehicles. This is an objective for the whole ecosystem, since a critical mass will generate the necessary demand for services and associated revenue opportunities.

Mobile operators should be focused on providing extended solution support in line with the automotive industry requirements, so as to aid in the deployment of seamless user experiences. The existing core competencies of operators need to be harnessed to provide value-added services. Support for charging and billing use cases at a regional and global scale in the near future will be a fundamental enabler for the evolving business models. Additional opportunities exist around integration platforms, content provision and providing access to infotainment services.

For those operators looking to become more deeply involved in the value-chain, strategic alliances in the development of complementary services is an option (for instance, a portal function for new embedded applications, such as stolen vehicle tracking).

**Figure 21. Development Path for Operators in the Connected Car Ecosystem**




### Chapter conclusion

Connected car services require new business models supported by strategic partnerships. As operators' core competencies are fundamental enablers for emerging business models, the opportunity for operators to participate in the value-chain is greater than ever. Furthermore, regardless of the operator competencies sought, the cooperation between automakers and operators needs to happen early in the process of service definition to ensure that the full technological capabilities are exploited. These capabilities must provide regional, if not global, solutions to the automaker requirements.

Operators also bring to the table the capacity to develop multifaceted, dynamic business models that capture the emerging trends and usage of the handset market. This competency suggests operators could provide assistance in the strategic definition of the value of connected car services to consumers (perhaps even before the consumer is aware of his "connected addiction").

Mobile operators also need to consider their role in a wider cross-sector, proactive business model, which aims to have "everything connected" (including vehicles).

# 8. Outlook for the future

This chapter highlights key future considerations for the deployment of connected car services underpinned by sustainable business models. It also seeks to provoke discussion on the opportunities for joint collaboration between automakers and mobile network operators in support of the evolution of these services and business models.

In the definition of business models for telematics and infotainment services, several key considerations for future evolutions emerge:

**Strategic positioning**

- The strategic positioning of automakers on telematics and infotainment services is at the heart of defining their value proposition and the appropriate business model. Up to now, this positioning generally has been based upon the assumption that automakers will be the owner of the whole process and the final customer. This position may need to be reconsidered, given the greater complexity of forthcoming services and the need for swift deployment.
- Expanded value-chains are going to be required to create multiple revenue streams. Automakers are going to have to define how to pursue their core interests while building the strategic alliances that can provide a fast time to market. Attracting and leveraging the involvement of developers will also be important for the evolution of the service supply.

**Balancing value, cost and market prices for services**

- In the absence of definitive insight from consumer research, achieving an appropriate balance between services in terms of cost, value, and price is complex, and at times counterintuitive. Finding this balance requires an iterative process and an analysis of bundled and unbundled services.
- Automakers have experimented with different consumer-facing business models, generally based on long-term commitments and relatively large costs at the time of the vehicle purchase. These models have rarely provided sustainable revenues, have generated low re-subscription rates, and have not encouraged tailoring of services to evolving consumer demands. Being able to select from a portfolio of services at any time has been an important factor in the success of smartphone app stores. Automakers should evaluate alternative business models, common in other service domains (such as those based on micropayments, freemium services and advertising). The ability to trial services and to incrementally build-up functionality are important emerging trends.
- The combination of revenue streams from multiple sources is key to lowering the final consumer price and optimising the sustainability of the service. The involvement of the relevant third parties also lends additional expertise in the development of non-automotive core services.
- Most vehicle owners do not appear to want to pay additionally for in-car connectivity. Potential solutions include the bundling of service costs with connectivity costs to end-users or providing connectivity, as part of a shared data plan for multiple devices.

**Requirements for business model enablers**

- Charging and billing models (including overall price and frequency) play an important role in winning consumer acceptance and unlocking the potential of more advanced business models (such as those based on multiple revenue streams). They are also key to the development of embedded connectivity solutions for a broad range of services with different beneficiaries.
- The more complex business models, involving the management of revenue streams and connected car traffic, will require additional technological solutions and enablers. The identification and agreement of priority requirements for business model enablers could be an important next step for automakers and operators.

**Defining connectivity strategies**

- The technical and commercial formula for providing connectivity for in-car services still needs refinement.
  - Although embedded connectivity provides the optimum user experience, it requires further progress on fitment rates, future-proofing hardware solutions, and defining the appropriate business model for in-car connectivity.
  - Tethering and smartphone integration solutions also require additional work to remove obstacles and ensure consumer satisfaction with the services.

### 8.1 Cooperation between automakers and mobile operators

The core business for automakers has been the development of the vehicle (rather than services), while mobile operators are supporting the development of advanced services in the handset sector. Both parties have relevant and complementary competencies that need to be leveraged for the successful deployment of the broad range of potential mAutomotive services.

