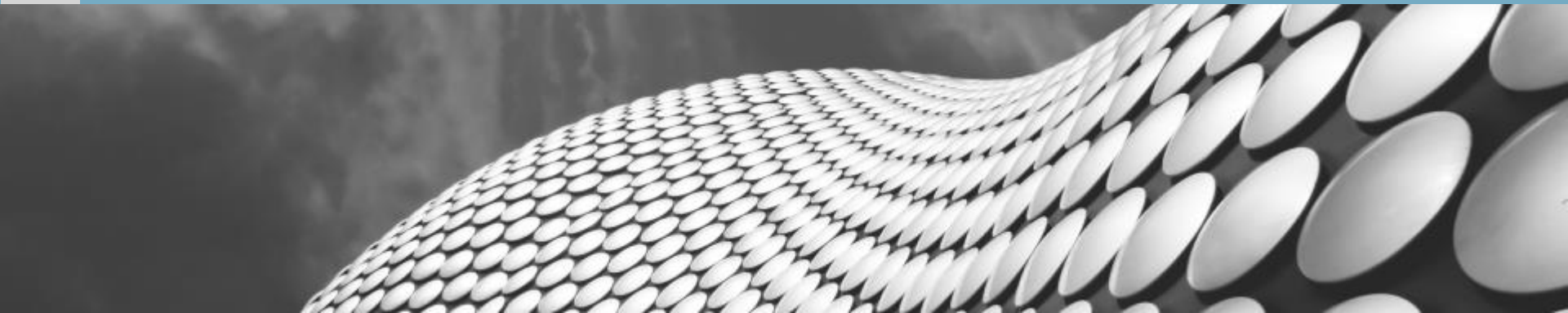


# Your IT Landscape in Shape

Scape Enterprise Architecture Office and Consulting



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## Measuring and Managing Enterprise Architecture Complexity

Sebis Workshop on the Complexity of Application Landscapes –  
Models, Measures, Management (CALM3)

Munich, January 17th 2013

# Facts on IT landscape complexity

## Some observations from enterprise reality



A large industry firm has taken records of over 4.000 business applications.

A large commercial bank employs more than 30 different DBMS versions.

A large universal bank has not turned off batches for years due to unknown side effects.

A global universal bank is investing about € 1 bn in the transformation of its' core banking systems.

### → 1. complexity is everywhere

Upon request, the board of an insurance firm was equipped with iPads although this was against the IT strategy.

The capital markets division of a public sector bank developed its' own DWH as the solution provided by IT was deemed 'unflexible'.

Within a regulatory audit, a reinsurance group identified about 50 'previously unknown' end user applications.

### → 2. complexity is created constantly

When introducing an EA tool, an insurance firm expected to collect 150 applications. One year later, the tool listed 450 applications.

An insurance subsidiary was assumed to run 15 applications. Within a target architecture planning cycle the number rose to 40.

Two architects of the same pharma group once attended a conference – they had never heard of each other.

