



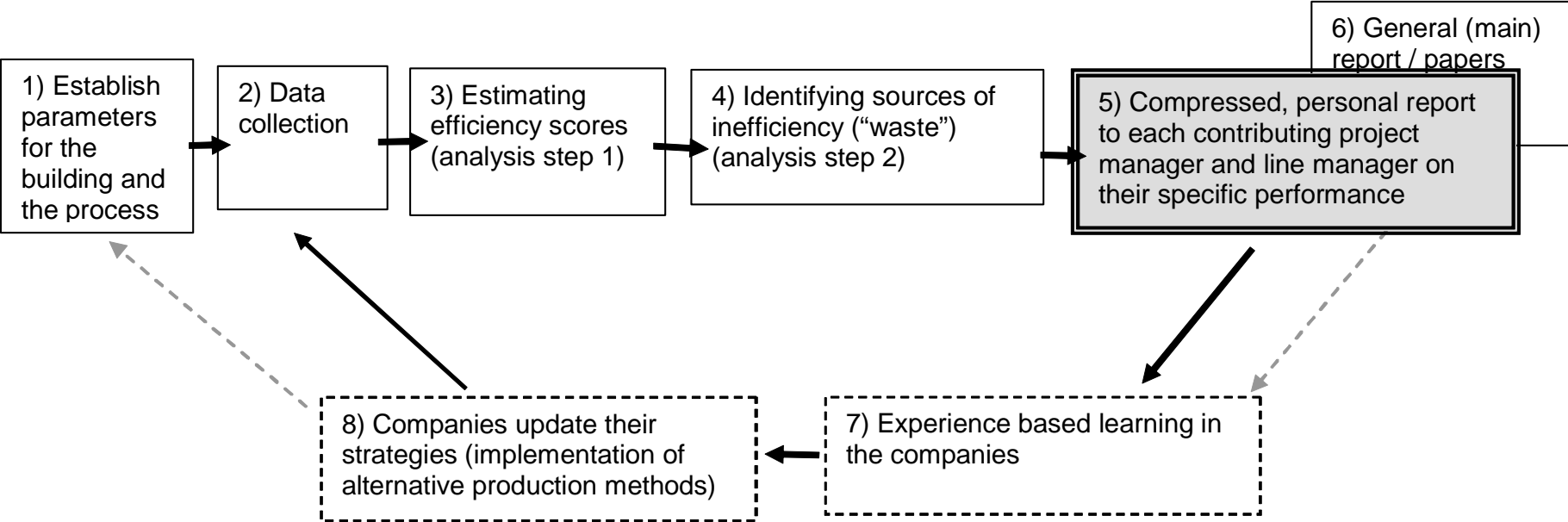
Measuring productivity and benchmarking efficiency of building projects

CIB Revaluing Construction 2007 – CROSSING BOUNDARIES,
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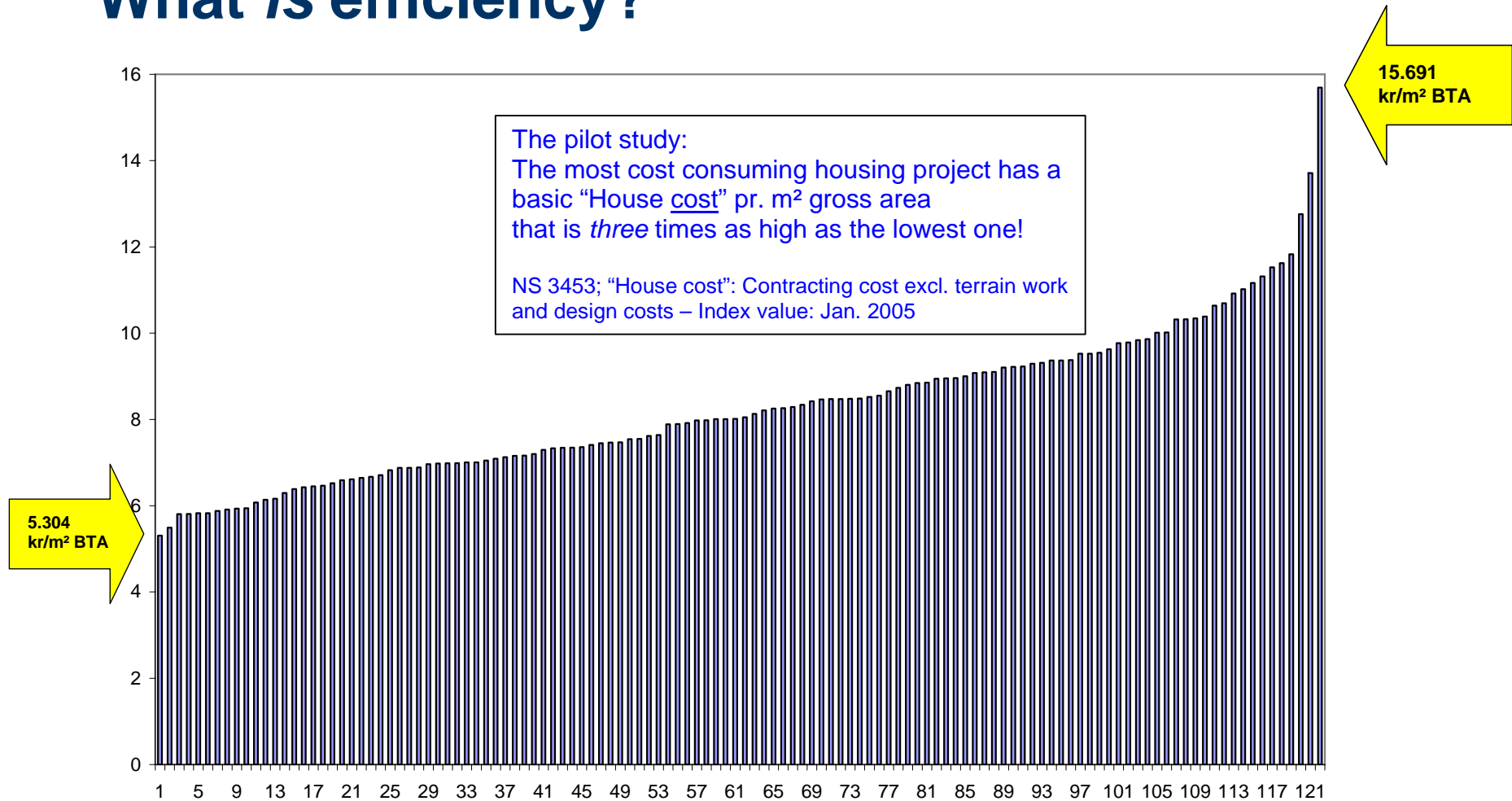
The R&D project has

