Deloitte.

CAS – In Focus Seminar
The Actuary of Tomorrow

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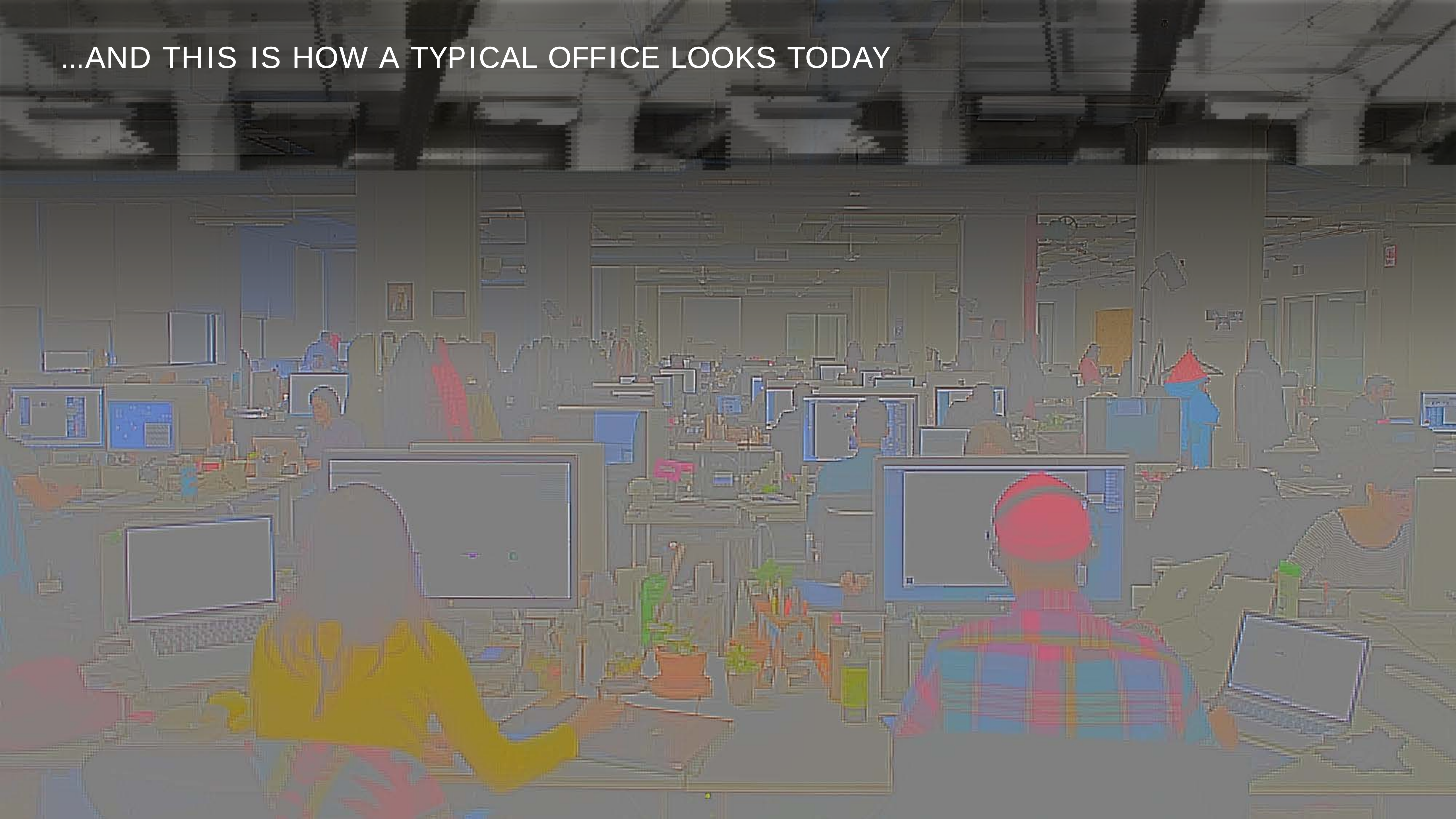
DISCUSSION OUTLINE

- Background
- What is Pixelation?
- The Pixelation of Actuarial Roles
- Advanced Technologies
- Impact on Actuaries

