

Paper 056-2013

## How Am I Driving ... My Business?

### BI techniques from the Insurance industry that can be applied to other business areas to “drive” better performance.

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#### ABSTRACT

Business Intelligence is widely accepted as being a crucial piece in the organizational performance puzzle. Many companies ranging from Small to Medium Enterprises up to and including Large Corporate Organizations, in both the private and public sector, use BI to measure and report how well the business is performing against its targets.

With the “bigness” of Big Data growing, and the “highness” of High Performance Analytics also increasing one may wonder what the future of traditional BI might be? HPA and Big Data is a definite-game changer regarding being able to analyze billions of data items in a matter of seconds. Directors of Analytics can sit around the boardroom table with their Executive peers exploring opportunities for growth and identifying areas for cost savings, in a way that can affect corporate strategy instantaneously. However, will that remove the need to measure whether those strategic decisions have indeed proven fruitful in the way that the data suggested? Surely, if strategic decisions can now be made on an hourly basis, rather than every 12 months at the AGM, there is even more need to keep track of those decisions and measure their effectiveness in the real market.

For example, a direct general insurance business can now identify customer segments which are not converting quotes into policies, perform what-if analysis on their rates, and adjust the rates to capture that market previously going to the competition. Excellent news, more business for the company – however it’s now imperative that this new segment appears in Executive Dashboards, on rating cubes, on claim development triangles and any other reporting that is regularly consumed by any number of departments.

With a more rapid response to strategic direction, comes a more rapid response required from the back-end Business Intelligence and supporting analytics. Fortunately for SAS® software users there are many different tools available, for these many different types of user, all driven from the underlying data. During this paper we will focus on:

- Types of information consumer, and how this affects technology choices for delivery of information
- Some key Business Intelligence topics and the reasons why they are of interest to management
- The reporting techniques we use, the data they require and how the results look to the information consumer

The examples that we’ll use to highlight each area will be from the General Insurance industry, however these techniques, commonality in the underlying data and the types of consumer all feature in most businesses.

We will finish with a look towards the future that is now upon us: the use of Telematics for “How am I driving?” pricing and for claim verification.

#### INTRODUCTION

You would not set out on a journey – even your routine drive to work – without watching the road, the traffic and external conditions such as the weather; you’ll be making decisions all the way, changing lanes, watching your speed and fuel consumption, and aiming to avoid that traffic jam you heard about. In the same way, as management ‘drives’ their business they need to be able to see what is happening around them so that they can speed up, apply the brakes when necessary and shift priorities to make a successful ‘journey’. Their eyes and ears are the Management Information reports and analyses they get on a regular basis.

Insurance as a concept has been around a long time – certainly since the late 17<sup>th</sup> century in London and soon after in Charleston, NC – and is based on a fundamentally simple principle: collect money (premiums) from customers in return for a promise to pay the cost or repair or replacement (claims) in the event of specified events such as fire, theft or accident. To do this, the insurers assess the risk of those events, and set a price for the premium so that they collect more than they expect to pay out over the period of cover. They then invest the money collected so that they have reserves to call on to pay those claims.

But behind these simple principles lie a huge amount of sophisticated analysis and reporting to predict the future and to monitor the present state of the business. From the days of quill pens and dusty ledgers we have come a long way, even for traditional reporting of such basic measures as loss ratios, through regular reports and spreadsheets to

interactive reporting and mobile BI. Now the advent of High Performance Analytics and Big Data is adding new options to view, analyze and interact with data. Will that make traditional management information reporting go away? Only time will tell, but for the moment we see them coexisting. So how do we help our business users (the internal customers for MI) choose appropriate ways from all the alternatives to receive information that meets their needs? We'll aim to give you a tour of how we do this.

Note: the illustrations in this paper have been airbrushed and blurred to protect client confidentiality; they are given to show the style of presentation, not to show actual numbers. In some instances test data has been used.

## INFORMATION CONSUMERS AND TECHNOLOGY CHOICES

Our information consumers are in many ways typical of most large organizations, although we have perhaps have a higher than average proportion of highly numerate senior management – Insurance attracts people with a good understanding of mathematics and statistics, and management have often risen from the practical business of insurance. However, as for management everywhere, time is limited and information is used “on the road”, so delivery to mobile devices is important – but there is a range of preferences, so a single method does not suit everyone, and it is recognized that investigative analysis will usually be done at a desk rather than while travelling.

In addition to our Business Intelligence information consumers we have a significant community of Analytic Intelligence users – actuaries, pricing analysts and fraud analysts – whose requirements can be summed up as “just give us all the data”. Meeting their needs is important too, but is not the focus of this paper so we will say no more about them here.

We can therefore categorize our BI information consumers based on requirements:

- C-level management, requiring a few high-level performance measures with actual-vs-forecast in tabular form
- Senior management requiring more performance measures at product-level detail with actual-vs-forecast, graphical overviews with the numbers that lie behind them, including some drill-down
- Operational management requiring detailed performance metrics for their area of responsibility (Agency management, Claims, Finance etc) that allow frequently-used drill down to details (sometimes to transaction level)
- Key operational staff requiring detailed reports of current and recent activity, to make day-to-day decisions
- Analysts requiring detailed data in simple tables to make specialized investigations and analyses, using SAS® Enterprise Guide

This final category is unlike the others, in that these users expect (even demand!) to be programming their own queries, reports and analyses – so in this paper we will leave them aside and concentrate on the others for whom we need to deliver prepared and packaged solutions, ready to use.

There is some overlap in these categories – for example some senior management are “hands-on operational”, due to the nature of their responsibilities – but as a broad grouping they help identify the style of information consumption.

The technology available to us comprises the standard SAS® BI Server toolset: data delivery in tables and OLAP cubes, Information Maps, SAS® Web Report Studio and SAS® Information Delivery Portal. Our customer has recently acquired the SAS® Mobile BI option and are we just starting to use it, while the arrival of Big Data in the shape of Telematics is leading to further change in the near future. Also in sight is the potential of SAS® Visual Analytics to provide new ways to explore and present both traditional MI content and Telematics.

## MONITORING THE PRESENT – DAILY PREMIUM REPORTING

Top of the list for management focus is the income being generated - in any business this will be one of the most important measures. Retail sales, card transactions, deposits, orders taken, contracts signed – ultimately these all boil down to income, so will be closely monitored on a daily basis to either confirm that “all's well” or identify weakness and underperformance in time to take corrective action.

