

# Using Balanced Scorecard to help achieve CMMI Maturity Level 4

European SEPG 2005

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software engineering  
**SYSTEMATIC**

# Agenda

- Who are we?
- Focus of CMMI Maturity Level 4
- Highlights of Balanced ScoreCard Methodology
- Goal Flow-down
- Integrating Level 4 and BSC
- Deploying Balanced ScoreCard
- Lessons and Results

# Systematic Software Engineering A/S

DANISH WINNER 2003



ERNST & YOUNG  
ENTREPRENEUR  
OF THE YEAR®



**Mission Critical**



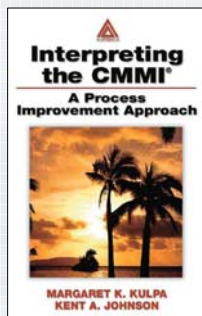
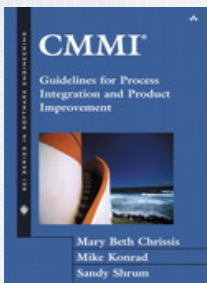
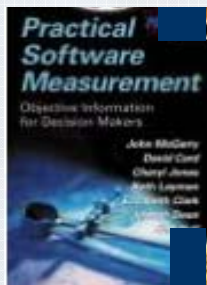
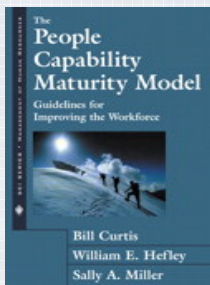
- Established in **1985** and now Denmark's **largest privately-owned** software and systems company
- **370+ employees**; 70% hold a MSc or PhD in software engineering
- High **employee satisfaction** – attractive **workplace** for **ambitious** software engineers
- Dun & Bradstreet credit rating: **AAA**
- **High solidity. No bank debt** – fully **self-financing**
- **CMMI Level 4** and ISO 9001:2000 and AQAP 110 + 150
- Supplier of products and projects to more than **27 countries**, **export share** is 60%
- 97% of our **customers would recommend Systematic** to other customers
- For further information – see [www.systematic.dk](http://www.systematic.dk)

software engineering  
**SYSTEMATIC**

The **IT-Knowledge** Company

# Borland TeraQuest

## World Leader in CMM/CMMI-based services



**Epner**  
VP



**Layman**  
Sr. Dir.



**Curtis**  
Chief  
Process  
Officer

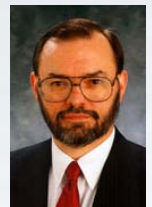
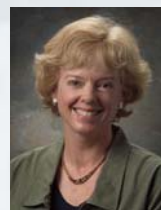


**Statz**  
VP  
Knowledge  
Management



**Oxley**  
VP  
Process  
Management

## Process Optimization:



## Experience

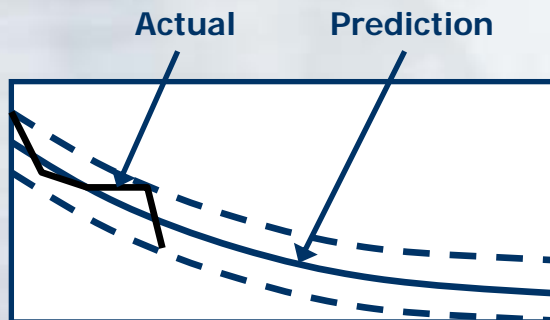
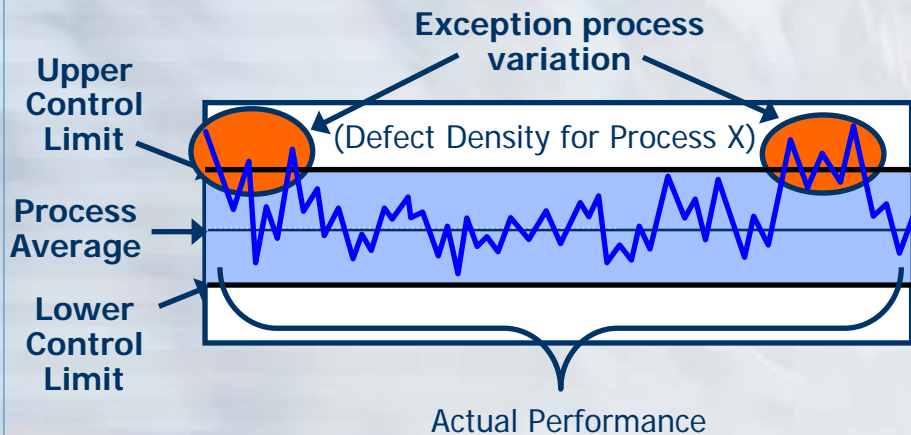
- 11 Lead Appraisers
- 20+ yrs. each

# CMMI4 – to Control and to Predict

- **Important Level 4 Concepts:**
- Level 4 is focused on predicting the performance of the processes based on historical and project data and managing according.
- **Quality and Process Performance Objectives** – important goals based on business objectives and past performance

	Control process variation	Predict quality and process performance
Vision	Known effort, costs and quality	Predict results, e.g. number of defects
Focus	Primarily past (Measures)	Primarily future (Estimates)
Method	Remove special causes for variation	Prediction models

# CMMI4 – to Control and to Predict



- **Event Level Measure** – a measure taken at the **completion** of an event
- **Process Performance Baseline (PPB)** – documents the **historical results** from a process. Used as a benchmark against actual project performance.
- **Process Performance Model (PPM)** – describes the relationship among attributes of a process and its work products. **Based on PPBs** and **calibrated to the project**. Used to estimate or predict a critical project value that cannot be measured until later in the project's life (e.g., no. of delivered defects or total effort).