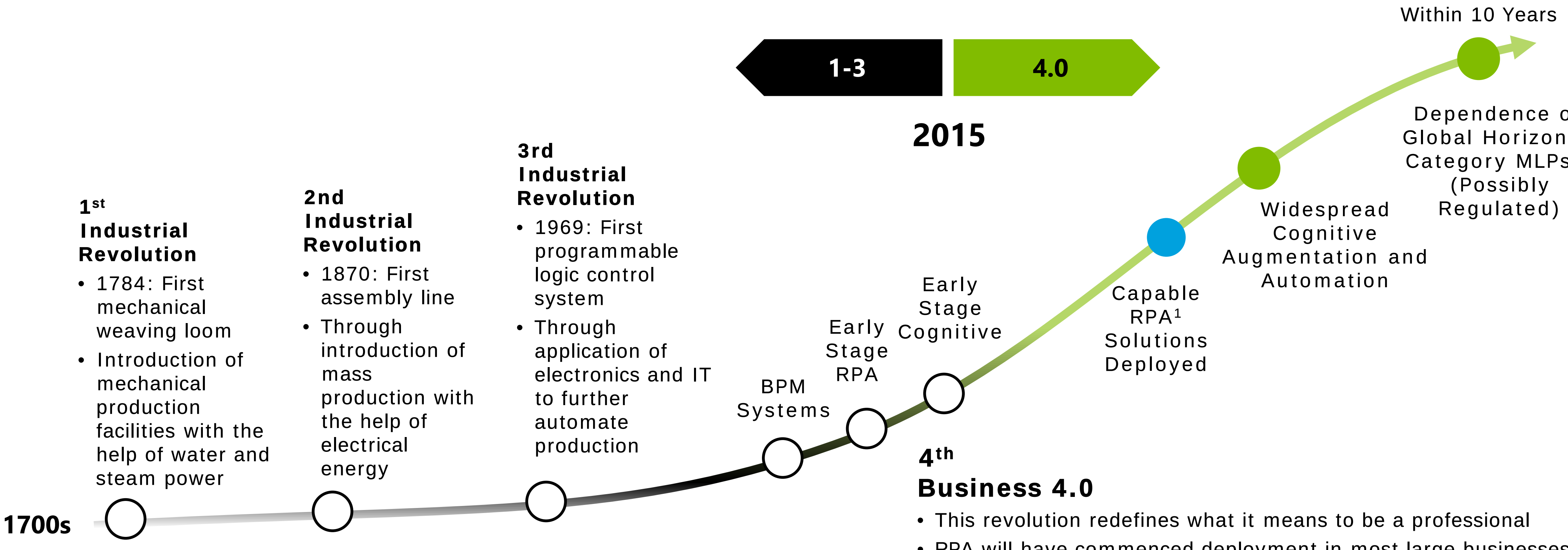
BACKGROUND

THIS IS WHAT A FACTORY LOOKS LIKE TODAY

...AND THIS IS HOW A TYPICAL OFFICE LOOKS TODAY



We are on the cusp of "Business 4.0"



1st Industrial Revolution
- 1784: First mechanical weaving loom
- Introduction of mechanical production facilities with the help of water and steam power

2nd Industrial Revolution
- 1870: First assembly line
- Through introduction of mass production with the help of electrical energy

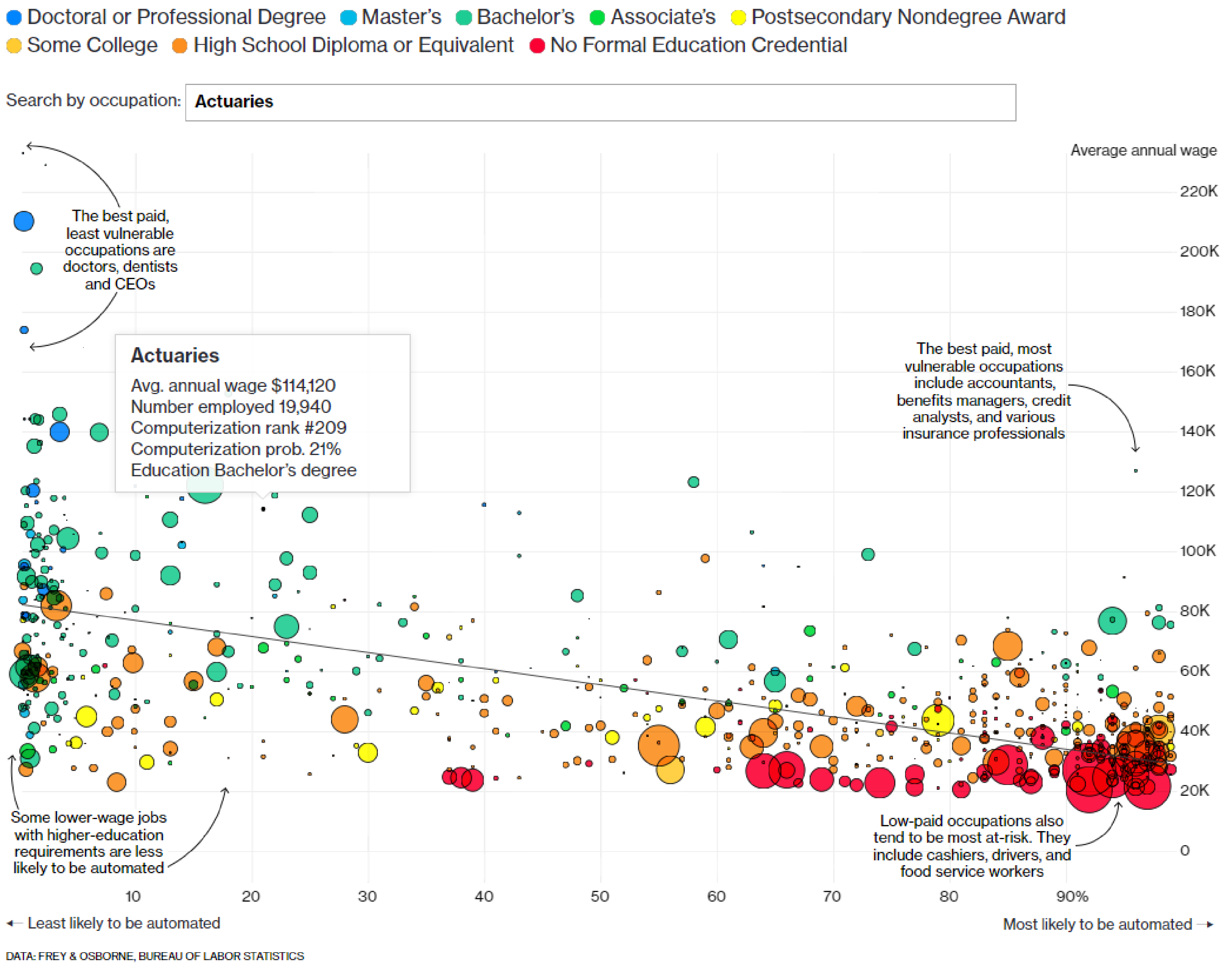
3rd Industrial Revolution
- 1969: First programmable logic control system
- Through application of electronics and IT to further automate production

4th Business 4.0
- This revolution redefines what it means to be a professional
- RPA will have commenced deployment in most large businesses by 2017
- RPA and Cognitive Automation will be ubiquitous in business by 2020
- **Horizontal Machine Learning Platforms (MLPs) become ubiquitous by 2025**

Legend: Industrial Revolution | Early Stage Technology | Mature Technology | Future Event

[1]Robotic Process Automation
Source: Industry 4.0: Challenges and Solutions for the Digital Transformation of Exponential Technologies, Deloitte AG, 2015 and Deloitte proprietary research

Is Your Job At Risk? [2]



