



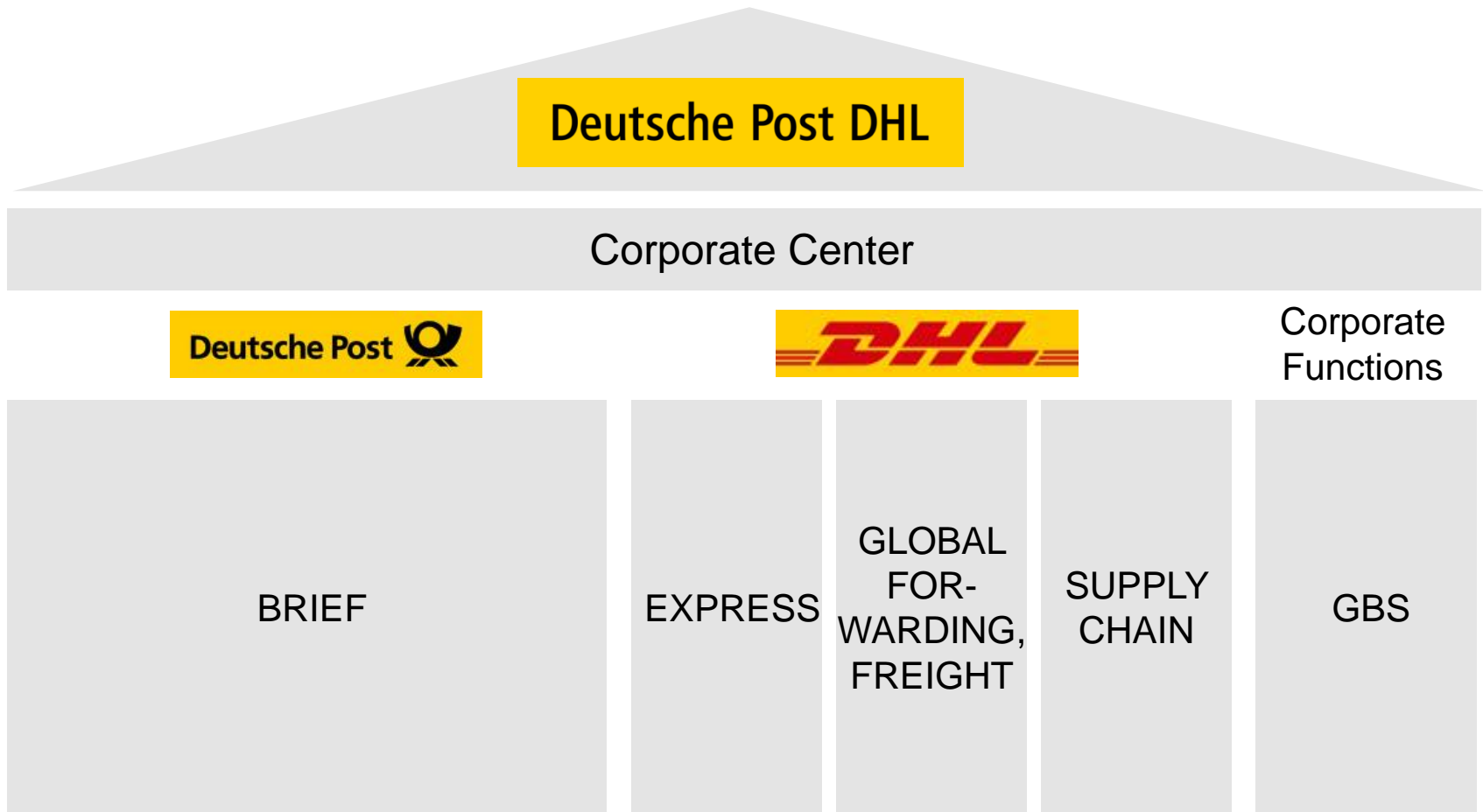
Towards an Estimation Model for Software Maintenance Costs

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BRIEF Deutschland

- 68 million letters per working day = 21 billion per year
- 82 national mail centers
- 80,000 mailmen
- 31,500 postal delivery cars¹⁾
- 3,100 delivery depots
- 53,000 delivery districts
- 40 million households
- 108,000 mailboxes
- 890,000 P.O. boxes
- 17,000 agencies and points of sale

