Telematics: Decision Time for Detroit

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With implications for navigation, safety, entertainment and vehicle maintenance as well as regulation and infrastructure investment in roads, telematics has the potential to transform driving more than any other innovation for decades. In the already well-established Asian telematics industry, revenue tends to come from extra charges at the time of vehicle-sale, with most subsequent services provided free. The US model has evolved differently, with much of the cost of telematics hardware and software subsidized in the initial vehicle sale price and revenue coming from services used. The decision to invest in telematics is therefore riskier in the US. This article first briefly summarizes the potential of telematics. It then analyzes the investment risks, particularly for automakers. It concludes with recommendations on how the US auto industry can minimize risk and make the most of the opportunities.

The auto industry is currently out of favor on Wall Street, largely because of low growth expectations. Globally, automotive unit volumes are likely to grow at 2 - 2.5% per annum over the next ten years. But this expansion will be largely outside North America. With sales in their home market flat, US auto companies are searching for ways of increasing profits that do not involve selling more vehicles. One seemingly promising avenue is telematics, which could be a $40bn market worldwide by 2010. Some think it could rejuvenate the stagnant US auto industry.

This article starts by providing some background on telematics, a technology that is not yet widely familiar. It then discusses the risks and potential rewards of investment in telematics and the ways the value delivery network might be structured as the industry grows. Finally, it analyzes whether automotive companies should invest in this technology, including the strategic implications of different approaches to pricing and customer service.

What Is Telematics?
The word telematics comes from the German telekomunikation + informatic. It refers to two-way voice and data communication between the vehicle and information service providers, using wireless technology (Figure 1). It has the potential to change the experience of driving vehicles more fundamentally than anything since reliability became the norm two or three decades ago (see box overleaf, “Driving into the Future”).

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Driving In(to) the Future

What will driving be like 10-20 years from now? Consider for a moment driving in the year 2020 and beyond. Will we drive or will we all be passengers? Will we manually manipulate the car or will we control it by voice only? Will it be necessary to focus our attention on the task of transporting ourselves or will we be able to concentrate on other things while driving?

Let us consider the future of the automotive experience.

We have watched the transition of an industry producing a few specialty vehicles for hobbyists and a large number of commodity vehicles for transportation to an industry which is increasingly focused on producing luxury vehicles to satisfy niche markets. Despite this shift in consumer focus, the cars of today are very much like those of the past in terms of primary function: getting from point A to point B.

Car manufacturers have spent much time and money in an effort to better understand consumer preferences along such dimensions as comfort and the aesthetics of the vehicle. This focus has, thus far, failed to answer the biggest challenge facing the automotive industry. This is how to jump-start growth. In order to move to a higher growth trajectory, automakers must identify ways to satisfy the needs of customers. The automotive industry must reconstruct itself into a service industry by building increased functionality into the platform of a transportation medium. The two services that seem to be most likely to attract the attention of the public and spur further growth are related to entertainment and productivity.

The differences and innovations over the next ten years have the potential to transform driving and car journeys. The automobile will allow the passenger to realize many of the comforts and accoutrements of the office or home as he chooses. In the end, the automobile will be a natural extension of either place and may even provide seamless transition from location to location without major disruption of activities.

According to some futurologists, the auto of the future will eventually allow the driver to enter the vehicle and speak a destination, which will be confirmed by the computer and logged into memory. The telematics system will then cause the car to proceed to the destination, all the while communicating with other vehicles around it as well as with other nodes for information delivery and receipt. This connectivity will allow the automobile to ride to its destination swiftly, without continued attention from the driver or fear of accidents or traffic. Commute time will be significantly reduced and will be transformed from a time of attention to the road and other vehicles to a time of relaxation, preparation for the day ahead, or attention to the family.

During the drive, the passenger too will have multiple options for things to do. The entertainment systems within vehicles will be synchronous with personal digital assistants and communicate with home computers. This communication will enable one to continue playing any game that was underway while at home. Music and motion pictures will be broadcast into vehicles at the touch of a button or by voice control.

Data access will be as though at home or the office. There will be seamless transition from these two environments to the vehicle and data will be neither harmed nor altered in the transmission. Communication will be enabled by wireless and Bluetooth technology so that connectivity to work, family and friends will be easily maintained. All current sources of information will be available while driving through the vehicle’s computer system and will be presented in a variety of formats as selected by the user.

One doesn’t have to agree with all this to see that telematics offers opportunities for automobiles to become extensions of the office or home depending on the choice of the individual. In particular, a distinction needs to be made between telematics applications which depend only on the equipment in your own car and those which require universal adoption or widespread infrastructure to be relevant. You will not be able to tell your car to avoid all the other cars on the road until every other vehicle also has telematics installed. But your children may well be able to watch TV and you may never need to buy a US road map again for navigation.
The range of possibilities is limitless. For the purposes of this article, we have grouped applications into five categories: driving, safety/security, engine maintenance/repair, regulation and infotainment/in-vehicle commerce (Figure 2). Advanced vehicles already have telematics functionality such as emergency calls and navigation assistance. The applications which are currently possible technically, though by no means standard even in new models, are listed in the second column of Figure 2. The applications listed in the third column are all expected to be technically possible by 2010.

