

# Actuary 4.0

The Actuary in Changing Times

- Prof. Dr. Hans-Joachim Zwiesler
- ifa – Institute of Finance and Actuarial Sciences

# About the speaker

## Hans-Joachim Zwiesler

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*Professor of Actuarial Sciences at Ulm University (Germany)  
former Vice-President of the German Society for Insurance and Financial Mathematics (DGVFM)*



## *ifa - Institute of Finance and Actuarial Sciences*

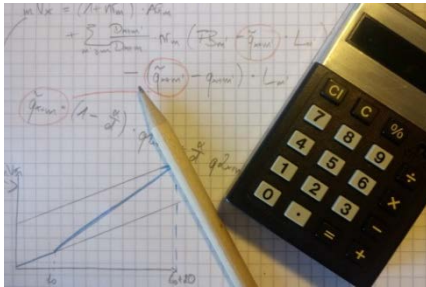
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# Actuary 4.0

## ■ The Actuary in Changing Times - Agenda



The Classical Actuary



The Traditional Actuary



The Modern Actuary



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The Future Actuary

# The Actuary in Changing Times

## The Classical Actuary

### The Classical Actuary

#### principal of commutation values



##### tools

pocket calculator



##### skills

arithmetic rules (e.g. „multiplication first“)



##### tasks

- calculation of premiums & reserves with commutation values
- calculation of own funds with simple formula



##### famous representative

August Zillmer (1831-1893)



# The Actuary in Changing Times

## The Traditional Actuary

### The Traditional Actuary

expert of deterministic projections



#### tools

(host-)computer with APL, Turbo Pascal, Excel, ...



#### additional skills

analytical thinking, programming



#### additional tasks

premium calculation, deterministic profit-test



#### timeline

since the 1990s  
(deregulation of the German insurance market)





# The Actuary in Changing Times

## The Modern Actuary

### The Modern Actuary

#### master of stochastic models



##### tools

Excel-VBA



##### additional skills

statistics / stochastics, financial mathematics



##### additional tasks

- stochastic models (Solvency II / risk management, ALM, policyholder's risk/return profile)
- financial mathematics (e.g. valuation of options / guarantees, MCEV, Variable Annuities)



##### timeline

starts with the first ideas for Solvency II



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# The Actuary in Changing Times

## The Future Actuary

### The Future Actuary

commander of the robo troop?



Which **tools** will the future actuary use?



Which **skills** does she/he need?



What are her/his **tasks**?