- **developed** a concept ("tool") for measuring productivity, benchmarking efficiency and identifying Best Practice in housing
- **applied** the tool on a sample of completed projects (122 blocks of flats projects)
- **revealed** statistically significant variation in cost efficiency among the 122 projects.
- **observed** a number of statistically significant explanations to the actual variation (14 of totally 407 tested variables)
- **established** template(s) for individual reports to PMs and CEOs – aiming to stimulate experience based learning processes based on the *facts* about Best practice

The R&D process – and the process of its clients

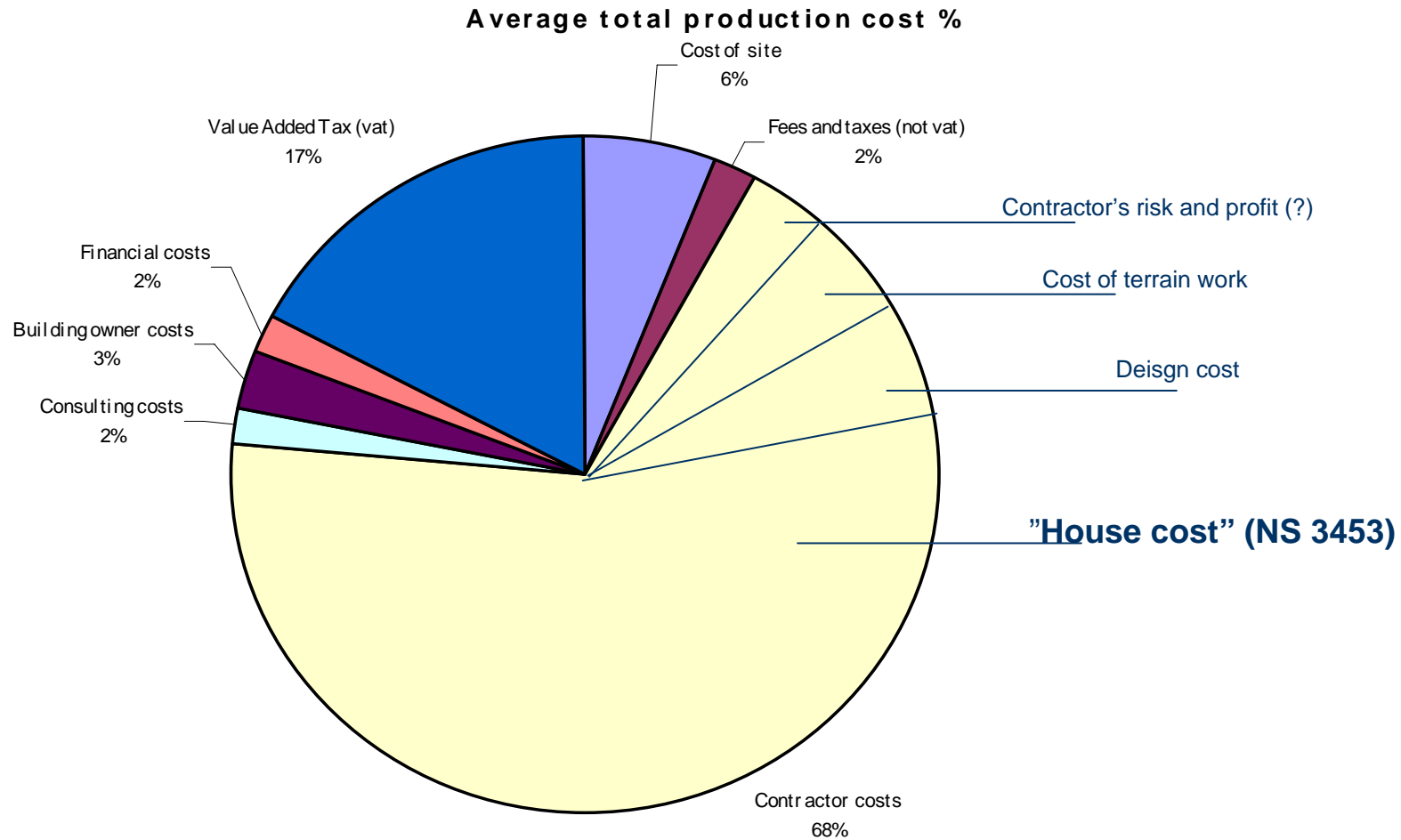


What *is* efficiency?



