# Business Models for ITS services

**Sander Smit**
Business Consultant, Logica
P.O. Box 159, 1180 AD Amstelveen, the Netherlands
+31(0)20 503 3000, sander.smit@logica.com

**Frank Berkers**
Senior Consultant, TNO
Brassersplein 2, 2612 CT, Delft, the Netherlands
+31(0)31 6 10968793, frank.berkers@tno.nl

## ABSTRACT

Mobility brings forward a sense of freedom and is an important economic driver, but it also brings forward safety and environmental issues, lost time and uncertainty. Intelligent Traffic Systems (ITS) promises to help tackle these issues.

In this paper we analyse this market in order to define a market engagement strategy for successfully deploying an open ITS platform. As ITS services will be provided by both public and private parties, we analysed both public and commercial perspectives by employing Value Network Analysis and Business Modelling techniques. In Value Network Analysis we describe the relevant parties in a business ecosystem and their interrelations. Business Modelling helps us to understand how key resources and activities make for value propositions brought to customers and how different stakeholders are impacted businesswise.

After long-listing possible ITS services we narrowed down to a shortlist by strategic fit with the open ITS platform, which was consecutively categorized into the segments B2B, B2G and B2C. After estimating the profitability and time-to-market for all shortlisted services we observed that the bulk of services that serve public values will probably be launched in a second wave, after a number of commercial services. Since, according to our estimations, these first wave services are sufficiently profitable and make returns – the risk of independent (non-interoperable) development of so called ‘stovepipes’ is apparent. The consequence is that the services serving public value face a fait accompli and cannot build on the services of the first wave, delaying and increasing the cost of mobility. Moreover stove-piped development squanders the opportunity of sharing cost and unlocking future options. This brings forward the requirement that open interoperable ITS platforms need to be open to the requirements of the second wave services. This requirement needs to be enforced early on.

We furthermore conclude that application of business modelling techniques is powerful in analysing this arena of public and private interest.

### Categories and Subject Descriptors

Topic: From cooperative systems to integrated mobility services

Subtopic: Current status, roadmap, trends and vision

Keywords: Intelligent Transport Systems, ITS services, business models, market strategy, OBU, RSU

# Introduction

The promise of Intelligent Traffic Systems (ITS) is that it provides an answer for today's mobility, safety and environmental issues while enabling sustainable business. Economic growth has driven the demand for mobility and mobility is also considered an important enabler of economic growth. As a result, today's road infrastructure is congesting, air- and noise-pollution levels in traffic dense areas are increasing and the number of injuries and damages caused by traffic is growing. The deployment of an ubiquitous information infrastructure enables new ITS services but stove-piped single solutions hamper the further uptake and realisation of promises of ITS. Therefore, public and private organizations are looking for ways to introduce ITS to a larger audience.

Future ITS services require cars, road-side units (RSUs) and back-office systems (BOs) to communicate with each other. Individual cars and RSUs can inform each other about conditions on the trajectory ahead while aggregated traffic data can be used for optimizing traffic flows. Today's infrastructure does not support these functionalities therefore a new infrastructure needs to be developed and deployed. This new infrastructure spans multiple technology and business domains which today are separated and often make use of non-interoperable technologies. Therefore, interoperability is considered key for the next phase of effects. Interoperability does not only ensure proper reuse of existing technology and allows for gradual replacement of underlying components (and thus allowing gradual but certain improvements), but it also unlocks functionalities not earlier available (e.g. one driver that has to heavily brake affects navigation of cars much further down the road). The necessary investments in systems and hardware prevent (potential) ITS service providers to develop and deploy new services and consequently slows down the adaptation rate of ITS. Bear in mind that some services provide effects that grow with each additional user (such as fuel-efficient engines), while other services require a critical mass to generate effect (such as cooperative mobility).Other services generate effects and value to others who cannot be charged, hampering returns on investment. Besides the right technology it is also important to align the developments in ITS by designing shared roadmaps and collaborative business models and coordination of activities between public and private organizations.

