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Session 106: Embracing Tools and Technologies to Improve Management Reporting

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Session 106

Embracing Tools and Technologies to Improve Management Reporting

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Overall Agenda



Data Tools and Technologies



Management Reporting



Business / Actuarial View

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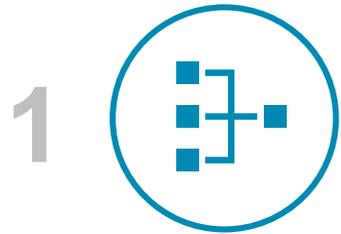
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Data Tools and Technologies



Agenda



Data transformation, analytics and automation



Cloud computing



Data warehousing

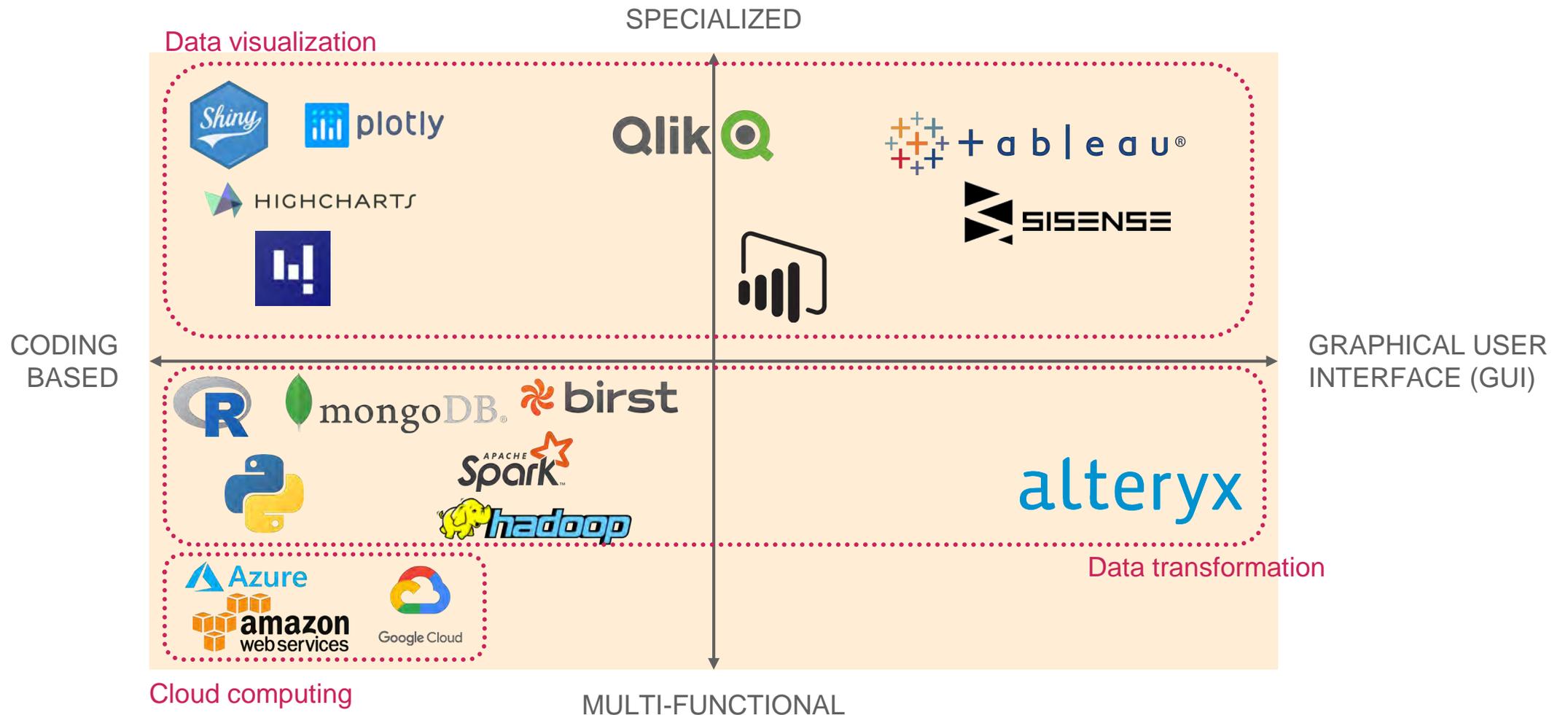


Data visualization



Modern data platforms quadrant

Analytics and visualization platforms tend to be more specialized whereas data transformation and data warehousing platforms are generally multi-functional





Data transformation, analytics and automation (1/3)