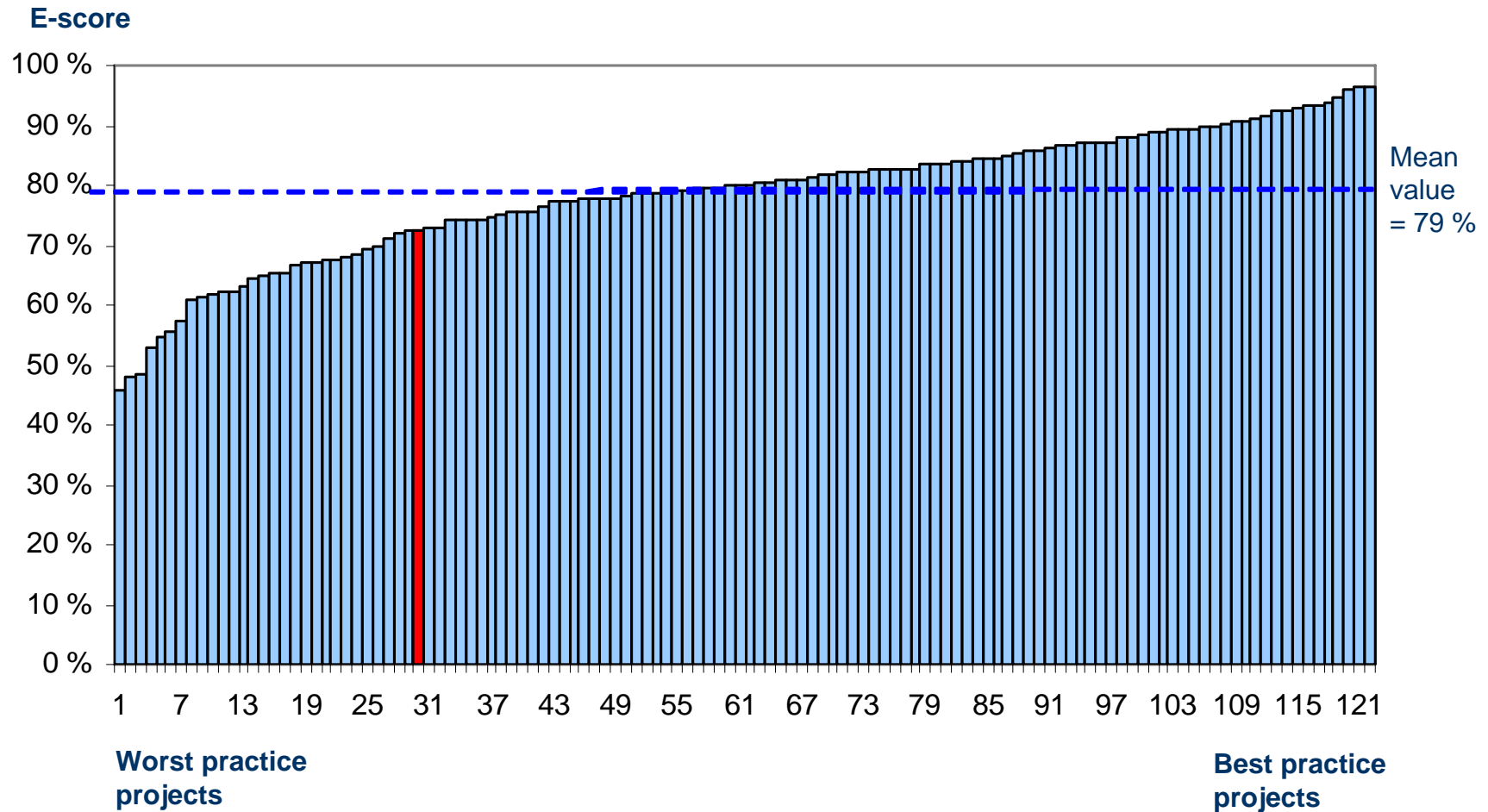
The E-score of a project can roughly be defined as the ratio given by the actual project's square meter cost on the square meter cost of the best performing project, after having made both of the values more accurate by taking into consideration the variation in floor area utilisation ("design efficiency") and interior and exterior standard ("quality")