1) incl. combined delivery with parcel



PAKET Deutschland

- 2,3 million parcels a day = 678 million per year
- 33 national parcel centers
- 9,900 parcel deliverer
- 6,970 employees at parcel centers
- 7,050 vehicles for package delivery
- 6,800 delivery districts²⁾
- 208 delivery points
- 2,500 Pack stations

2) Including 800 outsourced delivery depots



GLOBAL MAIL

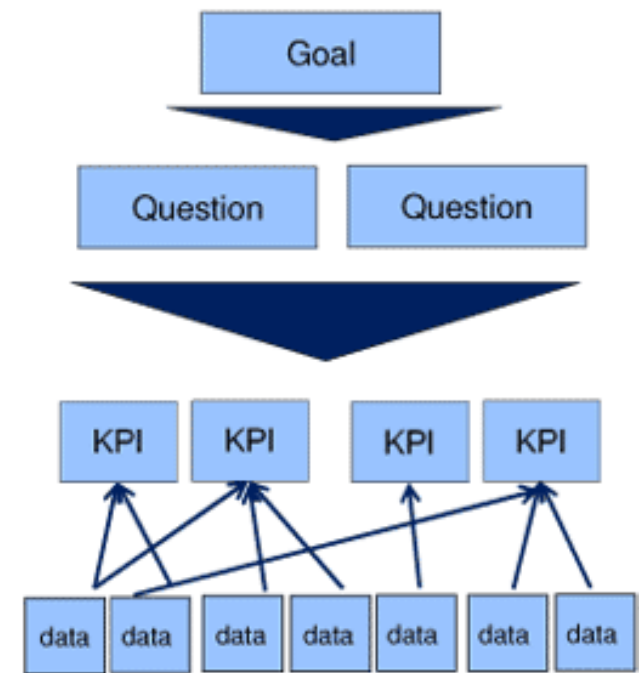
- Direct connections to the customer in over 200 countries
- About 2,200 employees
- About 40 production facilities
- About 100 selling agencies in Europe, United States and Asian/Pacific Area



archiMETRICA is a management and IT consultancy that has specialized on metric-based IT Management

Together with our clients we develop their IT Strategy and KPI based management framework to help align IT to the company's business strategy

- Deduce effective KPIs from the business goals
- Measure IT cost , complexity and responsiveness
- Support IT planning decisions with metrics
- Implement closed loop continuous improvement using Six Sigma




Based on GQM Method V. R. Basili, H. D. Rombach

Managing maintenance efforts requires to (i) characterise applications, (ii) assess intended changes, and (iii) compare bids of different providers

Situation


- Logistics and underlying business processes are supported by a large-scale application landscape
- Landscape consists of more than 150 applications
- Development, operation and maintenance by external providers
- 26% of total IT budget for software maintenance (2009)

Problem

- Historically grown heterogeneous application landscape
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- Blurred line between efforts for development, operations and maintenance
 - Non-uniform data
 - Provider's propositions are based on individual pricing models not always reflecting the genuine effort

Solution

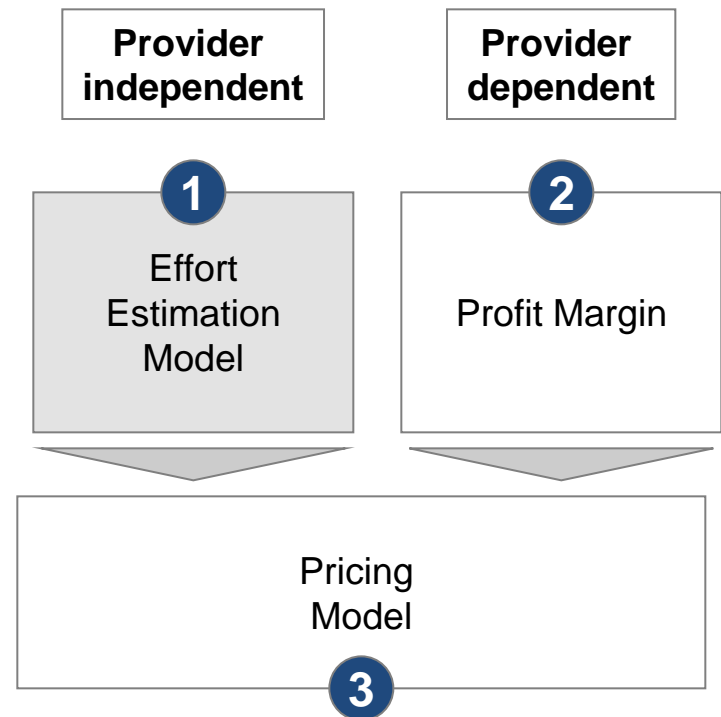
Multi-level approach consisting of 3 phases to