While Python and R remain go-to platforms, Alteryx is becoming increasingly popular and allows less-technical users to harness advanced functionality



| | | | |
|---------------------|---|---|---|
| Ease of use | <ul style="list-style-type: none"> • Simple drag and drop feature is self-documenting • No programming experience required | <ul style="list-style-type: none"> • Simple syntax with a focus on readability • Gradual learning curve | <ul style="list-style-type: none"> • Too many ways to do the same thing • Steep learning curve; but easy for statistical modeling |
| Capabilities | <ul style="list-style-type: none"> • Superior and user-friendly workflow, development, and automation | <ul style="list-style-type: none"> • Data libraries are more generalized compared to R • Lags in statistical libraries but very high potential to catch-up to R | <ul style="list-style-type: none"> • Head start compared to competitors with a large number of packages/libraries |
| Scalability | <ul style="list-style-type: none"> • Technology partners include Microsoft, AWS, Tableau, and Qlik • Blends and analyses large datasets without the need to move data | <ul style="list-style-type: none"> • High API support and production-ready • Easy to leverage for non-data tasks | <ul style="list-style-type: none"> • API support to other big data tools is limited • Low automation |
| Cost | <ul style="list-style-type: none"> • High | <ul style="list-style-type: none"> • Free (Open-source) | <ul style="list-style-type: none"> • Free (Open-source) |
| Speed | <ul style="list-style-type: none"> • Very efficient data structures resulting in faster data transformations than Python Pandas | <ul style="list-style-type: none"> • Depends on coding standards | <ul style="list-style-type: none"> • Depends on coding standards • Improvements over historical speed issues |
| Use cases | <ul style="list-style-type: none"> • Parametrization of workflows • Automation • Data transformation • Higher adoption from corporations | <ul style="list-style-type: none"> • Parametrization of workflows • Easy to implement algorithms • Development of production-ready solutions • Higher adoption from devs/programmers | <ul style="list-style-type: none"> • Strong statistical and data visualization packages • Easier for data exploratory work • Higher adoptions from data scientists, statisticians, and quants |



Data transformation, analytics and automation (2/3)

R and Python used to perform inforce analysis

Steps

1. Append current inforce data with recent lapse and deaths
2. Perform data cleansing to ensure lapse and death data is complete
3. Recalculate updated net amount at risk for each bucket
4. Output summary in an Excel file and email the file

```
1 #
2 #In-force Analysis
3 #
4 #Date: July 16th, 2019
5 #
6 #Purpose: This code updates the current in-force data with recent lapses and deaths.
7 # It then outputs a .csv file that summarizes the resulting in-force statistics by
8 # product and e-mails the results.
9 #
10 #####
11
12
13 #Load libraries
14 library(tidyverse)
15 library(dplyr)
16 library(sendmailR)
17
18 #Load raw data files containing in-force, deaths, and lapses
19 SampleInforce <- readxl::read_excel("C:/Users/mary.wu/Desktop/sampleInforce.xlsx")
20 DeathData <- readxl::read_excel("C:/Users/mary.wu/Desktop/sampleDeath.xlsx")
21 LapseData <- readxl::read_excel("C:/Users/mary.wu/Desktop/sampleLapse.xlsx")
22
23 #Combine raw data
24 df1 <- merge(x=SampleInforce, y=DeathData, by="Policy Number", all.x=TRUE)
25 df2 <- merge(x=df1, y=LapseData, by="Policy Number", all.x=TRUE)
26
27 #Data cleaning
28 df2 <- df2 %>% mutate(Status = if_else(!is.na(Date.x), "Lapse",
29   if_else(!is.na(Date.y), "Death", "In-force")))
30
31 df2 <- df2 %>% mutate(Date = if_else(Status=="Lapse", Date.x,
32   if_else(Status=="Death", Date.y, "Issue Date")))
33
34 #Calculation
35 df2 <- df2 %>% group_by(Product) %>% mutate("Percentage_NAAR"=NAAR/sum(NAAR))
36 Summary <- df2 %>% group_by(Product, Status) %>% summarise(NAAR = sum(NAAR), Percentage_NAAR = sum(Percentage_NAAR))
37
38
39 #Export and e-mail results
40 write_excel_csv(Summary, "C:/Users/mary.wu/Desktop/sampleCombined.csv")
41 sendmailR::sendmail(from="mary.wu@oliverwyman.com",
42   to="mary.wu@oliverwyman.com",
43   subject="In-Force Summary",
44   body = Summary)
45
```



```
import pandas
import numpy as np
import smtplib

'''
In-force analysis
Date: July 20th, 2019
Purpose: The code updates the current in-force data with recent lapses and deaths.
It then outputs a .csv file that summarizes the resulting in-force statistics by
product and emails the results
'''

#Load raw data files containing in-force, deaths, and lapses
sample_inforce = pandas.read_csv('SampleInforce.csv')
death_data = pandas.read_csv('SampleDeath.csv')
lapse_data = pandas.read_csv('SampleLapse.csv')

#Combine raw data
df = pandas.merge(sample_inforce, death_data, how='left', on='Policy Number')
df = pandas.merge(df, lapse_data, how='left', on='Policy Number')
df['Status'] = np.where(df['Date of death'].isnull(),
  np.where(df['Date of lapse'].isnull(), 'In-force', 'Lapse'), 'Death')

#Calculation
summary = df[['Product ', ' NAAR ']].groupby('Product ').sum().reset_index()
df = pandas.merge(df, summary, how='left', on='Product ')
df['NAAR_Percentage'] = df[' NAAR_x']/df[' NAAR_y']
summary = df[['Product ', 'Status', 'NAAR_Percentage']].groupby(['Product ', 'Status']).sum().reset_index()

#Export and e-mail results
summary.to_csv('output.csv')
server = smtplib.SMTP('smtp.example.com')
server.sendmail("mary.yu@oliverwyman.com", 'thebak.sothilingam@oliverwyman.com', summary)
```