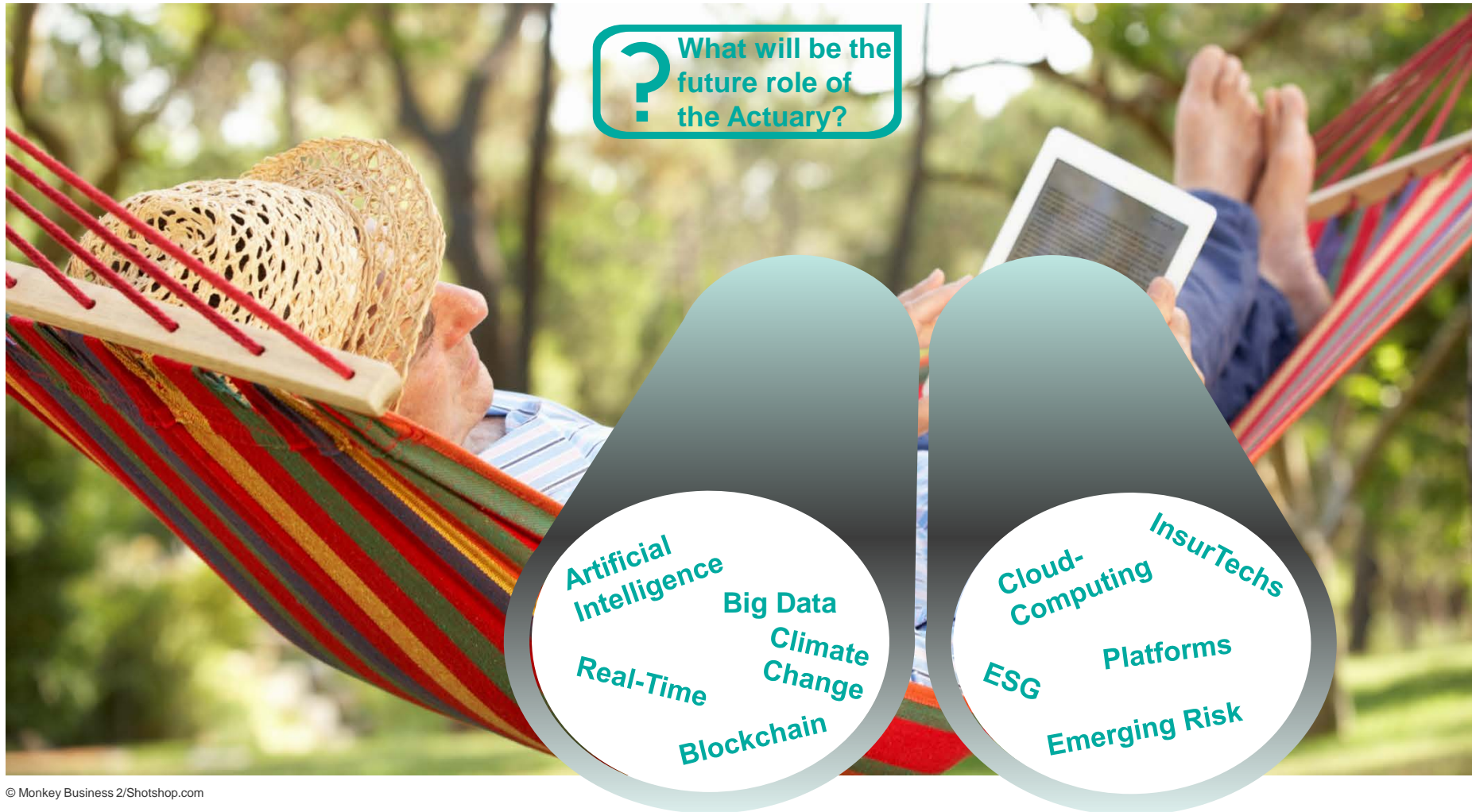


Is this really a **future** topic?



# The Future Actuary

## A Glimpse of Future Topics





# The Future Actuary

## A realistic foresight

less realistic



The actuary is no longer needed.

- Big Data is available in real-time and fast machines and algorithms supersede actuarial models.
- Actuarial tasks will be carried out by machines with artificial intelligence and other new technologies.

realistic



The actuary is still needed, but:

- New methods will be employed.
- There will be a new kind of working.
- New skills are needed.

# Examples from the Actuarial Department 4.0

## Data Analytics



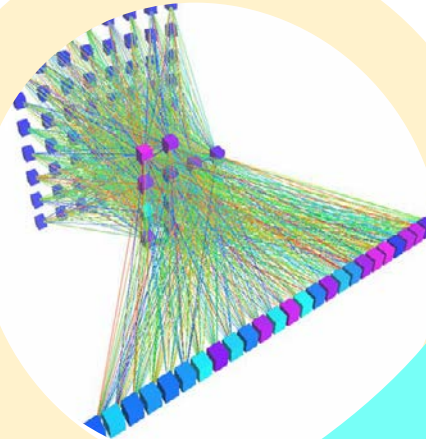
### Tasks

- development of a **forecast model** for **policyholders' behaviour**
- understanding the model and deriving suitable activities



### Challenge

- selection of **predictive features** and **specific pre-processing of data** (feature engineering)
- **model selection**
- **on-demand** evaluation and results



### Results

- detection of **non-linear patterns in the data**
- **acceleration and automation** of the analytic process
- comprehension and control of the **black box**



### Methods

- open-source programming languages (R, Python, ...)
- application of modern **mathematical/statistical concepts** (e.g. neural networks, gradient boosting)
- use of cloud-computing for efficient processing of Big Data

# Examples from the Actuarial Department 4.0

## Process Automation



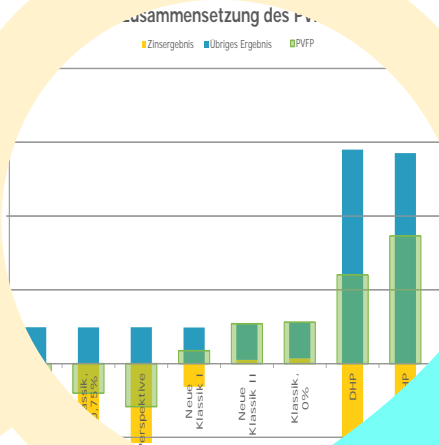
### Tasks

- periodic reporting of the profitability for different modelpoints and portfolios
- application of different capital market scenarios
- comparison and analysis of the results