In Insurance this is the *Premium Written and Earned*. Premium can only be counted as Earned as time passes – typically the premium you pay for an annual policy is earned at 1/365<sup>th</sup> of the year's Written Premium per day – but since the cancellation rate is typically low the primary focus is on Written Premium, because almost all of it will be earned by the end of the insurance term. Cancellations will be monitored, but only to ensure they do not start to rise unduly high.

High level objectives for the company are turned into income forecasts on a month-by-month basis for all the active lines of business, and in turn these translate into a daily predicted or ‘budget’ income amount by product. This then provides the daily figure to compare actual performance against – the principal tool in monitoring the present.

**Information consumers**

At a daily level, the CEO and board want to know “is written business above, below or on track against budget?”; for example, our CEO receives email on his Blackberry® – but if something requires investigation that will be referred to one of the Directors.

Product heads want the same, but with detail at product/line-of-business level and a “recent history” element over the past week that allows them to see the trends.

**Delivery method chosen**

This reporting needed to be simple, clear and readily available to read at a glance. Any follow up would be by managers who receive more detailed reporting, so little or no interactivity is required – hence pre-generated reporting was chosen. This can be supplemented by BI Dashboard reporting from the same data.

The top level report is provided by email in PDF format (it has to be readable on the CEO’s Blackberry). A more detailed line-of-business level report is sent by email in HTML format or may be viewed as an interactive report (to be read on iPad® or desktop PC). We can also show the same data in BI Dashboard for visual presentation of key measures, for those who prefer graphics to numbers.

We now also have the new option of mobile BI delivery using SAS Mobile BI / RoamBI® to iPad.

**Data and technique**

Budget/forecast is supplied in Excel format with monthly figures by product group, along with daily ‘phasing’ pattern to take account of variations between start of month, end of month and mid-month days – the data is processed by SAS programs to provide daily forecasts by product hierarchy. The actuals are from policy transactions summarized by product hierarchy by day. These are joined to provide a lightly-summarized forecast-vs-actual data mart table with year-to-date, month-to-date and daily values and difference above/below forecast – we use this intermediate data for other reporting which we will discuss later. This is then summarized and filtered into 7-day rolling result tables and a summary by month; Information Maps overlay these datasets to format the figures to whole numbers (pennies are not necessary!).

A Daily Premium Stats report was created using SAS Web Report Studio, with multiple sections:

- Top level actual-vs-forecast at the product group level; tabular report with month-to-date and year-to-date difference to forecast. Only this part is emailed to the CEO and it is also cc’ed to board members.
- Mid-level tabular reports with performance by product and product group, also with month-to-date and year-to-date difference to forecast
- Line graphs (one per product group), comparing 7-day history against both the forecast and the same period last year

The full report is scheduled daily to go to all direct recipients by email, and their mid-level managers have the option of viewing the same report interactively on the SAS Portal.

Here is the top level report:

**7 Day Gross Written Premium & Forecast Gross Written Premium**

	Daily GWP	Daily Forecast GWP	Daily Difference	Cumulative GWP	Cumulative Forecast GWP	Cumulative Difference
Day of The Month						
1	156	513	79,643	50,156	70,513	79,643
2	011	278	-42,267	85,167	47,791	37,377
3	087	097	-124,010	77,254	63,887	-86,633
4	276	274	111,002	61,530	37,162	24,368
5	638	274	-4,637	04,168	84,436	19,732

	Daily GWP	Daily Forecast GWP	Daily Difference	Cumulative GWP YTD	Cumulative Forecast GWP YTD	Cumulative Difference YTD
Day of The Month						
1	156	513	79,643	0.092	33,832	6,260
2	011	278	-42,267	5.103	11,110	3,993
3	087	097	-124,010	7.190	27,206	9,983
4	276	274	111,002	1.466	30,481	0,985
5	638	274	-4,637	4.103	47,755	6,349

**Figure 1 Daily Premium - tabular report**

You might wonder why there are no graphics on this part of the report; the answer is that the senior management at our site are "numbers people" – while they might glance at a graph they really want to see the actual figures. So the graphs follow later, with yet more tabular details.

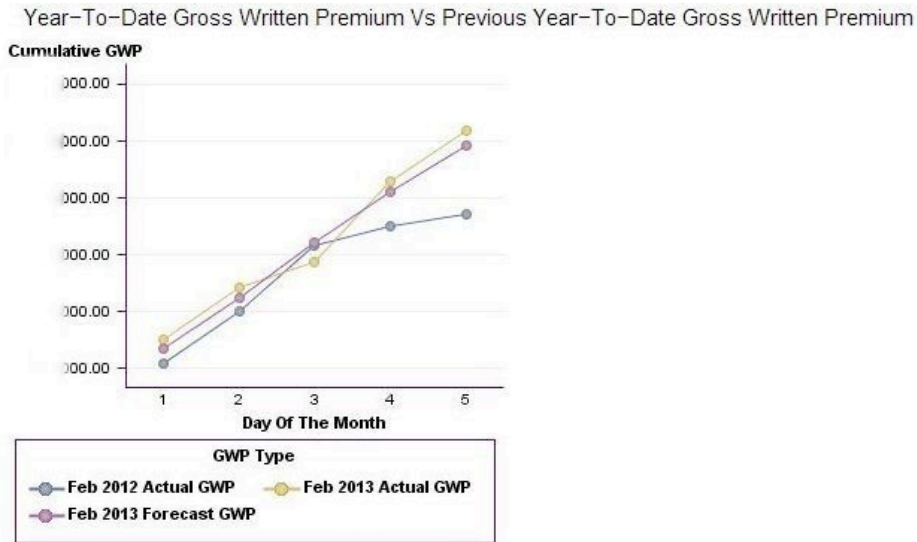


Figure 2 Daily Premium – Graph of Actual vs Forecast and Last Year's Actual

Latest Months Gross Written Premium & Forecast Gross Written Premium by Product Groups 3 & 4

		Latest Month GWP Position	Latest Month Forecast GWP Position	Latest Month Difference	Actual GWP YTD	Forecast GWP YTD	Difference YTD
Product Group 3	Product Group 4						
XXXXXXXXXXXXXXXX		462	2,819	3,643	9,315	10,319	10,997
	Subtotal	462	2,819	3,643	9,315	10,319	10,997
Commercial		466	3,495	4,971	12,088	10,495	593
Vehicle	Subtotal	466	3,495	4,971	12,088	10,495	593
		484	7,686	9,202	34,440	34,615	175
Hire Car			3,710	9,710	12,862	9,710	3,152
	Subtotal	484	7,396	8,912	17,302	14,325	3,023
XXXXXXXXXXXXXXXX				0			
	Subtotal			0			
		175	6,220	7,955	15,551	10,953	4,598
Private Car		582	3,506	2,076	9,848	13,663	3,814
		0	0	0	0	0	0
	Subtotal	756	1,726	9,030	5,398	4,616	0,783
Total	Subtotal	1,168	4,436	17,732	11,103	17,755	6,649

Figure 3 Daily Premium - Tabular by Product

The same data are used to drive a BI Dashboard display of the key measures; the 7-day data provides spark line graphics to highlight the trend while the tabular figures satisfy management requirements for seeing the numbers behind the trend.