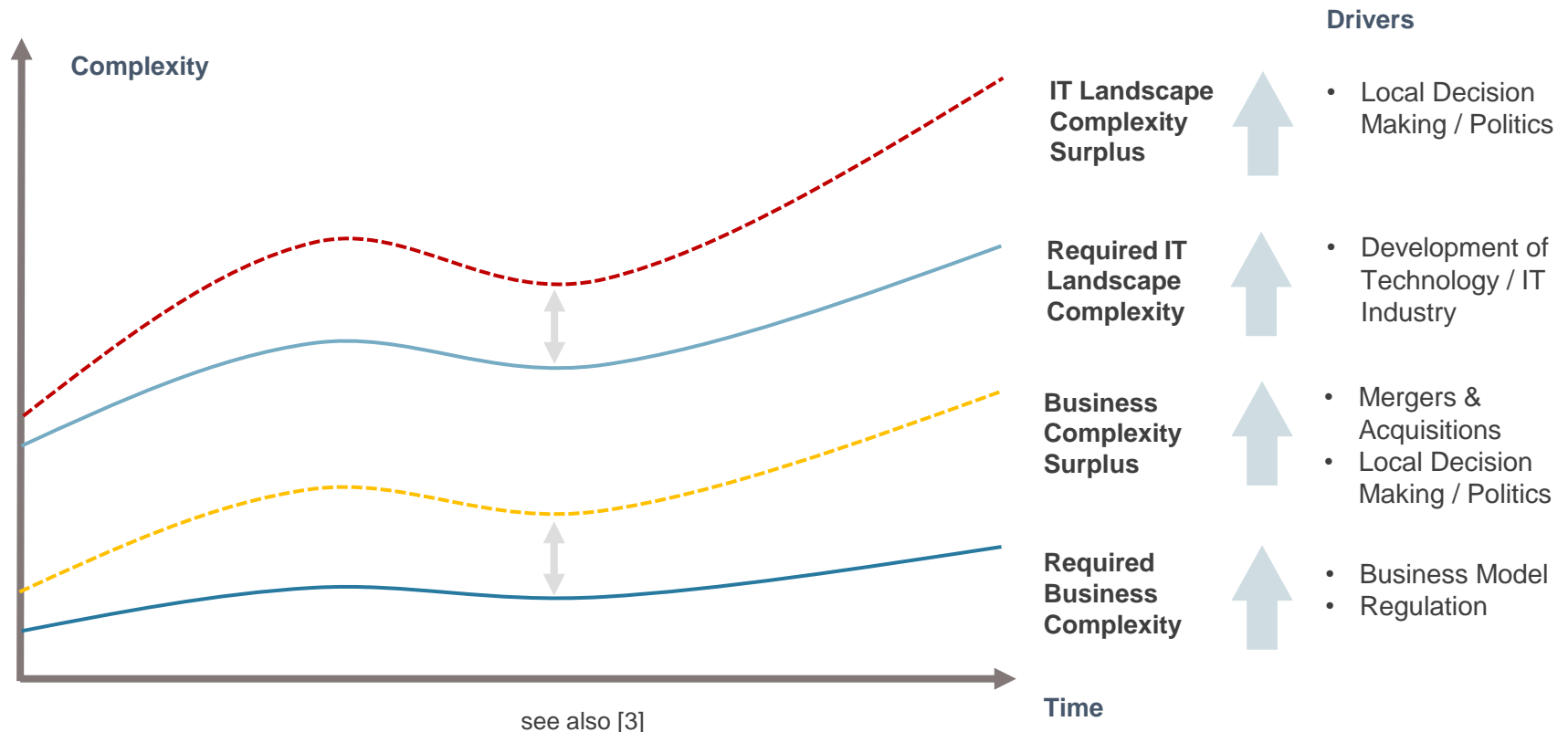
### → 3. complexity is generally underestimated