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1. Transparency and standardization
 2. Characterize different applications in terms of maintainability
 3. Decide on improvement measures

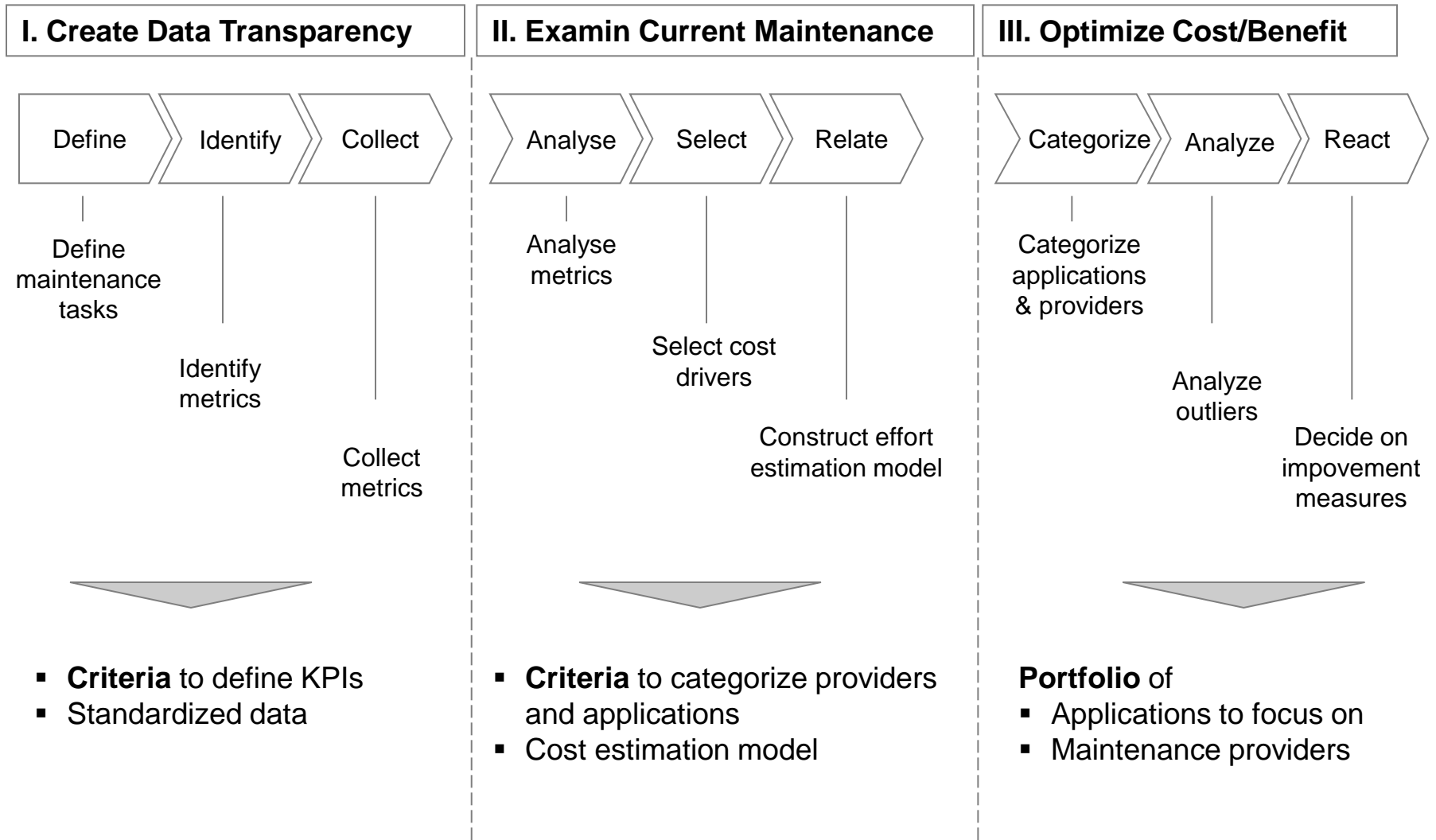
A provider's pricing model includes a effort estimation model and a profit margin - separating both is essential for comparison of bids and assessment of providers