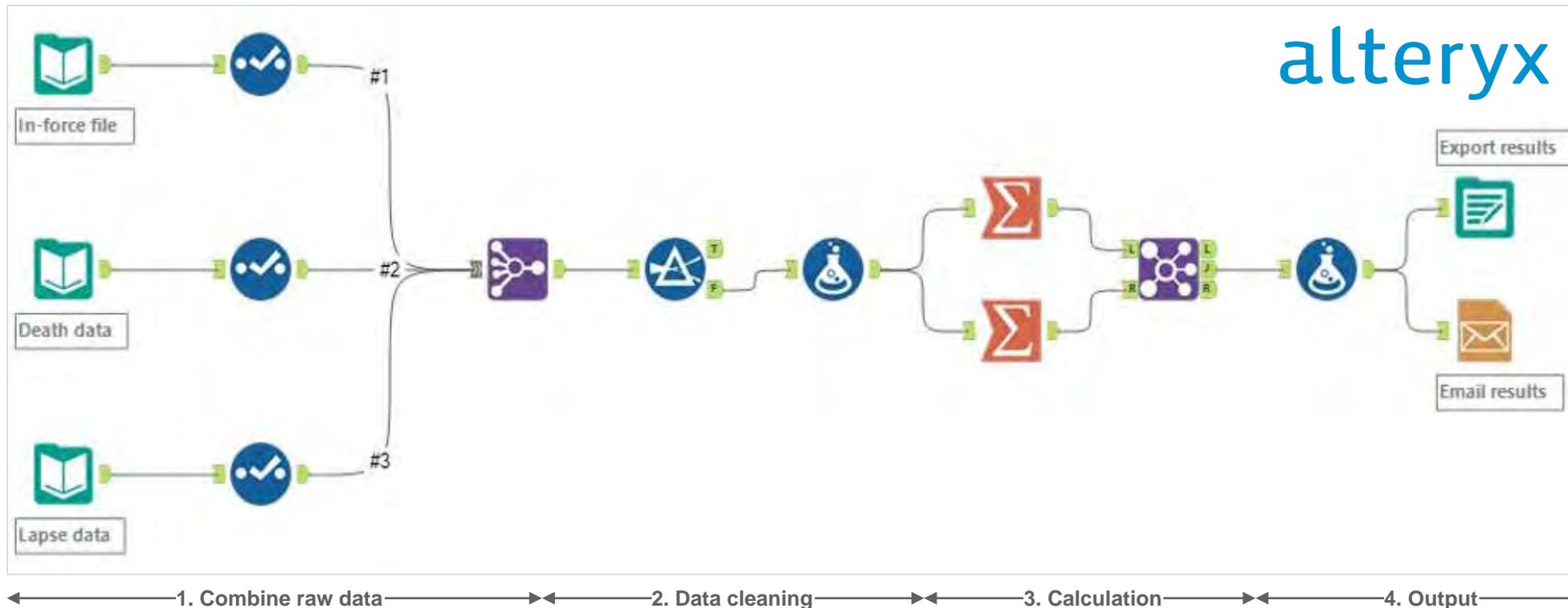


Data transformation, analytics and automation (3/3)

Alteryx used to perform inforce analysis

Steps

1. Append current inforce data with recent lapse and deaths
2. Perform data cleansing to ensure lapse and death data is complete
3. Recalculate updated net amount at risk for each bucket
4. Output summary in an Excel file and email the file





Cloud computing (1/2)

Cloud computing is the on-demand delivery of computing power, database, storage, applications, and other IT resources over the internet resulting in agility, scalability and economics of scale

Business models

➤ Infrastructure as a Service (IaaS)



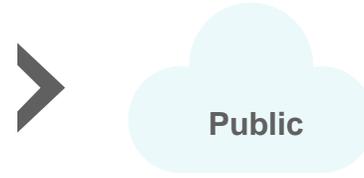
➤ Platforms as a Service (PaaS)



