

**Institute of Actuaries of India**  
**4th Capacity Building Seminar in General Insurance**  
**Session on Telematics**

**Ankur Agrawal**

Vice President, Actuarial Services

Email Address: [Ankur.Agrawal@axa-abs.co.in](mailto:Ankur.Agrawal@axa-abs.co.in)

**Vipul Goel**

Manager, Actuarial Services

Email Address: [Vipul.Goel@axa-abs.co.in](mailto:Vipul.Goel@axa-abs.co.in)



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# A. Introduction

## Background

- Behavioral information in the pricing and underwriting of risks is key for motor pricing
- Traditional 'class' variables are only a proxy for driving behavior – capturing driving statistics provides a more direct link to risk
- Early attempts at capturing driver behavior
  - No-Claims bonus
  - Prior Claims history
  - Distance driven (popular in last few years)
- Moving towards Pay-How-You-Drive policies (PHYD)

## What is Telematics

- Motor Telematics is the integrated use of telecommunications and information technology for vehicles. It is widely used for providing services such as real-time navigation, roadside assistance, vehicle tracking and recently, motor insurance

**Insurance telematics is the use of telematics by motor insurers with an objective to have better segmentation of customers and pricing to reflect to the actual risk for a customer**

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# B.1. Telematics Products (1/2)

## Main Products

### Pay As You Drive

- Pay as You Drive (PAYD) product is a usage based product in which premium depends on how much vehicle is driven over a specified period
- This products defines the consumer behavior by rewarding consumer for lower level driving e.g.: difference between a normal driver/ salesman, multiple cars owned by a customer may lead to lower usage for secondary car etc.
- In some products area, time of day in which vehicle is driven etc. are also considered for calculation of premium.

### Pay How You Drive

- Pay How You Drive (PHYD) product is a user behavior based product in which premium depends on how safely a vehicle is driven.
- Driving Behavior is qualified as 'Driving Score' which is defined in terms of speed, road used, time of driving, braking, cornering etc.
- Driving Score influences final premium charged which may be revised regularly at pre-determined intervals

## Initial discount is usually offered in two ways for PHYD customers

### Joining Discount

- A fixed joining discount may be offered to the customers for taking PHYD product; to account for self-selection as customers opting for this product are comfortable in getting their driving behavior monitored

### Try Before You Buy Discount

- Try Before You Buy allows insured to know their driving behavior before opting for the insurance coverage. Vehicle to be driven for specific distance (~200 miles); Initial discount as per driving behavior

## B.2. Telematics Products (2/2)

### *Value Added Services*

- **Stolen Vehicle Recovery**

Telematics system tracks the vehicle continuously which helps in recovery of the stolen vehicle; This also helps in reducing the claim cost for insurance company

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- **Fleet Management**

Fleet management includes the management of motor vehicles such as cars, vans and trucks of a company. It can include a range, such as vehicle maintenance, vehicle tracking and diagnostics, driver management, fuel management, health & safety management etc.

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- **Crash related**

In case of crash or accident, telematics enables insurers and car makers to assist insured with significant time saving by automated calls and messaging to emergency support and later, optimization of claims processes

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- **Teen Driver Monitoring**

Parents may install telematics devices in vehicle of their children, which can help them track the location and driving behavior of the children

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## B.3. Telematics Technologies

### Black Box Solutions

- Hard-wired devices installed in vehicles by professional installers. Mostly used in Europe for all segments and US for Commercial Lines
- This is a costly solution because of the device cost (~\$150); however, cost is reducing over the period
- Customers fear their manufacturer warranties may get impacted
- 'Insure the Box' is an example which is popular in the UK

### On Board Diagnostics Dongles

- Customer self-install devices via on-board diagnostic port (OBD) with other types of 'light' or self-install devices imminent. Mainly used by customers in Personal Line segment in the US market
- There are chances of fraud; customers not recording all their journeys
- First solution used for Telematics by Progressive in US market in 1998

### Original Equipment Manufacturers







- Device installed in the vehicle at the time of Manufacturing which records driving and car information
- Insurance companies may have tie-ups with car manufacturers
- Least chances of fraud as devices are fitted within the cars; may provide additional services like infotainment as well
- Car Manufacturers have already started working on this proposition. E.g. GM, Toyota

### Smart Phone

- Smartphone app/link providing connectivity to data streamed directly from vehicle
- Current use is limited to few insurers
- New technology which provides regular interaction/ feedback with driver and hence, provide more touch points with customers
- Data may not be reliable as there are more chances of fraud
- There can also be low battery and network connectivity issues