- 1 A **effort estimation model** based on cost-drivers for maintenance allows a rough prediction of maintenance costs as a baseline for negotiations
- 2 The **profit margin** depends on many parameters (e.g. pricing politics, market situation)
- 3 Cost estimation and profit margin are combined within the service provider's **pricing model** (simplistically)

Provider **independent** (depending on the application) factors influencing maintenance costs are blended with provider **dependent** factors



Our multi-level approach allows to: (i) create data transparency, (ii) examine current spending, (iii) optimize cost/benefit sustainably



Have to find a set of suitable metrics to measure applications' characteristics regarding maintenance, using standard metrics and those specific to Deutsche Post MAIL

Standard Metrics

- Backfired Function Points
- No. of Programming Languages
- No. of reported Defects
- No. of Interfaces
- No. of Users
- No. of Hotfixes
- No. of Minor Release
- No. of Major Release
- No. of Patch Release

Metrics specific to Deutsche Post MAIL

Implementation quality

- Code Maturity
- Code Quality

Regarding **coding standards** and **best practice** of Deutsche Post MAIL

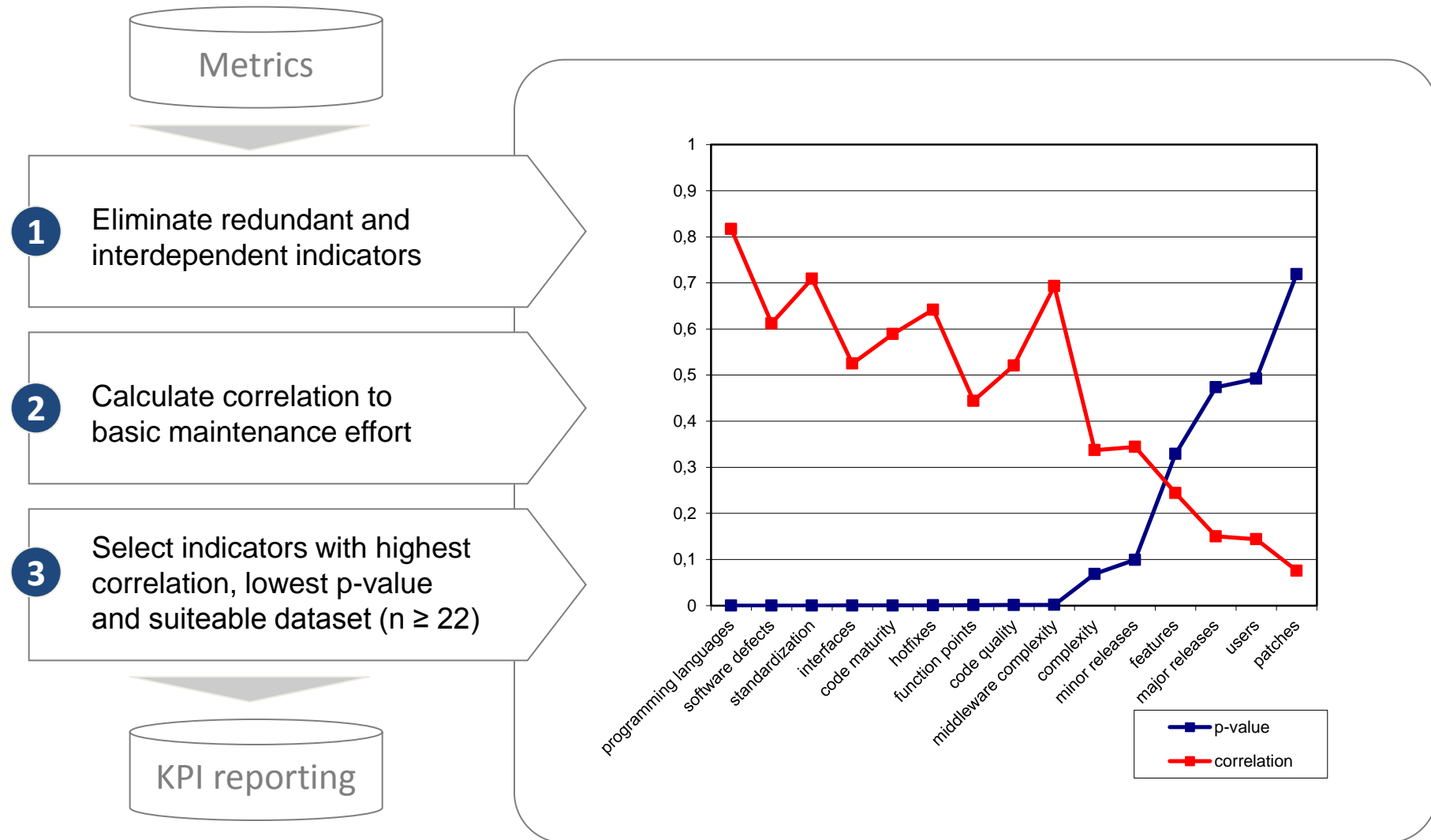
Application level complexity

- Middleware Complexity
- Features
- Complexity
- Standardization

Architecture complexity metrics used in the operations price model
Adherence to Deutsche Post target architecture

Available metrics

Factors were identified based on their causality (insight) and selected based on their statistical relevance



Linear and multiplicative regression models were constructed and evaluated using expert knowledge

- Empirical factors
 - Effort will depend on the number of interventions of maintenance team times the average time required for fixing
 - Average time for fixing depends on size times complexity
 - The monotonically growing function needs to be damped with increasing size and complexity
- Statistical Analysis was used to find the best fit