➤ Software as a Service (SaaS)



Types



➤ Hybrid



Pros vs cons

➤ Pros

- Scalability
- Agility
- Low risks
- Low upfront costs
- Security

➤ Cons

- High total costs
- Minimal customizations



Cloud computing (2/2)

AWS is a mature provider and a “safe” option for many companies, while Azure is a strong contender providing the best hybrid cloud offering and better integration for on-premise solutions



| | | | |
|-----------------------------|--|--|---|
| Overview | <ul style="list-style-type: none"> Offer very similar basic capabilities for flexible computing, storage, and networking Common elements of a public cloud are available under all options: 1) self-service & instant provisioning, 2) autoscaling, 3) security, 4) compliance, etc. | | |
| Strengths | <ul style="list-style-type: none"> Mature provider considered a “safe” option Extensive range of applications and native services solutions Well developed training certifications | <ul style="list-style-type: none"> Strong hybrid cloud offering results in a seamless transition between on-premises servers and cloud Microsoft heritage and integration with other Microsoft offerings | <ul style="list-style-type: none"> Designed for cloud-native businesses High computation offerings like Big Data, analytics, and machine learning Strategic adoption from BigQuery offering |
| Weaknesses | <ul style="list-style-type: none"> New to the hybrid cloud model. Playing catch up to Azure after VMware partnership Learning curve can be steep and keeping up with regular updates can increase costs | <ul style="list-style-type: none"> Larger-scale implementations have reported significant challenges due to inadequate technical expertise¹ Traditional Microsoft partners trying to support Azure may not have the required expertise¹ | <ul style="list-style-type: none"> Late arrival to the market Applications and native services along with training and expertise lags AWS |
| Service availability | <ul style="list-style-type: none"> Availability across 23 regions and 69 zones² | <ul style="list-style-type: none"> Global availability across 54 regions/zones² | <ul style="list-style-type: none"> Availability across 20 regions and 60 zones² |
| Cost | <ul style="list-style-type: none"> Reserved and on-demand pricing models Highest advertised prices | <ul style="list-style-type: none"> Reserved and on-demand pricing models Lowest advertised prices; additional savings possible as current Microsoft licenses can be used on Azure cloud | <ul style="list-style-type: none"> Reserved and on-demand pricing models Advertised prices between AWS and Azure |

1. Gartner: Magic Quadrant for Cloud Infrastructure as a Service, Worldwide
 2. Includes regions and zones currently available and planned

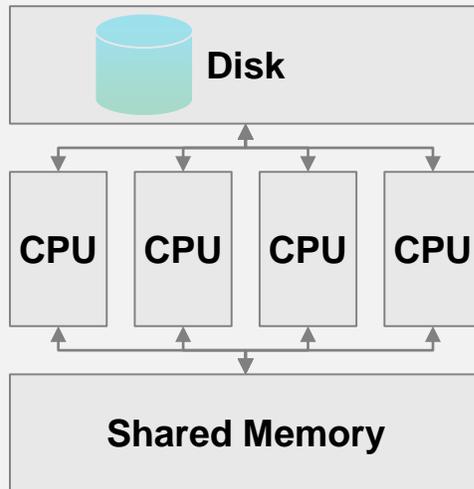


Data warehousing (1/2)

Data warehouse is a system that pulls together data from many different sources within an organization for reporting and analysis purposes to enable decision making

Types of systems

Symmetric multiprocessing (SMP)



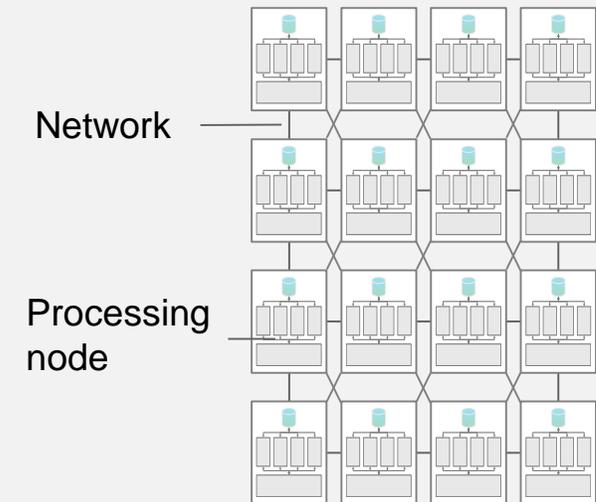
Multiple CPUs process data using shared memory and disk

PROS

CONS

| | |
|-------------------|------------------------------------|
| Reliability | Scalability |
| Hardware agnostic | Performance |
| Data consistency | Concurrency |
| Scalability | Complexity |
| Performance | Cost |
| Capacity | Data distribution becomes critical |

Massively parallel processing (MPP)



Independent machines use discrete computation power, memory and disk to perform a set of computations in parallel