A quick glance at the list shows just how significantly telematics could affect our lives. If something goes wrong with the car, we would no longer have to wait by the roadside while a mechanic drove to us – only to find that the vehicle needed to be taken away for repair anyway. For children, car journeys would become an extension of watching TV at home. Drivers would no longer be able to get away with speeding, or failing to buy a car license or insurance. With telematics providing universal road usage monitoring, public sector infrastructure investment worth billions could be better targeted.
With the seemingly limitless possibilities available through telematics, many experts both inside and outside the auto-industry have portrayed telematics as a highly lucrative opportunity.

- “By 2010, telematics products and services should be about $42bn.” – UBS Warburg
- “Over the next five to six years...some form of telematics products will be incorporated into 50% of the vehicles produced in the world (about 50 million annually).” – Raymond James
- General Motors (GM) OnStar service increased its subscriber base to 750,000 in 2000, and analysts predict four million by 2003.
- “The advancements in telecommunications technology, coupled with consumers’ increasing desire to maintain a real-time communication link with the external world, represent a golden opportunity for automakers to garner significant revenue streams long after a vehicle leaves the showroom.” – Deutsche Bank

In 1999 in the US, revenues from telematics were about $280m. Experience elsewhere supports a positive view of telematics investment by Detroit auto companies:

- Asia: revenue from end-users in 2000 was $3.68bn and is estimated to reach $13.54bn in 2010 – UBS Warburg
- Europe: revenue from end-users in 2000 was $0.23bn and is estimated to reach $13.47bn in 2010 – UBS-Warburg

The large potential market size by itself seems to offer good reason for automotive players to think about investing in telematics. Another motivation is to keep up with competitors: automakers which do not incorporate telematics might risk losing sales to those which do. Finally, telematics offers automakers another potential advantage: Continuous Relationship Marketing (CRM) also known as Customer Relationship Management.

CRM is a marketing approach by which companies seek to build close relationships with customers in order to encourage them to repeat purchase. The objective is to tailor offerings to high-value customers by acquiring a deep understanding of their needs. In US telematics, there are two main considerations on repeat purchase strategy. First, automakers that provide an innovative solution that excites customers can continually reinforce their brands and build loyalty. Second, due to the nature of the offering, the solution provider is in regular contact with the customers, and has an opportunity to understand and meet their needs.

**The Reality of Telematics: Great Uncertainty**

Our estimates of the potential size of the US telematics market in 2010 range from a seemingly low $1bn to as much as $36bn. Despite the promise of telematics to deliver fantastic growth and constant revenue streams, the uncertainty surrounding the future is great. There are six areas of uncertainty whose resolution lies mostly out of the hands of industry participants:

- **Customer demand**: preferences and willingness to pay for specific telematics services.
- **Regulatory and legislative restrictions**: limits on the use of telematics in the vehicle.
- **End-user interface**: The evolution of voice recognition technology and text-to-voice communication between telematics systems and the user.
- **Mandated services**: regulatory or legislative requirements to install telematics in vehicles
- **Wireless upgrade**: The evolution of cellular infrastructure from the current, multiple standards.
- **Payment method**: options include up-front payment, subscription, usage charges or a combination.

A systematic analysis of these six areas of uncertainty suggests that at the end of the day industry participants need to focus on only two key uncertainties. The remainder will have little impact on the telematics industry. While their resolution might be very uncertain, the potential outcomes, even at their widest range, will not greatly affect the market:

- **Mandated services**: Most discussion of potentially mandated services centers on safety and security, which are already the most commonly offered services.
- **Wireless upgrade**: In the US, there is much discussion around the wireless infrastructure, specifically the migration path to 2.5G and 3G. However, the wireless upgrade path has little...
impact on telematics, as most telematics applications can be provided with the current bandwidth. Those that require additional bandwidth such as video on demand will require 4G technology.

- **Customer payment model** (ie up-front or subscription/usage based): While important, this is a tactical decision, in that it can be changed quickly. In our opinion, the more pressing question is what customers will pay for, not how they will pay. Also, the ability to rapidly change the model means that the cost of a wrong guess is low.

The remaining three areas of uncertainty, in fact, boil down to two: customer demand and product availability. Driver distraction regulation and the level of technological advancement of voice recognition systems affect the industry in the same way, namely by bounding the range of products available in the vehicle. Thus, we combine the two to form one uncertainty surrounding “product availability”. The resulting key uncertainties related to customer demand and product availability cannot be resolved or ignored by industry participants. Therefore each company must understand these uncertainties and build a strategy that can adapt to the potential customer.