There are numerous opportunities to improve the deployment of telematics and infotainment services, including:

- Support for the definition and deployment of more innovative business models (including charging capabilities, revenue and cost sharing mechanisms);
- More active involvement of mobile operators in the design and deployment of specific services;
- Optimisation of connectivity solutions for embedded, tethering and smart phone integration;
- Provision of connectivity business models, which encourage "everything connected", including vehicles.

Progress on these opportunities will require automakers and operators to come together to define requirements and use cases. These cross-industry efforts to tackle barriers and create new service requirements will need to take place in parallel with bilateral commercial discussions. These discussions should occur early on in the service development process, so as to fully leverage the technological capabilities needed to support new service and evolutionary business model requirements. Operators will have to be able to provide regional, if not global, solutions to support automakers appropriately.

### Chapter conclusion

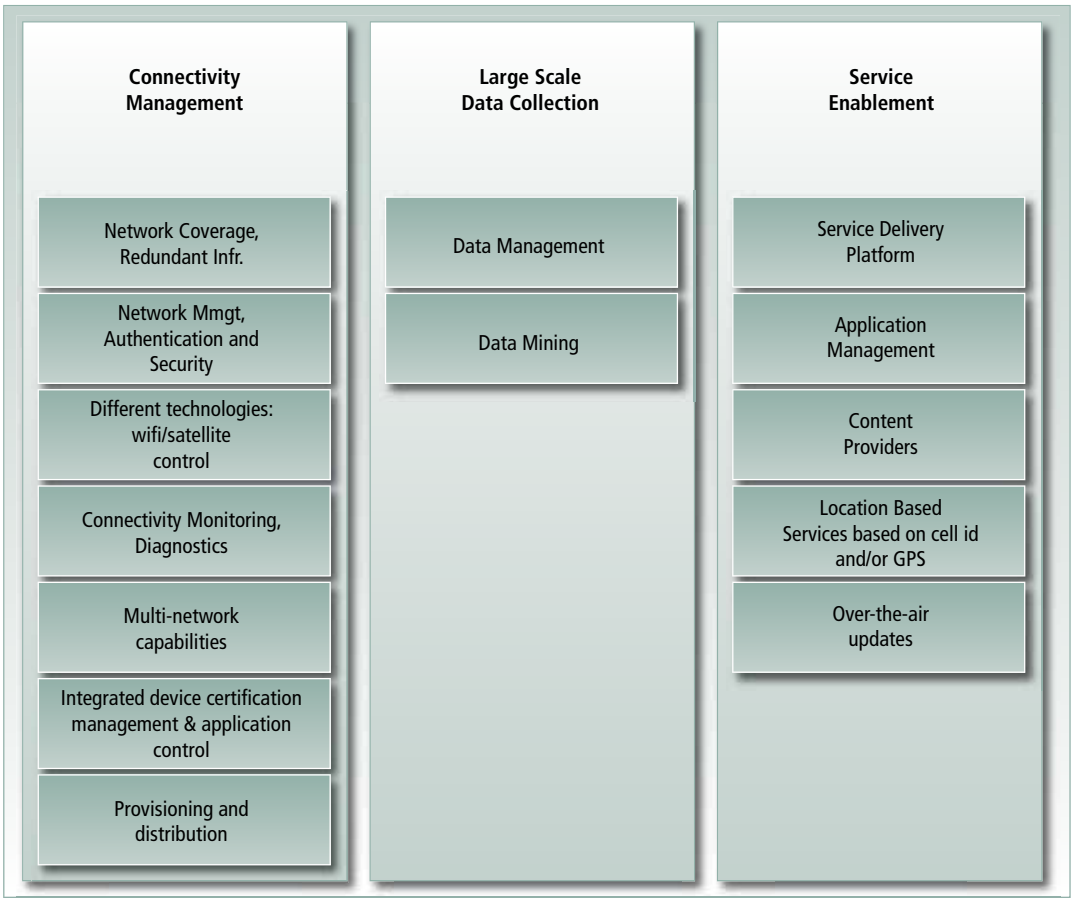
The large-scale uptake of connected car services depends upon business model innovation and revision. The application of many key business model considerations to the specific commercial offerings of automakers and operators is not immediate or simple. They also lead to some provocative questions:

- Vision, rather than risk-adverse, incremental improvements, should be driving the service creation process. How can we foster creativity in connected car services, so as to meet "real" consumer needs and expectations?
- How will the evolution of consumer electronic services drive demand and utilisation of connected car services?
- How can new technological developments, such as cloud computing, ubiquitous connectivity and HTML5, enable a new generation of connected car services? How may we begin to explore those opportunities today, so they are integrated into the automotive product planning process in a timely manner?
- How does the "everything connected, all the time" concept envisioned by the mobile industry change the landscape in terms of how we define, enable, deploy and measure connected car service success?
- How can service providers better future-proof solutions, so that risk aversion does not dampen the potential and need for service evolution?
- Are there key enablers (to be jointly developed by automakers and operators), which can provide the glue needed to deploy successful business models? What enablers are really most critical to make sure the potential success of a service is not jeopardised by a single industry's inability to realise the necessary innovations independently?
- Where are the biggest opportunities for mobile operators to provide added value in new areas to support connected car services?
- How deeply, and in what way, do operators want to engage in the value chain for connected car services?
- Will automakers look to mobile operators to support the strategic conceptualisation of connected car services, given operator expertise in addressing innovation in business models, sales, and customer support?

# 9. Annex: operator assets

Additional details on operator core competencies are presented in the following section, which details both the back-end assets (Figure 22. Operator Assets: Back End) and the consumer-facing assets (Figure 23. Operator Assets: Customer Facing).

**Figure 22. Operator Assets: Back End**




## 9.1 Connectivity management

### 9.1.1 Redundancy, resilience and availability

Mobile operators work to a principle referred to widely in the industry as 'five 9's' availability. This means that the network should be functioning 99.999% of the time, or put another way, the network can only be unavailable for an average of 5 minutes and 15 seconds per year.

Mobile operators aspire to this metric, but it is a challenging target to reach, particularly in a network where a radio interface provides the connectivity to the customer. There are variances between different radio technologies in terms of geographic coverage due to the timing of the roll out of each technology and the spectrum availability for each technology.

To ensure that the availability of the network is as high as possible, mobile operators implement redundancy in three key ways, thereby protecting the customer from different types of failure. These ways are:

- **Link redundancy –** this means that elements within the network are connected by pairs of connections (be that wires, fibres, point-to-point radio connections or a combination of these). This means that if one of the connections between two pieces of equipment fails for some reason, the second connection is able to automatically pick up the traffic without the calls or session being disrupted.
- **Node redundancy –** at network nodes, critical functions are either paired (1+1 redundancy) or, if the function is clustered so that more than one of the same element is on a site, there is a 'stand by' element (N+1 redundancy). This means that should one node fail completely, there is another equivalent node on 'warm stand by' that can take over any calls or sessions that would otherwise be lost. More advanced mechanisms for this are referred to as 'pooling', where multiple elements of the same type appear to the rest of the network as one large element, and so any individual failure is completely hidden from the network operationally.
- **Component redundancy –** within each node there may be, for example, ten cards that are all performing the same function. The node would be configured to have nine of those cards live and the tenth as a hot standby ready to take over should a component fail on one of the other cards.

If any of the above failures take place, the redundancy mechanisms that are implemented will mean that the network does not fail and calls are not lost. Any such failure also triggers alarms in the Network Operation Centre (NOC) which can then be addressed by maintenance staff who can replace any failed parts or re-establish connectivity.

More fundamental failures, such as power outages, are mitigated against through the implementation of batteries, diesel generators or some other form of site based power supply. The result is a network that is highly resilient to the failure of equipment and connections, and hence offers a high availability service to its customers.

As mentioned previously, the resilience and robustness of a mobile network does not imply that coverage using any specific radio technology is assured but the availability of the network when a device is connected to it is very high.

### 9.1.2 Authentication and security

Every mobile customer is accustomed to the experience of turning on their mobile phone and being assured that the network recognises them and will route calls made to their phone number correctly. To do this, the network and the device have to establish a trust relationship that can be relied upon. This is done by using encryption algorithms and network-generated 'challenges' to the customer's phone to make sure the network can be sure that the phone (and more importantly, the phone number and associated subscription) that is being registered on to the network is who it says it is.

In order for this to take place, two elements are implemented in mobile connections. One is in the device and is often referred to as the 'SIM card' – it is in fact more correctly called a UICC card, which has a SIM application installed on it. The UICC card is widely used, not just in telecoms, but also in banking (it is the same card as implemented on Chip and PIN credit and debit cards) and other applications because of it is highly-secure.

The SIM application on the UICC uses security credentials to generate responses to challenges generated from the network by the second element in the security relationship, the Authentication Centre (AuC). The AuC holds security profiles for every customer subscribed to the mobile network. When the customer or subscriber needs to be authenticated, the AuC generates security parameters that are used in the challenge to the SIM application on the UICC in the customer's device. The AoC also generates the expected result from the SIM application which is then compared with the result that is returned from the SIM itself.