# Process Performance Baselines and Models

## Status Measures

- Size
- Effort
- Cost
- Schedule

## Event Level Measures

- Hours per event - Productivity
- Requirement (defined)
- Requirement (designed)
- Object Implemented
- Test Executed
- Defects, Size, Hours per Event – Quality
- Design Review
- Inspection
- Test Executed
- Days Late or Early - Schedule
- Task Completed

## Process Performance Baselines

- Review Baseline
- Defects per page and per hour
- Productivity Baseline
- Hours per requirement by phase
- Effort Distribution
- Percentage of effort by phase

## Process Performance Models

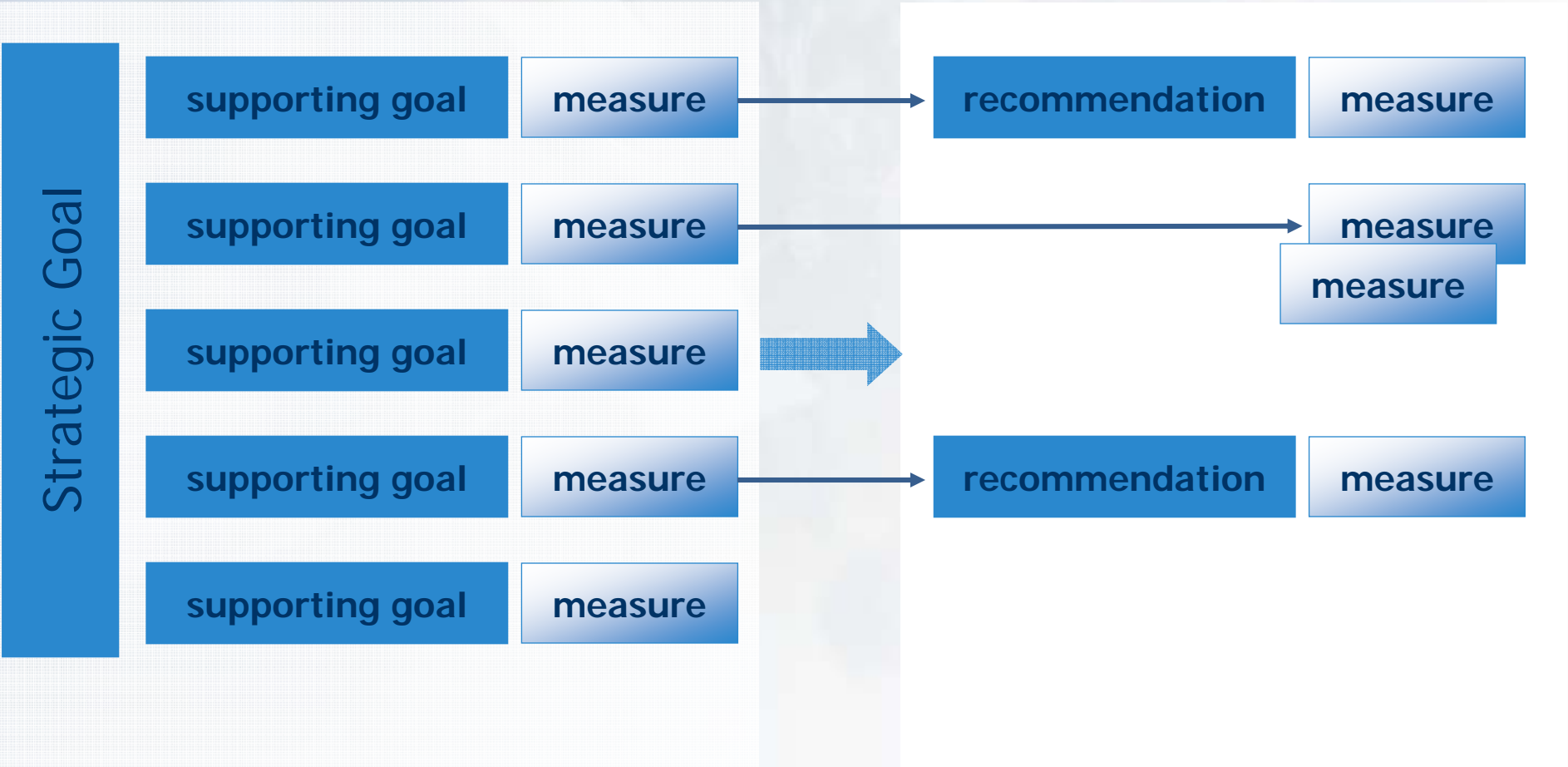
- Effort (estimation and prediction)
- New Development
- Maintenance
- Defect Insertion and Removal
- New Development
- Maintenance

Real Project  
Decisions

# Selecting the Right Business Objectives

## Corporate Business Goals and Measures

## Process Improvement Recommendations and Measures

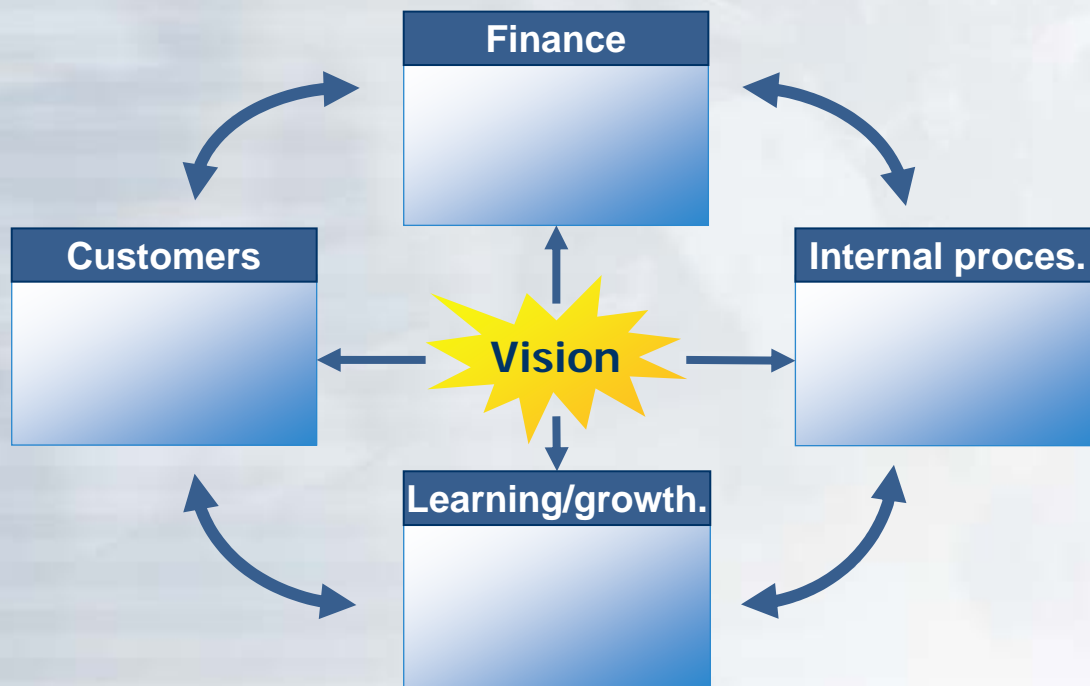




# Using Balanced Scorecard (BSC) for Goals

- **BSC provides a mechanism to balance**

- internal goals and external goals
- past performance and drivers for future performance
- short term and long term performance
- People, Process, and Technology investment