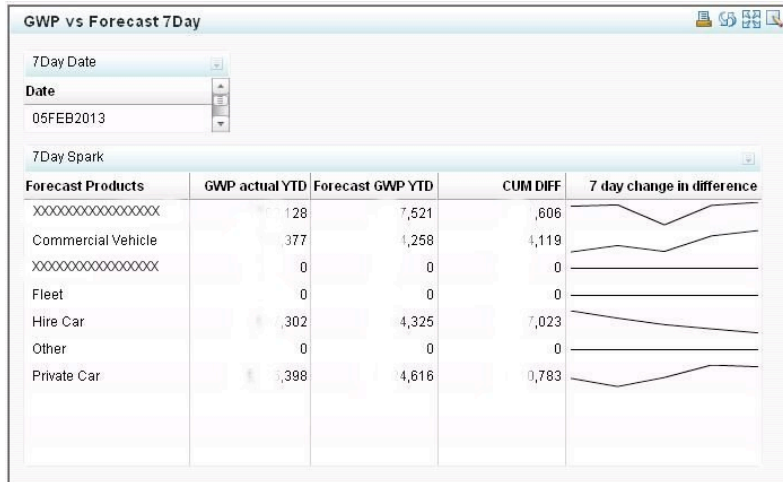


Figure 4 Daily Premium Dashboard with Sparkline

For delivery to those executives that use their iPad regularly we have several examples of sparkline, cardex and tabular reports. One of the most appropriate is the Premium Pieview™, which segregates lines of business on a rolling daily week with month-to-date, quarter-to-date and year-to-date summary figures.

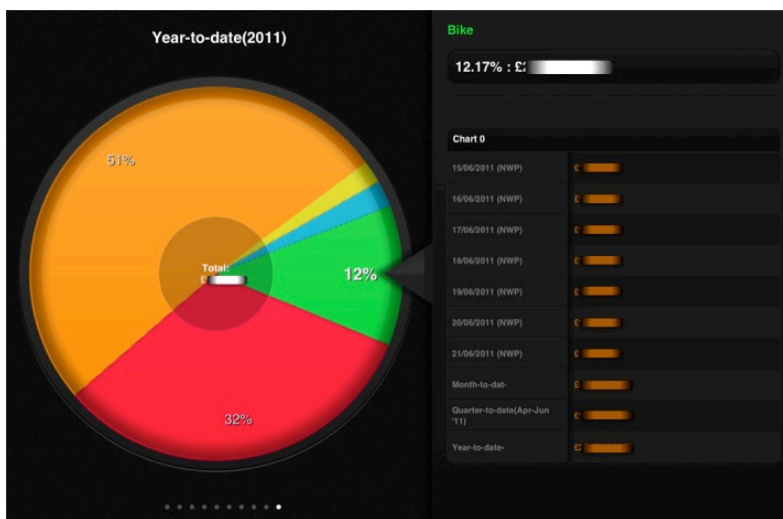


Figure 5 Daily Premium RoamBI Pieview

**MONITORING RECENT PROGRESS – CONFORMANCE TO BUDGET**

The next important aspect of MI deals with recent history and trends, giving feedback on how actions and intervention to improve performance, reduce costs or cause other changes are affecting the business. The time horizon of interest will be dependent on the type of business – for example, retail often has a shorter-term focus whereas manufacturing will naturally have to take a mid-term view – but in general this is the domain of senior and mid-level management, heads of department and so on. They also have an eye to the near future: what do we have to do next week/month/quarter?

**Information consumers**

Information consumers here comprise our senior and operational management such as Product managers, and senior managers responsible for agents and their performance. Current and recent performance needs to be seen in the context of past performance and expectations for the future – and operational decisions require drill-down and filtering to focus on key aspects of activity, such as business partners (Brokers, in our business).



**Delivery method chosen**

In our case, this report had to replace detailed spreadsheet-based reports generated by SAS Enterprise Guide programs run manually by a member of the product management support team. It had to provide the high-level performance against forecast and also allow detailed analysis of actuals by agent and product code.

We decided to use an OLAP cube with a pre-generated report and the option to explore or create custom reports so that each manager can focus on their area of responsibility. The report shows every month in the year, with actuals to date and the ongoing forecast. When opened in the Portal or from Web Report Studio the user can filter for their interest – specific Products and/or Brokers – to see where performance diverges from expectations; they then save these filter settings so they can view them repeatedly.

**Data and techniques**

The same job that prepares the actual-vs-forecast data mart for the Daily Premium report we discussed earlier provides the lightly-summarized data at Broker and Product hierarchy level and a single OLAP cube is built with low- mid- and high-level summary dimensions. This cube supports both the production of our routine Conformance to Budget report and interactive OLAP slice-and-dice reports.

By using a single job to derive the lightly-summarized data for this reporting and the fully summarized top-level reports we ensure consistency and reduce maintenance effort. Key tools for this are PROC SQL and SUMMARY to provide the aggregations.

A SAS Web Report Studio report with month-by-month progress against forecast is scheduled for execution and emails automatically to all recipients. The report can also be opened in the Portal where it may be expanded and/or filtered to focus on actual results from individual brokers, groups of brokers and even specific product codes – especially useful when pricing changes have been introduced.