Source: https://www.ibm.com/support/knowledgecenter/en/SSZJPZ_11.5.0/com.ibm.swg.im.iis.productization.iisinfsv.install.doc/topics/wsisinst_pln_engscalabilityparallel.html



Data warehousing (2/2)

While Google BigQuery is less complex, the added complexity of Amazon Redshift allows for more flexibility and special configurations



"Big data pioneer, game-changer"



"Amazon's fastest growing service"



| | | | |
|-------------------|---|---|--|
| Overview | <ul style="list-style-type: none"> Data is partitioned using both rows and columns 128MB blocks are partitioned and run on commodity servers | <ul style="list-style-type: none"> MPP with columnar database Predictable cost structure | <ul style="list-style-type: none"> MPP with columnar database Queries need to be pre-processed to lower cost Unpredictable cost structure |
| Strengths | <ul style="list-style-type: none"> Handles structured and unstructured data Limitless scalability High resiliency as data is replicated on multiple nodes | <ul style="list-style-type: none"> Directly queries data stored on AWS S3 Supports automated backups and facilitates fast restores Easy to update, delete & append records | <ul style="list-style-type: none"> Low complexity as the system automatically scales based on data volume and query requirements Native support for nested data |
| Weaknesses | <ul style="list-style-type: none"> Very high complexity to get started Immature analytical tools, hence primarily a database solution | <ul style="list-style-type: none"> Medium complexity Number of nodes limited to 128 (enough capacity for 326 TB of data) | <ul style="list-style-type: none"> Less supported data types than Redshift Only allowed to append records Record updates and deletion requires creating new tables which can be costly |
| Speed | <ul style="list-style-type: none"> Ideal to process unstructured data but behind competitors for structured data Not ideal for table sizes below 100 GBs | <ul style="list-style-type: none"> Speed will vary by configurations Fastest configurations will increase costs | <ul style="list-style-type: none"> Automatically optimized |
| Cost | <ul style="list-style-type: none"> Low as utilizing commodity servers is cost effective | <ul style="list-style-type: none"> AWS computing cost + Storage cost (\$300 to \$1,200 per TB per month) | <ul style="list-style-type: none"> Google Cloud computing cost + Storage (\$20 per TB per month) + Data querying cost is variable and unknown upfront |



Data visualization

Tableau and Power BI are market leaders providing leading-edge capabilities and superior user experience, while Qlik is an affordable solution with solid capabilities, but some limitations



| | | | |
|----------------------|--|--|--|
| Overview | <ul style="list-style-type: none"> • Superior business intelligence and data visualization capabilities for data-driven organizations | <ul style="list-style-type: none"> • Affordable business intelligence and visualization solution for both technical and non-technical users | <ul style="list-style-type: none"> • Affordable business intelligence and visualization solution |
| Strengths | <ul style="list-style-type: none"> • User-friendly and requires no programming knowledge • High focus on user experience • Superior sharing capabilities • Native support from Alteryx | <ul style="list-style-type: none"> • Free versions have very few limitations • Strong support for data exploration and transformation • Provides usability for both non-technical and technical users | <ul style="list-style-type: none"> • Familiar interface compared to Excel and Access • Drag and drop features • Highly integrated with the MS Office suite |
| Weaknesses | <ul style="list-style-type: none"> • Steep learning curve to become an expert • High cost for small business | <ul style="list-style-type: none"> • Sluggish performance when working with large datasets • Some functionalities require deep technical expertise | <ul style="list-style-type: none"> • Reports can't be published with underlying data • User experience is subpar |
| Data handling | <ul style="list-style-type: none"> • Unlimited data points | <ul style="list-style-type: none"> • Unlimited data points | <ul style="list-style-type: none"> • Certain charts have 3,500-10,000 points limit |
| Cost | <ul style="list-style-type: none"> • High • Viewer licence costs \$12/user/month • Creator licence costs \$35-70/user/month | <ul style="list-style-type: none"> • Low • Free for individual users • \$15/user/month for Cloud Business | <ul style="list-style-type: none"> • Low • Free for individual users • \$10/user/month for Pro license |