## B.4. Telematics Product Examples

Product Feature						
<b>Product Name</b>	<b>Drive Save</b>	<b>Aviva Drive</b>	<b>Snapshot</b>	<b>OnStar/InDrive/SYN C</b>	<b>Clear Box</b>	<b>Drive Safe</b>
<b>Geography</b>	Ireland	UK	US	US	Italy	UK
<b>Driving Score Range</b>	1 - 100	0 – 10 (10 safest)	Not Mentioned	Not Mentioned	Not Mentioned	0 - 100
<b>Driving Parameters</b>	Geographic position, travelling speed, acceleration and braking severity	Acceleration, Braking and Cornering	Braking, Miles driven, driving between midnight to 4AM,	Miles driven, driving characteristics	Miles driven	Time of day, Speeding, Cornering speed , Braking, Acceleration
<b>Technology</b>	<b>Smart Phone</b>	<b>Smart Phone</b>	<b>OBD II Dongle</b>	<b>Black Box</b>	<b>Black Box</b>	<b>Black Box</b>
<b>Maximum Discount</b>	Upto 30%	10% for premium b/w GBP 200 - 400; 20% for premium > GBP 400	Information not available	Upto 50%	Upto 18% of TP and upto 15% on Comprehensive	Not Mentioned
<b>Real Time Location Access</b>	Yes	No	No	Yes	Yes	Yes
<b>Any Loading due to low Driving Score</b>	No	No	No	No; could be basis miles driven(at renewal)	Not mentioned	Yes
<b>Premium Change interval</b>	4 months	No Information	6 months	6 months	No Information	3 months
<b>GPS Signal Required</b>	Yes	Yes	No	Yes	Yes	Yes

Source: <http://www.aviva.co.uk/drive/>  
<http://www.progressive.com/auto/snapshot-common-questions/>  
<http://www.theaa.com/insurance/telematic-insurance.html>

<https://www.statefarm.com/insurance/auto/discounts/drive-safe-save>  
<http://www.generali.it>  
<http://www.axa.ie/faq/axa-drivesave-faq/>

# B.5. Telematics in Different Geographies (1/2)

	USA	UK	Europe ex. UK	Asia
<b>Some Key Players</b>	<ul style="list-style-type: none"> <li>Progressive, Allstate, Farmers, State Farm, Liberty Mutual</li> </ul>	<ul style="list-style-type: none"> <li>Insure the Box, AA, Cover Box, Ingenie, Direct Line, Aviva</li> </ul>	<ul style="list-style-type: none"> <li>AXA, Allianz, Uniq, Unipol, Generali, MAIF, Groupama</li> </ul>	<ul style="list-style-type: none"> <li>Nascent Stage</li> </ul>
<b>Product Type</b>	<ul style="list-style-type: none"> <li>PAYD and PHYD</li> </ul>	<ul style="list-style-type: none"> <li>PAYD and PHYD</li> </ul>	<ul style="list-style-type: none"> <li>PAYD, limited PHYD</li> </ul>	<ul style="list-style-type: none"> <li>PAYD</li> </ul>
<b>Popular Technology Solutions</b>	<ul style="list-style-type: none"> <li>Black Box, OBD</li> </ul>	<ul style="list-style-type: none"> <li>BlackBox, Mobile App</li> </ul>	<ul style="list-style-type: none"> <li>Black Box Solutions</li> </ul>	<ul style="list-style-type: none"> <li>Black Box Solutions</li> </ul>
<b>Current Market Share<sup>1,2</sup></b>	<ul style="list-style-type: none"> <li>~ 1%</li> </ul>	<ul style="list-style-type: none"> <li>~ 1%</li> </ul>	<ul style="list-style-type: none"> <li>~1%</li> </ul>	<ul style="list-style-type: none"> <li>Very Nascent Stage</li> </ul>
<b>Estimated Market Share by 2020<sup>1,2</sup></b>	<ul style="list-style-type: none"> <li>~17.5%</li> </ul>	<ul style="list-style-type: none"> <li>~ 40%</li> </ul>	<ul style="list-style-type: none"> <li>~14%</li> <li>(Italy ~ 35%, France ~ 27%, Germany ~ 21%)</li> </ul>	<ul style="list-style-type: none"> <li>~ 4.5%</li> </ul>
<b>Distribution Channel</b>	<ul style="list-style-type: none"> <li>Direct and Agency</li> </ul>	<ul style="list-style-type: none"> <li>Direct / Broker/ Aggregators</li> </ul>	<ul style="list-style-type: none"> <li>Direct/Agents/Brokers</li> </ul>	<ul style="list-style-type: none"> <li>Direct/Agents</li> </ul>