# Thesis 1:

## Complexity grows over time if no specific action is taken



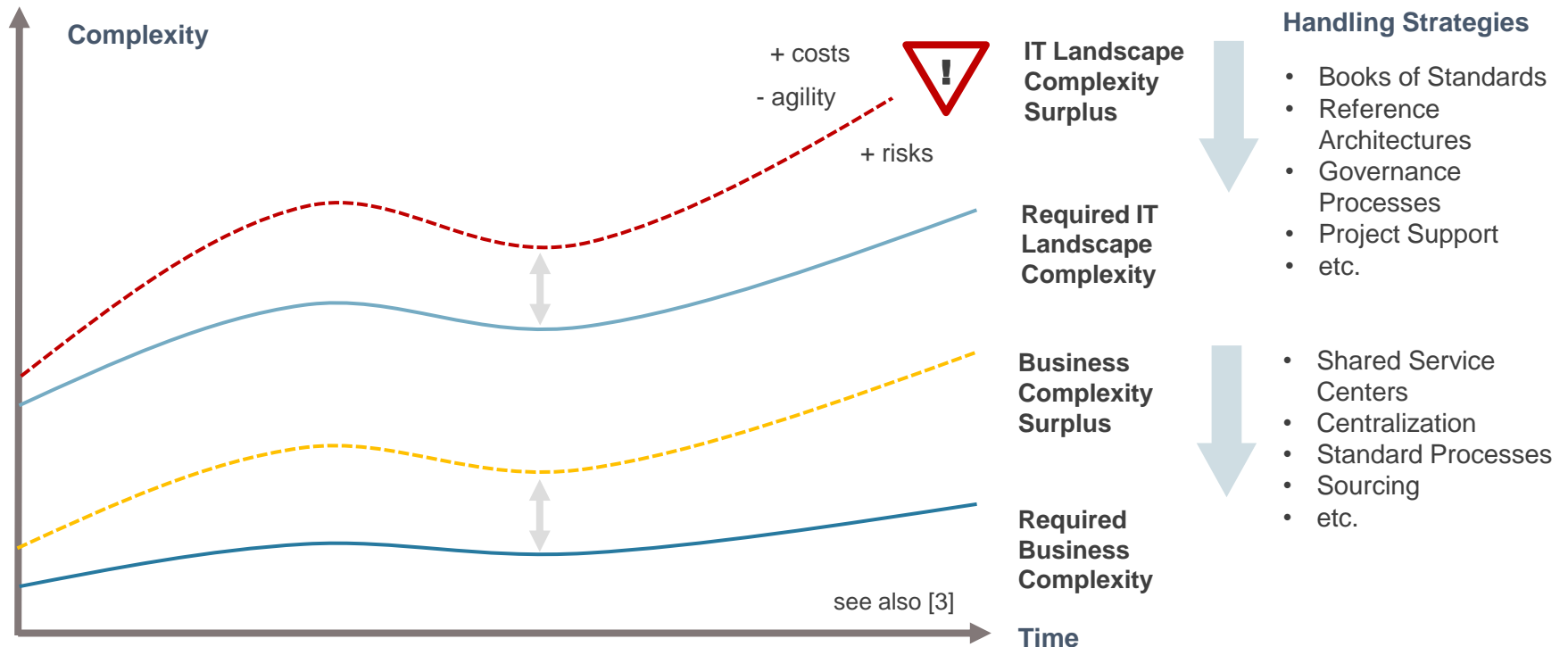
According to the **Second Law of Software Evolution**, the complexity of a software system in use will increase with time if no explicit action is taken to avoid this [2]. It may be argued that the law will also hold on a **macro level** (as an aggregation of the many individual evolution processes) [4].



# Thesis 2: Complexity management is a strategic competency



Complexity leads to increasing **costs** and decreasing **agility**. At the extreme, complexity growth may lead to a situation where changes can no longer be implemented efficiently ('**entropy death**') [4].



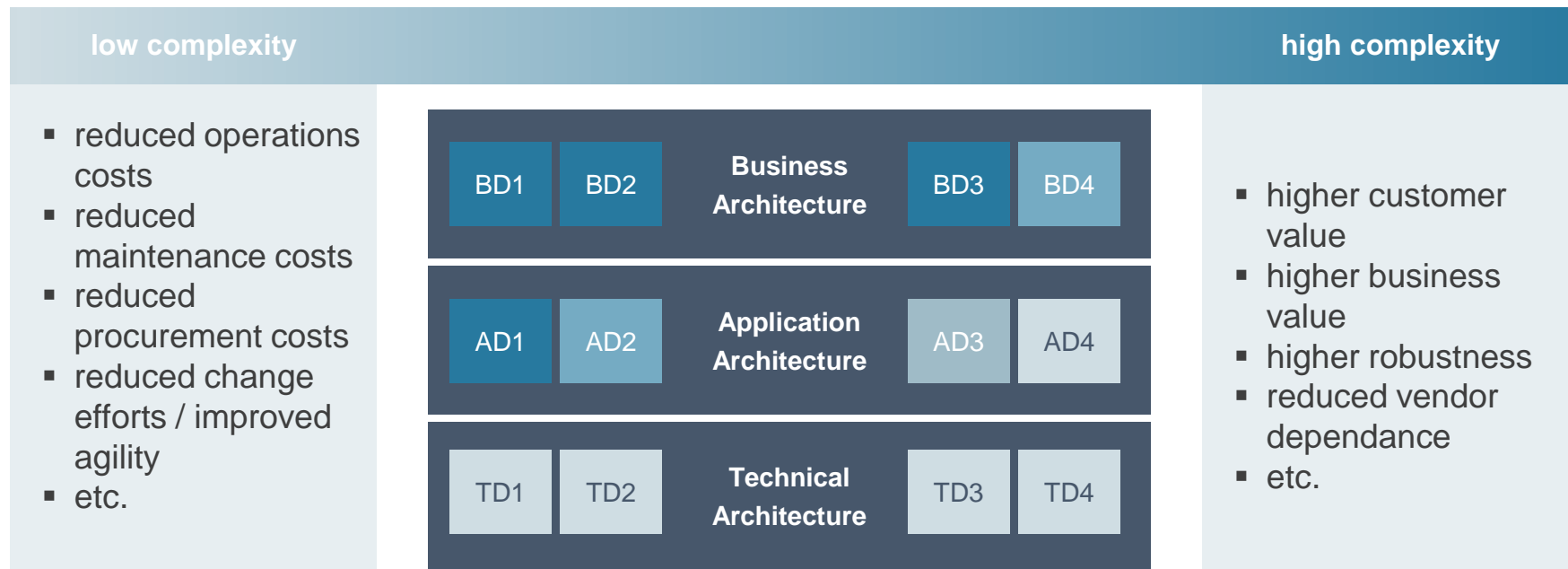
Organizations with an active complexity management capability (for both, business and IT) will be in a better position to cope with new market entrants and create a **sustained competitive advantage**.