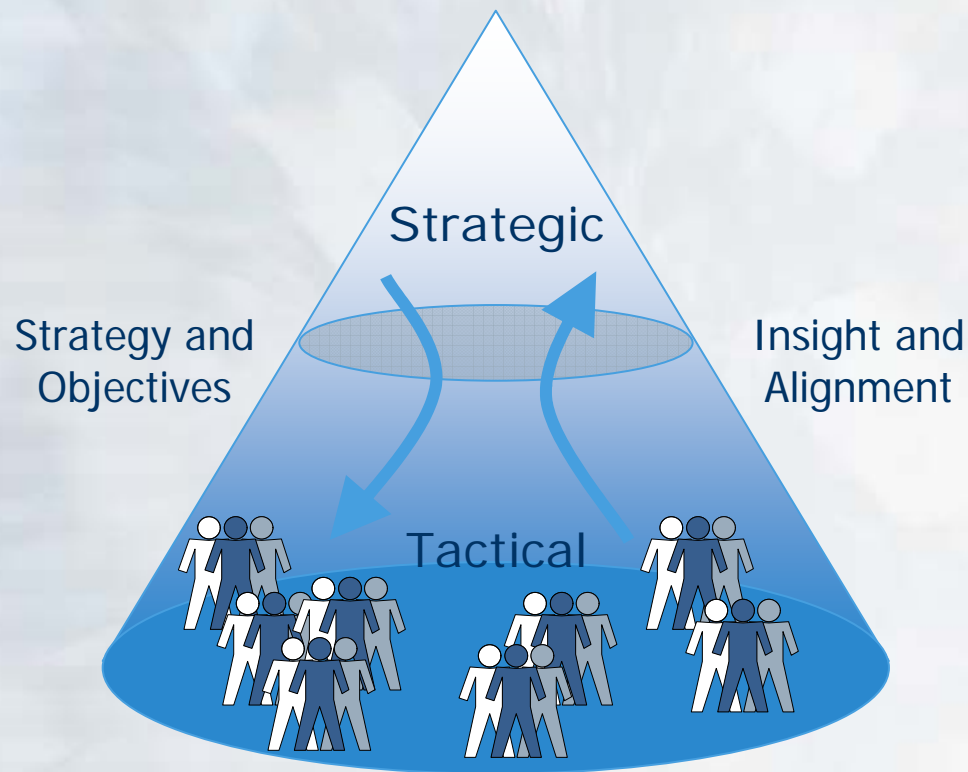
- **Generally used categories dimensions**

- Customers
- Finance
- Internal processes
- Learning & growth

# Setting up Balanced Scorecards

- **First, establish and communicate a strategy throughout the organization**
  - identify key needs of customers and market segments; link those to financial goals
  - set financial objectives
  - focus on internal business processes and efficiencies in meeting customer needs
  - invest in learning and growth to excel with the processes
  
- **Within the scorecard**
  - identify how to see financial goals are met
  - set targets for meeting customer needs
  - identify process changes or innovations needed
  - match learning and improvement objectives to these