Customer demand is the most uncertain aspect of telematics. While some may cite market research and focus groups, we are skeptical of such results in areas where the product is so new and unknown to customers. Furthermore, we must distinguish between interest in a product, and a willingness to pay. Looking to the internet world, we can see that while customers enjoy many services, they are not willing to pay for most of them. Also, the recent experience of NTT DoCoMo’s i-mode service illustrates the unreliability of market research where latent demand exists. i-mode’s market research overwhelmingly indicated financial services as the “killer app”. However, based on actual usage, the primary application of i-mode is entertainment, with financial services a distant fourth.

Only time will resolve the uncertainty surrounding the ability of voice recognition systems to recognize and respond to natural language commands. If the technology delivers less than its promise, telematics products will be more limited. As for driver distraction regulation, this has been at the forefront lately as legislatures such as New York State have begun to ban the use of hand-held cellular phones by drivers in moving vehicles. While such bans pose no immediate threat to telematics, the issue of what is and is not allowed in the vehicle is far from certain, and far from decided.

These two “killer uncertainties” together produce four industry scenarios for 2010 (Figure 3) and are further analyzed in Figures 4-6. While the best-case scenario could result in significant value creation, the worst-case scenarios could result in value destruction.
The four scenarios are:

- **Telematics takes off**: High demand and high product availability lead to 100% installation rates, average revenue per user (ARPU) of $50 per month, industry revenues of $36bn, and industry operating profits of $8.1bn.

- **Low-tech telematics**: High demand and low product availability lead to 75% installation rates, ARPU of $33, industry revenues of $17.3bn, and industry operating profits of $3.1bn.

- **Great products in search of demand**: Low demand scenario with full range of products possible in niche markets with paying customers.

- **Bleak landscape**: Limited offerings with few customers willing to pay for services.
and high product availability lead to 25% installation rates, ARPU of $26, industry revenues of $5.3bn and industry operating profits of $800m.

- **Bleak landscape**: Low demand and low product availability leads to 10% installation rates, ARPU of $13, industry revenues of $1.1bn, and industry operating loss of $200m.

It is important to note that the figures above are a snapshot for one year well into the future, and do not take into account investments in R&D and infrastructure. So, while 3 of 4 scenarios result in operating profits at an industry level, cashflows may not be enough to offset initial investments, especially given the lag between investment and return. In the end, “Great products in search of demand” might be a nightmare scenario if firms invest heavily expecting high demand and actual demand is low.

**Who is Well Positioned?**

If uncertainty analysis clarifies the situation, and allows one to estimate market size, then the web of participants complicates the picture. We believe that no single player has clear control of telematics. Furthermore, the highest-risk/ highest-reward position in the value delivery system appears to be the role of solution provider – the role that many automakers are thinking of adopting. The main risks of this role include the uncertainty of demand, the potential up-front expenditures to install and possibly subside hardware, and the costs required to develop the infrastructure to handle customer requests. For automakers, the combination of uncertainty, lower than normal control of the industry, and higher risk/reward profile has led many automotive players to ask whether they should play in telematics, and if so, how.

It is important to understand the players, and the nature of their interactions. Figure 7 (overleaf) shows their relative positions. Participants include: software providers, hardware providers, content providers, bandwidth providers, content aggregators, solution providers and installers (automakers and aftermarket). Unlike other industries that can be described by a sequential “value chain” approach, telematics operates as a “value delivery system” made up of seven different industries with complex relationships that go beyond the typical “value chain” view. It is worth noting that all segments of the value delivery system existed prior to telematics except one – the telematics solution provider. In many respects, the solution provider is the glue that holds the industry together. The role of the solution provider is to seamlessly integrate hardware, content, and customer management.

Of the seven players, no one has an overwhelming advantage, although some players appear better positioned than others (Figure 8).

- **Bandwidth providers** control the pipe into the car, have existing customer relationships and can offer a mobile, upgradeable solution that will follow the
Figure 7
Telematics Value Delivery System

- Bandwidth provider
  - Installs and manages mobile data network
  - Examples: Verizon, AT&T, Sprint, XM

- Solution provider
  - Integrates system, network, and content
  - Provides front-line customer interface
  - Provides access to content
  - Makes data customized, personalized and usable
  - Examples: OnStar, Wingcast, AFX

- Installer - OEM
  - Installs telematics equipment in vehicle
  - Examples: GM, Ford, Mercedes

- Customer

- Hardware
  - Consumer electronics
  - Supplies hardware
  - Examples: Motorola, Delphi, Palm, iBiquity

- Software
  - Application, OS
  - Supplies software for OS and applications
  - Examples: Microsoft, Linux

- Content provider
  - Generates telematics content
  - Example: CNN

- Content aggregator
  - Provides access to content
  - Makes data customized, personalized and usable
  - Examples: AOL, Yahoo, XM Radio