Management Reporting



Agenda

1

Defining management reporting

Management reporting vs. Financial reporting

2

Internal and external influences

Driving the evolution of management reporting

Constraints on improvement

3

Effective management reporting

Characteristics of effective management reports

Characteristics of quality data

4

Current market and closing the gap

Market trends

Current challenges

Closing the gap

Defining management reporting



Management reporting vs. Financial reporting

Management reporting, in contrast to financial reporting, is an internal reporting structure, generated by management to support the leadership in their business decision-making process

| | Regulatory/financial reports | Management reports |
|--|---|--|
|  <p>Structure</p> | <ul style="list-style-type: none"> • Rigid • Subject to regulatory changes varying by jurisdiction • Multiple jurisdictions require multiple structures | <ul style="list-style-type: none"> • Dynamic and customizable • Constructed as unified and consistent across entities |
|  <p>Internal vs. external nature</p> | <ul style="list-style-type: none"> • Tailored to provide insight to regulators and investors • Focus tends to be on bottom line, prioritizing financial stability, meeting market standards, and regulatory adherence | <ul style="list-style-type: none"> • Created to provide actionable insights to management • Involves fit-for-purpose representation of results • Focus on particular business key performance indicators (KPIs) |
|  <p>Time frame relevance</p> | <ul style="list-style-type: none"> • Monthly/quarterly/annually aggregated data • Reports actual results, requires supplemental projections | <ul style="list-style-type: none"> • Can be generated as frequently as desired • Can include actual and projected results to provide management with full picture |

Management reporting vs. Financial reporting (cont'd)

| | Regulatory/financial reports | Management reports |
|--|--|--|
|  <p>Level of granularity of results</p> | <ul style="list-style-type: none"> Financial results produced on an aggregated level Based on fixed hierarchies | <ul style="list-style-type: none"> Allow for dynamic segmentation of financial results on ad-hoc basis Granularity of information is aligned with level required to steer business and promote understanding |
|  <p>Assumptions used</p> | <ul style="list-style-type: none"> Use mostly prescribed assumptions with little room to reflect best estimate or company-specific experience | <ul style="list-style-type: none"> Developed using the company's own view of their assumptions and reflects current experience |
|  <p>Controls and deadlines</p> | <ul style="list-style-type: none"> Adhere to high level of controls Relatively quick timelines in order to meet external submission deadlines | <ul style="list-style-type: none"> Internally developed timelines More realistic timelines allow efforts to be focused on accuracy of desired data |
|  <p>Data visualization</p> | <ul style="list-style-type: none"> Format of regulatory statements are predetermined by regulatory entities Hardcoded black-and-white numerical exhibits | <ul style="list-style-type: none"> Advanced analytics and data visualization tools can be used Graphs and charts facilitate accurate interpretation of trends and movements in data |

Evolution of management reporting



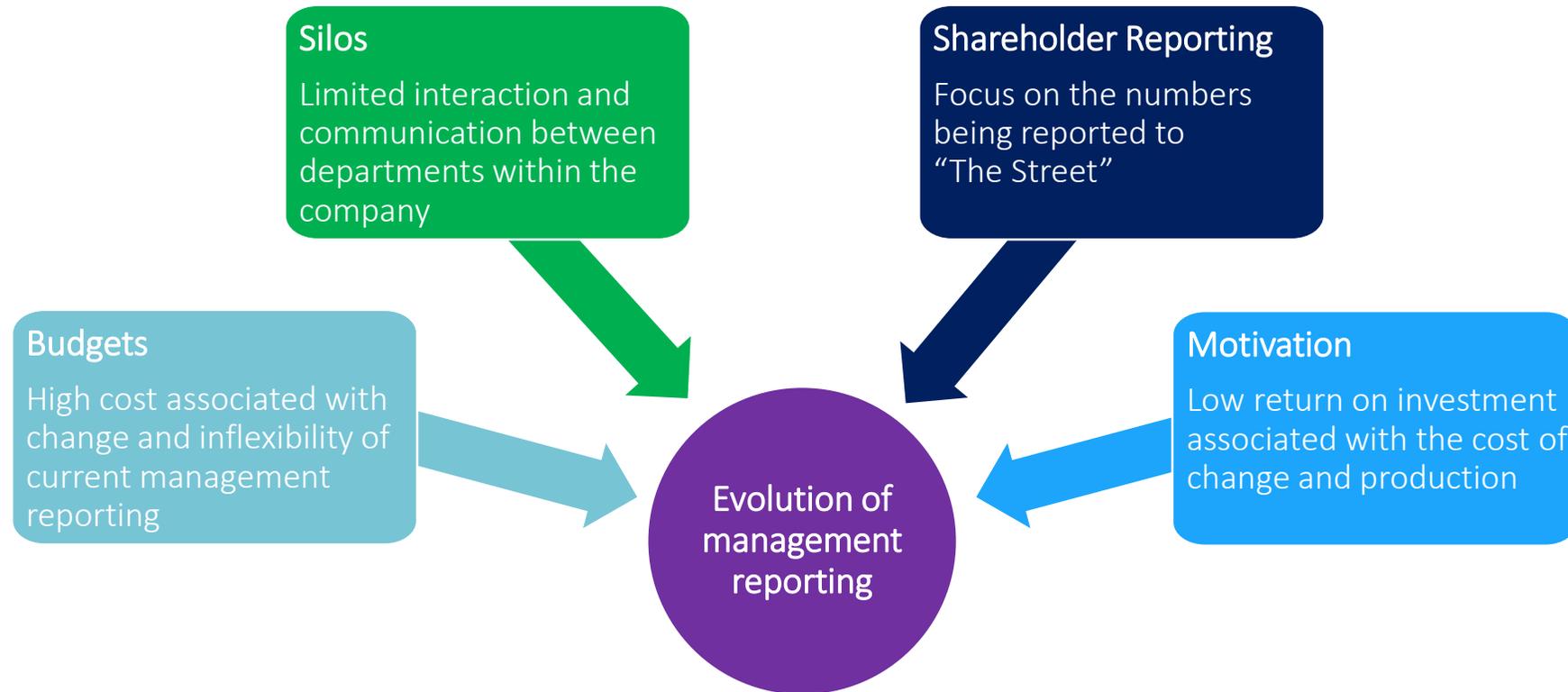
Driving the evolution management reporting