Report Quarter		2012Q3															
Report Month		JUL2012				AUG2012				SEP2012				OCT2012			
Product Hierarchy Level Three	Product Hierarchy Level Four	GWP This YTD	Forecast ytd GWP	Difference to YTD Forecast	Percent Over (under) YTD Forecast	GWP This YTD	Forecast ytd GWP	Difference to YTD Forecast	Percent Over (under) YTD Forecast	GWP This YTD	Forecast ytd GWP	Difference to YTD Forecast	Percent Over (under) YTD Forecast	GWP This YTD	Forecast ytd GWP	Difference to YTD Forecast	Percent Over (under) YTD Forecast
		Bike															
Subtotal: Bike		2,551	27,369	24,818	(4.86%)	58,683	778,949	1,266	(4.63%)	56,843	113,639	7,796	(5.30%)	96,878	122,359	25,481	(5.57%)
Commercial Vehicle		80,311	9,700	90,011	(27.32%)	37,994	324,303	1,309	(29.79%)	58,238	101,926	43,688	(30.72%)	37,904	147,034	109,130	(31.26%)
Subtotal: Commercial Vehicle		80,311	9,700	90,011	(27.32%)	37,994	324,303	1,309	(29.79%)	58,238	101,926	43,688	(30.72%)	37,904	147,034	109,130	(31.26%)
Courier			10,145				297,450				43,170				180,115		
Subtotal: Courier			10,145				297,450				43,170				180,115		
Fleet		18,921	2,347	16,574	(20.61%)	55,871	956,968	1,097	(9.88%)	457,521	51,689	405,832	(11.10%)	333,807	448,210	114,403	(14.40%)
Subtotal: Fleet		18,921	2,347	16,574	(20.61%)	55,871	956,968	1,097	(9.88%)	457,521	51,689	405,832	(11.10%)	333,807	448,210	114,403	(14.40%)
Hire Car		19,999	9,016	10,983	(18.69%)	73,438	290,304	1,866	(17.40%)	117,565	51,592	65,973	(18.50%)	149,125	112,880	36,245	(18.63%)
Subtotal: Hire Car		19,999	9,016	10,983	(18.69%)	73,438	290,304	1,866	(17.40%)	117,565	51,592	65,973	(18.50%)	149,125	112,880	36,245	(18.63%)
Other		17,741	3,260	14,481	1.77%	19,103	891,967	1,141	1.46%	149,169	30,756	118,413	1.19%	125,884	113,039	12,845	2.84%
Subtotal: Other		17,741	3,260	14,481	1.77%	19,103	891,967	1,141	1.46%	149,169	30,756	118,413	1.19%	125,884	113,039	12,845	2.84%
Private Car		35,533	6,868	28,665	(12.01%)	71,481	1,333,331	1,851	(4.64%)	464,684	100,003	364,681	(9.02%)	422,972	466,670	43,698	(14.62%)
Subtotal: Private Car		35,533	6,868	28,665	(12.01%)	71,481	1,333,331	1,851	(4.64%)	464,684	100,003	364,681	(9.02%)	422,972	466,670	43,698	(14.62%)
Total		29,099	4,412	24,687	35.17%	57,421	853,021	1,400	31.93%	170,739	196,272	25,533	27.49%	143,386	480,583	331,197	21.97%

**Figure 6 Conformance to Budget - Detailed Tabular by Product**

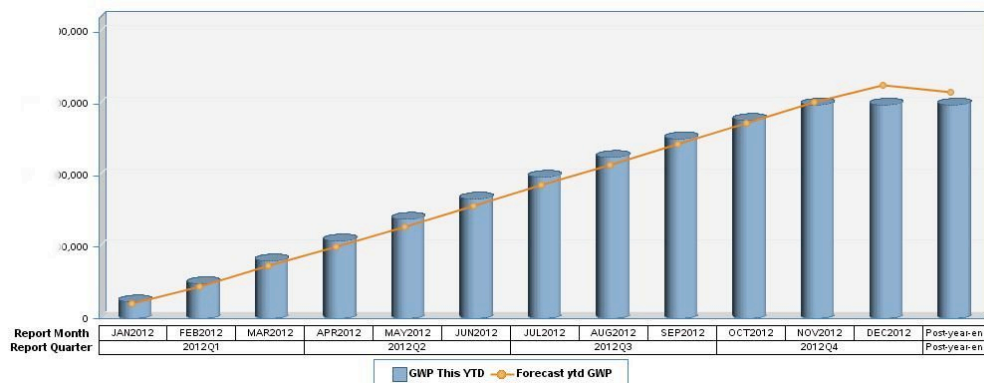


Figure 7 Conformance to Budget - Graph overview (also provided for each product)

## LONGER TERM: ANALYZING PROFITABILITY – LOSS RATIOS, DEVELOPMENT TRIANGLES

Our third type of Management Information looks at whether the business activity is profitable – it's no use in any business to have a lot of activity if it is loss-making! Management interest here centers on costs measured against income. In some businesses the costs are somewhat fixed by long-term investment and infrastructure; others may have very variable short-term supply and delivery costs; whatever the dynamics, there is an interest in controlling expenditure, monitoring sales margins and balancing income with outgoings. In a similar vein, the Finance department will focus attention on debt recovery to ensure that supplier invoices are paid on time and that late payers are brought into line.

Insurance is unusual, in that a large part of the cost is in paying Claims – and those claims develop over many months or even years. Controlling those costs depends on spotting new trends and any shift from past patterns, as well as an ability to drill down into individual cases to investigate reasons for higher than usual costs. Pricing of Insurance products depends heavily on having predicted an ultimate loss ratio (the percentage of premium paid out in claims) so monitoring how this is developing towards the expected value is a crucial part of the long-term view.

### Information consumers

There is a strong Operational influence on this reporting, as the results are used directly to prioritize where attention will be directed. There is also a need for high-level visualization to tell the story to senior management.

The Head of Claims and his team focus on controlling claim costs, and the rate at which claims develop over time. They monitor this using *claim development triangles* which show incurred claim costs developing on a monthly basis for each policy year ('year of account' in UK insurance terminology); typically the costs build up over the year and into the following year although a few larger or more complex claims may take longer to fully settle. The key measure is *loss ratio* – the percentage of the Earned Premium which has to be paid out in claims – and the management of the Claims team will know what ultimate percentage will be acceptable for a given product.

Comparing recent years with historical development patterns allows managers to spot when costs in a particular area may be building faster than expected, so that they can focus effort on controlling those costs. They also need to see what estimates are in place for claims reported but not yet settled – improving accuracy in estimating is a key tool in this activity.

For high-level visualization, some KPI dials comparing the recent position against the past can put current performance in perspective.