This paper addresses the question how the public and private sector can cooperate best to get the most benefit out of ITS, now and in the future. First, the approach used to identify common public and private interests is explained. A market engagement strategy for an open ITS platform is presented, providing recommendations for governments about services to stimulate or regulate. A description of the driving forces in the market is provided to demonstrate how this strategy affects the various business domains. Finally, two examples of new business models for ITS services are described.

# Approach

To get an idea about the kind of services the SPITS platform could support, a long list with seventy possible services has been prepared. Input for this list has been taken from various sources such as market reports, interviews with industry partners and reports from research projects like CVIS. A set of selection criteria has been defined to rank the services on business potential and fit with the SPITS objectives. The top thirty services, the so called shortlist, have been sorted over the business domains Business to Business, Business to Consumer and Business to Government representing the various target customer groups (see Figure 3 - Shortlist ITS services), and timeline, representing earliest possible market introduction (see Figure 1 - ITS services sorted on profitability). For each shortlisted service, a high level business case has been prepared, indicating addressable market and profitability based on revenues and required investments (capex and opex). A select number of more detailed business modelling analyses have been developed for services with a high potential, be it commercially or in public value. Two of these services, "Insure How You Drive" and "Cooperative Mobility", are presented later in this paper. These business cases included business model and value web analyses as well as a quantified costs and benefits overview and cash flow forecast based on available market reports and expert estimations. Visualization of the business models and value webs helped in communicating and discussing the concepts with other people. Based on the services roadmap, market drivers have been identified and similarities between public and private services have been investigated. Finally, mechanisms to speed up the penetration rate have been identified. This has resulted in a market engagement strategy that guides business in the selection of new profitable services and governments in the identification of service domains most beneficial for stimulation and regulation.

# Market engagement strategy

Driven by the megatrend of constantly available and affordable connectivity, the ITS market is gaining momentum. Interconnected sensor networks enable tracking and tracing of individual vehicles and traffic flows and connected cars enable real-time communication and

interventions in traffic. The promise of ITS is that it will enable a new generation of connected-car services and will contribute to the improvement of the safety, mobility and environmental footprint of the European traffic by addressing public and private values.

Before ITS reaches its full potential, major investments in the underlying infrastructure are required. Cars need to be equipped with On-Board-Units (OBUs), roads need to become "smart" by implementing sensor networks and installing RSUs, all connected with the OBUs and talking through BOs that are capable of processing large amounts of traffic related data. Note that not each service will require all of this IT infrastructure. However the complete set of ITS services would. Therefore this infrastructure is considered a platform.

Goal of the SPITS market engagement strategy is to increase the penetration rate of commercial and public ITS services using interoperable ITS platforms in order to keep the market entry barrier for ITS service providers delivering new ITS services as low as possible. The strategy especially considers the role of governments as directors of this development and safeguards of public interest.

Today, the total number of passenger cars in use in Europe is approximately 220 million and around 33 million commercial freight vehicles (vans & trucks) has to be added to this number. 30% Of the passenger cars is older than 10 years. Without other stimulation measures, it takes over 20 years before the European car fleet is replaced and all cars support ITS assuming that adequate systems are pre-installed in new vehicles. Regulating the introduction of OBUs in new cars ensures compatibility between the various parts of the infrastructure. The same measure applies for the introduction of new road side infrastructure. Ensuring compatibility through regulation enables the growth of a pan-European ITS infrastructure.

To speed up the penetration rate, aftermarket solutions can be used to roll-out OBUs in existing cars. Only a limited number of commercial ITS services can carry the investments for the necessary ITS infrastructure, without losing profitability. One can expect that these services can and will be developed independent of government stimulation or regulation and consequently run the risk of becoming 'stove-piped' (i.e. not interoperable) (see Figure 1 - ITS services sorted on profitability). Examples of such services are telematics-based car insurances and fleet management systems. Aligning the development of these services will increase the penetration rate of ITS systems and result in a market with multiple interoperable competing platforms and lowers barriers for future introduction of new services (as the platform already is available). Governments can direct the development of this part of the market with regulation with respect to adherence of existing industry standards, especially for the future applications of the 2nd wave.