1. <http://www.ptolemus.com/content/uploads/2013/11/PR-3-Press.pdf> ( for Telematics market by 2020)

2. <http://www.ptolemus.com/content/uploads/2012/11/Why-insurance-telematics-matters.pdf>

## B.5. Telematics in Different Geographies (2/2)

	USA	UK	Europe ex. UK	Asia
<b>New Telematics Initiatives</b>	<ul style="list-style-type: none"> <li>Mobile telematics app launched by Direct Auto</li> </ul>	<ul style="list-style-type: none"> <li>Smartphone App based product by Aviva and Direct Line</li> </ul>	<ul style="list-style-type: none"> <li>PHYD product by Genertel (Generali Group) in Italy</li> </ul>	<ul style="list-style-type: none"> <li>Ongoing Pilots</li> </ul>
<b>General Discounts Offered</b>	<ul style="list-style-type: none"> <li>Upto 30% by Progressive and upto 50% by State Farm</li> </ul>	<ul style="list-style-type: none"> <li>5% - 30%</li> </ul>	<ul style="list-style-type: none"> <li>5% - 30%</li> </ul>	<ul style="list-style-type: none"> <li>Ongoing Pilots</li> </ul>
<b>General Driving Parameters</b>	<ul style="list-style-type: none"> <li>Time of Driving, Acceleration, Braking, Speeding</li> </ul>	<ul style="list-style-type: none"> <li>Time of Driving, Acceleration, Speeding, Braking</li> </ul>	<ul style="list-style-type: none"> <li>Engine Power, Annual Mileage, time of driving</li> </ul>	<ul style="list-style-type: none"> <li>Annual Mileage (other factors may come in later as currently at nascent stage)</li> </ul>
<b>Value Added Services</b>	<ul style="list-style-type: none"> <li>Voice-based roadside assistance, vehicle diagnostic reports, vehicle locator</li> </ul>	<ul style="list-style-type: none"> <li>eCall, Breakdown Services, Stolen Vehicle Tracking, Eco Driving</li> </ul>	<ul style="list-style-type: none"> <li>eCall, bCall, theft notification and vehicle tracking applications</li> </ul>	<ul style="list-style-type: none"> <li>Stolen vehicle recovery, impact alert</li> </ul>

- <http://www.slideshare.net/bukszi/insurance-telematics-study-overview>
- <http://www.postonline.co.uk/post/analysis/2264472/telematics-taking-the-wheel>
- [http://www.ms-ad-hd.com/ir/library/annual/pdf/2006\\_ioi\\_02.pdf](http://www.ms-ad-hd.com/ir/library/annual/pdf/2006_ioi_02.pdf)
- <http://www.drivefactor.com/drivefactor-powers-the-first-exclusively-mobile-telematics-program-in-the-us-for-direct-general/>
- <http://www.insuranceage.co.uk/insurance-age/news/2198537/aviva-trialling-telematics-app-for-private-car-insurance>
- <http://www.directline.com/car-insurance/driveplus/>
- [http://www.in-drive.com/sf/assets/pdf/SF\\_DSSwID\\_FAQs.pdf](http://www.in-drive.com/sf/assets/pdf/SF_DSSwID_FAQs.pdf)
- <http://analysis.telematicsupdate.com/insurance-telematics/telematics-and-customized-ubi-business-models>
- <http://analysis.telematicsupdate.com/insurance-telematics/qa-insurance-telematics-and-intellectual-property>

## B.6. Target Customers

### Young Customers

- Young customers are usually the target segments for insurers as premiums are usually very high to justify costs involved and discounting levels are enough to attract customers
- Policies are sold usually in two ways:
  - Standalone policies
  - Parents buying policies as main driver with children as additional drivers

### Middle Aged and Older Customers

- Traditionally, cost of device is high in proportion to the premium, and discount on lower side; therefore the proposition is less appealing
- With reduction in cost of device and gaining popularity of smartphones based technologies, there is an opportunity to focus on these customers as well
- Targeted approach may be required for this customer segment and low cost solutions are required