Figure 8
Leverage in the Value Delivery System

<table>
<thead>
<tr>
<th>Strength of leverage</th>
<th>Source of leverage</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Potential to create ubiquitous standard</td>
<td>Competition to build share may cede leverage to large hardware providers</td>
</tr>
<tr>
<td>Software/OS provider</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hardware provider</td>
<td>System integration (auto H/W providers)</td>
<td>No ongoing customer relationships with auto H/W providers</td>
</tr>
<tr>
<td>Bandwidth provider</td>
<td>Controls communication access</td>
<td>Products face rapid price erosion</td>
</tr>
<tr>
<td>Solution provider</td>
<td>Integrates entire value chain</td>
<td>May compete away profits to gain access to customers</td>
</tr>
<tr>
<td>Installer – OEM</td>
<td>Vehicle access</td>
<td>Growth may be limited by captive OEM relationship</td>
</tr>
<tr>
<td>Content aggregator</td>
<td>Existing customer relationships, Brand, Distribution network</td>
<td>Low switching costs</td>
</tr>
<tr>
<td>Content provider</td>
<td>Quality of content</td>
<td>Customers expect free content</td>
</tr>
</tbody>
</table>

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customer beyond the vehicle. However, the low marginal cost of providing service offers incentives to compete away profits in an effort to acquire customers.

- **Solution providers** control the choice of hardware, software, and services that are provided along with holding the primary customer relationship. However, solution providers must heavily subsidize hardware in the current environment.

- **Content aggregators** control the quality of the services provided in addition to holding a claim on the primary customer relationship based on the strength of their brand. Companies such as Yahoo! have developed strong customer relationships as aggregators.

Within other segments there are companies which may look well placed to capture these high leverage positions in the value chain. Cellular phone and consumer electronics firms, essentially hardware providers, bring the strength of their brands and their ability to innovate and rapidly introduce new products into the market. However, rapid price erosion and the need for constant innovation make it difficult for them to exert control over the industry. Automotive OEMs look stronger, given their ability to control vehicle access, and their relationships with millions of customers. However, this leverage centers around access to the vehicle, and may be reduced by a number of factors:

- Many telematics services do not require access to the vehicle or its systems. These services include cellular phone calls, infotainment, and navigation.

- Upgrading the telematics systems and services will occur as technology evolves and will be on the timescale associated with consumer electronics, typically 1-3 years. On-board and installed telematics systems would be long outdated before the vehicle is decommissioned as the typical lifetime of a vehicle is 10-13 years.

- Vehicle designs are typically finalized 3-5 years before production, increasing the chances that the designed telematics systems would be outdated by the time the vehicle reaches the market.

Revisiting our key uncertainties, and comparing telematics with the experience of other industries, we can see how uncertainty drives economics (see box overleaf “The Economics of US Telematics: Lessons from Other Industries”). As customer demand increases, so do revenues. Additionally, penetration rises, reducing the effective subsidy between users and
The Economics of US Telematics: Lessons from Other Industries

To gain insight into how the economics of telematics might develop, we can look to other industries. The buck starts with the consumers who will purchase the hardware and software and will select their preferred services from a menu of options.

First of all, we assume that all segments of the value delivery system except the solution provider will not participate in telematics unless returns are roughly equal to current returns.

Currently, the upfront hardware and software costs are heavily subsidized in an effort to drive consumer adoption. Cellular phone hardware demonstrates that this might not end soon.

- In spite of high penetration, cellular phones remain heavily subsidized by wireless carriers striving to capture customers and recurring revenue streams. Thus, we estimate that a 50% hardware subsidy will perpetuate as solution providers strive to build their customer base.

- We believe the original equipment manufacturer (OEM) or installer will capture 10% of the customer’s upfront payment for hardware. This is consistent with historical margins on such items as car stereos.

- As an example, for an upfront hardware price of $200, the OEM/installer keeps $20 and passes $180 to the solution provider. The solution provider then passes $400 through to the hardware provider.

Various industry participants must come together to deliver services to customers and the revenue streams must be shared between them. There are parallels between the evolving telematics industry and today’s cable industry. Both industries require a pipeline to the consumer to deliver content packaged by an aggregator. Also, basic, premium and pay-per-use services are provided for the customer’s selection. Cable revenues are split between these three roles: 50% to the cable company, 25% to the network and 25% to the content provider.

In the telematics industry, the cable company role is played by a combination of the solution provider and bandwidth provider who will split the 50% share, 40% for the solution provider and 10% for the bandwidth provider. The network and producer roles are played by the content aggregator and content provider which will each capture a 25% share.