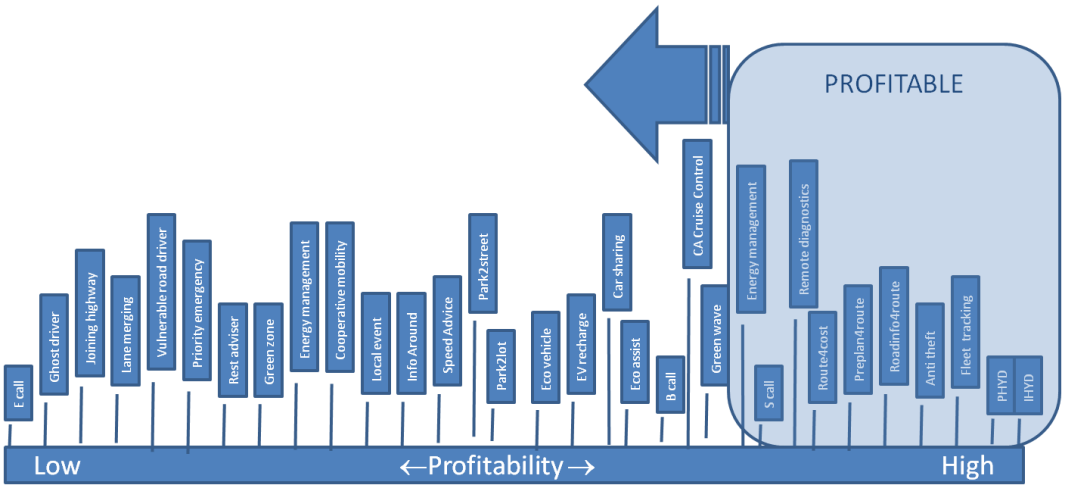


**Figure 1 - ITS services sorted on profitability**

A larger number of commercial ITS services is, despite their public value, probably not capable of earning back the capital investments required for new infrastructure, independently. Possible strategies for getting these services to the market are

1) Stimulating an open ITS infrastructure as early as possible
2) Stimulating uptake of wave 1 services to get enough coverage (and exploit 2nd wave public value services at marginal cost)
3) Ensure interoperability with the public value services
4) Investigate bundling with more beneficial services
5) Stimulate if the service patently contributes to societal benefits.
6) Investigate in innovation of business models to deliver both public and private value to specific stakeholders, e.g. insurance companies, fleet management, municipalities

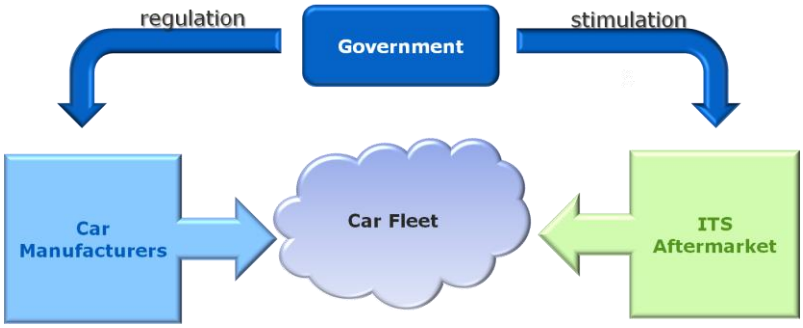


**Figure 2 - Governmental tools for guiding the ITS market**

This strategy of regulation and stimulation ensures compatibility between ITS platforms that have the capability of bringing ITS to mass market and shortens the time to reach mass

market by lowering the market entry barrier. Governments can reach societal benefits by making optimal use of developments and investments from private companies.