### Challenge

- MS Excel programs evolved over time and were developed by different experts
- tools have slow performance
- error-prone and confusing tools with many manual intermediate steps included (e.g. import of data)



### Results

- significant reduction of running time needed for the calculations
- more time left for analysis and discussion of results



### Methods

- revision of existing tools with focus on
  - automation and connection with external data
  - increasing the performance and elimination of legacy code
- automatic preparation of results to facilitate analysis of results

# Examples from the Actuarial Department 4.0

## Market Entry



### Task

- life insurer from overseas seeks to **enter German market**
- products differ significantly from German requirements



### Challenge

- products are **neither compliant with** German supervisory and tax law nor customer needs
- **distribution** organisations are sceptical



### Results

- re-design of product
- convincing distribution channels



### Methods

- actuary must **understand and interpret the laws.**
- **communication** with experts outside the actuarial world
  - lawyers
  - distribution channels
- **communication** with experts inside the actuarial world with different mindset

# Examples from the Actuarial Department 4.0

## Agile Methods



### Tasks

- upgrade of a retirement product to improve the position in sales & marketing and reduction of risk
- addressing the needs of customers and technical constraints



### Challenge

- product development goes far beyond actuarial aspects
- intense communication with many other specialists
- new requirements evolve during the project (e.g. adaption of new ideas)



### Results

- development of the best product from all perspectives
- better management of project's timing and risk

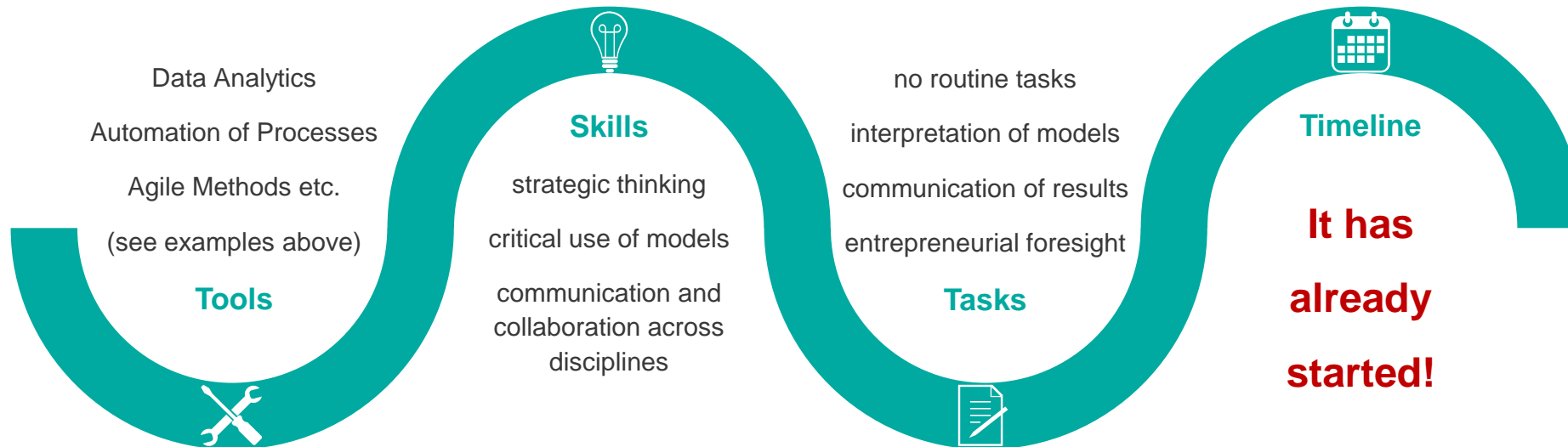


### Methods

- systematic communication (e.g. daily meetings and review)
- agile expert workshops
- visualization of the project's progress on a task board
- frequent feedback of the stakeholders in a review meeting

# The Future Actuary

## Tools, Skills, Tasks and Timeline



The Classical Actuary



The Traditional Actuary



The Modern Actuary

- The actuary will still be needed in the future.
- Many tasks of the classical, traditional, and modern actuary persist – but new tasks will evolve.
- Compared to today, the demands on the actuary will increase.