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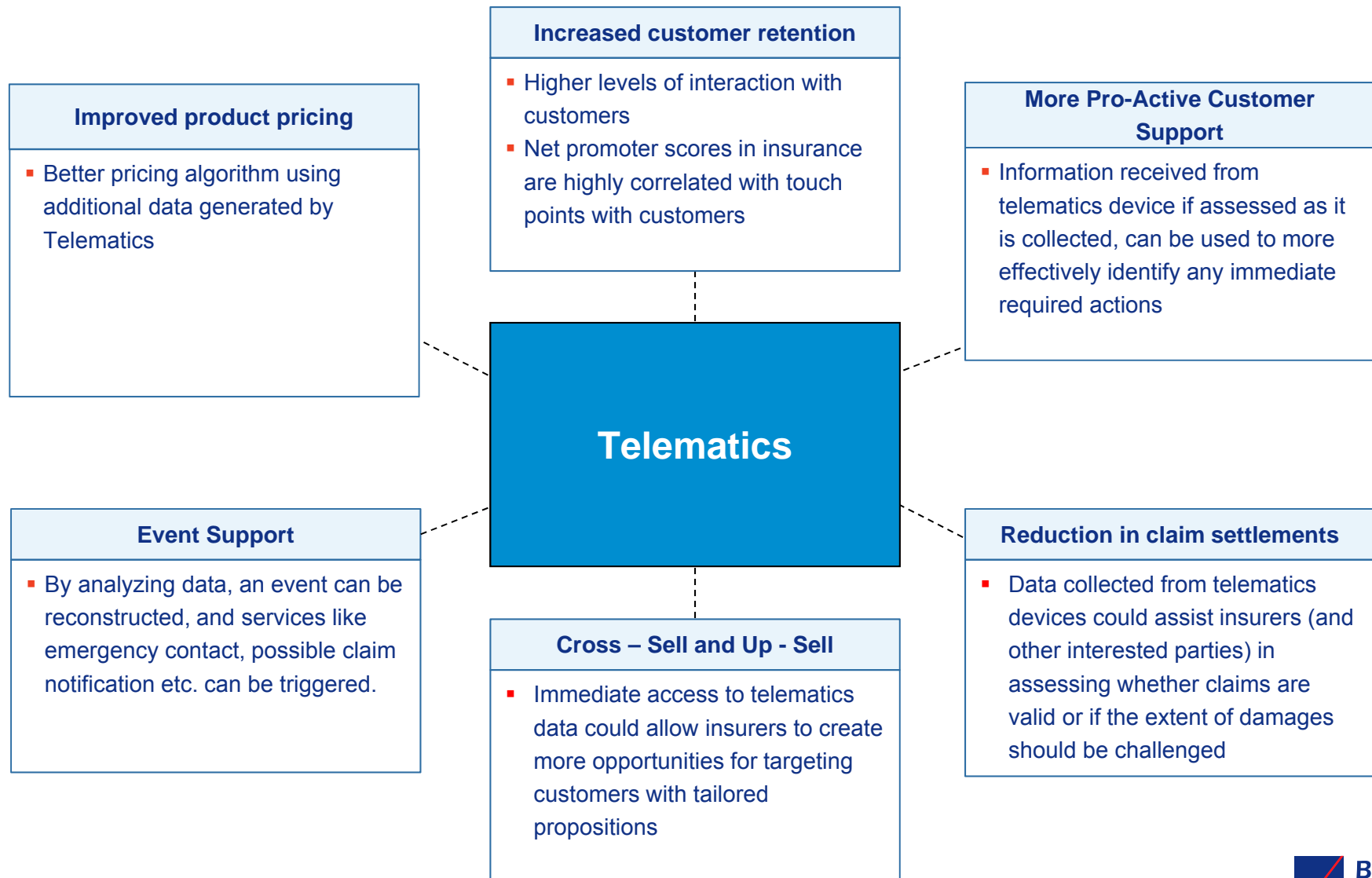
**C. Telematics SWOT Analysis**

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# C.1. Telematics Strengths



## C.2. Telematics Weakness



### Privacy Issues

- Customers may have privacy issues and feel threatened by an external company collecting their personal data; however, over last few years with advent of networking sites like Facebook, customers are more open to share their driving information



### Resistance to Change

- Agents, Brokers may have some resistance to change for Telematics products as these are hard to explain to customers and may need higher commissions to push these sales