Total cost¹ – and the House cost

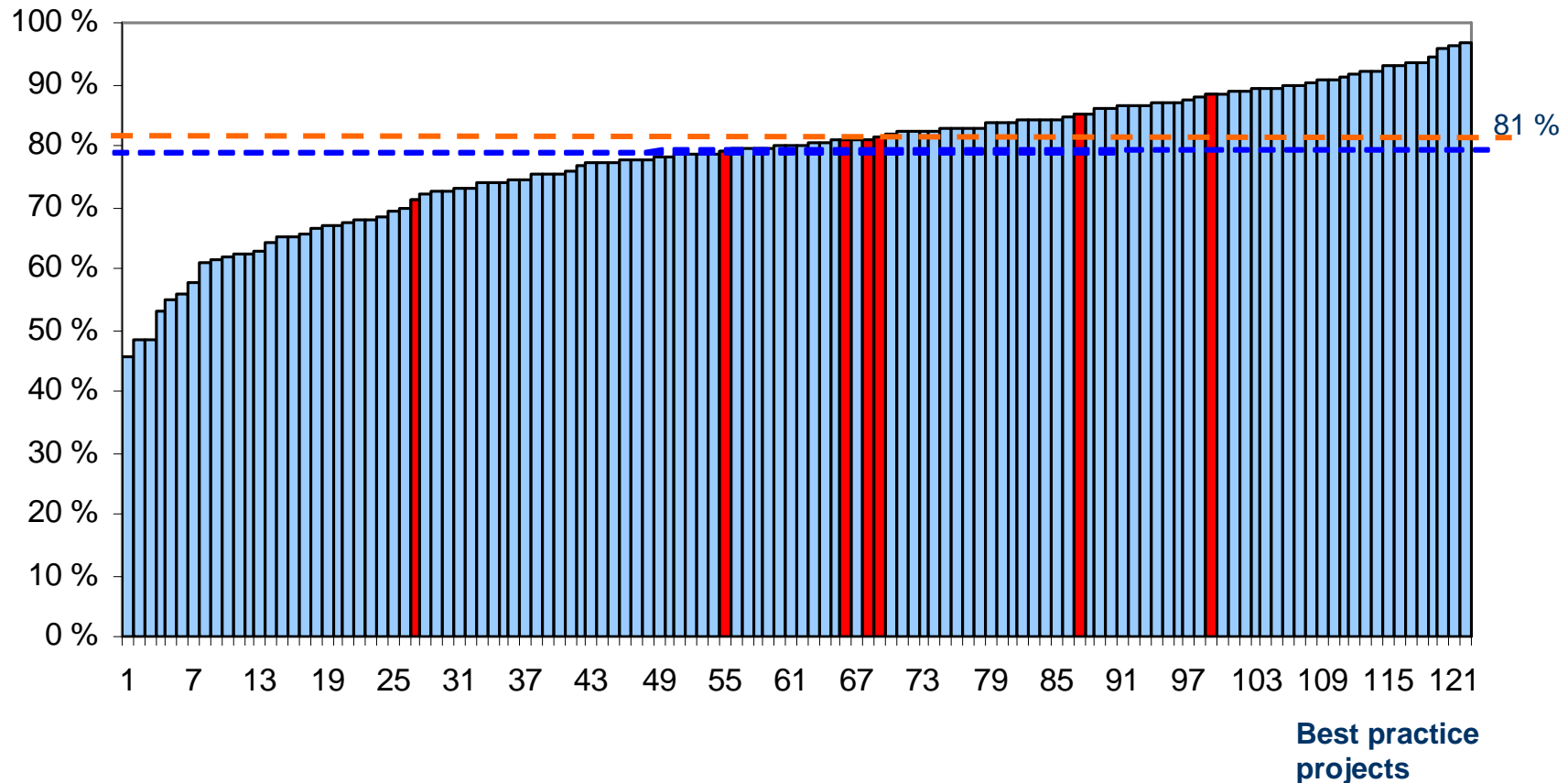


1) Sweden, Housing Dept., 2000; mean values for 26 housing projects

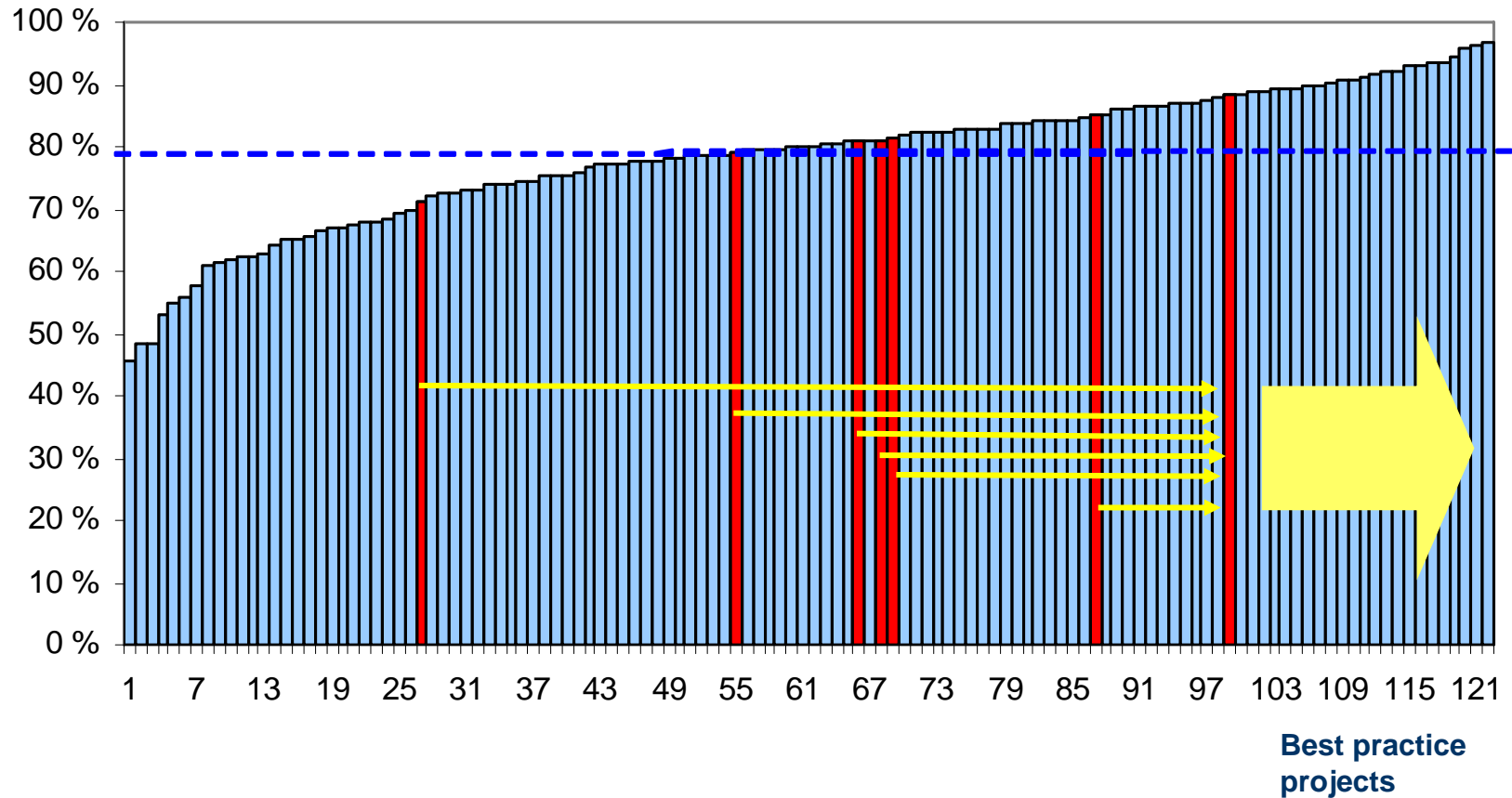
Step 1: Benchmarking of efficiency of 122 blocks of flats projects from 38 competing companies – by DEA