# It is not a simple task!

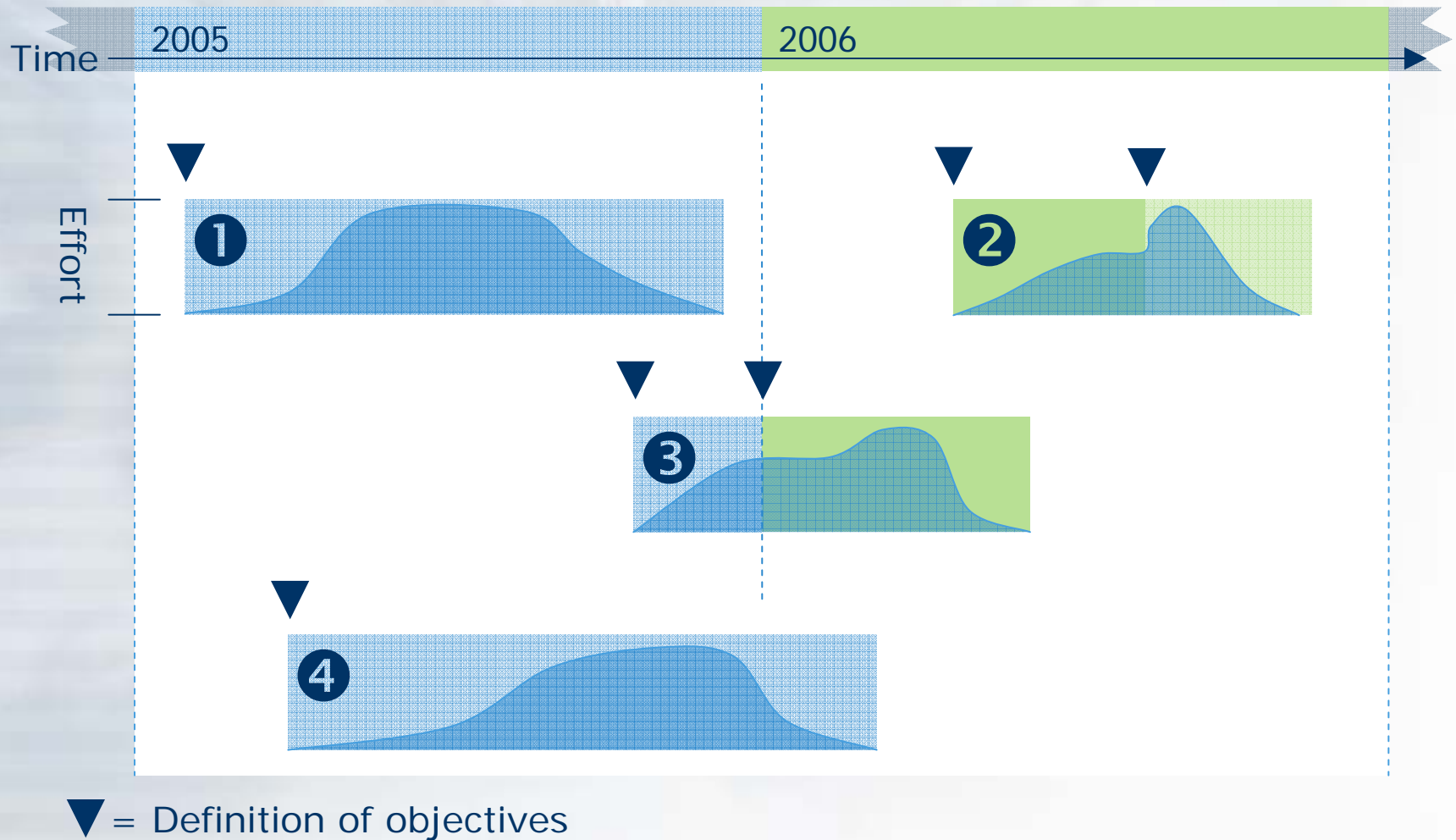


## Focus

- Growth
- Efficiency
- Competence
  
- Time
- Cost
- Quality

**Making two different worlds work together...**

# Project Organizations are Dynamic



# The Idea!

## Integrate the Balanced Scorecard and CMMI Maturity Level 4

Finance	
Harmonic Growth	Growth in SSE turnover
Satisfied Earning	Profit ratio
Increased Internationalization	Export share of corporate turnover
Customers	
Long-term Customer Profitability	Invoicing degree
High Customer Loyalty	Project customers with essential additional sale IRIS-customers signing up for maintenance
Maintain High Customer Satisfaction	
Understand the Customer's Business Area	
Internal Processes	
World-class Process Maturity	
Stable and Reliable Delivery	
Precise Estimation Ability	
Reduction of Rework	
Increased Productivity	
Employees	
Satisfied Talents	
Visible and Motivated Management	
Intensive Competence Development	
Active Knowledge Sharing	

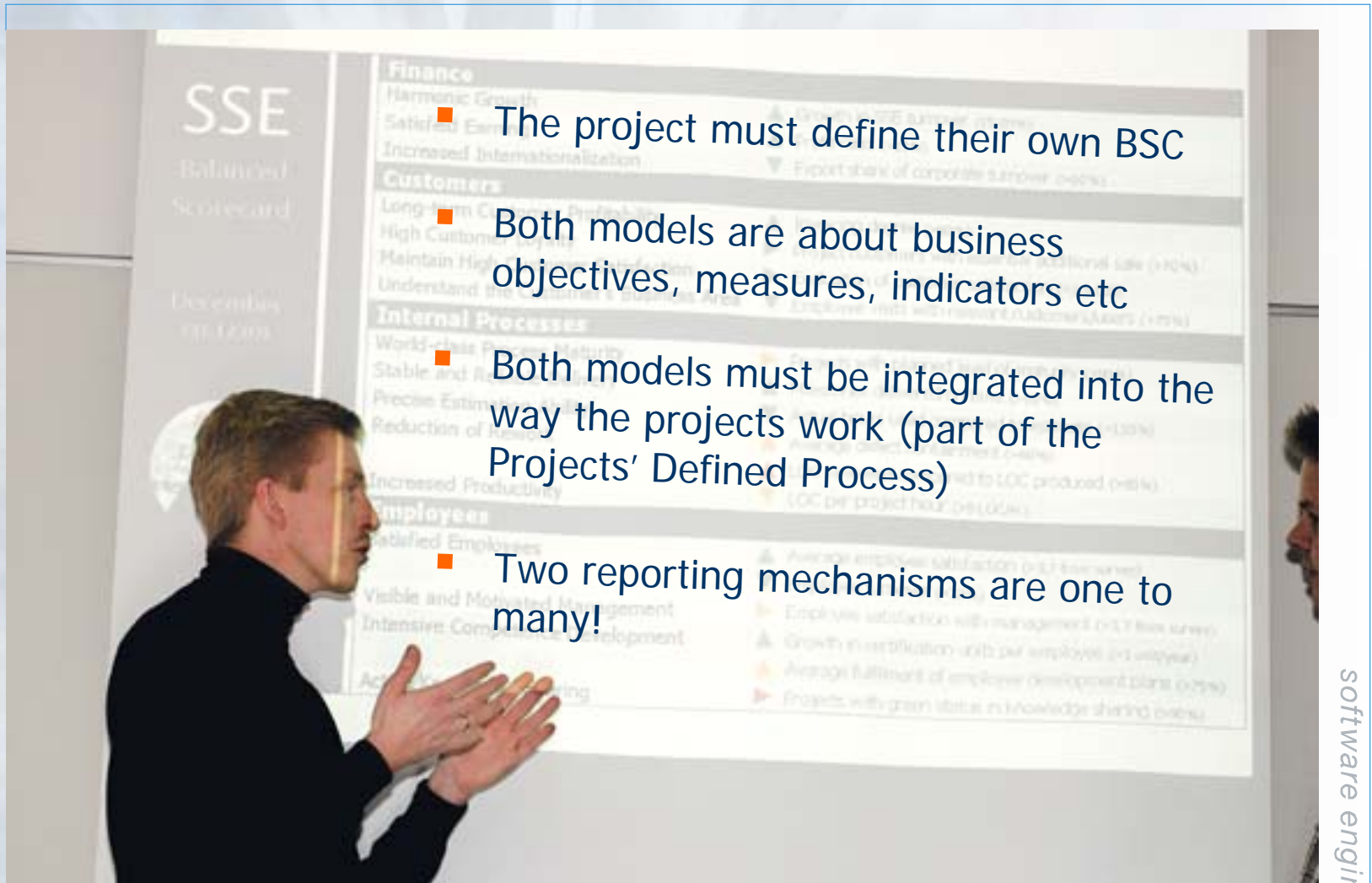
Alignment 



Define  
Collect  
Control  
Predict  
Present  
Analyze  
Conclude  
Act!