### Business Case

- The added cost of the technology, combined with lower penetration of Telematics is making insurers wary of adopting telematics and not supporting a clear cut business case



### Small Company

- Small companies may have difficulties in building partnerships and may loose to big players in the market as Telematics may gain popularity

## C.3. Telematics Opportunity



### Technological

- Telematics is based on advancement in technology including processing power, network connectivity, popularity of smartphones
- As technology costs is reducing, Telematics proposition is becoming more viable



### Economic

- In European markets, softening of premiums is the norm in last few years and insurers are looking for new avenues to attract good customers
- Offering low premiums to low risk customers is key to attract and retain such customers



### Regulatory

- There can be rulings regarding use of certain rating factors for pricing; Telematics can provide actual driving behavior of a customer which can provide better measure of risk
- Future rulings may lead to requirements for safety measures. E.g. emergency alarm system, which can be triggered by Telematics device



## C.4. Telematics Threat



### OEM

- Suppliers of OEM, Black boxes may try to push for additional services themselves and may not be willing to share all data collected with insurers



### Regulatory Environment

- Lack of clarity over regulations specifically applicable to PAYD./ PHYD has often been seen as an obstacle to the launch of mass telematics-enabled insurance offerings



### Customer Acceptance

- Customers may be more habitual of buying traditional product which they understand and may not be open for Telematics products (which are new and complex in nature)



### New Technology

- New communication technology may obsolete current platform, which may mean a new entrant may easily provide more technically advanced products; may technology may bring costs element

# C.5. Telematics SWOT Analysis

## Strength

- Pricing, based on actual driving behaviour
- Attract and retain good customers
- Value added services like theft recovery, emergency services etc
- Helps to reduce fraud
- Strong incentive to improve driving skills and style

## Weakness

- Risk of backlash against "customer tracking"
- Resistance to change by intermediaries
- Smaller companies may have harder time building telematics partnerships
- Lack of clear cut business case

- Decreasing cost of Telematics devices
- Position cell phones as information transfer devices
- Growing digitally literate population
- Regulations may change over the period which may provide opportunity for Telematics products

## Threat

- Interest of OEMs for value added services around the connected vehicles
- OEMs may further restrict access to information
- Customers have low acceptance esp. in developing markets
- New communication technology may obsolete current platform
- Ever changing Regulatory environment

## Opportunity

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# D.1. Telematics Data

- Few common rating factors generated by Telematics:
  - **Speed** – Speed at which vehicle is driven compared to road speed
  - **Mileage** – Actual miles driven (useful for PAYD)
  - **Garaging** – Location of usual parking of vehicle
  - **Lane Driving** – How much lane changing is observed
  - **Road Usage** – Distribution of road types for vehicle driving (city, highway, rural etc.)
  - **Cornering** - Lateral (i.e. parallel to the road surface) force produced by a vehicle tire during turning
  - **Time of Driving** – Distribution for time of driving
  - **Day of Week** – Distribution for day of week driving
  - **Hard Braking** – G-Force applied at time of braking
- Basis above parameters, a driver's driving score is created (for e.g. 0 to 100, category A - E etc.) which measures quality of driving and is used for pricing

## D.2. Telematics – Sample Data

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Obs.	Date	UTC	Degrees Latitude	Degrees Longitude	Minutes	Miles	Fuel Consumption	Miles per hour	g-force
1	04/08/12	14:45:30	-27.117	-109.364	0:00:00	0	0	0	0
2	04/08/12	14:46:30	-27.118	-109.364	0:01:00	0	0.05	0	0
3	04/08/12	14:47:00	-27.118	-109.364	0:01:30	0	0.053	0	0
4	04/08/12	14:47:00	-27.118	-109.364	0:01:30	0	0.053	0	0
5	04/08/12	14:47:30	-27.117	-109.371	0:02:00	0.08	0.055	20	0.03
6	04/08/12	14:48:30	-27.15	-109.379	0:03:00	0.552	0.06	50	0.06
7	04/08/12	14:49:30	-27.109	-109.388	0:04:00	1.499	0.078	65	-0.1
8	04/08/12	14:50:30	-27.098	-109.398	0:05:00	2.538	0.091	59	0.01
9	04/08/12	14:51:30	-27.093	-109.41	0:06:00	3.234	0.105	40	-0.07

### Note :

1. Data elements are recorded at sixty-second intervals beginning and ending when the ignition is switched on and off, respectively.
2. GPS coordinates in the third and fourth columns indicate location
3. Columns five, six, and seven show that the driver's cumulative time, mileage, and fuel consumption, respectively, increase with each observation.
4. The speeds and accelerations in columns eight and nine show that the driver experiences different driving conditions during each leg of his journey.