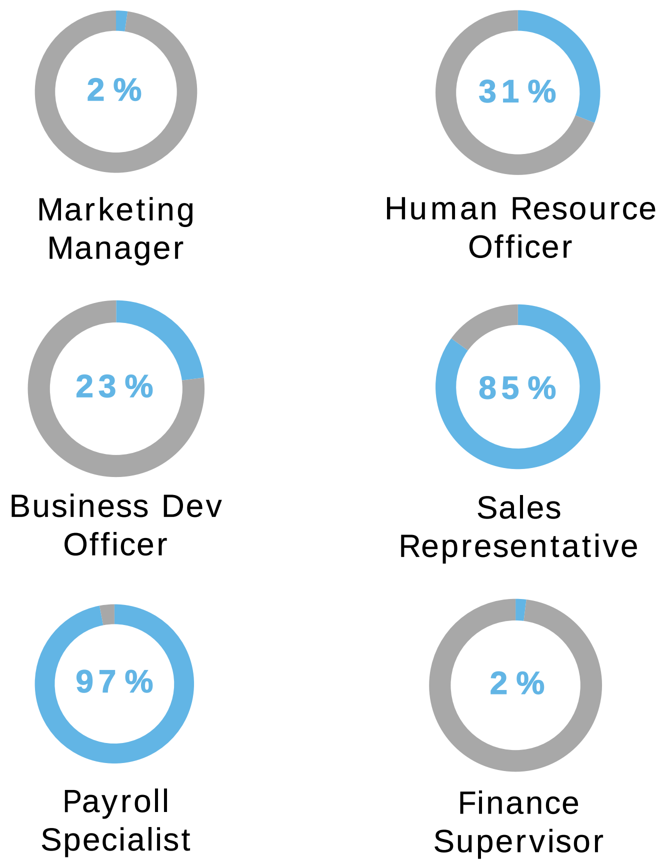
https://www.bloomberg.com/graphics/2017-jobs-automation-risk/

Impact of Automation

A glimpse into the next 10 to 20 years for a sample of Technology, Media and Telecommunication jobs…

Proportion of tasks that can be automated[1]

Probability of automation[1]



[1] C. Lamb. (June 2016). The Talented Mr. Robot: The Impact of Automation on Canada's Workforce. Brookfield Institute.

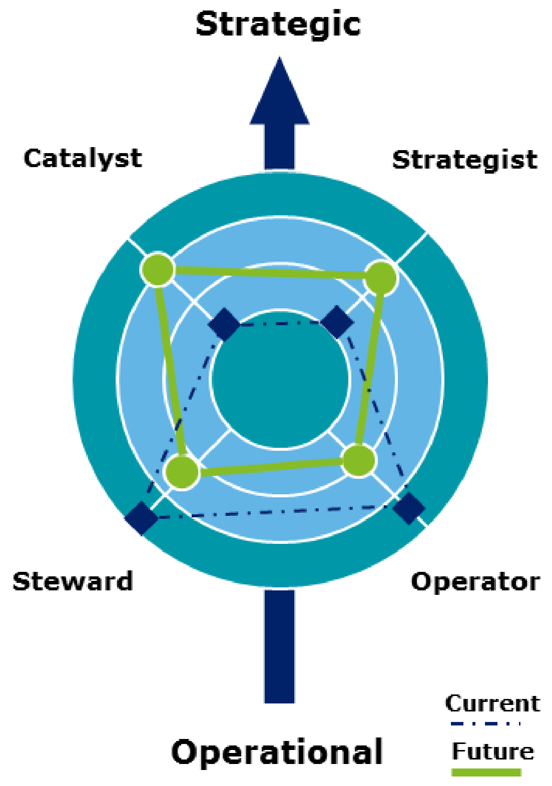
A LOT OF BUZZ ABOUT ACTUARIAL MODERNIZATION

There are numerous challenges across the Insurance industry driving the need for Actuarial Modernization.

Insurers are trying to address similar pain points in the management of financial results, reserving, pricing and ERM …

…and are making targeted investments to shift the focus of Actuaries into more strategic activities

Industry Challenges	Opportunity
Patchwork of Outdated Systems	Leading Actuarial Systems
Disconnected Operations	Integrated and Connected Services
Constrained by Process and Data	Focus on Value Add Activities
Actuaries Performing IT Roles	Automate IT Tasks
Reactive Operations	Proactively Analyze Results
Limitations in Governance	Embedded Governance
Emerging Regulations	Readiness for New Regulations



MODERNIZATION AND EXPONENTIAL TECHNOLOGIES

Seven technologies have growing relevance for how the work of Actuaries gets done