# Markets and drivers

ITS affects a broad range of markets, all more or less related to mobility, transport or automotive. The ITS market can be divided in three business domains, being Business to Consumer (B2C), Business to Business (B2B) and Business to Government (B2G). Each business domain has its own characteristics and drivers and can benefit from an ITS platform in a different way. The next paragraphs describe the three business domains briefly.

## Business to Consumer

The B2C market is focussed on short ROI and payback times (driving independent stove-piped development) and provides a broad range of services like personal navigation, insurance, entertainment or traffic information to their customers, the end-users. Where initially these services were only offered through aftermarket channels, nowadays many car manufacturers are equipping their cars with infotainment systems that have the capability to offer the same functionality. As a result, hardware oriented companies will transform to service oriented companies. Carriers for rolling out ITS infrastructure are entertainment services, personal navigation and telematics-based insurances.

Today, 30% of the cars in Western Europe are equipped with some kind of navigation system, PND, smartphone or in-car. While over 95% of the car owners has a car insurance (by law), telematics- based insurance is still an emerging market, which has the potential to reach mass market. The “Insure How You Drive” service described in this paper exemplifies how such a service could look like. Every new car is equipped with some kind of entertainment system ranging from audio only systems to multimedia systems featuring mobile TV and Internet connectivity.

## Business to Business

Roughly, the B2B market can be divided into Tier 1 suppliers who deliver hardware and systems to car manufacturers and aftermarket solution providers who deliver products and services to professional end-users and businesses (delivering to private end-users or Governments). Tier 1 telematics providers deliver systems that support navigation, track & trace and reporting functionalities and can be integrated with third party fleet management software. Their target customer group are the truck manufacturers. A second category of tier 1 suppliers relevant for ITS are the suppliers of in-car entertainment systems for passenger cars.

## Business to Government

In the B2G domain, non-financial drivers play an important role, especially mobility, safety and environment. A society's need for mobility requires, amongst good public transport, a sound road infrastructure for a reasonable price. Today, there is no direct link between the people and parties who pay the price for mobility in terms of environment and safety, and the degree of usage by people and parties who receive both positive and negative benefits. One can speak of collective property. Customer segments in this domain are road operators and local authorities who have a need for systems that monitor and manage traffic flows in order to guarantee mobility in a certain area. Systems can range from traffic information systems which inform drivers about traffic conditions or incidents, to road tolling systems for toll collection and traffic light systems for an optimal traffic flow. Cooperative systems are being introduced to improve traffic flows and the distribution of traffic information even further but they require a certain critical mass before effects become visible**.** Note that although classified under B2G benefits can be focussed on specific actors, such as fleet owners. This may be an opportunity for involving specific beneficiaries in realizing the service.

# ITS SERVICES

Based on market potential and SPITS strategic fit, a selection of services has been made (see Figure 3). The services have been categorized according to key benefit and distributed in time according to their expected market introduction. Some services require legal changes or infrastructural development before they can be deployed successfully and consequently are scheduled further in the future ($2^{nd}$ and $3^{rd}$ wave).