One company (of 38 ones) with 7 projects in the sample



A project's distance from Best practice: The learning and improvement potencial



Step 2: Identification of Best practice

- **Datamining**; Computerized iteration
- The questionnaire; 407 variables
- Á priori start (Apprx. ten presumed explanatory factors)
- Partial regresion ($Y = a + bX$) gave 61 "candidate variables"
- Multivariante regression ($Y = a + b_1X_1 + b_2X_2 + b_nX_n$ for each of the 122 Y-values, i.e. E-scores) gave the 14 variables with relevance for efficiency

We have taken the first step in drawing up "the map of Best construction practice in Norway"

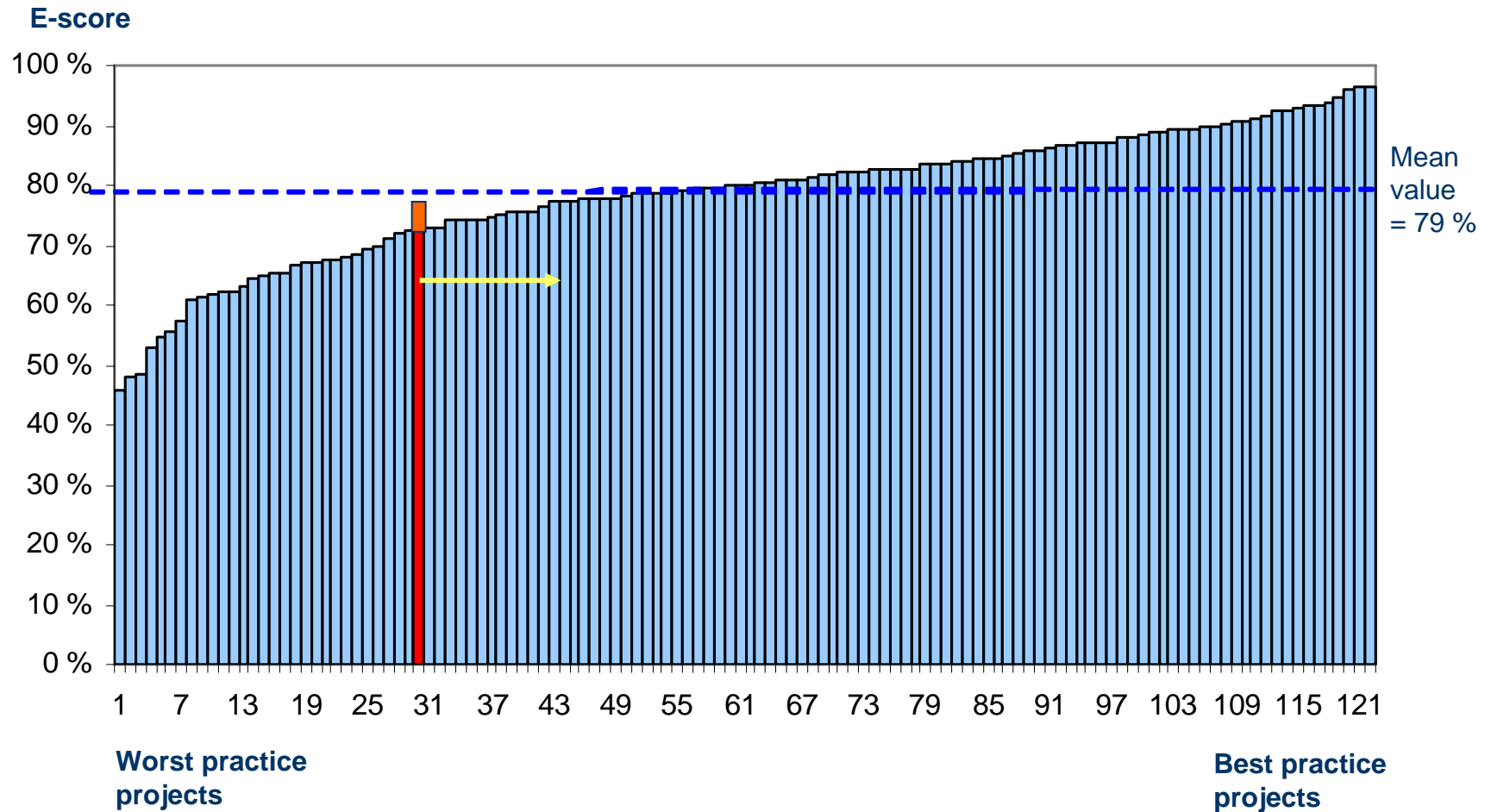


The Best practice map – examples from first edition¹

- 407 hypotheses of efficiency were tested against the efficiency score
- 14 variables were found to have empirical relevance for efficiency:
 - 6 environmental factors ("frame condition" to the project)
 - for instance *"Very narrow site" correlates with low efficiency*
 - 3 consequences of managerial prioritizing (in addition to efficiency)
 - for instance *"Very low number of injuries per gross area" correlates with high efficiency*
 - 5 PM priorities regarding use of own time, attention and authority
 - for instance the PM statement: *"Compared to all other activities of mine, I spent much time on following up the economy of the project", which correlate with high efficiency*

1) With reservations due to lack of complete verifying tests in accordance with scientific principles (The total data set has been used for the development of the model)

Correction of the E-score value



2) Findings of the type "Consequences of managerial prioritizing" – presented in the individual report to the CEO

Explanation of the type Consequences of managerial prioritizing	Effect on the E-score	The number of projects within YOUR duty assignment of which the statement is valid (yes), respectively invalid (no)	
		Yes	No
High quality costs , measured as remedy costs during the period of guarantee in % of total cost, correlate with low E-score value	3	4