Core Modernization

Here Now

Cloud

Visualization

In-Memory Computing

Process Robotics

Exponentials

Emerging Quickly

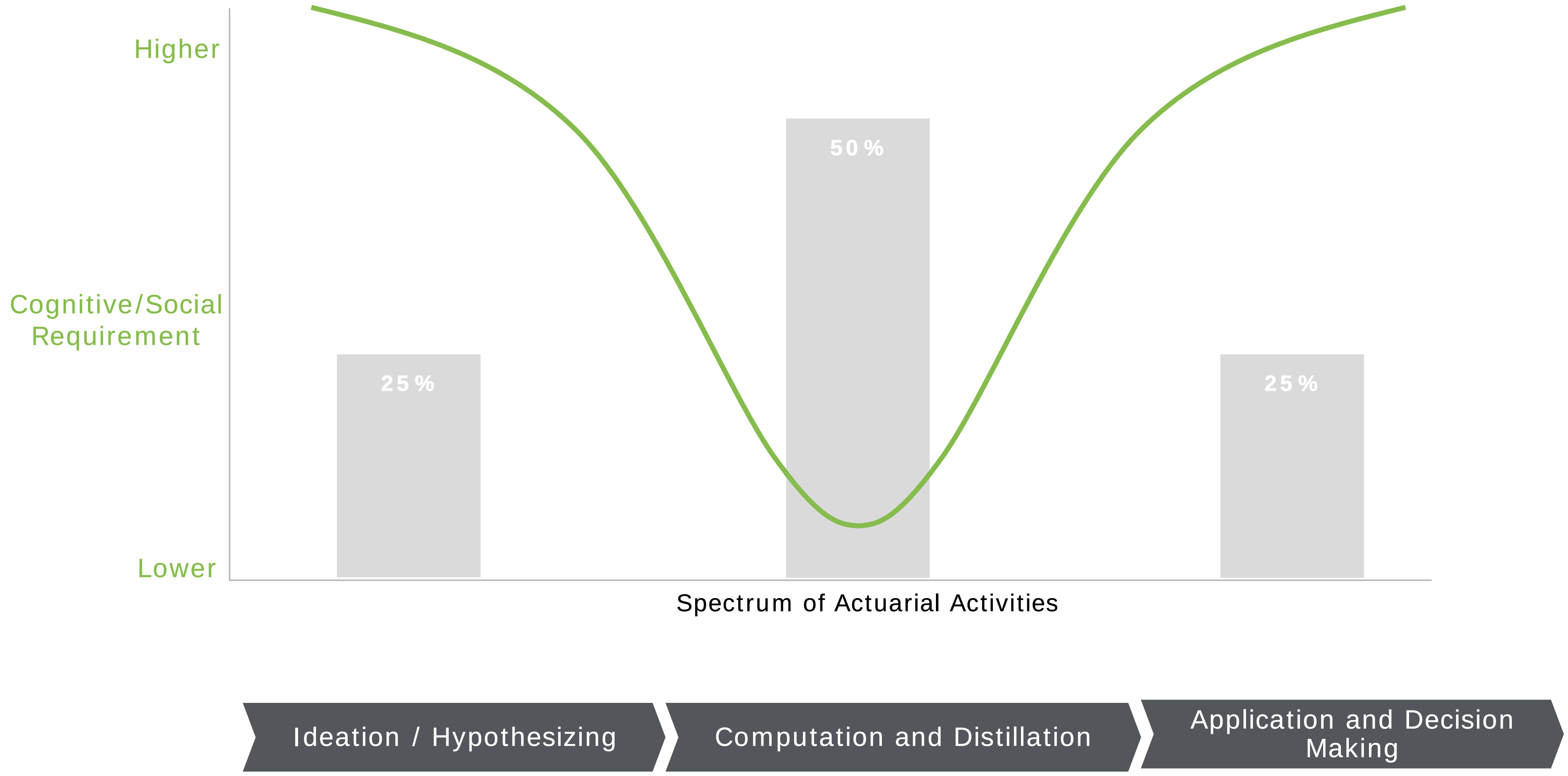
Advanced Analytics

Cognitive Computing

Crowd Sourcing & Competitions

CURRENT STATE OF ACTUARIAL FUNCTIONS

The Actuarial Profession performs a range of activities across the cognitive/social spectrum with more effort spent than desired on lower cognitive activities. Automation has been used to automate some of these activities.



E.g. Product development, Marketing, Distribution

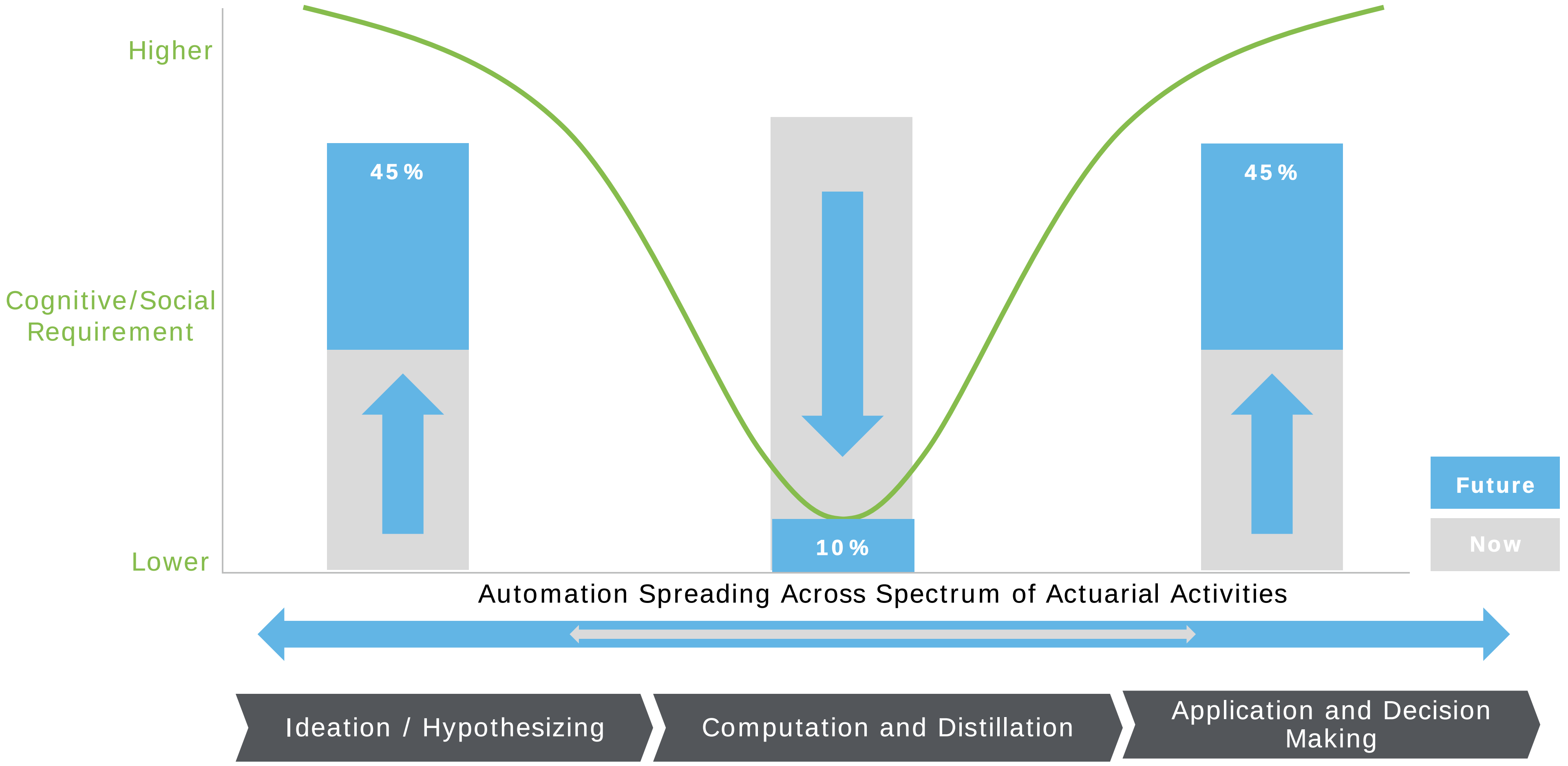
E.g. Modeling, Pricing, Reserving, Financial Reporting

E.g. Strategic Planning, Inforce Management

WHAT WILL THE ACTUARIAL FUNCTION LOOK LIKE A FEW YEARS FROM NOW?

