"Towards Financial Eco systems:
Science, Engineering, Economics"
Agenda

- Who are we?
- ING strategy on a page
- Our journey:
  - From “Classic” Bank -> IT Company with Banking License
  - From IT Company with Banking License -> preferred BRAND in (financial-) ECO system
- Becoming preferred BRAND in ECO system
- Q&A
We are a global financial institution with a strong European base offering banking services. Our customers are at the heart of what we do.
ING Bank’s Think Forward strategy

Empowering people to stay a step ahead in life and in business.

Customer Promise

Clear and Easy  Anytime, Anywhere  Empower  Keep Getting Better

Creating a differentiating customer experience

1. Earn the primary relationship
2. Develop analytics skills to understand our customers better
3. Increase the pace of innovation to serve changing customer needs
4. Think beyond traditional banking to develop new services and business models

Enablers

Simplify & Streamline  Operational Excellence  Performance Culture  Lending Capabilities
From (IT-) Strategy to execution:

- Software is eating the world
- Society is more and more depending on software in its daily life
- IoT on its way
- Growing to PLATFORMS & ECO systems (autonomous Multi-Agent systems)
- Development more and more concentrated on “customer journey’s & providing WOW effects”
- Continuous change on our software systems (months => days, hours)
- Increasing regulatory REQ’s

=> Time to rationalize / automate what we can => involve our academic partners
Our perceived strengths, weaknesses, opportunities and threats

**Strengths**
- Well-known, strong brand with positive recognition from customers in many countries
- Leader in digital banking
- Sustainability leader
- Strong capital and liquidity position; solid financial and operating performance
- Global network provides competitive advantage
- Presence in growth markets with moderate to strong economic growth
- Omnichannel distribution strategy

**Weaknesses**
- High interest-income dependency
- Some legacy IT/operational systems
- Need for more agility
- Efficiency could be improved
- Diversity challenges

**Opportunities**
- Maintain trust by demonstrating care, especially towards customers, and being more transparent about our strategic choices
- Further improve the customer experience by accelerating innovation and improving efficiency
- Cultural change. Top more into employees’ talents
- Grow faster than the market by offering a differentiating customer experience
- Further use competitive advantage of Wholesale Banking global network

**Threats**
- Low interest rate environment
- Basel 3.5 capital requirements remain unresolved and could negatively impact our role as facilitator of the economy
- Regulatory environment increasingly complex, with heightening execution risk
- Lack of an international level playing field
- Potential competition from new entrants to the market
- Financial sector has an unfavourable public image in many countries
- Cybercrime

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**Innovation**

Innovation to enhance customer experience and move beyond traditional banking

- Digital channels account for 98% of contact with retail customers; mobile interactions increased by more than 50% during 2016
- Innovation Fund to finance initiatives
- Data analytics to identify customer needs and tailor services and products accordingly

**Innovation to improve operational excellence**

- Target Operating Models (TOMs) to streamline Finance, HR, Procurement and Risk functions
- PCI DSS methodology to experiment and quickly turn ideas into new products and services
- Cybercrime programme to mitigate any security threat
- Developing thought leadership
- Developed thought leadership on blockchain

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**ING Group Annual Report 2016**

[Link to the ING Group Annual report 2016](https://www.ing.com/web/file?uuid=bbbbb6628-52ea-4469-8232-2a0d0d60f099&owner=b03bc017-e0db-4b5d-abbf-003b12934429&contentid=39230)
From “Classic” Bank -> IT Company with Banking Licence (Mobile first)

“Customers are at the heart of what we do”

“surprise them with differentiating experience”
Current (simplified-) landscape behind the experience

retail : 98% customer contact
New requirements coming in...

Trend: Electronic / Internet / Mobile Payments

New law active as of 2018 (Wft 3:17):

“All financial institutions in NL providing payment services will be reviewed by DNB on availability of **time critical payment** orders (e.g., iDEAL, eCommerce Creditcard and PIN) initiated between 06:00 – 00:30 daily availability required by Law: **99,88%**

(+performance, (optimized) resource utilisation)

“Payment Service Directive 2 (PSD2)

Basic assumption Response time **Instant Payment order <= 5 sec for NL and 10 sec rest of SEPA!”**
Mastering complexity: use performance models!