Goal flow down 

# Initial Thoughts

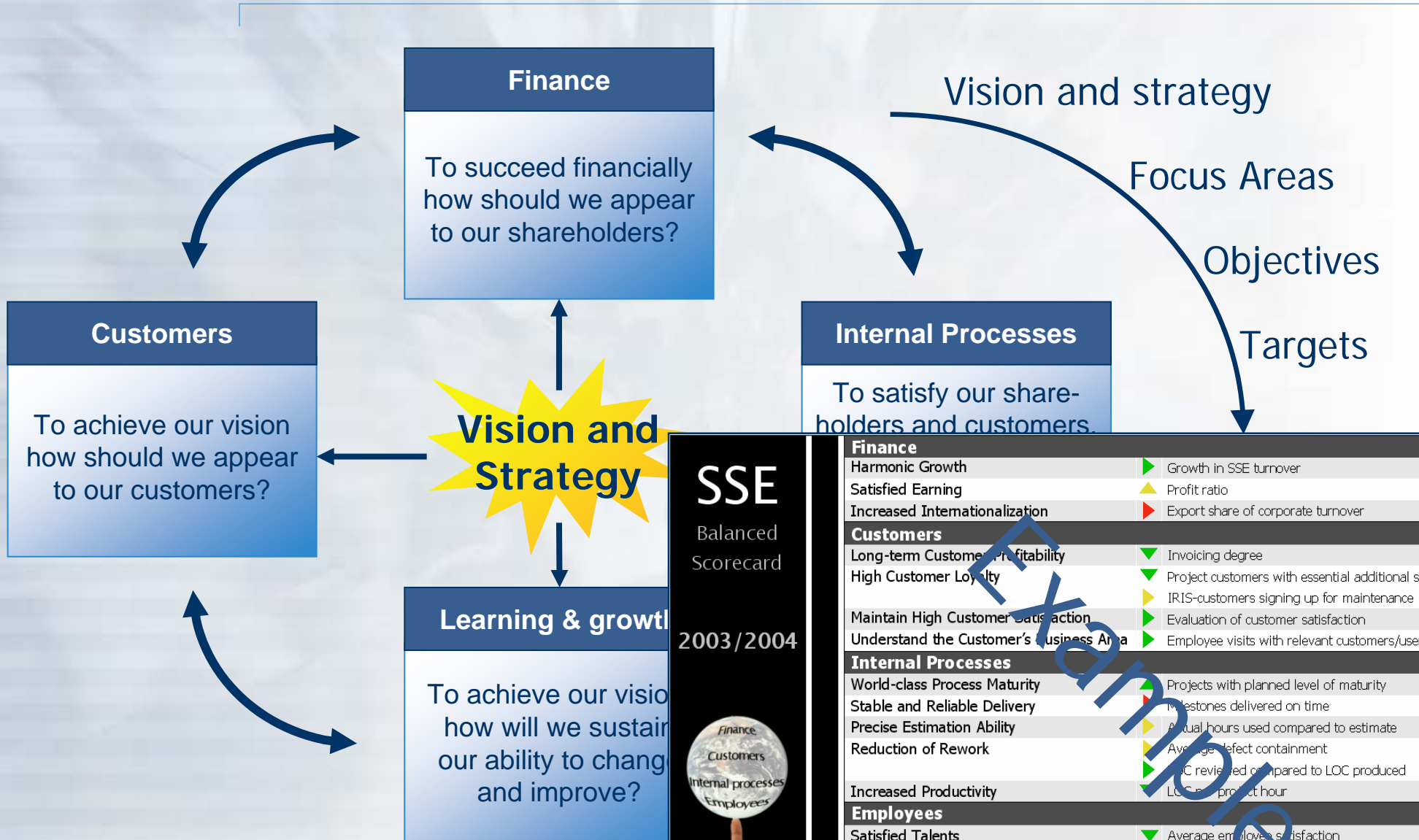


**SSE**  
Balanced Scorecard  
December 2012

- Finance**
  - Harmonic Growth
  - Satisfied Employees
  - Increased Internationalization
- Customers**
  - Long-term Customer Satisfaction
  - High Customer Loyalty
  - Maintain High Customer Satisfaction
  - Understand Customer Needs
- Internal Processes**
  - World-class Processes
  - Stable and Reliable Processes
  - Precise Estimation
  - Reduction of Errors
  - Increased Productivity
- Employees**
  - Satisfied Employees
  - Visible and Motivated Employees
  - Intensive Competence Development
  - Active Learning

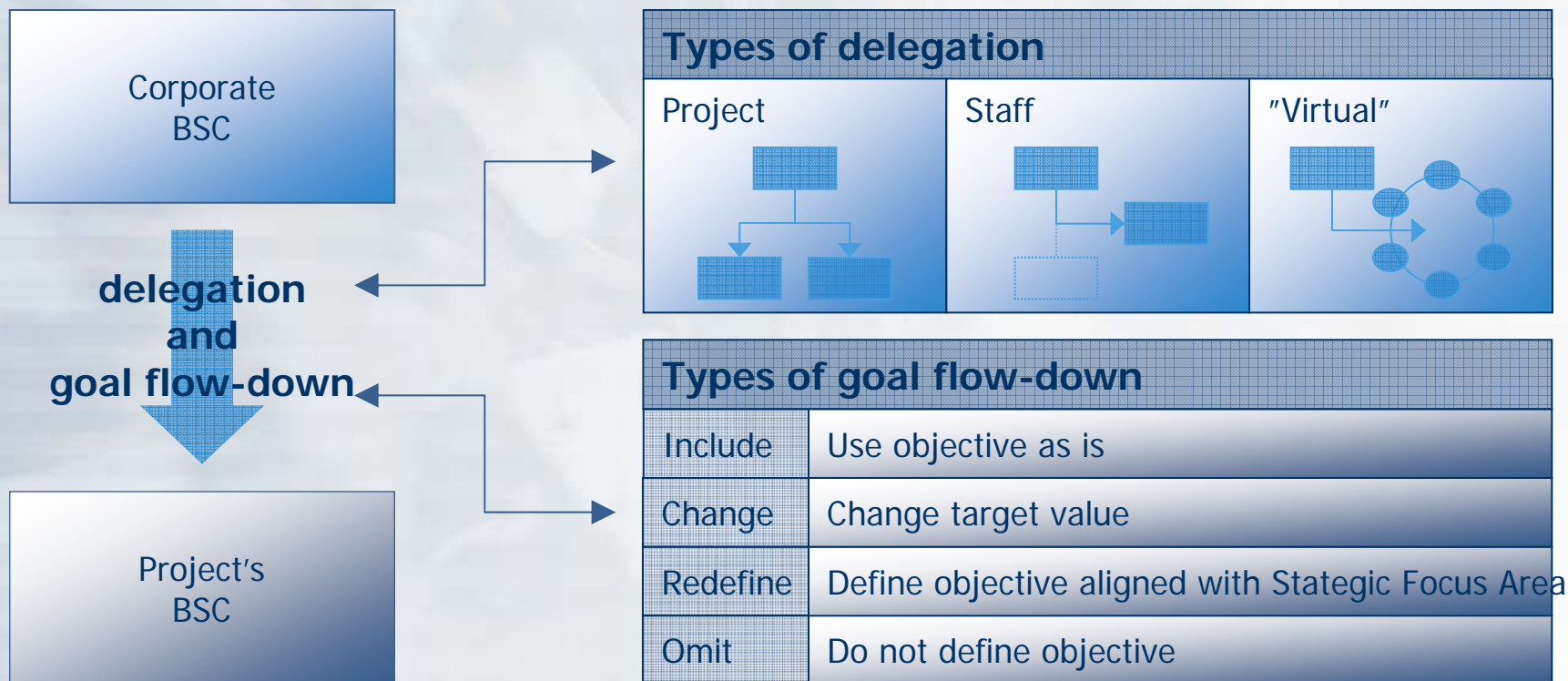
- The project must define their own BSC
- Both models are about business objectives, measures, indicators etc
- Both models must be integrated into the way the projects work (part of the Projects' Defined Process)
- Two reporting mechanisms are one to many!