Resale of cellular minutes presents a win-win opportunity for cellular providers and solution providers. Because solution providers can offer up thousands of customers, customer acquisition costs will be much lower than if the cellular provider had to acquire each customer individually. Looking at the economics of a typical cellular provider, we can estimate the value created. Starting from a gross margin of 50%, we expect that selling, general and administration costs, typically representing 30% of revenues, will be cut in half. Additionally, assuming that the network has enough capacity, the fact that most telematics applications are low bandwidth means that new customers will have no impact on fixed costs. In the end, we expect a 35% margin on the sale of cellular minutes, with the value being split 50/50 between solution provider and cellular provider.

Based on the earlier observation that the solution provider role is unique to telematics, the solution provider captures most of the revenue unique to telematics, and also bears the costs unique to telematics. As a result, the solution provider fares very well in best-case scenarios, and very poorly in the worst-case scenarios.

Based on our experience in other industries, the ability to automate user responses, as opposed to handling them with human interaction, has the greatest impact on costs.

If telematics takes off (top right hand quadrant of Figure 3 and Figure 9), the solution provider appears...
to be a big winner. However, without profits from cellular resale, the position of the solution provider is roughly break-even. Thus, those considering a solution-provider role should focus on improving the profitability of core telematics, to ensure that they are not held hostage to the volatility and price erosion surrounding cellular telephony. Also in the takes-off scenario, the size of the profit pool opens up many opportunities for cross subsidies among participants.

In the bleak landscape scenario (bottom left-hand quadrant of Figure 3 and Figure 10), there is a net loss in the industry, and the lack of a profit pool inhibits opportunities for cross subsidy. Thus, there may not be enough momentum for the industry to survive in this scenario.

In all scenarios, managing the cost to serve customers, namely hardware subsidies and call center costs, is critical to achieving profitability.

**The Way Forward**

Automotive manufacturers are faced with a big dilemma when considering what role to play in telematics. Becoming involved exposes them to the challenges of competing in unfamiliar territory for an unknown prize, coupled with the inability to wield their traditional leverage in this new industry. Remaining on the sidelines condemns them at the very least to their snail’s-pace growth and at the worst to a loss of automotive market share to automakers which provide a rich telematics offering. Ultimately, the decision whether and how to enter centers on the firm’s risk/reward preference. In this industry, there are few “no regrets” moves (i.e., moves with positive payoff in all scenarios). Firms will have to bear higher risk to have a chance of higher returns. While there is no single “best” answer regarding how to proceed, we do believe that for a given risk/reward profile there is a right way to go to market.

Figure 11 shows a three-step framework for making decisions on how to approach telematics.

- The first step is to develop a posture towards the industry. Posture is the overarching logic of how a firm aspires to interact with its industry. The three basic postures one has to choose from are: shaping, adapting, and reserving the right to play.
- Selection of posture then drives the key strategic choices around where, when and how to compete.
- Lastly, and regardless of previous choices, firms must pursue a path of operational excellence.
While there are many potential permutations of strategic actions based on posture and the “where, when, how”, we focus the discussion primarily on shaping the industry from the perspective of an automotive manufacturer entering the solution provider segment. However, the framework is generally applicable to any firm thinking about telematics.

The aspiration of a shaper is to drive the industry to a desired outcome rather than operating within the current industry structure. Historical examples of shapers include Microsoft, which drove the PC operating system industry to an outcome effectively of its choosing. While Microsoft is easily remembered as a successful shaper, there are numerous examples of failed shapers.
A necessary, but not sufficient, requirement for a shaper is the right type of organization (Figure 12). Based on our research across many industries, shapers tend to have the following characteristics: risk tolerance, innovation, distinctive customer insight, and rapid product introduction cycles. Automotive manufacturers are well-placed in the first two, but less so in the last two.

- **Risk tolerance:** Automotive companies fare well along the dimension of risk tolerance, given the history of big bets on new models.
- **Innovation:** Automotive players have shown innovation in telematics, judging by the breadth of products offered through OnStar, and proposed by Ford’s Wingcast offering.
- **Distinctive customer insight:** It is too soon to tell whether automotive players and others in the value delivery system have demonstrated distinctive insight into customer demand. Our perspective on the industry is that participants are offering as many services as they can, in the hopes that some will be successful. Over time, as the industry develops, we expect that winning will require better-targeted offerings. Truly distinctive insight is an ability to look at the same information as a competitor and generate superior knowledge from it. In an uncertain market such as telematics, ability to understand demand better than competitors is a powerful advantage.

**Fast product introduction cycles:** This is the one area where automotive firms are clearly lacking, especially compared to consumer electronics producers with their 12-18 month product introduction cycle.

Assuming the particular OEM has an organization suited to shaping, there is a set of strategic questions that must be answered before deciding whether and how to invest (Figures 13-16): which products to invest in directly or in partnership or whether to outsource; how to structure telematics in relation to the rest of the vehicle; and when to invest.