### Delivery method chosen

Historically the claim development triangles were delivered as a set of spreadsheet files at different levels of detail – but this is inflexible and complex to maintain. The main challenge to delivering this in a self-service environment was the need to provide cumulative premium and claim amounts, and calculate loss ratios at all levels. Once we were able to define these using Multi-Dimensional Expressions (MDX) in an OLAP cube we were able to choose this as a delivery method.

Web browser reporting is provided by a configured report which can be customized to concentrate on topics of interest. The same cube can also be opened in Excel using the SAS® Add-in for Microsoft Office, allowing users who are more familiar with the calculation and graphing methods there to benefit from a shared data resource.

For high-level visualization we chose presentation in KPI dial format.

### Data and techniques

For the Claim Development Triangles, transactional data are lightly summarized into “movement” data that is used to build the cube, and policy-claim level “summary” data that can be drilled down into. This is necessary because when a user drills down from the OLAP report they do not want to see all the individual movements – they want the overall position on the claims involved, so that they can then investigate those claims in the operational system. To allow this to work, the drilldown table is built to include the dimension class variables that the cube uses.

The data for this are complex because of the need to include Earned Premium in monthly development periods, Incurred and Paid Claims in monthly development periods and Written Premium in the period when the policy starts or when the amendment is transacted. This allows several perspectives on the data to be available in the cube.

To speed up the cube build, and because the cube building data is not the same as the drilldown data for this cube, the movement data are summarized to mid-level (accident year, product hierarchy, type of cover, broker and development period) using PROC SUMMARY before building the cube. The same data are also summarized to the “as at now” total for each Policy, but including the same dimension values that will be used to present and filter in the OLAP report – this provides the drilldown data in a form that is easier to read. If we were to simply drill down to the movement transactions the result would be information overload!

Using “movement” data in the cube allows us to define cumulative measures; we prototyped this using point-and-click but because there are many measures involved we then defined MDX macros to make this repeatable in code. Our MI developers are used to code-based maintenance, and the metadata for the cube is built when the code runs, so we can transition to a point-and-click based maintenance in future if we wish to do so.

**Edit a Calculated Member**

Parent Dimension: Measures

Parent Member:

Name: Cml Gross Incrd

Formula:

```
iif(isempty([Measures].[CT_G_INC_TOT_Sum]), NULL,
AGGREGATE(PeriodsToDate([Dev_Period],[Dev_Period],[
All],[Dev_Period],[Dev_Period].CURRENTMEMBER),
[Measures].[CT_G_INC_TOT_Sum]) ),
format_string='comma20.2'
```

Build Formula... Verify OK Cancel Help

Figure 8 Calculated Member MDX as seen in SAS OLAP Cube Studio

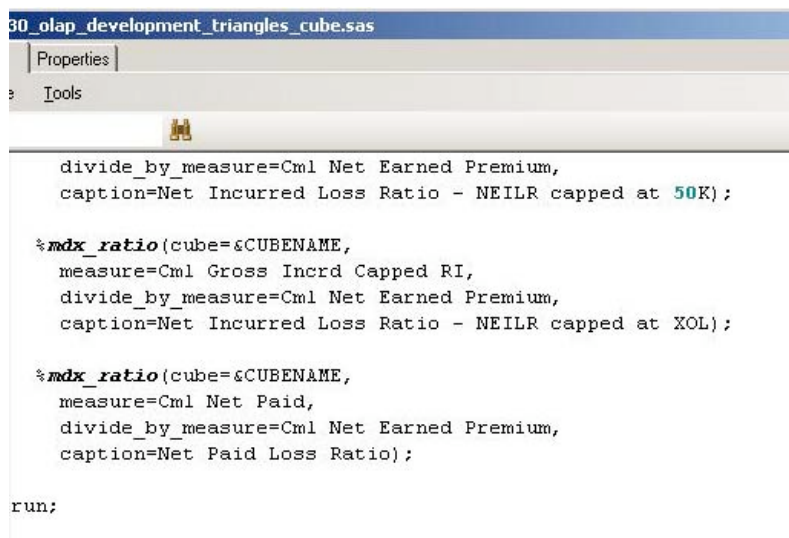


```

%macro mdx_cumulative(
  cube=,
  measure=,
  caption=,
  time_hierarchy=,
  time_hier_top_col=,
  format='comma20.2'
);
* define cumulative measure member;
DEFINE MEMBER "[&CUBE].[Measures].[&CAPTION]" AS
  "iif(isempty([Measures].[&MEASURE]),
    NULL,
    AGGREGATE(PeriodsToDate([&TIME_HIERARCHY].[&TIME_HIERARCHY].[All],
      [&TIME_HIERARCHY].[&TIME_HIERARCHY].CURRENTMEMBER),
      [Measures].[&MEASURE] )
    ) , format_string=&FORMAT " ;
%mend;

```

**Figure 9 Macro to make MDX coding easier**



```

30_olap_development_triangles_cube.sas
Properties
Tools

divide_by_measure=Cml Net Earned Premium,
caption=Net Incurred Loss Ratio - NEILR capped at 50K);

%mdx_ratio(cube=&CUBENAME,
measure=Cml Gross Incrd Capped RI,
divide_by_measure=Cml Net Earned Premium,
caption=Net Incurred Loss Ratio - NEILR capped at XOL);

%mdx_ratio(cube=&CUBENAME,
measure=Cml Net Paid,
divide_by_measure=Cml Net Earned Premium,
caption=Net Paid Loss Ratio);

run;

```

**Figure 10 Cube code using one of our macros**

The end result allows SAS Portal users to view claim development triangles for routine reporting, and Excel users can open the cube directly as a pivot table if they prefer.