## Thesis 3:

# Complexity decisions are multi-dimensional tradeoffs



Minimal (functional) complexity is not always appropriate. Rather, a **strategic positioning** is required specific to architecture layers and domains.



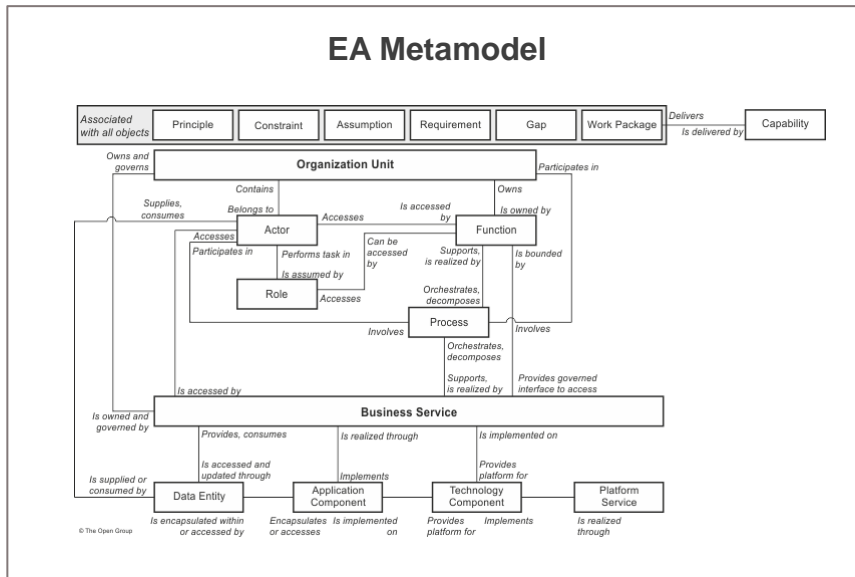
The optimal positioning will depend on a number of **firm-specific context factors** including the business model, the vendor, and sourcing strategy. Ideally, general decision principles or **patterns of complexity** could be identified (e. g., higher complexity for differentiating front-end domains, minimum complexity level for backoffice domains).

# Thesis 4:

## EA data provides the right basis for complexity decisions

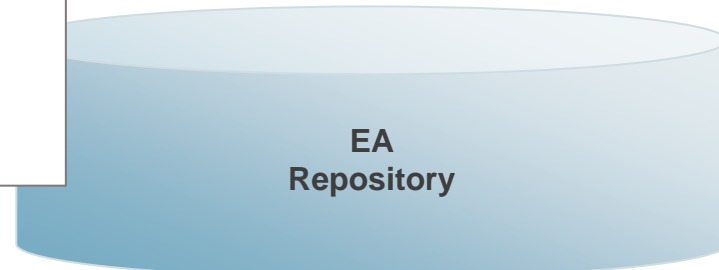


You can't manage what you can't measure: To measure the complexity of a system, an appropriate **system model** is required (measures may vary depending on the granularity of the model).



Source: The Open Group (2012) [5]

$$C = \sum_{i=1}^n ?$$



**EA metamodels** provide the 'right' level of abstraction for complexity measurement and management. Ideally, EA tools can be leveraged to calculate KPIs in an automated fashion.