“Where” to compete refers to the product/market strategy (Figures 13-14). In terms of product offering, we looked at products across two dimensions: size of the profit pool, and ability for an automaker to capture value. Automakers can capture the most value in areas that require access to the vehicle, such as safety and security, and telediagnosics. Not surprisingly, most current solution providers offer these services. For automakers, the less attractive markets include infotainment, and information services. This is not to say that consumers are not interested in these markets, but rather, that the willingness to pay is unclear, and/or the skills required to service the customer are beyond those of an automaker. We would counsel automakers to outsource these areas or partner with a more experienced firm.

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**Figure 13**

Where – Scoring of Potential Product Offerings

- **High Attractiveness – size of profit pool**
  - Partner to capture value or
    - Information services
    - Low-bandwidth entertainment
    - Usage-based insurance
  - Hardware
  - Software
  - High-bandwidth entertainment
- **Low Attractiveness – size of profit pool**
  - Outsource

- **Target zone**
  - Safety and security
  - Telediagnosics (warranty, CRM)
  - Cellular resale
  - Navigation
  - Electronic toll (ETC)
  - Regulation and

- **Ability to capture value**
  - Manage for profitability or exit

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Perspectives on OEM product offerings

- Prioritize safety and security, telediagnosics, and cellular resale
- Approach navigation with caution unless attractiveness can be improved
- Offer information services and low-bandwidth infotainment through a partner
- Minimize hardware subsidies
The main choice around market is the captive or all-makes decision. While the market is still in a formative stage, we are starting to see the paradox of captive ownership. The captive solution provider’s relationship with the automaker offers the solution provider guaranteed demand (for installations at least) in the automaker’s vehicles. However, other major automakers are reluctant to adopt solution services offered by their competitors. That being said, both GM and Ford have had surprising success in marketing their solutions to other automakers, namely the Japanese (see box, “Who’s Doing What – and With Whom?”). The primary challenge in this area is using the guaranteed demand to build awareness, but then distancing the solution provider from the automaker in order to encourage adoption across the industry.

Of course, once GM and Ford have their solutions in the cars of competing automakers, they may face an important challenge in using telematics as a CRM tool once the solution provider takes on a different brand. Broader reception of a telematics solution may provide new sources of data, but dilution of the association between a solution provider and a particular automaker may decrease the automaker’s ability to use telematics as a way to retain customers and tailor the value propositions of various products. Thus, there is a fundamental strategic question for automakers: is the objective solely to enter the race for the potential profits of telematics, or is it to sell more cars and set up incentives for customers to stay with the same automaker over time? In the former case, spreading the solution provider brand is an important goal, while it may not be in the latter case. A decision on this topic ultimately comes down to how much automakers see telematics as a competitive advantage versus a separate market opportunity.

The central questions around “how to compete?” involve the amount of hardware and software embedded in the vehicle (Figure 15), and the type of relationship to establish within the value delivery system. In this area of embedded equipment, we see four options, ranging from a standalone, car-centric, to a fully-integrated approach, where all functionality is built into the vehicle. While the fully-integrated approach provides automakers with the strongest claim to revenues, it is the highest-cost option. Additionally, highly-integrated systems will be more problematic to upgrade over the lifetime of the vehicle. We believe that a complementary approach is most feasible. While the revenues may not be as high as a fully-integrated approach, the economics, especially the break-even point, are more favorable. To shape telematics, a participant must either control or have a relationship with each of the critical nodes in the value delivery system. An OEM Shaper therefore should look to form bonds with the solution provider, content aggregator, and bandwidth provider.
### Who’s Doing What – and With Whom?

#### GM OnStar
Set up within GM, OnStar was conceived in 1995 with initial rollout in 1996. Starting with installation on three Cadillac models, OnStar is now available on 32 of GM’s 54 models in addition to providing service for Lexus LS430 and Acura RL customers. Alliances have been struck with Audi for its late 2001 models and Subaru for the 2003 Outback. OnStar has developed alliances for various services with Verizon, Wall Street Journal, Fidelity Investments, to name a few. The customer base crossed 1 million subscribers in April 2001. OnStar does not disclose profitability, but most industry observers and participants believe profitability is still some years away.

#### AAA
Based on the strength of its 44 million customer base and strong brand presence, AAA opened Response Services Center LLC in 2000 to enter the telematics market. It is wholly owned by the AAA national organization and five of its major clubs. It will integrate mobile access to its database of maps and travel information, and thousands of AAA-approved auto repair shops, lodgings, restaurants and campgrounds. Response Services Center computer operators will also use global positioning system (GPS) satellite data to pinpoint members in need of assistance and process requests for a host of services already provided by AAA.

#### Ford Wingcast
Ford has a JV with Qualcomm called Wingcast. Setup in early 2001 to offer telematics services to Ford customers, the launch has been delayed from late 2001 to mid-2002. Alliances with Visteon, Sprint, Oracle, etc have been established to provide services. Ford and Nissan(USA) are expected to be early customers for the Wingcast offerings. Further, Ford & PSA have agreed to explore the possibility of jointly developing telematics in Europe.