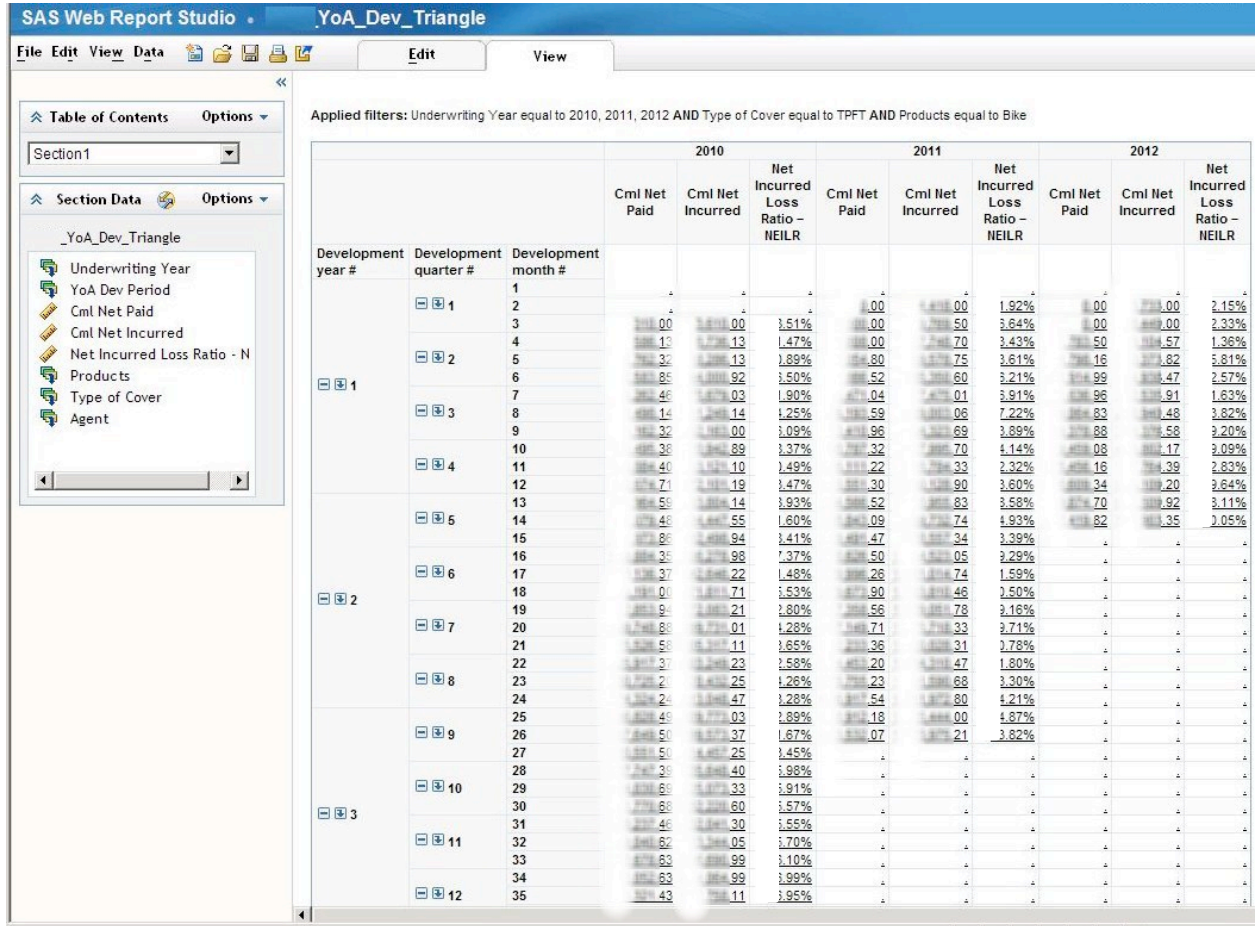


Figure 11 Claim Development Triangle from an OLAP cube

The KPI view is separately calculated by combining the summarized premium data from the daily premium reporting with similarly summarized claim data. The loss ratio is calculated in data step processing during the merge – we can do this because drilldown or aggregation is not offered in this format – and the table presented as a set of KPI dials.