## Thesis 5:

# Complexity measures could be defined generically



In practice, complexity measurement is still dominated by more or less sophisticated **complexity indicators**. Often, the following aspects are covered:

- Application System Redundancy
- Technical System Redundancy
- Market Conformity / External Standards Conformity
- Decoupling between sub-landscapes / domains
- Reuse of Services
- Data Ownership / Master Data Management

This approach is pragmatic and a good start. However, **interpretation** and **aggregation** of KPIs remain challenging.

An alternative approach could be to develop a **generic measure** based on a generic system definition. This could lead to the following advantages:

- flexible application to different architecture layers (e. g., business architecture, application architecture, technical architecture)
- flexible application to different levels of granularity (e. g., landscape, domain, application)
- better interpretation and simplified aggregation
- potential meta model neutrality

But: research is required to verify whether this is really feasible.

## Thesis 6:

# Heterogeneity can be captured as a statistical property



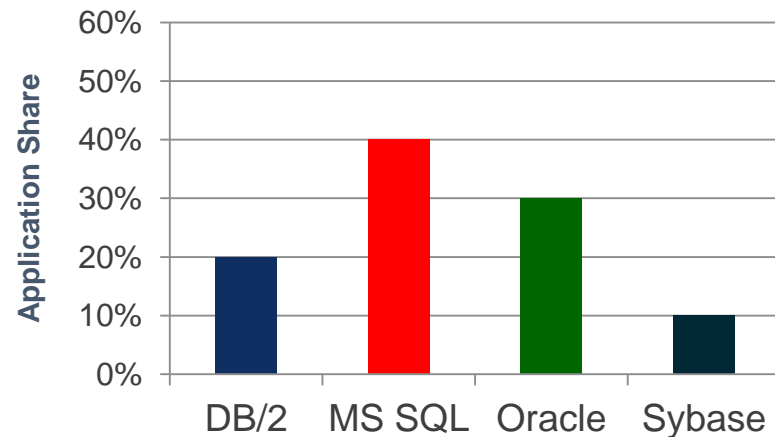
The **heterogeneity** of a certain element of the enterprise architecture can be conceptualized as a **frequency distribution**.

Based on this, well-studied **concentration measures** from other domains (incl. monopoly regulation) like the **entropy measure** [1] can be adopted [6]:

$$EM = \sum_{i=1}^n f_i \ln \left( \frac{1}{f_i} \right) \quad \text{with } f_i = \frac{x_i}{\sum_{j=1}^n x_j}$$

The entropy measure has the following **properties**:

- it increases with the number of different values (e. g., number of DBMS types)
- it decreases with a rising disparity between values



Interpretation is facilitated by the **numbers equivalent** entropy measure (equivalent number of equally distributed values):

$$EM_A = e^{EM}$$

The measures are **fully generic** and can be applied at different levels and scopes and along various attributes. This can also be used to **drill-down** in the data in order to analyze the reasons for heterogeneity.



# Outlook

Many things to find out



**A long way of  
research ahead...**

**...but the time seems  
right to make a start**

- [1] Jacquemin, A.P., and Berry, C. H. (1979): *Entropy Measure of Diversification and Corporate Growth*. The Journal of Industrial Economics (27:4), pp 359-369.
- [2] Lehman, M. M. (1997): *Laws of software evolution revisited*. In: Software Process Technology – Proceedings of the 5th European Workshop on Software Process Technology (EWSPT '96) (Montangero, C., Ed.), Nancy, Oktober 1996, pp 108–124, Springer, Berlin.
- [3] Rutz, U. (2012): *IT Complexity Management @ Commerzbank – Overview on Commerzbank Initiative*. Presentation at EAMKON Conference, Stuttgart, April 2012.
- [4] Schmidt, C., and Buxmann, P. (2011): *Outcomes and Success Factors of Enterprise IT Architecture Management: Empirical Insight from the International Financial Services Industry*. European Journal of Information Systems (20), pp 168-185.
- [5] The Open Group (Ed.) (2012): *TOGAF (The Open Group Architecture Framework) V. 9.1*. [www.opengroup.org/togaf](http://www.opengroup.org/togaf).
- [6] Widjaja, T., Kaiser, J., Tepel, D., Buxmann, P. (2012): *Heterogeneity in IT Landscapes and Monopoly Power of Firms: A Model to Quantify Heterogeneity*. In: International Conference on Information Systems (ICIS), 16.-19.12.2012, Orlando, Florida, USA.

**Thank you for your attention**

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