#### ATX Technologies
The company pioneered in-vehicle telematics services in 1996 with the launch of the Lincoln RESCU system in partnership with Motorola. ATX quickly added more automakers to its customer base - Nissan unveiled telematics services with Infiniti Communicator in 1998, Mercedes started providing TeleAid services in 1999 and Jaguar started Assist in May 1999, all provided by ATX Technologies. ATX serves nearly 300,000 subscribers through its customers’ brands.

#### Honda
Honda plans to leverage OnStar’s infrastructure in the US for the first three years. OnStar will be available in the US in Honda’s 2002 Acura RL luxury sedan. Honda (HMC) and OnStar also announced that they will team with XM Satellite Radio (XMSR) to jointly develop telematics and data applications. Separately, Honda is negotiating with XM Satellite to provide digital satellite radio service to Honda and Acura customers in the U.S.

#### Toyota
Toyota follows suit adopting a “wait and watch” stance in the US market. Delphi Automotive Systems [DPH] integrates complete telematics systems for Toyota’s [TM] Lexus division, supplying the Lexus LS 430 luxury sedan. Lexus uses the call centers of General Motors’ [GM] OnStar division. Among the services provided automatic crash notification, involving GPS location. Although Lexus will use OnStar call centers, it has designed the in-car hardware, and offers additional services, as well.

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On the final question of “when to compete” (Figure 16), we believe shapers must have a strong presence in the large markets now. It is this aspect of shaping that exposes the firm to great risk. Given the lead time and upfront investment (in the form of call center costs and hardware subsidies), shapers are forced to make a bigger bet. Some might argue that a “probe and learn” strategy is the right course of action. We agree with the principle that growth businesses should be built through incremental steps. But we think that shaping telematics requires a bolder form of probe and learn. The danger of moving too slowly is losing the chance to shape; while the obvious danger of moving too fast is risky investment. In the end, shapers will have to probe and learn at a faster pace than they may be comfortable with, in order to preserve the
Figure 15
How – In-Vehicle Hardware Options

<table>
<thead>
<tr>
<th>Options</th>
<th>Product offering</th>
<th>Advantages</th>
<th>Challenges</th>
<th>Value</th>
<th>Feasibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stand-alone</td>
<td>• Basic, car-centric telematics (maint., S&amp;S) - Built-in emergency phone - Remote link to engine, airbags, doors</td>
<td>• Close to core competency - Clear ownership of car-centric revenues - Low cost</td>
<td>• Limited market</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light complement</td>
<td>• Remote link to engine, airbags, doors - CE/vehicle interface plus microphones &amp; speakers - Portable phone</td>
<td>• Ergonomics - Wide appeal to all customers with existing devices</td>
<td>• How to capture revenues? - How to ensure safety/security without built-in phone</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heavy complement</td>
<td>• Light complement plus: - integrated video display(s) - In-vehicle cell phone</td>
<td>• Ergonomics - Ability to pursue potentially lucrative niche</td>
<td>• Higher cost</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Competitive</td>
<td>• Full telematics - Heavy complement without - CE/vehicle interface</td>
<td>• Full functionality on-board - Strong claim to revenue streams</td>
<td>• May lose customers due to upgrade difficulties and duplicate services</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Most feasible position for OEM ordinary solution providers

option of defining the industry. If things work out well, shapers will reap big rewards, but, if not, they could experience huge failure.

Regardless of strategic choice, operational excellence can provide a buffer against some uncertainty – by lowering the break-even levels. The main area of focus for a solution provider should be in call-center operations.

As a caveat, we do not recommend shaping for everyone. Rather, we have used the previous example to illustrate our approach to the strategic issues facing telematics. At the end of the day, a prudent strategy combines a strong knowledge of potential outcomes, a deep understanding of organization and aspiration, and thoughtful strategic choices.

Risks and Alternative Outcomes
There are clearly risks involved in telematics. In addition to the “killer uncertainties” described previously, there is a set of uncertainties driven by the actions of industry participants. While the list of possibilities is endless, we see the following as the most possible.

Poor pricing decisions could destroy margins. Given the nature of the cost structure – high fixed cost and variable revenues – firms have incentives to lower service prices to the point of just covering variable costs. While volume might increase, margins could be reduced and value destroyed. Last year, profits of the Big Three automakers fell despite record sales volume. The main reason for the drop in profitability was the record incentive levels. Unfortunately, the volume was insufficient to offset the lower margins from incentives.