1. Data Source : <http://www.casact.org/pubs/forum/12wforumpt2/Weiss-Smollik.pdf>

## D.3. Pricing – Some Ideas

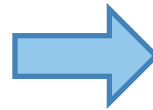
### Initial Pricing

- When launching a product data may not be available for pricing of product
- Use data obtained from bureaus/ market to initially price the product
- Initial optin discount/ nehvaioir related discount may be based on above data and basis underwriter's professional judgement

### Repricing

#### Data Preparation -

- Collect claims data, telematics data, policy data and external data. Assemble all information at policy level, create derived variable and prepare modeling data.
- It is assumed here that enough credible claims data is available for analysis.



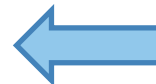
#### Modeling -

- Build GLM model/Decision tree/ Quantile regression model in to assess relationship with telematics variables, traditional factors and claims.
- Telematics model will include the traditional factors as well as some telematics factors.
- Develop another model without incorporating telematics variables



#### Discounting structure –

- Develop the revised discounting structure observing the difference between the rates of the models
- Adjust Rates to avoid anti-selection and ensure attractiveness of the product
- Revise driving score algorithm after examining the significance and cut-off points of different telematics variables



#### Model Comparison: With and without Telematics

- Compare rate for different risks according to telematics model with the rates calculated using the other model (without telematics) to compute the difference between the two rates across different risk characteristics.

## D.4. Driving Style

- One of the major challenges for actuaries would be to determine actual driver of the vehicle to reduce chances of fraud.
- This is important in markets where multiple drivers may actually be driving the car or in case of Try Before You Buy products
- For the purpose, actuaries need to create a driving style which has been observed over a period; any significant deviation may not be recorded
- Driving style may evolve over the period, hence this needs to be regularly updated for a driver as well
- Basis above data reliability basis driving style can provide inputs for pricing