FUTURE STATE OF ACTUARIAL FUNCTIONS

The nature of the Actuarial Profession and their activities is being disrupted due to technological and talent/operating innovation. This will shift human work towards higher cognitive and value-add activities.



E.g. Product development, Marketing, Distribution

E.g. Modeling, Pricing, Reserving, Financial Reporting

E.g. Strategic Planning, Inforce Management

IN THE NEXT FEW YEARS, ACTUARIAL ORGANIZATIONS WILL LOOK VERY DIFFERENT

Imagine A World Where…

5:00 AM
An automated robot completes running of actuarial models and reserves. Output is sent to its analytics engine

6:00 AM
The data from the modeling engine is staged on a Tableau server and dashboards are refreshed

7:00am
The natural language generator adds in narratives to the dashboard

8:00am
The Chief Actuary has access to the updated reports and narratives as soon as he/she arrives in the office

8:10am
The Chief Actuary interacts with the chatbot in natural language to drill down into splits by channel/product

8:15am
The Chief Actuary further drills down into variance analyses for products /services with dropping margins

All of the technologies required to realize this vision of the future exist today

WHAT IS PIXELATION?

Pixelation comes from the world of digitized images

When an image is broken down into its component pixels such that you can better identify its building blocks

Pixelation zooms into a task/project to break it down to its core components (pixels)

Identify the components of a project in order to architect the right approach and leverage the best mix of technologies, people and crowds to deliver results.

A common place where Pixelation is used is with Crowdsourcing

Crowdsourcing can be used for design, development, and testing activities that require a reliable source of skill or technique. The power and flexibility of crowdsourcing allows you to use the community for individual project components to facilitate an end-to-end solution.

How it works

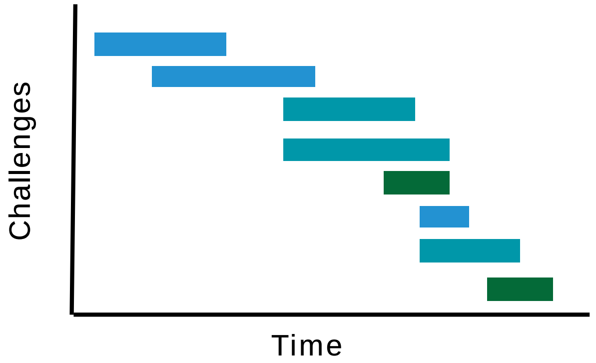
1.Requirements

Design and development projects can start with a rough idea or a full requirements document.

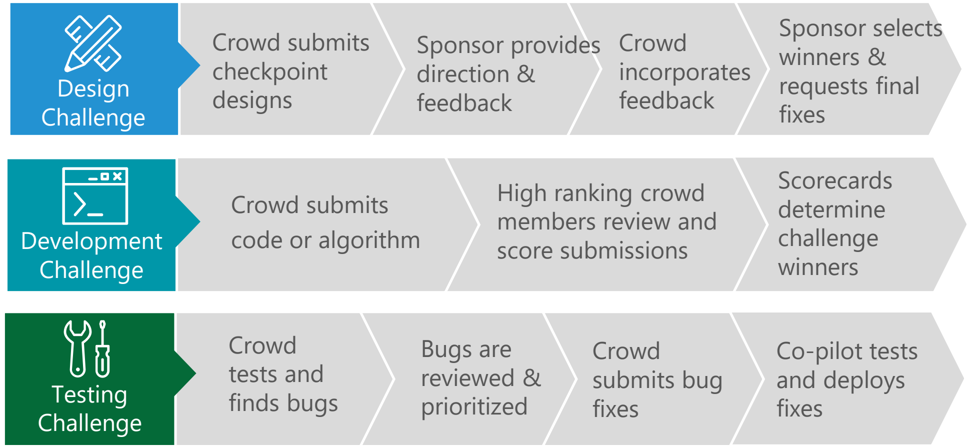
Whiteboard Mockup or **Scope survey** or **Detailed requirements documents**

2.Gameplan Creation

A gameplan breaks the project into small, open competitions that attract hyper-specialized competitors. Deliverables iterate and build on each other until the final product is complete.



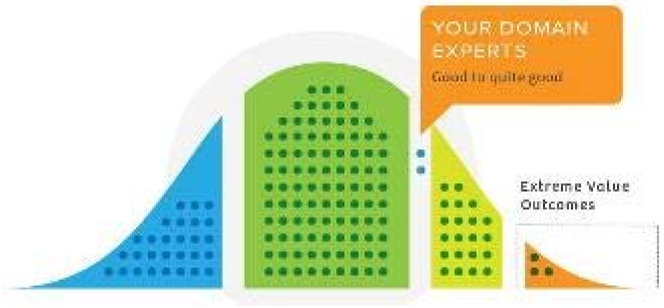
3. Challenge Execution



Why it works

Statistics

The scale and specialization of the crowd increases the probability of extreme value outcomes



Structure

Competition drives creativity and quality
The raw nature of competition forces participates to think out side the box and outperform their competition

Sponsor feedback sets direction & forum posts answer questions Sponsor manages the feedback processes and the challenge forum where the crowd gets their questions answered

Incentives

Why does the crowd want to participate?