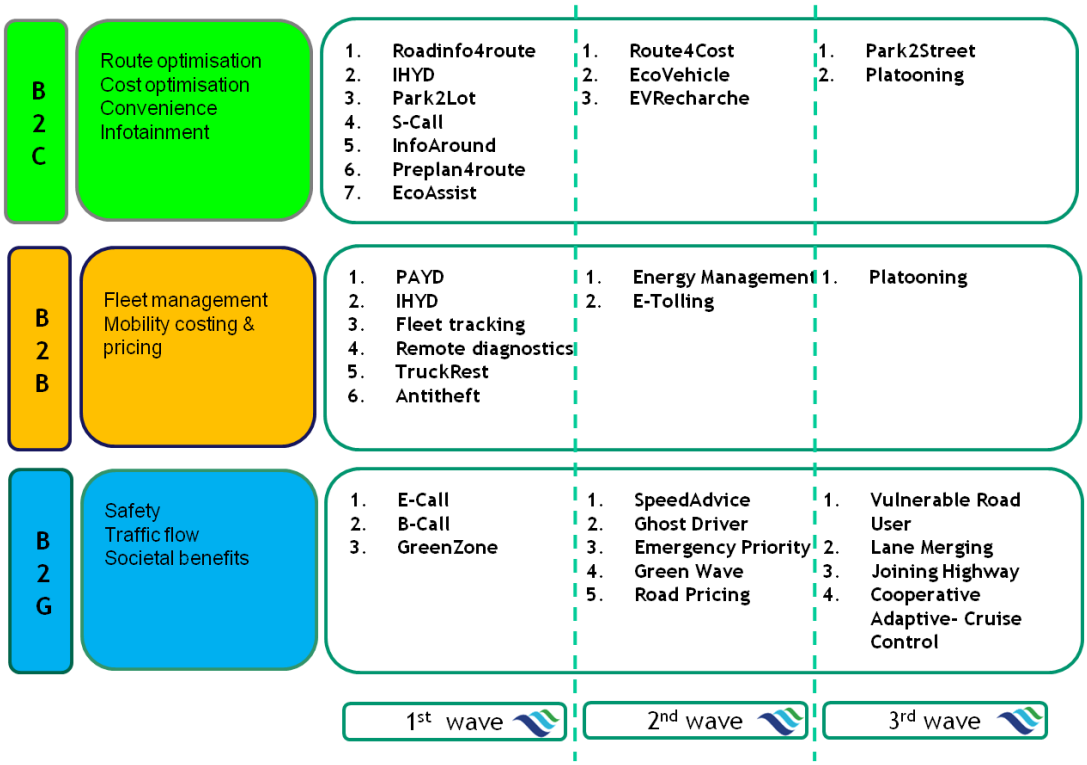


**Figure 3 - Shortlist ITS services**

In general, services in the B2G domain are not financially profitable but some commercial services contribute to public interest as well.

| Public value | Contributing Services |
|---|---|
| Mobility | IHYD, Platooning, S-Call, Smart Routes |
| Safety | B-Call, IHYD, S-Call, Smart Parking |
| Environment | EcoAssist, EcoVehicle, IHYD, Smart Routes |

**Table 1 - Mapping of commercial services on public interests**

The contribution of commercial ITS services to public values is described in more detail in the SPITS documentation. The next paragraphs shows two examples of ITS services.

## Insure How You Drive

An example of a service that can benefit from SPITS is the "Insure How You Drive"-car insurance (IHYD). Historically, car insurances are offered on an "all you can drive base". Premiums are based on age, car type and accident history and as a result, low risk drivers subsidize high risk drivers. Although this collective approach is the basis for many insurances, an essential difference with for instance health issues is that risky behavior in traffic can now, enabled by ICT, be measured and thus accounted for.

With an "Insure How You Drive" car insurance, the car owner is rewarded for safe driving

behavior through an insurance discount. The insurance benefit is defined on the basis of the actual route driven (linked with actuarial statistics on particular road accident probabilities), the actual circumstances and the actual driving behavior during the trip. Figure 4 visualizes the concept of IHYD in a business model canvas.