## D.5. Challenge – Finding a Needle in a Haystack

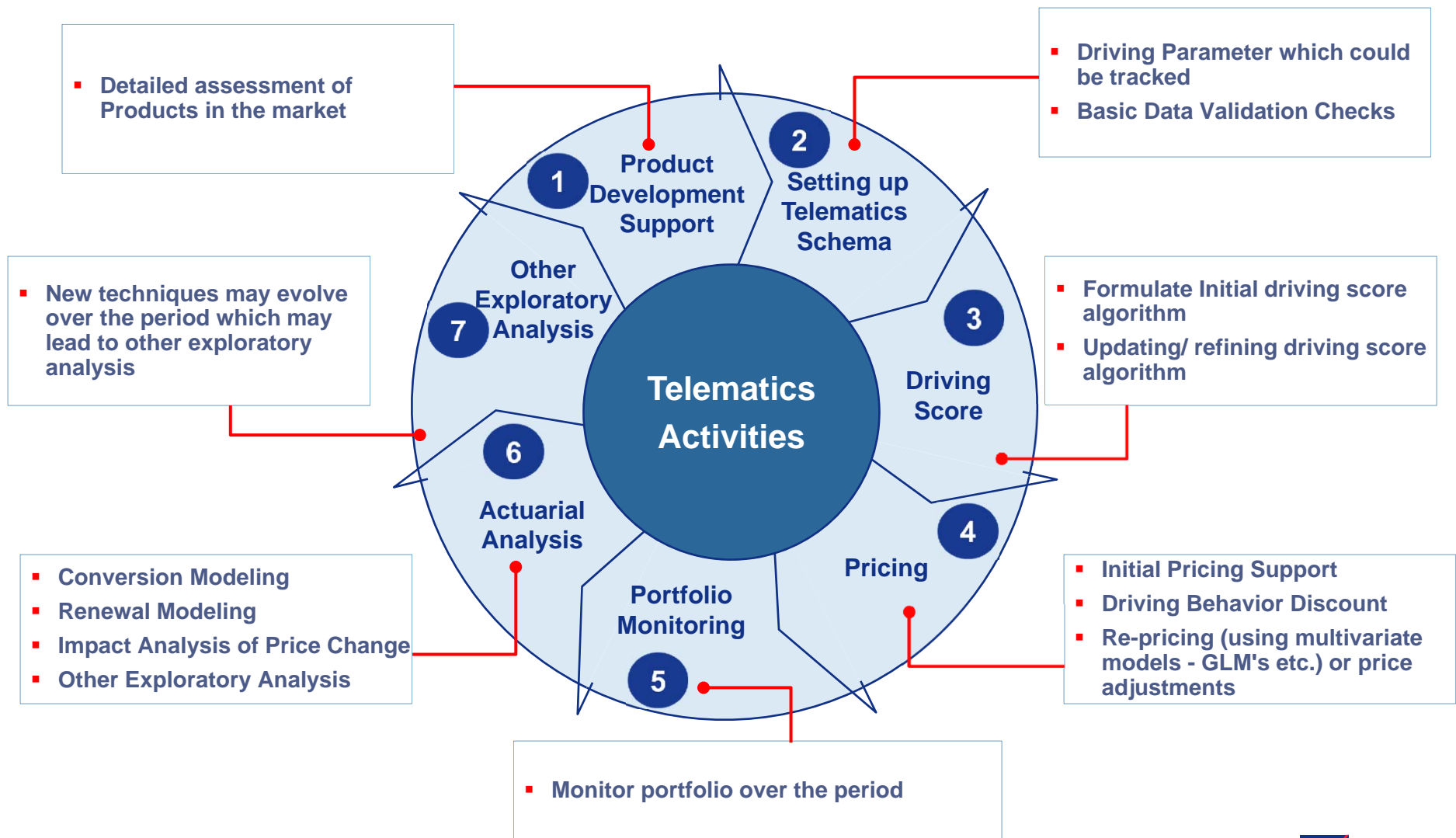


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- Insurance industry has always been data-centric. Currently actuaries rely on historical data from policy administration solutions, claims management applications and billing systems.
- Telematics data records or data sets can represent approximately 5-15 MB of data annually, per customer. With a customer base of 1,00,000 vehicles, this represents more than 1 terabyte of data per year<sup>1</sup>!
- Actuaries certainly need to learn new tools to handle this much volume of data.
- Actuaries may need to learn new data handling skills for Big Data and learn new techniques to quickly transform this to meaningful information
- New techniques may evolve over the period to aid in actuarial analysis



# D.6. Possible Actuarial Services



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## E.1. Telematics in Indian Market

- Average Premium size in India is small and may not justify costs to invest in a black box solution
- Smartphone may be a preferable solution; however,
  - Smartphone is a new technology and to be proven even in developed markets
  - India has poor network connectivity compared to developed market which is a key to record Telematics data

Some of the initiatives in the Indian market are:

- An online aggregator launched a PHYD product in April 2013<sup>1</sup>
- A General Insurer is working on a pilot project on “Telematics”. Plan is to install an electronic Telematics device in about 1,000 cars which will help the insurer know and assess the driving habits of the car driver<sup>2</sup>
- There are plans by a couple of Insurers on using the Pay As You Drive system to reduce the amount of premiums for motorists using a GPS device to monitor the data<sup>3</sup>

1. <http://telematicsnews.info/2013/05/08/india-chleon-and-policybazaar-to-offer-phyd-insurance/>

2. [http://www.business-standard.com/article/companies/liberty-videocon-installs-tracking-devices-in-1-000-cars-113093000585\\_1.html](http://www.business-standard.com/article/companies/liberty-videocon-installs-tracking-devices-in-1-000-cars-113093000585_1.html)

3. <http://www.insurance-telematics.com/topics/automobile-clubs/pay-as-you-drive-to-be-used-by-tata-insurance/22-1272.htm>

## E.2. Health Telematics

- Some Insurers are exploring options of deploying telematics kind of technologies for healthcare insurance
- Current initiatives are primarily focused around improving quality of healthcare and managing costs through reduced emergency events, re-hospitalization rates, managing chronic conditions, etc.
  - Advanced medical technology and devices like wearable tracking devices (wristbands, implantable chips, etc.) being used to track and capture data around key vital statistics (temperature, pulse rate, BP, sugar levels, etc.) as well as wellness and preventive care data like calorie intake / burnout rate, exercise, etc.
  - Telemedicine and eHealth initiatives to involve patients in the healthcare delivery through mobile apps for medicine reminders, health risk awareness, and better preventive and wellness measures
- Coming years could see more direct use of these data by insurers for pricing, product design, and cost management

Thank You