On the basis of this, a security relationship is established and the subscriber is considered to be authenticated, or confirmed to be who they claim to be. On the basis of this authentication, calls to the phone number associated with the authenticated subscription can be routed to the customer and activity for which the customer will be billed can be correctly calculated and charged to that account.

In the context of embedded mobile services, it is also fundamentally important that a device and subscription is unique and is authenticated to the network to prevent fraudulent behaviour. This is fundamental to correct billing for a service and also is key for any location-tracking services.

#### 9.1.3 Subscription and device management

The mobile operator has a responsibility to manage its customers' subscriptions correctly, so that the customer receives all services that they are entitled to and equally does not receive (and as a result, is not charged) for services that they do not subscribe to. The management of the subscription for an individual customer requires technical integration between customer care systems, provisioning systems and the subscription management elements within the mobile network - the Home Location Register (HLR) or Home Subscription Server (HSS).

### 9.2 Large scale data collection and management

Operators manage immense quantities of data on mobile locations, which can be anonymously analysed and mined to provide patterns on locations and traffic. Vodafone, for instance, worked with TomTom on the incorporation of anonymous cell phone data as a proxy for floating car data to fortify TomTom's live traffic services.

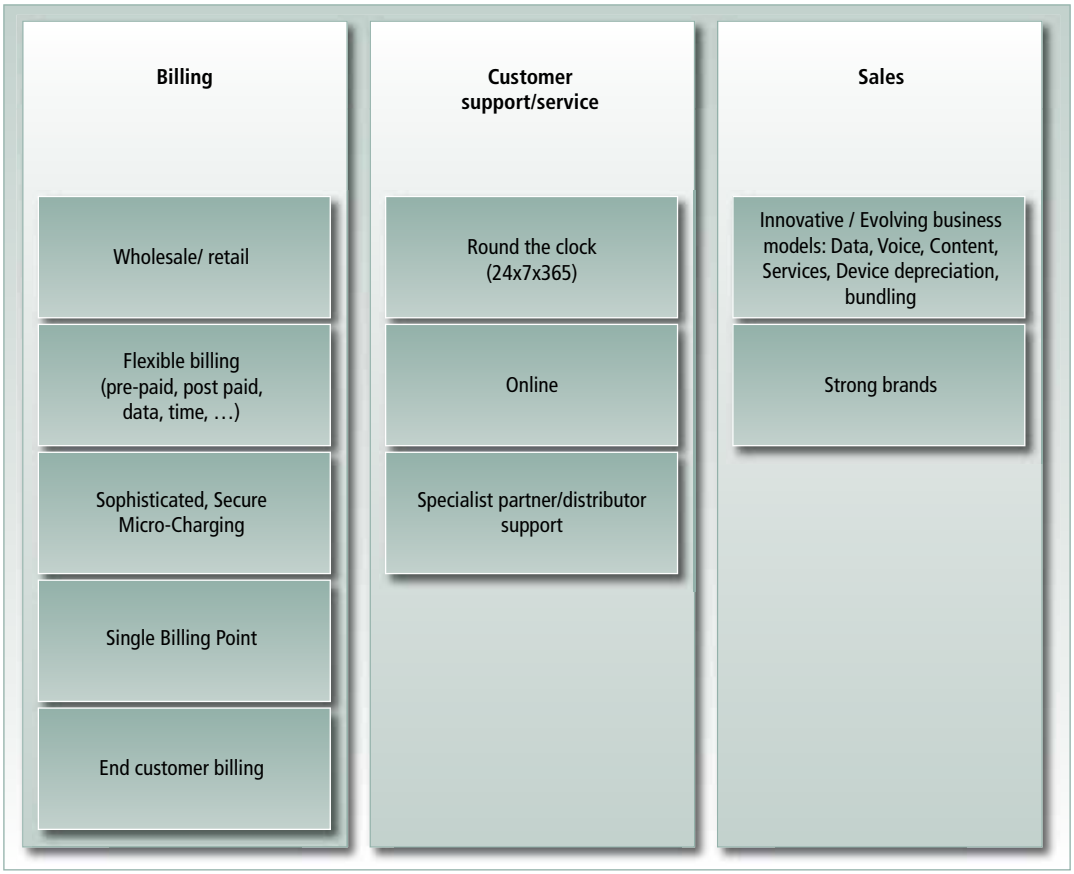
### 9.3 Service enablement

Operators' service enablement capabilities include a number of individual functions that combine to provide a toolkit that enables operators to activate, maintain and upgrade services that either they control or that are defined and implemented by third parties. This toolkit also enables operators to enrich services through the employment of information that is generated from within the network. The extent to which each of these functions can be brought to bear on a specific service or application depends upon who owns and operates the service and the nature of the service itself.