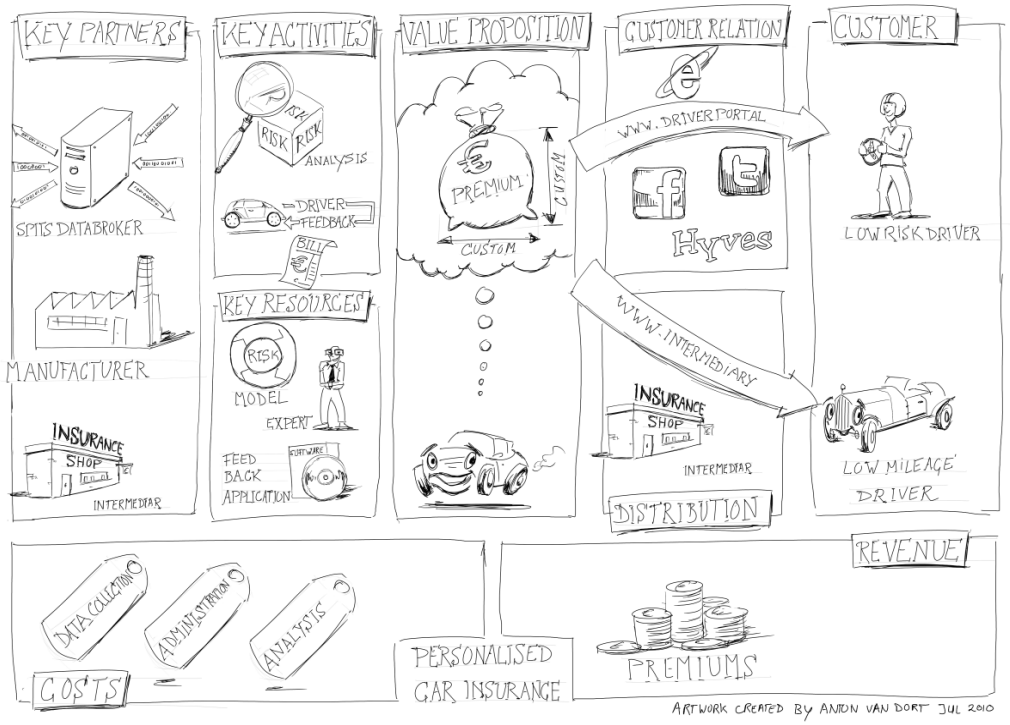


**Figure 4 - IHYD business model**

The business model canvas displays key building blocks of a service; the service (or value proposition) is delivered via distribution channels to customers in segments. Sales of the services generate revenue. A service is created by activities performed with esources and in collaboration with partners and suppliers. Activities, resources and partners represent the cost structure. This business model revolves around differences in actual driving behaviour. The key asset in this business model is the ability to infer whether the driver's behaviour actually avoids damage and claims.

The most important stakeholders for IHYD are shown in Figure 5, representing the value web.

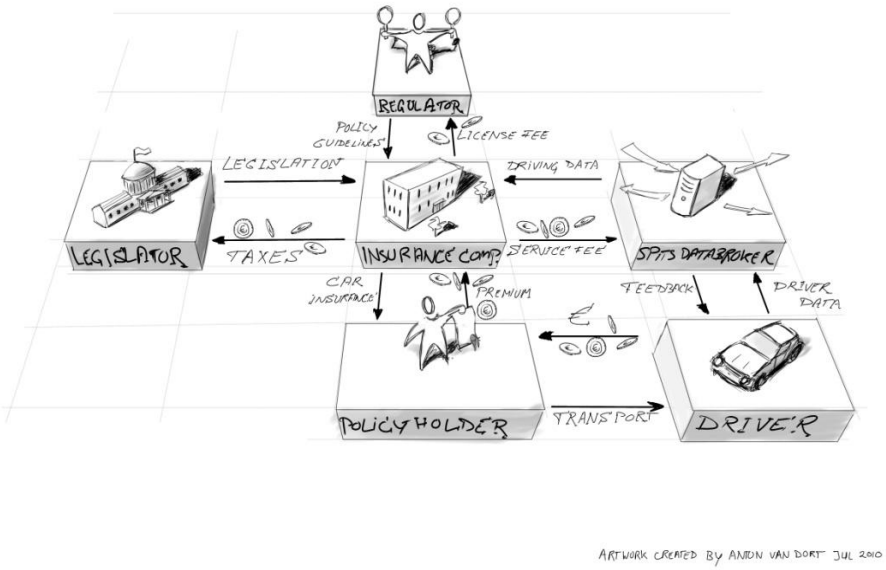


**Figure 5 - IHYD value web**

This value web describes the key players for the car-insurance business ecosystem. It clearly shows that the insurance company – car owner relation is essentially bilateral. However there are multiple stakes involved in designing the IHYD service well; for example a large consultancy firms that lease cars for their employees have a cost reduction stake, while the employees may have privacy stakes on their travelling behavior.