# Balanced Scorecard: Quantifying the Strategy



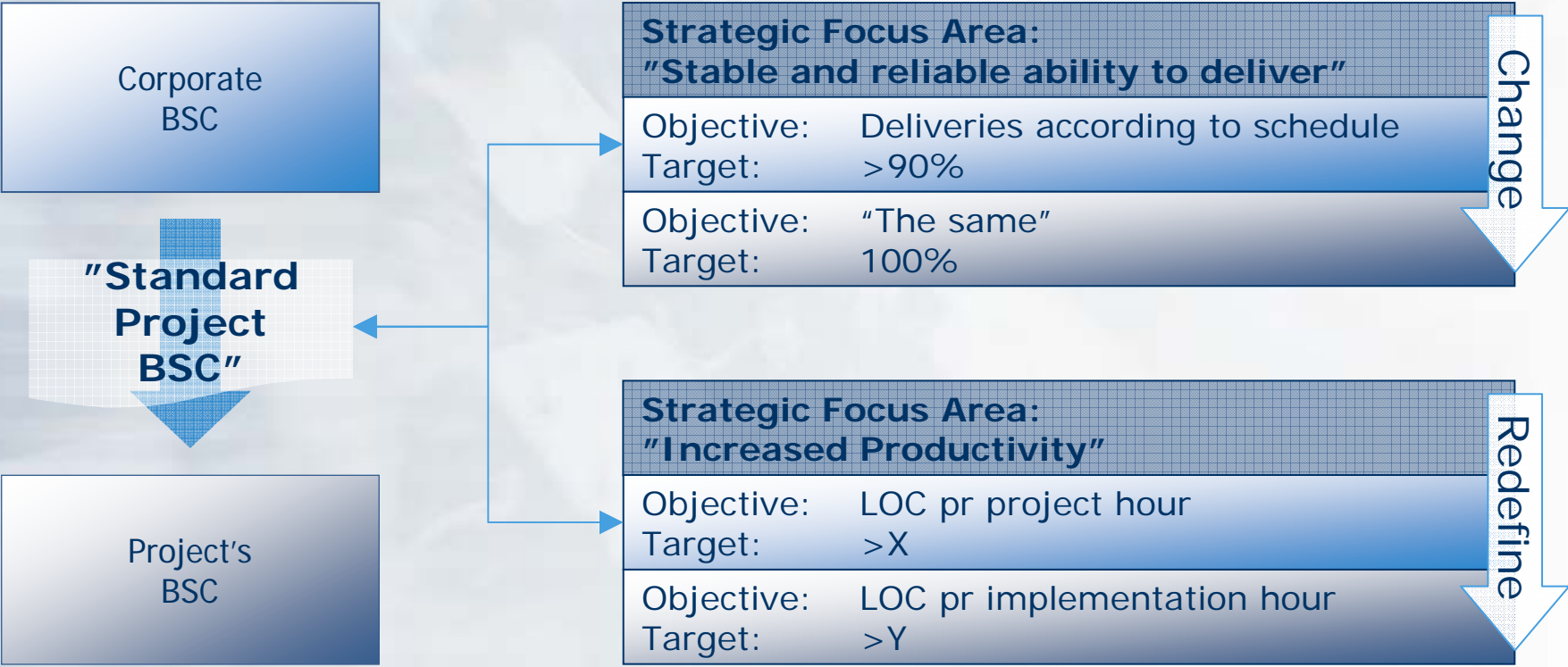
SSE Balanced Scorecard 2003/2004		
<b>Finance</b>		
Harmonic Growth	▶	Growth in SSE turnover
Satisfied Earning	▲	Profit ratio
Increased Internationalization	▶	Export share of corporate turnover
<b>Customers</b>		
Long-term Customer Profitability	▶	Invoicing degree
High Customer Loyalty	▶	Project customers with essential additional sale
Maintain High Customer Satisfaction	▲	IRIS-customers signing up for maintenance
Understand the Customer's Business Area	▶	Evaluation of customer satisfaction
	▶	Employee visits with relevant customers/users
<b>Internal Processes</b>		
World-class Process Maturity	▶	Projects with planned level of maturity
Stable and Reliable Delivery	▶	Milestones delivered on time
Precise Estimation Ability	▲	Annual hours used compared to estimate
Reduction of Rework	▶	Average defect containment
	▶	QC reviewed compared to LOC produced
	▶	LOC per project hour
<b>Employees</b>		
Satisfied Talents	▶	Average employees satisfaction
	▶	Employee turnover
Visible and Motivated Management	▲	Employee satisfaction with management
Intensive Competence Development	▶	Growth in certification units per employee
	▶	Average fulfillment of employee development plans
Active Knowledge Sharing	▶	Projects with green status in knowledge sharing