Prize money **Status in community** **Educational Opportunities**

BREAKDOWN OF IMPACTED ACTUARIAL TASKS

Various segments of the Actuarial process can be automated and enhanced

End-to-End Actuarial Process

Data Acquisition & Preparation

Modeling

Reporting and Analysis

Automation Spreading Across Spectrum of Actuarial Activities

Use Cases

Using rules-based processes and data automation to mimic human actions

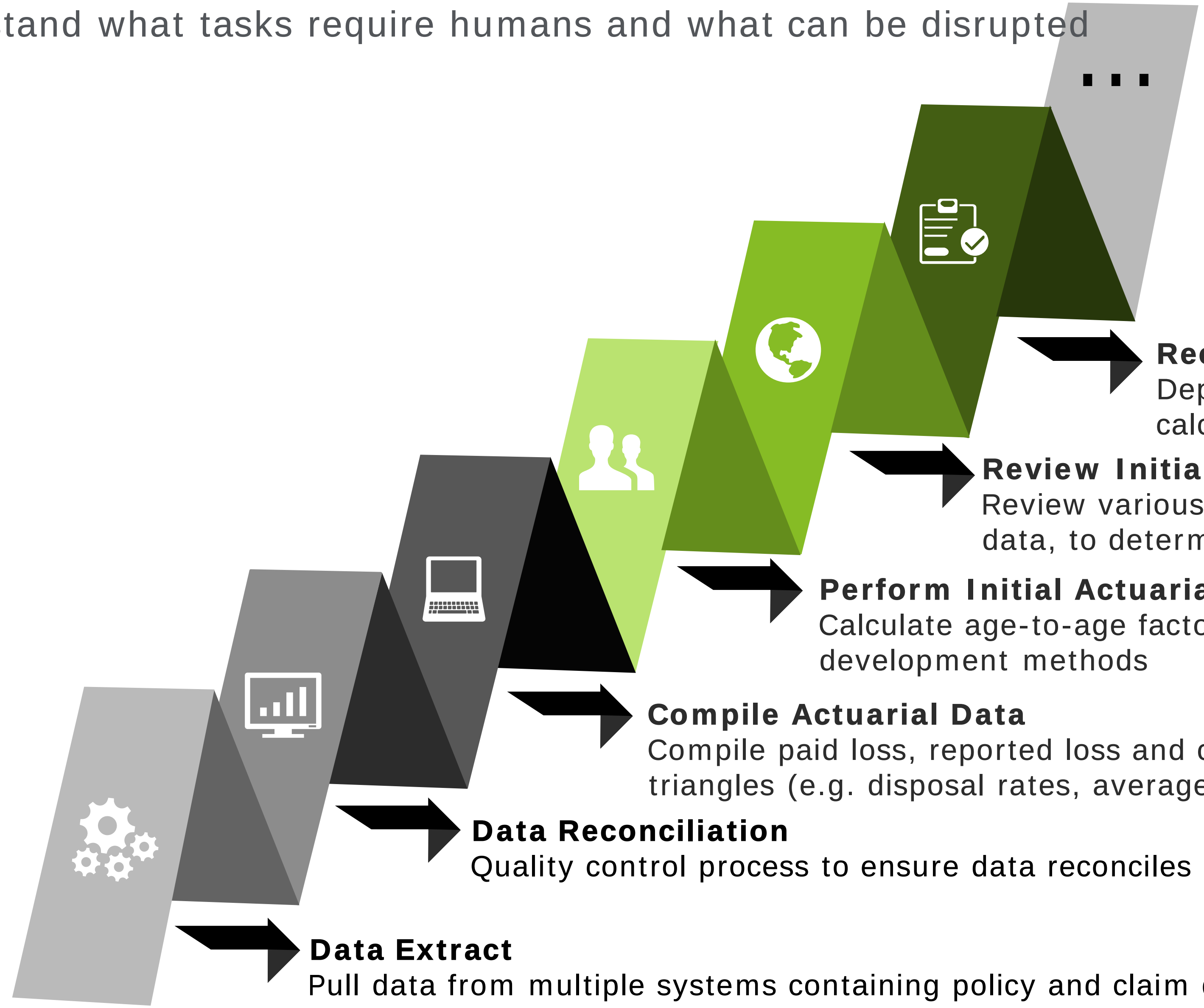
Using cognitive automation to enhance the actuarial processes

Using enterprise content management and natural language generation to augment memorandum and report generation

THE PIXELATION OF ACTUARIAL ROLES

BREAKING DOWN PROCESSES INTO EVEN MORE REFINED STEPS IS REQUIRED

Understand what tasks require humans and what can be disrupted



Recalculate Alternative Estimates
Depending upon results of Initial Results, calculate alternative estimates, etc.

Review Initial Results
Review various actuarial methods, along with diagnostic data, to determine appropriateness of various methods

Perform Initial Actuarial Method Calculations
Calculate age-to-age factors, cumulative LDFs, B-F estimates, loss development methods

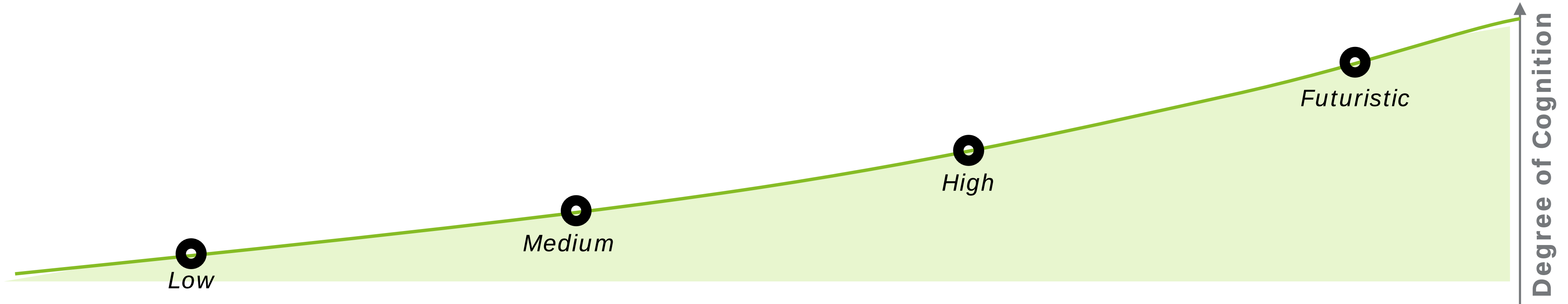
Compile Actuarial Data
Compile paid loss, reported loss and claim count triangles along with diagnostic triangles (e.g. disposal rates, average case reserves, etc.)

Data Reconciliation
Quality control process to ensure data reconciles to financial systems and prior year analyses

Data Extract
Pull data from multiple systems containing policy and claim data required for actuarial analysis

SPECTRUM OF COGNITIVE TECHNOLOGIES

New technologies show significant application for the Actuarial profession, delivering substantial savings and efficiencies



Robotic Process Automation

"Mimics human actions"

Computer program or "robot" that mimics rules-based actions in existing applications

Applications: Invoice receiving, 3-way matching, customer credit assessment, reconciliation etc.