For example, operators widely support the servers that activate upgrades to smartphone operating systems. This 'device management capability' could be used for similar upgrades to systems implemented in the automotive sector, be that an OS upgrade or the upgrade of a specific application or service. Operators also control the provision of information related to roaming for their installed base of customers, so that they can add availability of new networks with which they have agreed roaming partnerships.

At the rawest level, subscription management allows operators to activate and deactivate services associated with individual customers' devices, be that for their own purposes or through interaction between customer support systems and the network. Operators can also use information associated with an individual, such as location, to enhance the nature of services offered by themselves or by exposing the information to third parties. Increasingly, operators are also forming relationships with content providers to enable specific content to be made available to their customers under commercial conditions.

**Figure 23. Operator Assets: Customer-Facing**



### 9.4 Billing

Billing systems go hand in hand with the authentication and security mechanisms of a mobile network. If a customer cannot be correctly identified, or the traffic that they generate cannot be tracked and recorded correctly, it is impossible for the network to generate an accurate, event-based bill. Currently, billing systems (BSS) are designed to identify specific events for which charges are levied against the customer's account – these are referred to as 'billable events'. The network watches the traffic that is generated by a customer and monitors for these billable events. When events occur, they are reported from the network to the BSS in call data records (CDRs). The CDRs are then correlated in the BSS and result in either charges being added to the customer's bill, if they are a post-paid customer, or credit being removed from a customer's pre-paid account if they are a pre-paid customer.

By using the mobile operator's billing systems to generate charges and to understand connection utilisation by individual devices, third parties can in turn pass on charges (if the use case for such a service is designed around that model) or be assured that the charges being levied by the mobile operator to a third party are accurate. The integrity that has been built into mobile operator billing systems can be used by businesses outside of the traditional mobile telecoms value chain to understand a great deal about their customers' usage patterns.

Equally, operator billing systems can be used to manage other forms of contract that may be required by different sets of their customers. Wholesale agreements with large companies or enterprises can be established to provide a single bill for a large number of individual devices, even when those devices may not be tied to an individual person. This makes the operator capable of providing bills to customers with large numbers of 'non-traditional' devices as a consolidated bill, on the basis of any form of charging model from a flat-rate monthly service charge to a highly granular bill with detail of each individual occasion of device-network interaction. No change in network technology is required to enable this, only an understanding of the contract and suitable software changes to reflect the billing model on the customer bill itself.

### 9.5 Customer care and customer support

Operators have a pre-existing requirement to support their customers. This has been traditionally done via call centres, but is increasingly moving to online support as a cheaper, more efficient option. The expertise that mobile operators have in being able to provide end users and corporate customers with advice and support on matters relating to both their services and the devices in the hands of the customers has considerable value which can be extended to include support for services that are in the embedded mobile sphere.

Operators often support large corporate clients with dedicated customer support teams, and so for a deployment of a large number of embedded mobile devices, operators could similarly provide a customer support offering which is tailored to the specific requirements of the organisation operating those devices.

### 9.6 Sales

Operators also have the expertise to develop multifaceted, dynamic business models that can address emerging trends and new kinds of usage in the handset market. This competency is combined with very strong brand identification and a broad retail presence (closely related to customer support, but generally focused on ensuring optimised sales channels for consumers and businesses).

## About the GSMA and the Connected Living programme

The GSMA represents the interests of mobile operators worldwide. Spanning more than 220 countries, we unite nearly 800 of the world's mobile operators, as well as more than 200 companies in the broader mobile ecosystem. Connected Living is a three year market development initiative whose mission is to help mobile operators accelerate the delivery of new connected devices and services. Our target is to assist in the creation of 700 million new mobile connections, whilst stimulating a number of service trials and launches in the Automotive, Education and Healthcare sectors. We also have a special focus on Smart Cities to support Barcelona becoming the Mobile World Capital.

## About GSMA Connected Car Forum

The GSMA's Connected Car Forum (CCF) is a new platform for automakers and mobile operators to:

- Share information and enable joint industry cooperation.
- Resolve barriers to connected car deployment.
- Improve the speed and take up of telematics and infotainment services.

Current CCF activities include:

- Showcasing operator value add assets in support of connected car services (such as split, service based charging and payment).
- Conducting trials and/or service launches for value-add services.
- Critical enablers such as the remote management of the SIM in the automotive sector.
- Identifying requirements and next steps for connectivity barriers.

To join the forum please email: **mautomotive@gsm.org**

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