# Delegation and Goal Flow-down

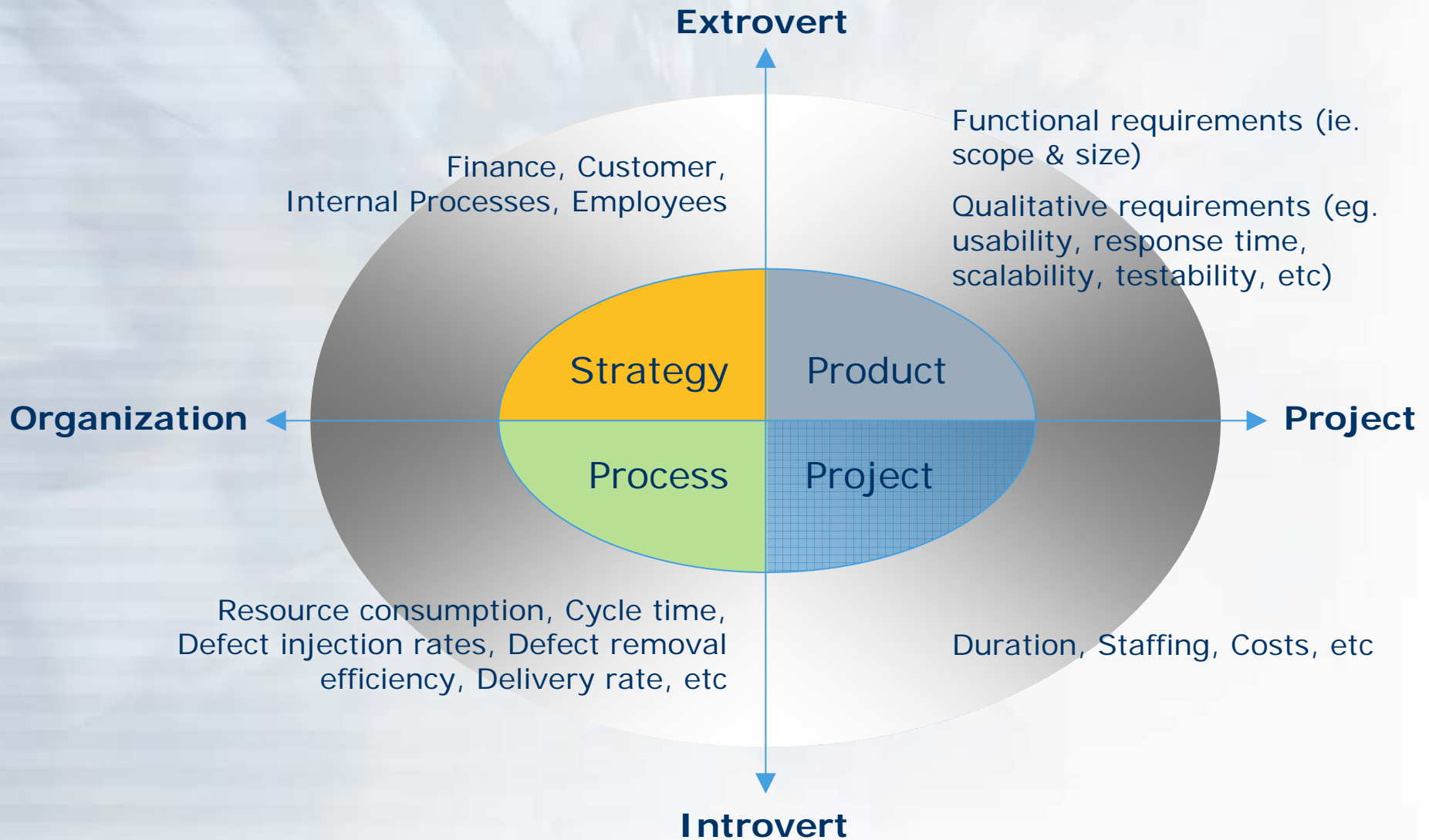




# Defining Objectives



# Quality and Process-Performance Objectives



# BSC Dimensions and Degree of Control

	Monitor	Plan and track	Control using thresholds	Statistically control	Predict
Finance	○				
Customer	○				
Internal Processes			○		
Employees	○				

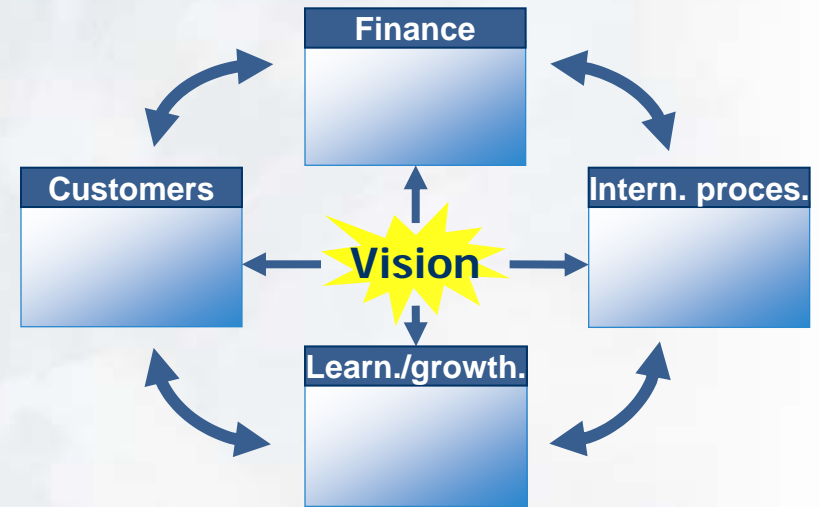
# Synergy of Models

Definition

BSC

## Balanced Scorecard

- Focus primarily on defining strategy
- Strong in defining (balanced) goals
- Little guidance in implementation

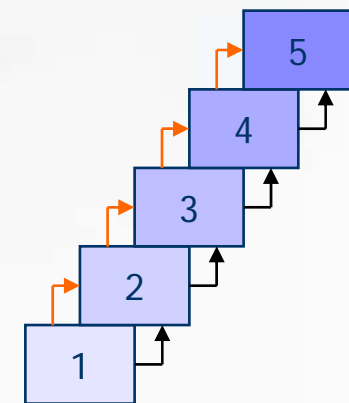


Implementation

CMMI4

## CMMI level 4

- Focus primarily on implementing project goals
- Strong in implementing known/defined objectives
- Little guidance in finding the right objectives