Intelligent Automation

"Mimics human judgment"

Tools that allow for the natural language generation based on a dataset and business rules

Applications: Invoice processing and filing, workers comp. filing, underwriting advisor etc.

Cognitive Automation

"Augments human intelligence"

Computerized models that simulate human thought processes through predictive decision making

Applications: Creation of competitor analysis, advanced planning & predictive forecasting etc.

Artificial Intelligence

"Mimics human intelligence"

The theory and development of computer systems that can perform tasks which normally require human intelligence

Applications: Self-sustaining reconciliations etc.

Technology is a source of sustainable cost reductions

ADVANCED TECHNOLOGIES

ROBOTICS VS. COGNITIVE AUTOMATION

Technology is evolving rapidly, opportunity exists to exploit disruptive technologies to increase the value and pace of change of information assets across service, process, and workforce transformation

Realm of Process Robotics (RPA)

Structured Data
Deterministic Outcomes

"Mimics Human Actions"

RPA Realm:
- Rules-based tasks
- Operational processes

RPA Technologies:
- Robotic Process Automation
- Rules engines
- Event stream / complex event processing
- Human-in-the-loop process automation

Potential RPA Applications:
- Reporter – Automated story writing
- Back Office – All "swivel chair" clerical tasks
- Customer service – Mass customization of automated CRM

Realm of Cognitive Automation

Unstructured Data
Probabilistic Outcomes

"Augments Human Intelligence"

Cognitive Realm:
- Cognitive analytics
- Decision making

Cognitive Technologies:
- Deep learning
- Supervised machine learning
- Integrated Cognitive Computing Platforms (e.g. IBM Watson)

Potential Cognitive Applications:
- Pharma – Cognitive creation of new drugs
- Hedge Fund – Algorithmic trading
- Banking – Financial crime detection

WHAT ARE THE BENEFITS OF RPA?

RPA can be executed with low costs, high accuracy, and high scalability, with the potential to produce transformative change and benefits

Key Benefits	
Efficiency & Quality	• Robots perform tasks with a **high degree of accuracy** and operate 24x7 leading to **high-throughput** • Robots can work up to 15x faster than humans in some cases, **dramatically reducing time spent on process execution** • RPA streamlines, standardizes and optimizes the processes, **improving quality and reducing costs**
Scalability & Expertise	• A process can be automated quickly, **reducing reliance on recruitment to handle workload spikes** • RPA helps engage talent by **freeing time to work on strategic roles** and develop new competencies / expertise
Insource & Control	• RPA opens new doors for insourcing processes by providing **greater control** over service delivery model
Governance & Compliance	• Robotic platforms are **secure, audited and managed** within an IT corridor of governance • RPA **improves data quality / consistency** that can result in **better analytics, insights and increased revenue**
Competitive Advantages	• RPA has a **short payback period** since robots drive existing applications with low integration costs • RPA provides **high potential ROI** which can be leveraged to drive critical initiatives

Transformative Change

Re-engineer core processes while automating the function

Decouple Profits & Labor

Revenue and profit generated becomes less dependent on the ability to scale labor; automation enhances the abilities of current resources

Flexibility

Rapidly scale up or down depending on the nature of the business issue

New Competencies

Process owners elevated to process transformation leaders and robot designers as production becomes more automated

Cost Reduction

15 – 90% cost reduction opportunity depending upon the characteristics of the functions selected for automation

WHAT IS ROBOTIC PROCESS AUTOMATION (RPA)?

RPA is delivered through software “bots” that can be configured to undertake rules-based (deterministic) tasks; it is not actual robots in a production line

RPA is…

- Computer-coded software
- Programs that replace humans performing repetitive rules-based tasks
- Cross-functional and cross-application macros

RPA is not…

- Walking, talking auto-bots
- Physically existing machines processing paper
- Artificial intelligence or voice recognition and reply software

What it can do

- Open emails and attachments
- Copy and paste items
- Move files and folders
- Log into web / enterprise applications
- Fill in forms
- Scrape data from the web
- Connect to system APIs
- Make calculations
- Extract structured data from documents
- Collect social media statistics
- Follow “if/then” decisions/rules

What it cannot do

- Work with unclearly defined processes
- Handle unstructured data
- Have a conversation with humans
- Adjust on the fly
- Manage unpredictable processes
- Change process automation steps without human operation
- Adapt to frequent changes
- Make judgments and decisions
- Force human action
- Resolve exceptions

COGNITIVE AUTOMATION – WHAT IS IT?

Cognitive systems employ technology and algorithms to automatically extract concepts and relationships from data and “understand” their meaning, learn independently from data patterns and prior experience and extend what either humans or machines could do on their own.

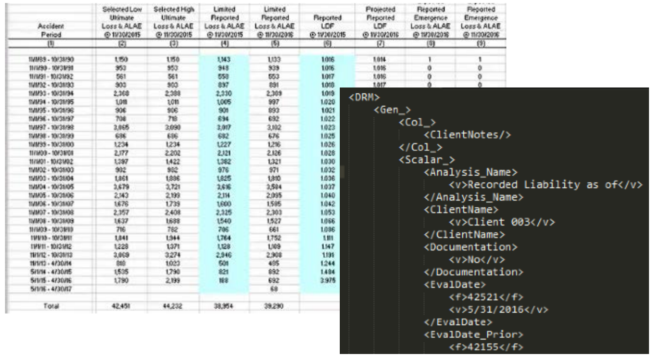
- Emulates strengths of the human brain, including parallel processing & associative memory
- Enables natural language processing of structured and unstructured data.
- Understand/leverage big data in real time
- Use machine learning to develop context-based hypotheses
- Convert text, images, and voice data into meaningful concepts and relationships
- Make reasonable predictions and recommendations based on learned concepts and relationships
- Understand environment and present contextually relevant information
- Ability to automatically process, filter, and extract key information from a vast amount of data
- Interact with humans in natural language, voice, and text

Cognitive computing can push past the limitations of human cognition and connect the dots between big data, enabling more informed decisions.