Data/fact about each of the three variables in this table are listed in the table at page 3 above

The distribution of performance with respect to quality (3 to 4 in this example) indicates to the line manager with more than one project in the sample how his managerial system works – and should consequently give direction to the improvement process within his field of responsibility.

Details about the performance of each of the projects (like the 7 in this example) is available through the individual reports to each of his PMs

3) The prioritizing of the Project Manager - A fundament for experience based learning at basic level

Among the projects with high E-score....	YOUR prioritizing (text in a cell) vs. Best practice (green part of the scale)		
...it is typical that the project managers often			
1) spent relatively much time on following up the economy. Their answers (tick offs) are shown as the green part of the scale to the right.		neutral	
2)			
3)			
	<i>oposite</i>	<i>neutral</i>	<i>like</i>

Examples of questions that the project manager should ask himself – preferably in a talk with other members of his team in the actual, completed project:

- Have I understood the question and the scale correctly?
- How far from the highest E-score is the E-score of our project?
- Would it be possible for us to perform better?
- Is it likely that more time spent on following up the project economy would give us a higher E-score?
- If the answer is yes, do we believe that this can be achieved in future projects?
- How shall I communicate our thoughts about the importance of following up the project economy in the next meeting in the **Company Improvement Project**?
- Taken into consideration all the 8 statistical explanations of low E-score (in general), which should be given highest attention in **my improvement work**?

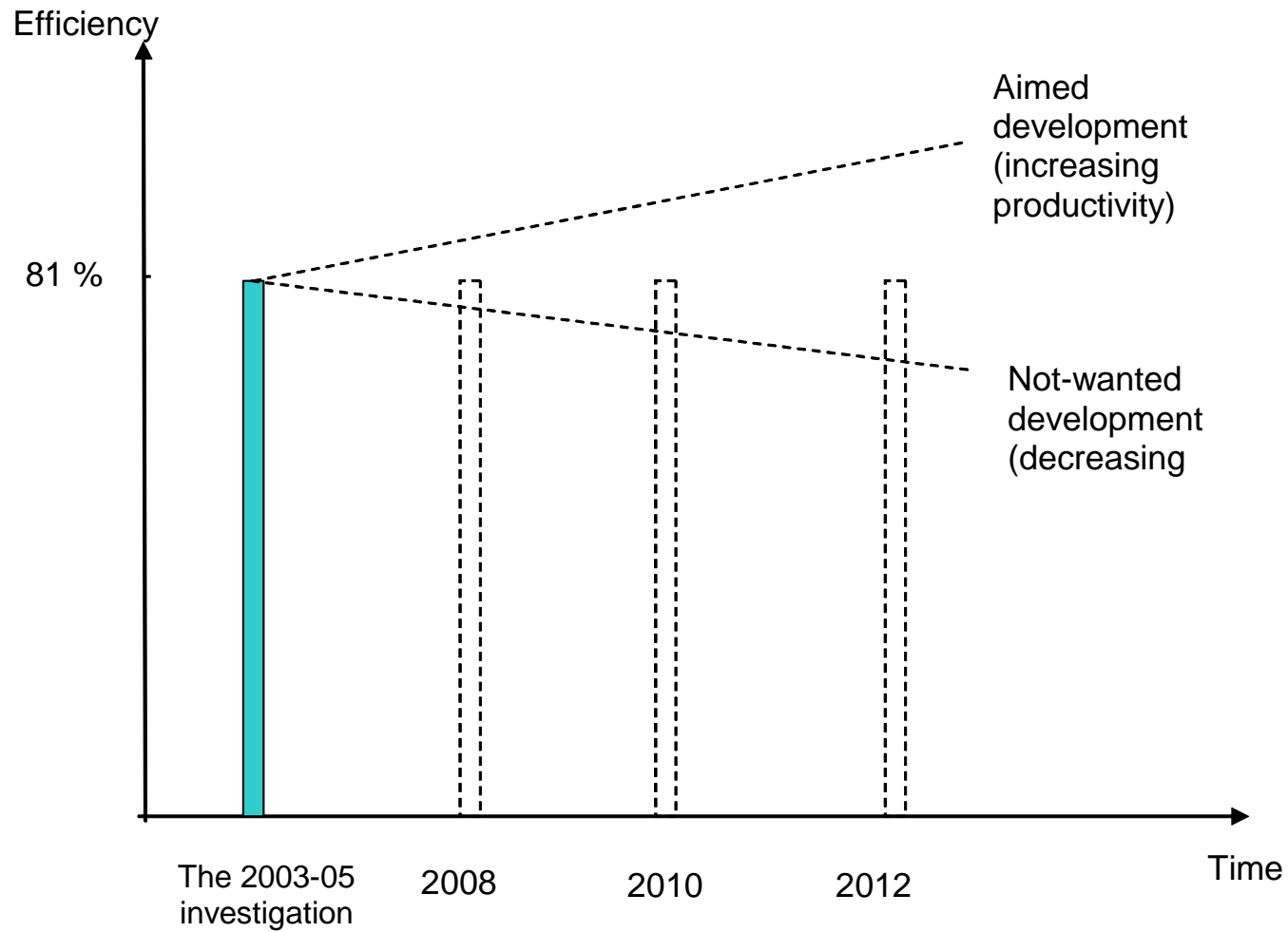
3) The prioritizing of the Project Managers – A fundament for experience based learning at company level