The new business model requires the introduction of a new business entity, the ITS Data-broker. Key responsibility of the Data-broker is the secure exchange of (personal) in-car data and driver feedback information between insurance companies and drivers. An example of such a data broker is UK-based Wunelli who provides telematic solutions to multiple insurers since 2009. Studies show that customers with a Pay Per Mile car insurance reduce their mileage between 8% and 20% and save up to 25% on their premium. Based on these figures, calculations show that IHYD based car insurance can be deployed profitable with a pay-back time of 2 years.

## Cooperative Mobility

An example of how a government could improve mobility is by introducing Cooperative Mobility concepts. Cooperative Mobility is aimed at increasing road safety and efficiency, and reducing the environmental impact of road transport, while ensuring a good level of mobility. Cooperative Mobility is supported by innovative technology solutions that enable vehicles to communicate and cooperate directly with the roadside infrastructure and with other vehicles.

The concept of Cooperative Mobility enables road users to effectively anticipate on the actual situation on the road by exchanging information on the condition of the road and traffic and on the behavior of other road users, for example information on: speed limits, road signs, actual local weather, distance and speed of near-by vehicles. Cooperative Mobility is not a single service but a class or 'package' of measures that jointly produce the results described. This package will not be released at once and penetration may not be sufficient immediately. Therefore the infrastructure needs to be adapted. Initially, when a lower number of cars is enabled with car to car communication, a larger number of RSUs will be required, whereas later on less RSUs are needed for enabling car to car communication, since a higher penetration in cars will be reached.