NATURAL LANGUAGE GENERATION

Auto-generate parts of actuarial memorandums with the goal of reducing manual reporting, improving time-to-market, improving consistency of communication

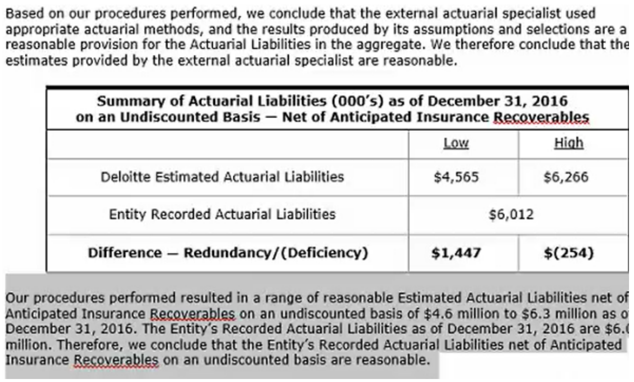
INPUT



Ingests the following components:

- Current Actuarial Liability data such as reserve analysis for each line of business
- Past-year data/analysis to perform retrospective analysis
- Data structure, which can be visualized in Excel workpaper via macro

OUTPUT



Based on our procedures performed, we conclude that the external actuarial specialist used appropriate actuarial methods, and the results produced by its assumptions and selections are a reasonable provision for the Actuarial Liabilities in the aggregate. We therefore conclude that the estimates provided by the external actuarial specialist are reasonable.

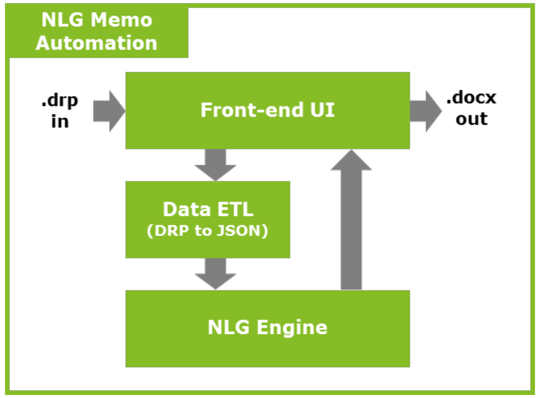
Summary of Actuarial Liabilities (000's) as of December 31, 2016 on an Undiscounted Basis — Net of Anticipated Insurance Recoverables		
	Low	High
Deloitte Estimated Actuarial Liabilities	$4,565	$6,266
Entity Recorded Actuarial Liabilities	$6,012	
Difference — Redundancy/(Deficiency)	**$1,447**	**$(254)**

Our procedures performed resulted in a range of reasonable Estimated Actuarial Liabilities net of Anticipated Insurance Recoverables on an undiscounted basis of $4.6 million to $6.3 million as o December 31, 2016. The Entity's Recorded Actuarial Liabilities as of December 31, 2016 are $6. million. Therefore, we conclude that the Entity's Recorded Actuarial Liabilities net of Anticipated Insurance Recoverables on an undiscounted basis are reasonable.

Automated parts of the memo, including:

- Substantiation to the summary table (produce variable narratives for financial items selected though human analysis)
- Substantiation to the Retrospective Procedures analysis (such actual vs expected, year over year changes, etc.)
- Templated/boilerplate descriptions

IMPACT



The solution enables company to:

- Reduce time spent on manual reporting
- Reinvest hours to more value-added opportunities
- Improve quality and consistency of communication
- Improve delivery from data to actionable insights

Key Takeaways

The **high volume** of data sources and inputs make actuarial processes good candidates to be augmented with robotic automation

Interactions with internal and external crowds should be designed differently. Each crowd is **incentivized and motivated** in their own unique way

Cognitive learning software can be used to identify trends in actuarial data and learn from **human-provided corrective feedback** to become smarter and more effective

Natural language generation and processing could simplify the process taken to develop opinion memos, actuarial reports and documentation that are frequently **hundreds of pages long**

Surges in demand for actuarial services has led to a potential opportunity to incorporate crowdsourcing to address specific tasks

Robotic automation and crowdsourcing **cannot replicate the breadth of work** done by an actuary. Instead, it can be leveraged to make the actuary more effective and efficient

IMPACT ON ACTUARIES

HOW DO YOU GET STARTED

ESTABLISH A DIGITAL ACTUARY LEADERSHIP TEAM

Identify a visionary program leader and assemble a team to accelerate your digital goals. Determine a governance model and understand policies that might need to be adapted to execute successful change management and ensure the solution is absorbed into the business fabric

THINK BIG

Immerse Yourself in Innovation

Join an immersive experience (e.g., Exponential Actuary™ Lab) to explore the "art of the possible" and determine a future state vision, goals, and benefits

Build Your Ecosystem

Evolve your Actuarial organization by collaborating with other business functions, BPO providers, and digital vendors

START SMALL

Scaling the Edges

Disconnect from the core business and set up a digital actuary leadership team to assess disruptive opportunities within the organization

Pick One or Two Plays

Prioritize your desired tactics and pick just one or two to get started in order to establish proof of concept

ACT FAST

Prove it Works (Quickly)

Use an agile, iterative piloting approach to move from strategy to prototyping as quickly as possible – "fail fast" and achieve rapid results

Market Your Own Success

Seek opportunities to share digital experiences with other functions – knowledge share

KEY TAKEAWAYS

Disruption will impact Actuaries and other white-collar professionals, in addition to those blue collar professions that we typically associate with disruption (e.g. Uber/Taxis)

Examples of change / disruption are manifold and include technology enablers such as robotics and cognitive automation

Pixelating the opportunity set is important, which requires breaking the spectrum of work and entire end-to-end process into bite sized chunks

Professionals need to continue to meet **professional standards** and how these are met will evolve as processes change

There are **significant implications for professional operating and talent models**, such as the change in how we source talent and design organizations – encompassing an array of resources, both internally and externally

Training and education of actuaries will dramatically change as the role moves away from performing mathematics and towards business decisions and insights using the results of automated processes and results

The **outlook for the future is bright** and will enable professionals with the right skillsets to add more value to organizations through more strategic activities