New accounting, regulatory and reporting requirements are forcing insurance organization to take a hard look at the quality and timeliness of their management reports at the same time they are grappling with new technologies and internal change.

| External drivers | Internal drivers |
|---|---|
| <p>Regulatory changes</p> <ul style="list-style-type: none">Upcoming and proposed regulatory changes, such as IFRS 17, are requiring more disclosures, added transparency, and depth in reporting. | <p>Change in company structure</p> <ul style="list-style-type: none">Acquisitions or mergers often lead to a shift in an organization's culture, with new management influencing the way results are analyzed. |
| <p>Growing complexity in reporting requirements</p> <ul style="list-style-type: none">External reporting requirements continue to grow in complexity, such as IFRS requirements to unbundle elements of insurance liability. | <p>Transformation initiatives and technology</p> <ul style="list-style-type: none">Our KPMG Global Insurance CEO and CIO survey found that one of the top three priorities for insurance CEOs was implementing disruptive technology (24% vs. 16% in 2016), and 61% see technology disruptions as an opportunity rather than a threat. |
| <p>Market and shareholder influence</p> <ul style="list-style-type: none">Insurance companies are focusing on communicating their results to capital markets. | <p>Integration of management and financial reporting</p> <ul style="list-style-type: none">Analysis needs to support management understanding on what is driving change, and it must be of sufficient quality to support business steering. |

Constraints on Improvement

While the previous internal and external factors drive the increased need for enhanced management reporting processes, organizations are typically faced with constraints that limit what they can do.



Effective management reporting



Characteristics of effective management reports

Effective management reports must be flexible and contain sufficient detail to allow senior leadership in their decision making process. They should do the following:

1

Be dynamic and allow for “real-time” drilldown capabilities into aggregate results

2

Allow for trend and volatility analysis on an ad-hoc basis

3

Offer data segmentation using a range of product, policyholder and market variables

4

Have the flexibility to produce results by desired frequency and for any time period

5

Produce dynamic data visualization dashboards and allow for “what if” analysis

6

Focus on the KPIs Management is most interested in

Characteristics of quality data

It all starts with data. In order for management reports to be effective, quality data and supplemental information is required to support the reporting process.



Current market and closing the gap



Market trends

Outlined below are a number of trends in the development of management reporting process. This gives a view on where the industry stands currently.



Accurate analysis & improved explanation

- Rapid, driver-based analysis
- Data discovery tool
- Enhanced analysis reports
- Improved collaboration



Tighter control & heightened transparency

- One source of truth for data
- Improved auditability



Faster speed & greater frequency

- Leveraging new technology
- Automation of reporting
- Reduced reliance on spreadsheets
- Improved data accessibility



Integration of functions

- Reconciliation across reports
- Consistent data treatment

Current challenges

Current challenges to using internal reporting for management decisions include the following:

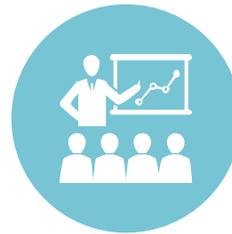
- Inability to source granular data due to internal consolidation/aggregation
- Inefficient and/or outdated server capacity and software
- Poor data quality (missing data, inconsistent or inaccurate values)
- Slow data processing leading to rushed analysis and cursory analysis
- Lack of flexibility and high cost of change
- Lack of materiality thresholds and tendency to go into unwarranted level of detail/accuracy
- Conservative approaches to innovation and force of habit preventing companies from taking full advantage of available data and tools

Closing the gap

In order to develop a robust management reporting structure, organizations need to develop a comprehensive action plan to address the gaps in their current structures. Outlined below are some of the action items to consider as part of that plan.