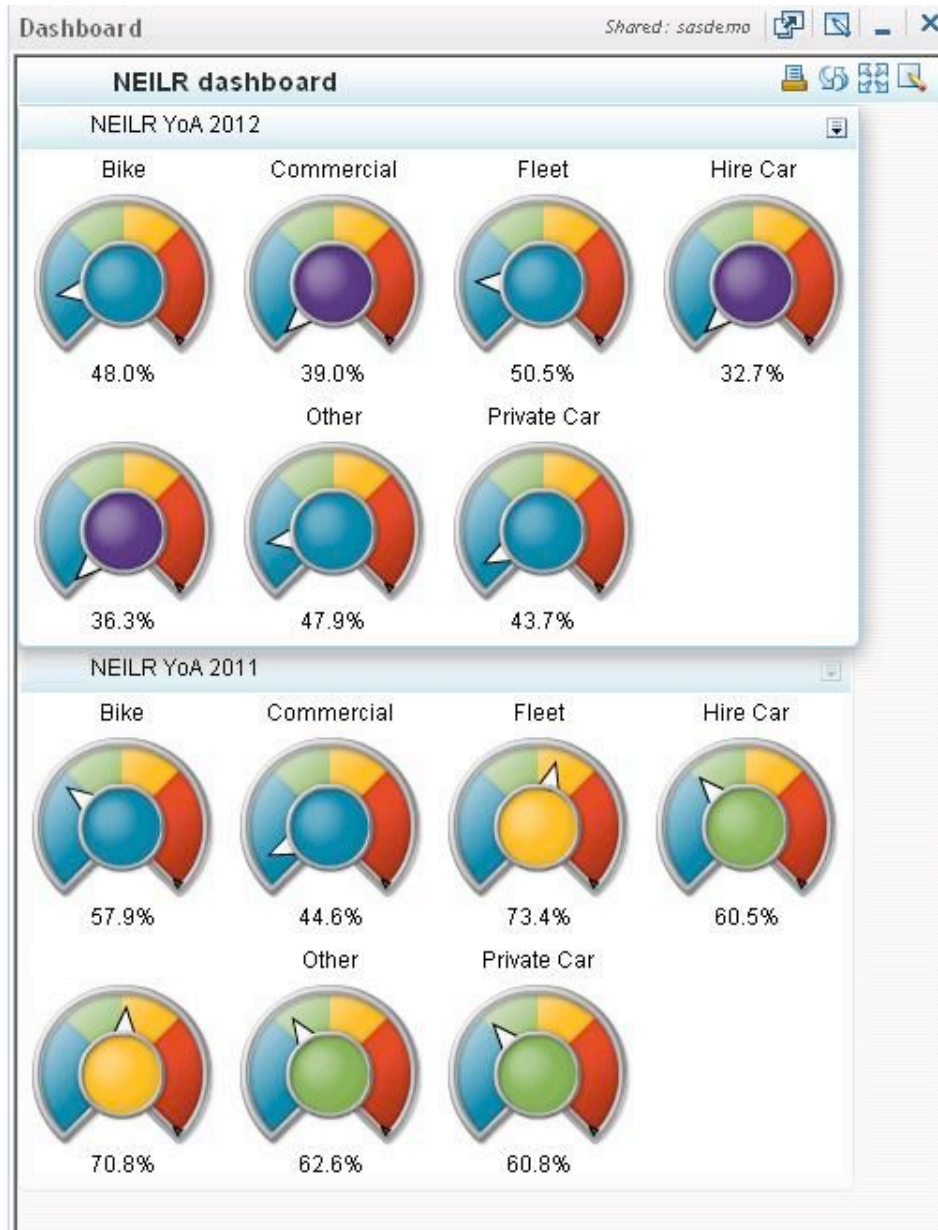


Figure 12 Loss Ratio Dashboard - KPI Dials

## HOT TOPIC REPORTING – BODILY INJURY CLAIMS

No matter how well we try to forecast the future and manage the present there is always the unexpected – shifting financial markets, adverse weather systems or the summer heatwave that causes a run on the ice cream stores! To react to these requires a flexible response. Some types of event can be anticipated and the data will be in the data warehouse ready to report, but others may demand new data, or a level of detail not previously used that must be combined with existing reporting resources to meet the new demand. A strategic approach requires this new data to be integrated to the data warehouse, even if short-term tactical reporting requires a less rigorous one.

The particular case we will look at is Bodily Injury claims, which have come to the forefront as a rapidly rising cost in motor insurance. Some of this is genuine increase, as legislation requires lifetime provision for people disabled by motor accidents for example; however some cannot be explained – even though vehicle safety has improved over recent years the number of injured claimants has risen. There is some evidence that this is due to opportunist claiming for “whiplash” injury, so insurers want to examine injury claims more closely than ever before.

**Information consumers**

Depending on the scope of the hot topic, this may be required at any level. We would expect very large factors, such as the impact of this winter's snowstorms on business, to be reported directly to the boardroom – and probably in near-real-time too. Topics like Bodily Injury Claim costs are more long-term and operational, although they are also of keen interest to C-level management. This type of reporting may also feature for “management task force” groups, where a special team is formed to address the issue – and their requirements can develop quite rapidly.

**Delivery method chosen**

Past reporting for injury claims had only been concerned with the money – how much was incurred and paid for injury claims. Now, as a hot topic, the interest shifted to more detailed metrics: how many injured claimants per claim, number and type of injuries, when the injury was reported, the number of claims with injured third parties versus those only involving damage to the vehicle and so on.

This required detail data that was not already in the data warehouse, so a new extract was built to collate this detail, merge it with existing policy and claim data in the data warehouse, and make it available in a cube for reporting.

**Data and techniques**

New data from the operational database was sourced by additional ETL processing. Some of the new metrics had to be calculated using data step because the sequence of records is a factor, others were simply SQL or SUMMARY processing. These were then joined to “as at today” claim and earned premium data to provide the required data for the cube. This was done as a separate cube to the development triangles so as not to impact existing reporting, and because the focus of reporting was somewhat different. Drilldown data in this case led to further details of the injury aspects of the claim.

The screenshot shows the SAS Web Report Studio interface for a report titled 'Claim\_Freq\_with\_BodInj'. The report displays data for three years (2010, 2011, 2012) across 32 Policy Development Months. The table includes columns for BI Claim Freq, BI Claimants per BI Claim, and Cml Injured Claimant Count for each year. The interface also shows a 'Table of Contents' and 'Section Data' pane on the left, and 'Applied filters: Year of Account equal to 2010, 2011, 2012' at the top of the data area.

Year Of Account	2010			2011			2012		
	BI Clm Freq	BI Claimants per BI Claim	Cml Injured Claimant Count	BI Clm Freq	BI Claimants per BI Claim	Cml Injured Claimant Count	BI Clm Freq	BI Claimants per BI Claim	Cml Injured Claimant Count
01	.63%	2.00	18	.99%	1.78	32	.15%	2.38	18
02	.27%	2.12	44	.62%	2.02	21	.94%	1.95	49
03	.69%	2.00	09	.43%	1.92	17	.88%	1.77	25
04	.98%	1.85	40	.05%	1.84	57	.91%	1.73	32
05	.65%	1.83	98	.91%	1.82	12	.79%	1.70	35
06	.45%	1.79	00	.65%	1.80	37	.30%	1.69	31
07	.24%	1.76	51	.59%	1.78	35	.16%	1.67	37
08	.97%	1.75	02	.81%	1.76	26	.39%	1.65	35
09	.73%	1.74	16	.18%	1.74	79	.79%	1.65	33
10	.54%	1.73	97	.66%	1.72	06	.29%	1.65	32
11	.38%	1.72	39	.27%	1.71	57	.92%	1.64	31
12	.20%	1.72	74	.91%	1.70	50	.58%	1.63	33
13	.07%	1.71	93	.66%	1.69	68	.32%	1.62	46
14	.98%	1.71	79	.42%	1.68	48	.12%	1.62	10
15	.85%	1.70	33	.20%	1.68	43			
16	.76%	1.69	49	.01%	1.67	29			
17	.68%	1.68	90	.86%	1.67	88			
18	.62%	1.67	13	.75%	1.66	48			
19	.58%	1.67	02	.65%	1.66	31			
20	.54%	1.66	86	.58%	1.66	06			
21	.52%	1.66	69	.54%	1.66	28			
22	.52%	1.66	20	.51%	1.66	46			
23	.53%	1.66	73	.50%	1.66	68			
24	.55%	1.65	12	.49%	1.66	72			
25	.57%	1.65	54	.50%	1.65	78			
26	.59%	1.65	12	.50%	1.65	33			
27	.60%	1.64	36						
28	.62%	1.64	63						
29	.63%	1.64	95						
30	.64%	1.64	24						
31	.66%	1.64	53						
32	.67%	1.63	74						

Figure 13 Bodily Injury claim statistics



## BIG DATA – TELEMATICS

If data is an organization's most valuable asset then Big Data is more valuable still. Yet Big Data is not just a technological issue to overcome - the technology is largely here; the overwhelming element is cultural and organisational. Big Data and High Performance Analytics offer businesses a chance to truly innovate and gain huge competitive advantages in the marketplace, if they are prepared to invest in a sea-change for their business processes.