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# Important Lessons

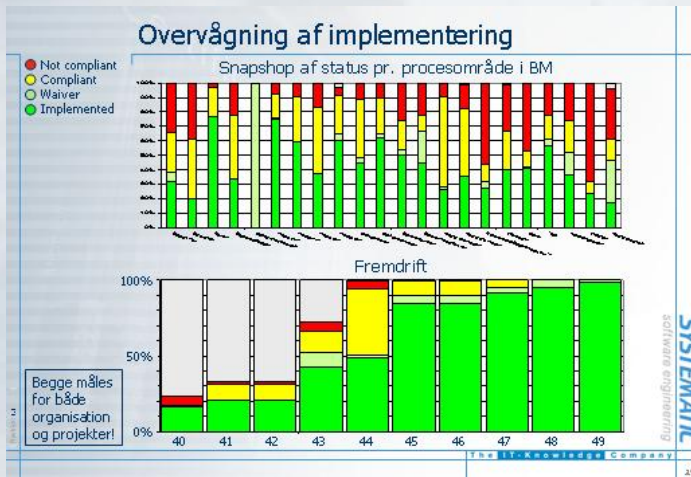
## Communicate the vision



## Plan and follow up



## Change Progress Indicators



## Wall of Fame

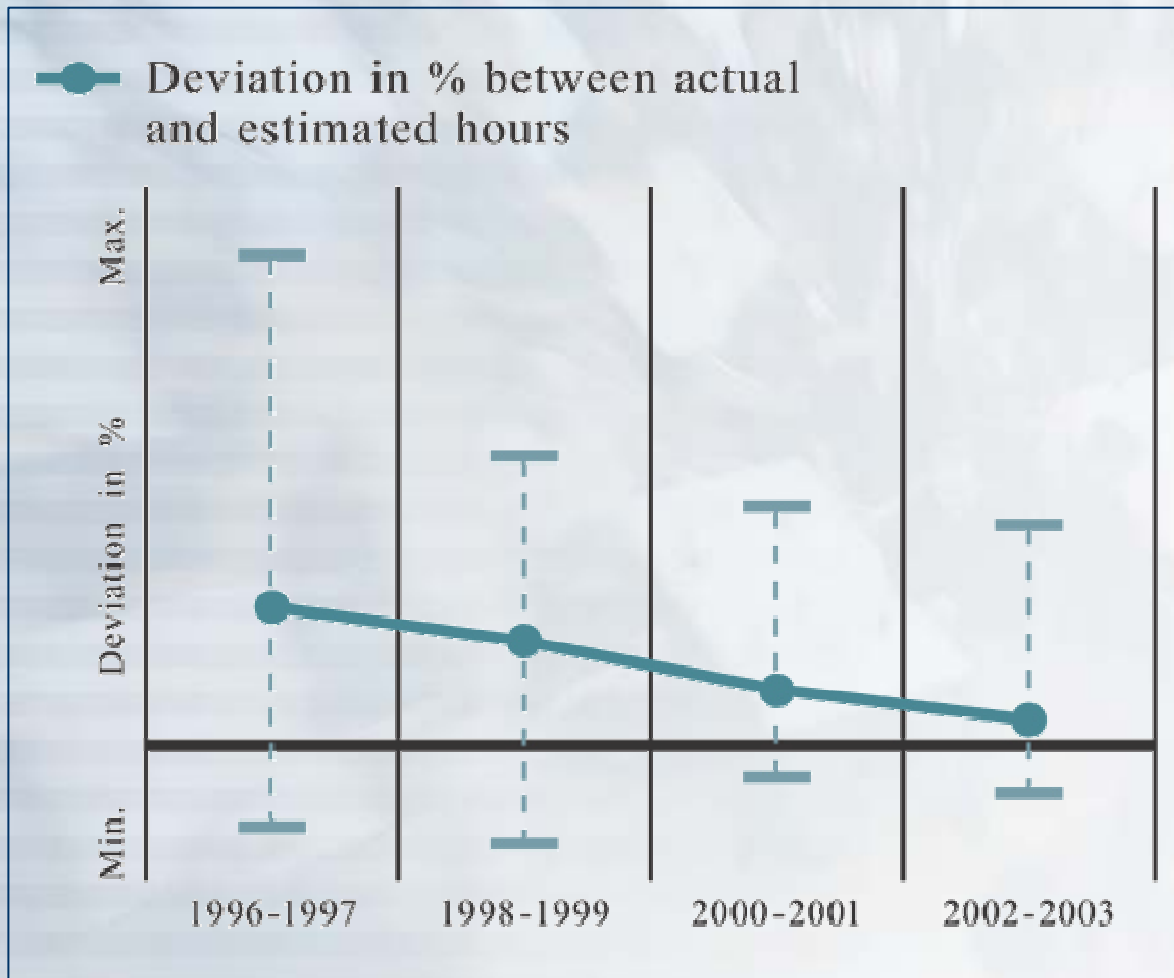


# The Results



- **Systematic gets (the Business Challenges)**
  - Improved Implementation of Strategy
  - Increased Insight into the right Project Parameters
- **The Projects get**
  - Explicit, balanced objectives and evaluation
  - Management Decisions based on Quantitative Data
- **The Customers get**
  - Improved Product Quality
  - Predictability
- **The Employees get**
  - Increased Focus on Employee Development

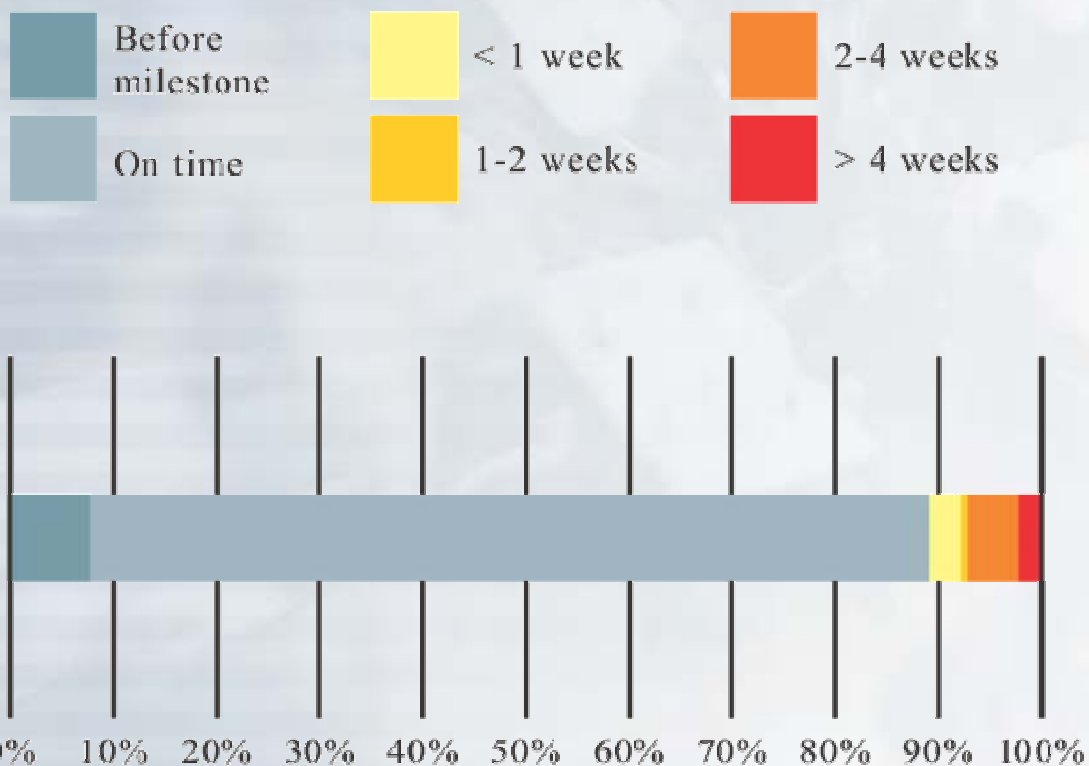
# Improvement of Estimation Ability



- Estimation precision has improved significantly since 1996
- The gap between hours spent and hours estimated has been reduced to one fifth
- The variation in the ability to meet estimates is reduced by 50%

# Delivery on Time

**89% of all deliveries in 2003 were on time**



- Deliveries on time  
66% in 2001  
79% in 2002  
89% in 2003
- In 2004 we expect to fulfill our objective that we deliver at least 90% on time



# Contact information



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