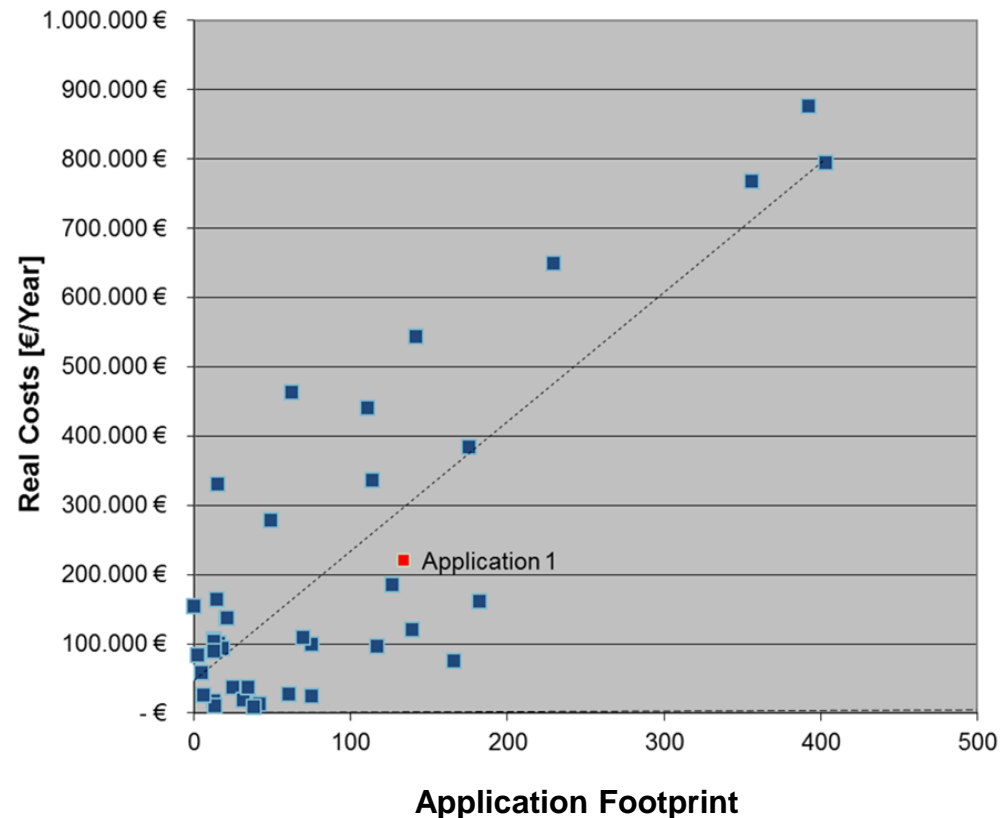
• *Best Model found*

$$\text{Application Footprint} = PL * FP^{0.25} * D^{0.3}$$

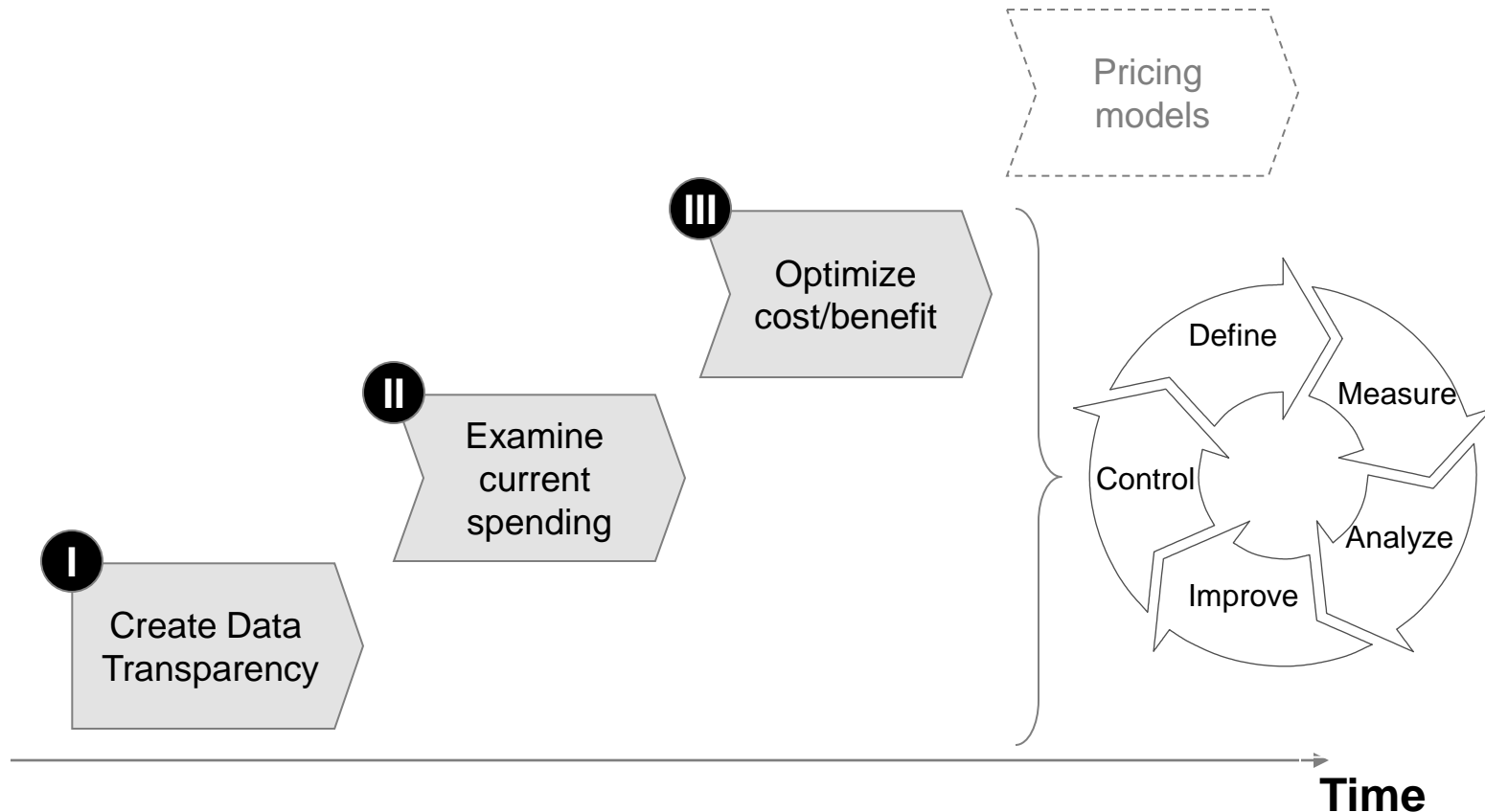
PL = num Programming Languages

FP = num of Function Points

D = num of reported Defects



As part of our future work we are going to improve our approach as a baseline for future pricing models



Thank You for Your Attention