Telematics is one such example. Data is captured via a box fitted to the car, and sent back to the insurer to monitor the driving behavior; such as braking, acceleration and directional g-force. This data can be captured at intervals of seconds, or even fractions of seconds if an incident occurs. Multiply that granularity for every trip, for every driver and you soon get into the realms of Big Data.

### Information consumers

Telematics gives insurance companies the best insight they have ever had into the risk associated with their policyholders. The traditional model of using rating factors based on policyholder demographics will be replaced by behavioral factors, as underwriters adopt a new "carrot or stick" approach to pricing their business. Claims handlers can use the telematics incident data to drill into the fine detail in order to validate the claim and analyze what g-forces were at play at the time of accident. Confirmation of road type and direction travelled can be determined from the GPS co-ordinates, and g-force indicators can help with fault allocation. Perhaps the most important type of information consumer is the policy holder themselves. Using customer portals they can monitor their own driving patterns (or quite often parents can monitor their offspring's driving patterns) – leading to safer driving and ultimately lower premiums.

### Delivery method chosen

Underwriters move towards a more monitored approach, rather than forecasting risk, with telematics data. Depending on the pricing model of rewarding good behavior or punishing bad, the initial rates are set by the underwriters. From that point on they are interested in the driving patterns to determine the risk. High exceptions (e.g. excessive speeding, multiple lane-changes, and of course accident shunts) are alerted to the underwriters each morning, via a scheduled web report, which is emailed to the relevant product head. This allows expert knowledge to be applied as to whether the policy should be withdrawn, with the oversight that GPS data can sometimes be unreliable depending on number of satellites available at the time. For more general insight and monitoring the data can be augmented into a cube, or in the long term using a product like SAS Visual Analytics.

Claims managers can see an overall view of driver behavior using information showing speed, miles travelled and time of day, via BI dashboard bubble plots, dials and spark tables. Claims handlers required a different level of detail – drilling into the low level detail of incident trip data to see the direction and velocity at actual time of accident.

### Data and techniques

In order to generate high exception reporting some box providers deliver this as a separate feed, depending on threshold settings on the box. The alternative method would be to read the overnight feed of all trip data and siphon out the exceptions based on the insurers own set of rules. The email approach should only be taken for show-stopper behavior, rather than general interest – otherwise the recipient will soon fill up their inbox with large reports.

Figure 14 Claims Telematics Dashboard shows a proof of concept, to allow claims managers the ability to analyze the profile of their claims book.





Figure 14 Claims Telematics Dashboard

Figure 15 Claims Telematics Detail shows examples of graphs that the claims handlers can use to verify certain aspects of the accident, such as location, road type, velocity and direction.

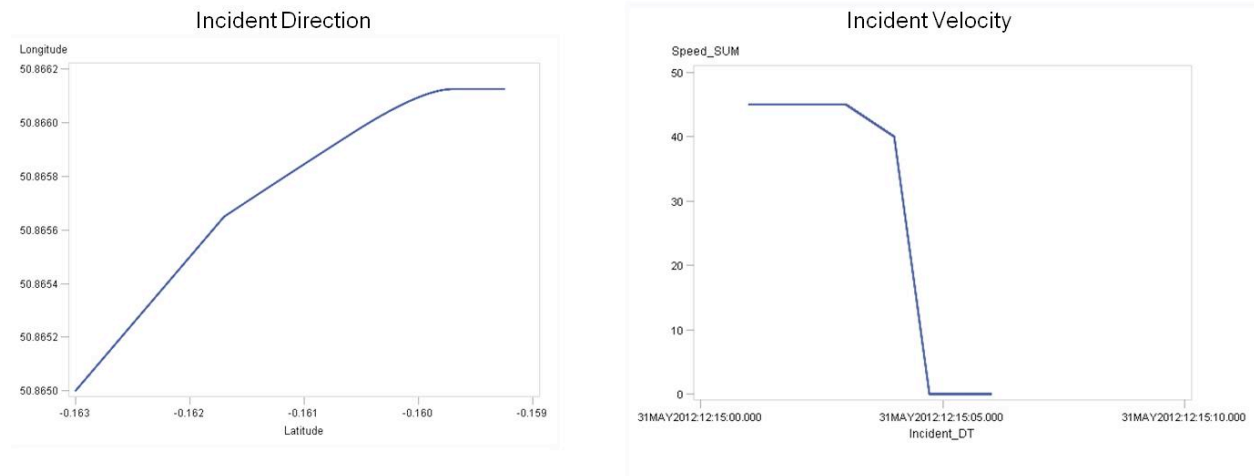


Figure 15 Claims Telematics Detail

## WHAT NEXT? THE APPEAL OF VISUAL ANALYTICS

### Flexibility

SAS Visual Analytics provides an enhanced front-end to the power of the SAS system. The tablet inspired interface moves the presentation of reporting and analysis to a whole new level. SAS Visual Analytics is more flexible than that of OLAP functionality. Similar analysis can be performed; however there is no need to pre-define hierarchies to drill through, but rather the user has the ability to choose dimensions on the fly.

## Functionality

There are many types of analysis available, such as correlations, which are not available in OLAP cubes, with additional functionality being added with each release.

## Power

Coupling SAS Visual Analytics with high performance processing gives a new way of visualizing massive amounts of data instantaneously. For organizations that buy into the concept that analytics breeds growth this opens up a whole new world of possibilities. In the insurance arena this has applications from determining whether your direct website is deterring customers, by monitoring web page drop-off rates, through to counter-fraud applications and the aforementioned new pricing opportunities.

## Enrichment

This also brings about the discussion for enriching data, which is the practice of augmenting previously thought to be "too big" information onto your analytics platform to bring added value. A classic example in the insurance industry is including weather statistics data. Before SAS Visual Analytics was released, the suggestion of gathering all the weather data at 5 minute intervals, from all around the country, so that when a claim occurs you know exactly weather it was rainy, foggy, icy etc., would have been deemed outlandish and impossible to process effectively. Now it's just one of many factors insurance companies can use to reduce their costs and improve their profitability.

## CONCLUSION

These early years of Big Data and High Performance Analytics offer a new dynamic to businesses that was previously only available to the big players with big budgets. Being able to use these applications on commodity blade servers changes the game for the Small to Medium Enterprise allowing them to compete on a more level playing field.

And yet, the ability to monitor the present, measure the progress and predict the long term profitability of an organization will still be required as long as there are businesses to run.

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