Even with rational pricing decisions, up-front equipment subsidies might limit profitability. Subsidies are a popular lever to encourage customers to adopt telematics. In the US, GM’s OnStar service is standard equipment in many GM vehicles, with one year of service included. While GM does not disclose whether the price of hardware is included in the price of the vehicle, most industry observers and analysts believe that GM is subsidizing several hundred dollars per vehicle. While this surely drives penetration, we wonder if customers will become conditioned to expect a subsidy. Based on our analysis, hardware subsidies are the single biggest cost driver for the solution provider, and reducing or eliminating such subsidies can greatly improve profitability. In the US cellular market, we still find hardware subsidies, although cellphone penetration is in excess of 50% and
considered a “must-have” accessory by millions. We wonder if profits might be higher if the industry had made a conscious choice to reduce or eliminate hardware subsidies. In telematics, the emerging Japanese model is one where customers pay for upfront equipment, and are reluctant to pay for services on an ongoing basis.

Another risk is that a non-automotive player might take control of the value delivery system. We have discussed strategy from the point-of-view of an automotive company looking to shape the industry as a solution provider. But players from other segments of the value delivery system might get there first. Automotive players have a strong knowledge of the vehicle engineering issues, but others might be more skilled in critical areas such as customer management. From our point of view, existing organizations, such as the American Automobile Association (AAA) might be well positioned to establish themselves as solution providers. AAA currently has 44 million customers, significant call center capability, and no affiliation with one particular OEM. These factors combined together make it well positioned to play a shaping role in telematics.

Dealers may not fully support telematics – as telematics services expand to provide more services remotely, the need for dealer service may diminish. Additionally, as a CRM opportunity, telematics may provide OEMs with a direct relationship to the customer. While we are not suggesting that dealers will cease to exist because of telematics, we do believe that telematics will increase tension between OEM and dealer.

Finally, the industry might unbundle – currently, hardware installation and service provision are bundled together. We believe this is a vertical integration decision, and that the firm bearing the cost, and risk, of hardware subsidies would logically want to lay claim to the rewards, namely contact with the customer and the ensuing revenues. Key to unbundling the industry is a means by which each sliver of the value delivery system could “connect” to as much or as little of the system as desired. The main enabler of such a scenario is a common standard. However, the approach to standards is a significant question that could shift the basis of competition in the industry (see box, “Closed or Open Standards?”).

**Conclusion**

While some hold out telematics as a way to provide the automotive industry with significant growth, profits and increased market capitalization, the reality is less clear. While the rewards may be great, so too is the uncertainty. The possibility of enormous profits must be balanced against the possibility of spectacular failure, as no one can predict key drivers of the future. Given the uncertain outcome, there is no clear path to winning, and the decision on which path to choose depends on aspiration and risk/reward appetite. While

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**Figure 16**

*When – In-Vehicle Hardware Options*

<table>
<thead>
<tr>
<th>Market maturity*</th>
<th>Market potential (revenue)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>High</td>
<td>High</td>
</tr>
</tbody>
</table>

- **Communications**
- **Safety/security**
- **Maintenance**
- **Entertainment**
- **Regulation**
- **Driving**
- **High bandwidth**
- **Low bandwidth**

*Expected for Shaper

- To remain consistent with the shaping posture, shapers should focus service offerings on large markets

*Relative to other telematics services; based on amount of time a product category has been in the market and how established demand is for the category.
Closed or Open Standards?

There are two approaches to standards, open and closed.

A closed standard is proprietary to each solution provider. The benefits of a closed standard are the tight linkage between vehicle and telematics, and a strong claim to revenues from the standard setter. The downside of a closed standard, is that suppliers must develop components to multiple standards, which dilutes efforts, and reduces the advantages of scale. Under a closed standard scenario, unbundling would be unlikely.

Open standards describe a situation where the interfaces to the standard are widely available. These can be either proprietary or non-proprietary. An analogy is Microsoft Windows: this is an open standard in the sense that the application programming interface (API) is publicly available, but proprietary in that Microsoft owns the code, controls changes to the code, and charges to use its software.

The benefit of an open, proprietary standard is that it represents a revenue opportunity for the standard setter, who can charge a fee for access to the standard. However, the challenge is the tension between driving adoption and capturing revenues from the standard – users of the standard might be unlikely to adopt a standard that is promoted by a competitor. This is especially relevant to OEMs as they try to develop industry standard architecture. In our experience, we have found one example of an incumbent imposing a standard on competitors, namely American Airlines’ SABRE reservation system. In most cases, a supplier imposes a standard on the OEMs.

The major benefit of open, non-proprietary standard is adoption. With no-one benefiting disproportionately from the standard, the barriers to adoption are lowered. However, there are two main costs to such an approach. The first is time. Looking to other examples of standard setting, it takes a long time for multiple players to agree on standards. As an example, the GSM standard for mobile telephony in Europe took 11 years from start to implementation. The second cost is lowering the barriers to imitation. Looking again to GSM, the development and public disclosure of the standard allowed new entrants into the market. Applying this lesson to telematics, we could see open standards leading to a future where Toyota or Sony might be installing telematics software on GM and Ford vehicles.

We believe that open standards would help the industry grow faster, and might lead to unbundling. However, we would counsel players to be thoughtful about the decision, as it has profound implications on the competitive landscape.

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