The Future Actuary



**Thank you very much for  
your attention!**

contact details

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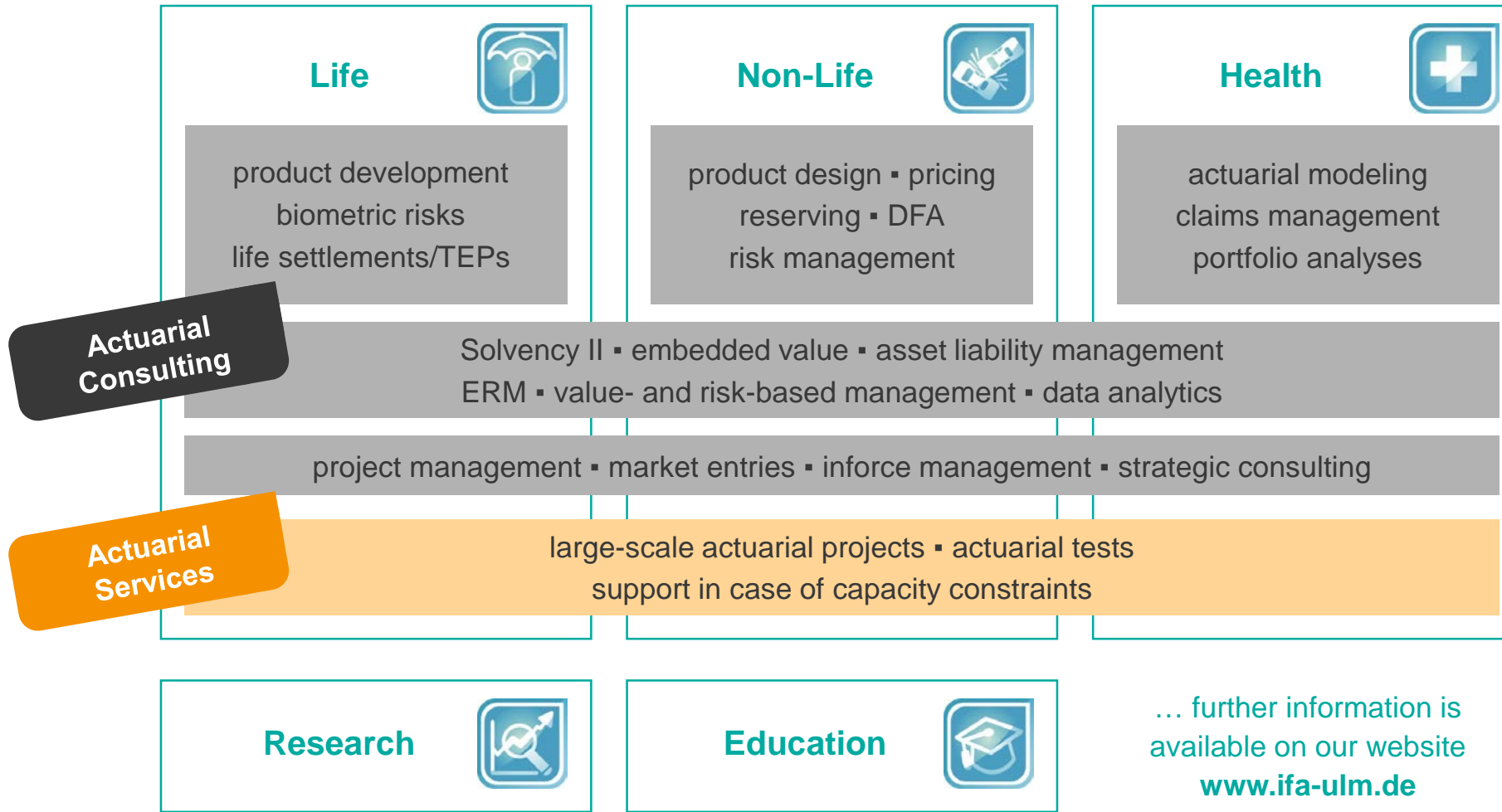
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