Decide on the design of the reports



Define the process and controls around management reporting



Fix the data



Decide on a suite of software to support processes



Get stakeholder buy-in

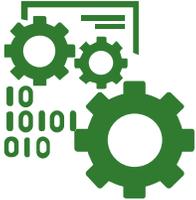


Improve the culture

Business / Actuarial View



Business / Actuarial View

- 1  **Leading through change**
- 2  **Making change stick**
- 3  **Fostering ongoing innovation**

Leading through change

During implementation, guide leaders and end-users to adopt new tools that support modern and dynamic management reporting processes.



Get stakeholder buy-in

- Celebrate early adopters
- Test and learn
- Facilitate and respond to feedback
- Shared expertise and accountability



Improve the culture

- Embrace different perspectives
- Balance leader and staff objectives
- Change is the new norm
- Focus on system resiliency

Making change stick

The project is complete. The consultants have left. The team has disbanded. What now?

Resist going back to legacy processes and rigid roles to support your modern system.

Preserve collaboration between actuarial and IT resources. Retain key project resources.

Establish a support team that specializes in the actuarial processes from end-to-end.



Fostering ongoing innovation

You've created a modern system and delivered substantial improvements to address known challenges. Where can you go from here? Allow space for ongoing innovation.

Embrace Constant Change

Our industry will continue to be pushed to innovate. Faster systems, easier processes, reliable data, deeper insights, complex analysis and other demands will drive change.

Expand Your Actuarial Toolkit

Tools can be expanded to support all actuarial functions. Once established, you can then integrate actuarial tools with finance and management reporting tools.

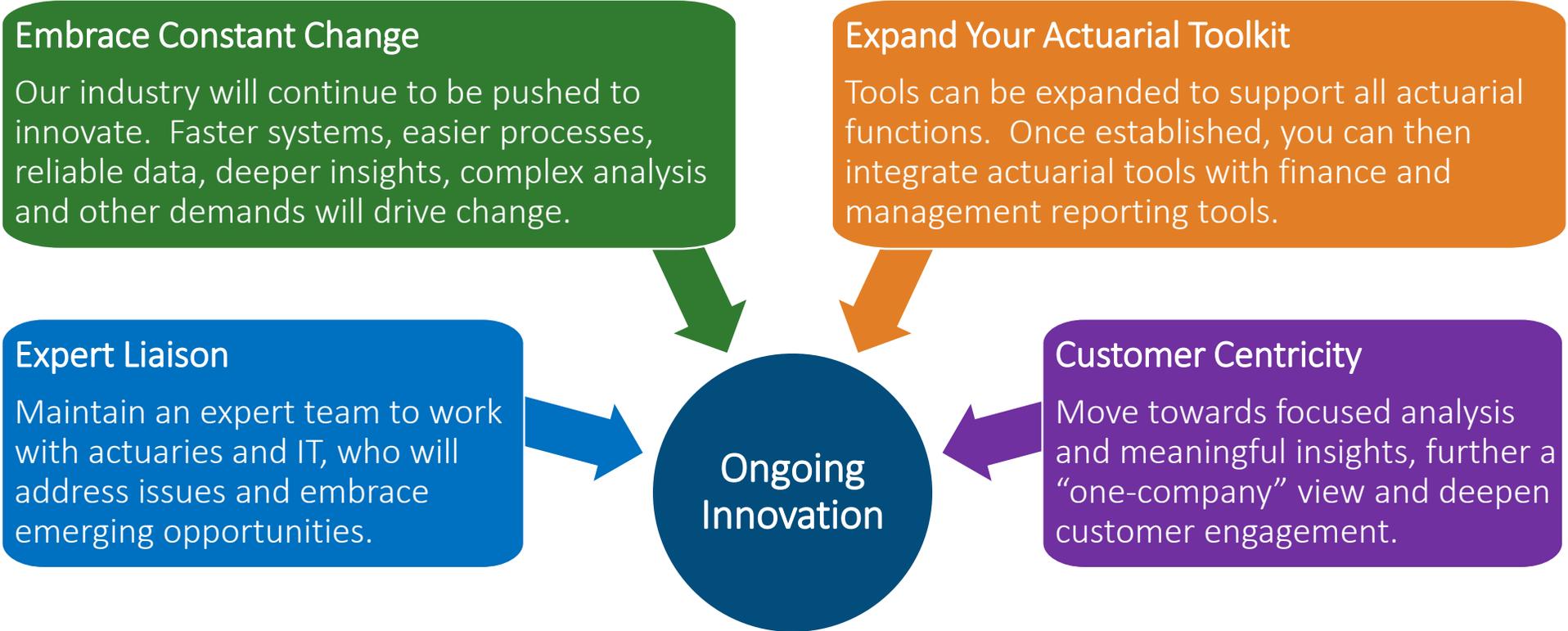
Expert Liaison

Maintain an expert team to work with actuaries and IT, who will address issues and embrace emerging opportunities.

Customer Centricity

Move towards focused analysis and meaningful insights, further a "one-company" view and deepen customer engagement.

Ongoing Innovation



Thank you



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