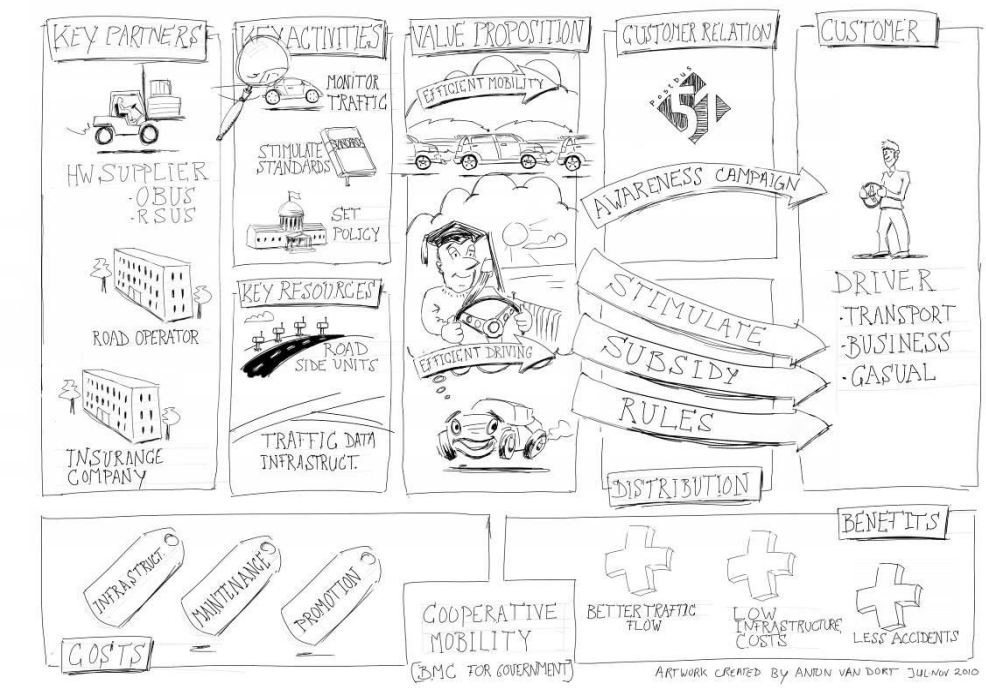


**Figure 6 - Business model Cooperative Mobility**

This business model poses efficient mobility as a service from government to driver. It shows a number of benefits that do not generate cash to the government. These benefits may however imply huge cost savings to specific actors; think of productivity increases by losing less time due to traffic jams or recovery from accidents, cost savings on damage repairs. The value proposition of Cooperative Mobility is based on the societal effects of increasing road safety and efficiency, and reducing the environmental impact of road traffic. Furthermore, the more efficient use of existing infrastructure can result in a lower need for new infrastructure (we have observed new roads may cost around 6 Meuro per km). Specific drivers and other road users will benefit from efficient mobility and driving resulting in a smoother traffic flow and less accidents. Effects like these will however need to be proven. Recently the SPITS

project has performed a Field Operational Test on shockwave damping technology. The value web of Cooperative Mobility services is shown in Figure 7.

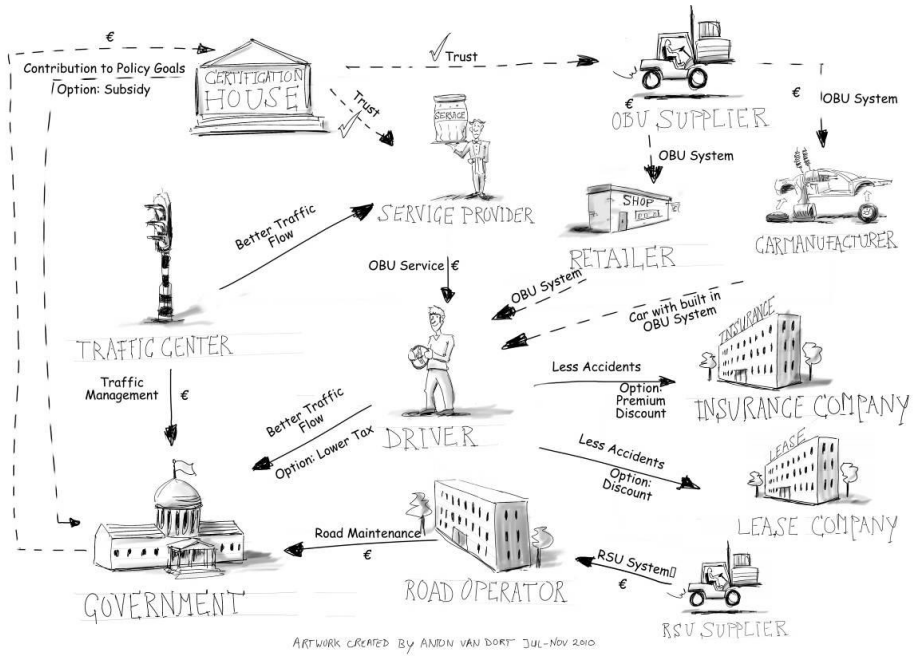


**Figure 7 - Value web Cooperative Mobility**

In this value web the role of certification house appears as a new role. This role is responsible, in name of the government, to certify service providers' material and operation to establish public value. Since this class ITS services may intervene in driver's behavior, liabilities need to be arranged as well. This role is played by the certification house.

# Conclusion

ITS services have a strong potential to contribute to solving some of society's problems with mobility. Services in the ITS market produce both public and private values and will be provided by both public and private parties. We analysed the ITS market using Value Network Modelling and Business Modelling techniques. Our estimations on the order in which services will be launched reveals that the realisation of services providing public value are under pressure as a result of the risk of 'stove-piped' service development. This can be overcome by stimulation of an open platform that supports the first wave services while interoperability with the services providing public value that come in the 2nd wave must be ensured.

Rather than defining a single business model, service platforms as developed in SPITS support a set of coexisting and cooperative models that fulfil the business requirements of particular partners. The business models vary from closed to open models, and with different actors in the lead, i.e. OEM, road-operator or service centric models. Governments can realize a pan-European ITS infrastructure by stimulating and regulating the right developments in the

ITS domain.

## Acknowledgments

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