Among the projects with high E-score....	The 7 project managers within YOUR area of response have answered in accordance with the digits below		
...it is typical that the project managers often			
1) spent relatively much time on following up the economy. Their answers (tick offs) are shown as the green part of the scale to the right.	0	2	5
2)			
3)			
	<i>oposite</i>	<i>neutral</i>	<i>like</i>

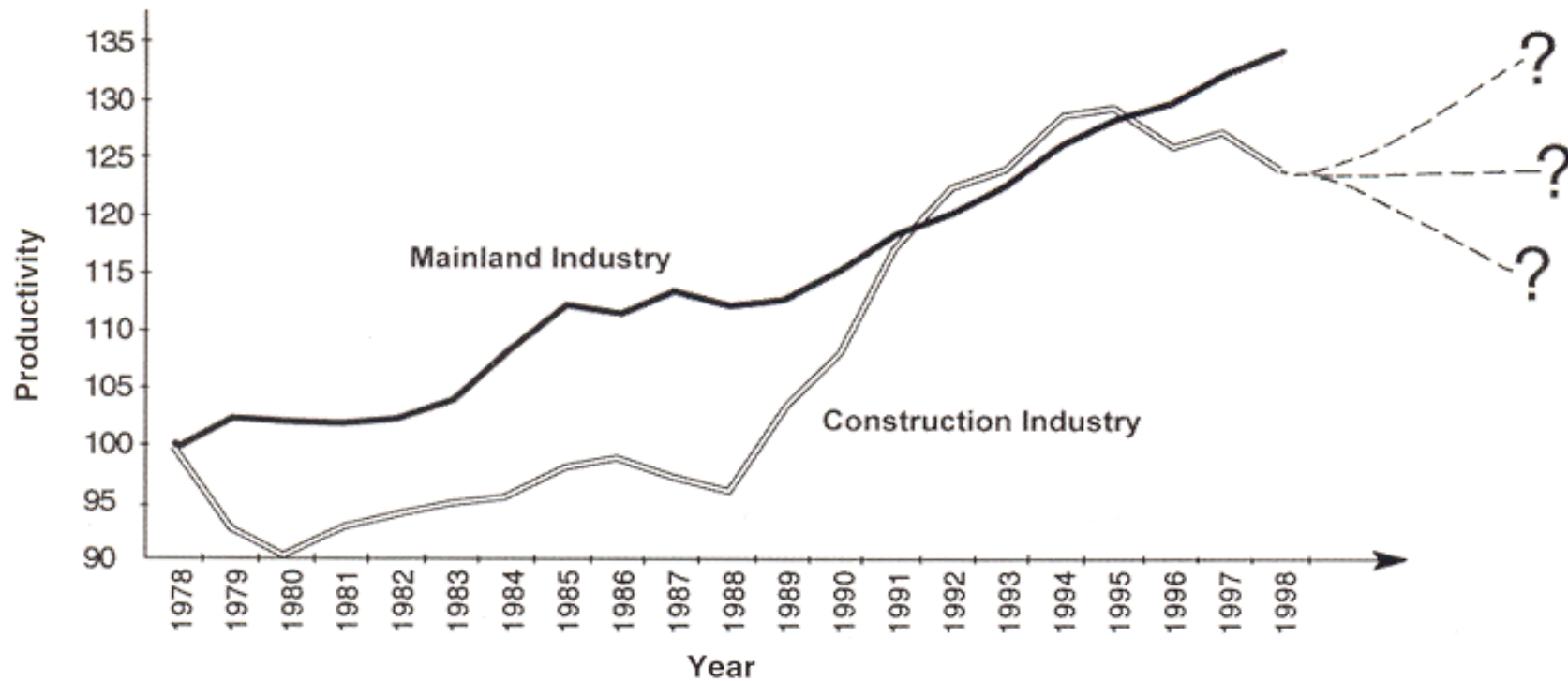
Examples of questions from **the facilitator** of the experience learning process during **a session** in the **company's improvement project**:

- Will each of the seven project managers present their thoughts about following up the project economy, please?
- Is the variation among our projects shown in the table explicable?
- Is the time spent on following up the project economy dependent on special circumstances of each project?
- What is stated in our company policy on this matter?
- If we regard the actual finding true and relevant for us, what exact should be changed or emphasized with respect to following up the project economy?
- In which coming projects can an adjustment of our procedure on this matter be exercised and studied ?

4) How does the productivity in a company develop?

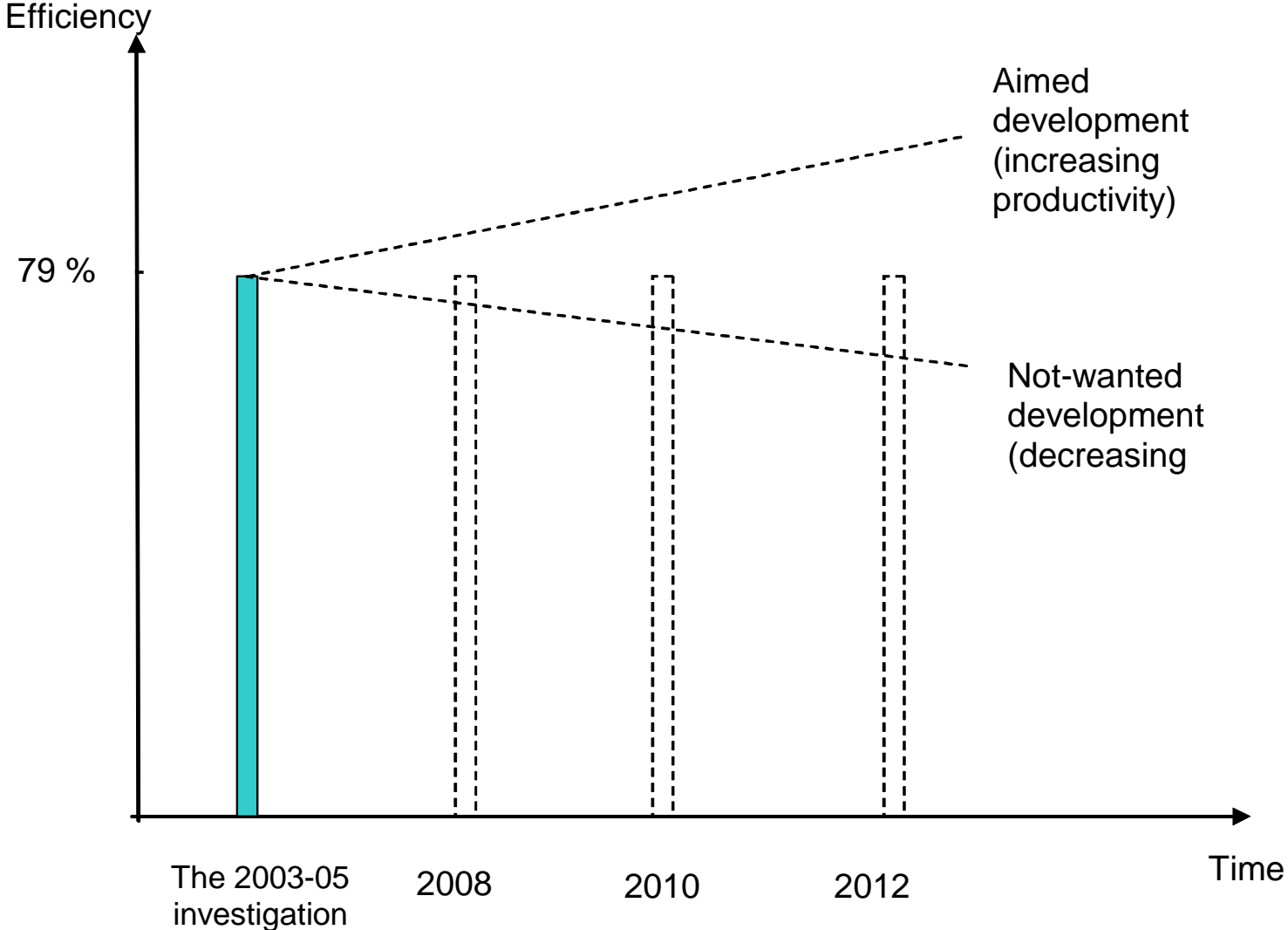


5) How does the productivity in the industry develop?



Productivity in Norway (1978 = 100)

5) Productivity development of the industry based on project economy investigation



A pair of golden scales of justice is the central focus of the image. The scales are positioned diagonally, with the left pan higher than the right. The background is a gradient of blue, transitioning from a darker blue at the top to a lighter blue at the bottom. The scales are highly reflective, showing bright highlights and deep shadows. The text is overlaid on the scales and background.

Statistical benchmarking of efficiency will provide

- credible feed back about a project's performance
- facts about Best practice in certain fields
- improved basis for learning
- better cost control in companies
- basis for credible research activities

Thank you!