Context

Performance Model

Quality of Service

Quality of Experience

Arrival patterns

Demand

Response

QoS aware resource provisioning

Forecasting models

QoS aware scheduling & routing strategies

Constraints

Regulations
- SOX
- MiFID
- GDPR
- WfT
- eso

ING Policies
Example of forecasting model

- Predicts the duration of individual bookruns (collection of bookings to be booked in Account Management System)
- Updates during the day using real-time data.
- Combines multiple linear models to make forecast.
Forecasting IT metrics

• Our forecasting challenge
  • IT utilization metrics (CPU, storage, memory...)
  • Transaction volumes for various services
  • Features or predictors (calendar day, hour of the day, business processes, weather...)

• How we currently do it
  • Multivariate (linear) regression
  • Calendar features and domain knowledge
  • (Calendar-) Feature vector creation
    - By hand
    - Time consuming
    - Feature discovery not possible

(Multiple) linear regression:

\[ y_i = \beta_1 x_{i1} + \beta_2 x_{i2} + \cdots + \beta_p x_{ip} + \epsilon_i \]

Examples of calendar features:
  • Weekday / weekend
  • Holiday
  • The Monday before Christmas
  • Salary day

=> Explore NEW opportunities
Recurrent Neural Networks

RNN
• New part of machine learning, studied by Google, Apple, etc.
• System trains and improves itself.
• Easier to scale up.

Implementation of prototype
• Using Google API called ‘TensorFlow’.
• Only uses Bookruns of previous days as input, together with some basic calendar features.
• Can predict peak moments within a few minutes of training.
From QoS and prediction to new ways of Software production

Drastically improve **effectiveness & efficiency** of software production/maintenance and exploitation

**Can machines do the job?**

Yes! But not before we as human beings can do it upfront and understands the formalisms (ASM’s)!

- **Knowledge engineering**
  - analysis → requirements
  - conceptualization → synthesizing

- **Software engineering**
  - (formal-) specification
  - simulation

- **Manual**
  - construction
  - testing
  - deployment

- **Automated**
  - bounded checking
  - automatics simulation
  - Construction formalism software generation
  - Test formalism test generation
  - Deployment formalism deployment generation

**generate entire systems**

**as immutable services**
Customer journey can be a long and bumpy road...

.... from idea to running code
Customer journey can be a long and bumpy road...
For well known reasons

It is really confusing!!!

If we don’t clearly understand each other here....

Real enterprise IT looks like this

..what will happen there (in a complex environment)?
Time to do things differently
Specify / Simulate / Check / Generate Code / Apps / API’s

Rebel ISE = (∀ Specifications (Rebel DSL))

Product Owner & Development Team

creates

Specifications (Rebel DSL)

build

generates

Build specifications

checks

uses

Code generators (Rascal language)

generates

Application

Application

Visualise / Simulate

Code generators

Application
Formal representation

Formal concepts to rewrite specs in target languages

Bounded model checking
Theorem proving

Generate code out of specs

Generate Visualisation/simulation feedback

Proceed MVP by MVP
From IT Company with Banking Licence -> preferred brand in (fin-) ECO system

Changing context
Changing the context.....

(Fin-) ECO systems
Requires new capabilities I

Quality of experience =

Quality of Customer facing (integration-) services +

Quality of Platform services

Know your customer & markets

Establish & maintain ECO system relationships

Provide trust
Respect privacy
Guarantee security
Manage your Risk
Be compliant

Provide superb API’s in an automated way

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Provide superb API’s in an automated way
Requires new capabilities II

- OLRT prediction of ECO system behavior
  **Instantaneously** take RIGHT business decisions

- Use highly sophisticated algorithms

- Implement business descisions in ECO system in terms of minutes/hours (generate!)
Final goal: Optimize Quality of experience, become preferred Brand

• **Create WOW effect for our customers**
  • Customer journeys / design thinking / experience innovation

• **Model Driven Organisation approach**
  • Allows RIGHT business decisions taken fast based on
    • Advanced Analytics of data (sources)
      • Customer need development
      • Mutual benefit expectations
      • Market (incl RISK) development
      • ….  

• **Model Driven Engineering**
  • Allows FAST implementation of Business decisions in ECO system

=> requires “holistic” ECO system
“Holistic ECO system” driving innovation

Credit Katri Valkokari
Thank you
Follow us to stay a step ahead

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