



DECISION MAKING SYSTEMS IN SMALL AND MEDIUM SIZE ENTERPRIZES USING BUSINESS INTELLIGENCE

STAVROS FASOULAS

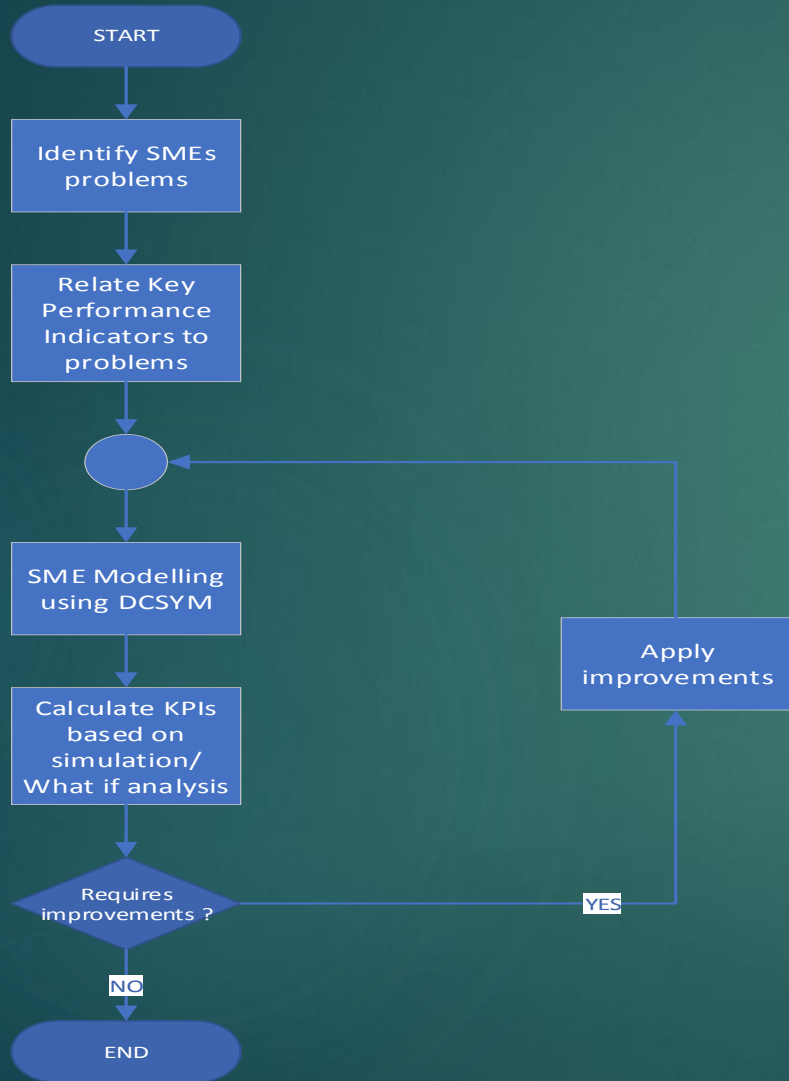
DIMITRA PATSI

JOHN ALEXIOU

Contents

- ▶ Introduction
- ▶ State of the art
 - ▶ Business Intelligence
 - ▶ Components of BI system
 - ▶ Business Intelligence and Key Performance Indicators
 - ▶ Dashboards
- ▶ DCSYM
- ▶ Key Performance Indicators related to SMEs problems
 - ▶ Net profit margin /Operating profit margin
 - ▶ EBITDA
 - ▶ Return on Equity (ROE)
 - ▶ Debt to Equity
 - ▶ Cash Conversion Cycle (CCC)
 - ▶ Human capital value added (HCVA)
 - ▶ Customer retention rate
 - ▶ Brand Equity
 - ▶ Return on Innovation Investment – ROI²
 - ▶ Six Sigma level
 - ▶ Project Schedule Variance - PSV
- ▶ Conclusions

Methodological approach



- ▶ Identify problems of contemporary SMEs in Greece
- ▶ Identify metrics (in the form of Key Performance Indicators – KPIs) that can be used to improve the performance of the company
- ▶ Introduce Systemic theory approach to create a conceptual model, using DCSYM system thinking
- ▶ Calculate KPIs to quantify the reference values for each one of the perspectives (financial, employee, customer, marketing/ sales and processes)
- ▶ Detect targeted changes to improve the system under consideration using what-if scenarios
- ▶ Depict improved system, recalculate KPIs to measure the effectiveness of the proposed changes and validate the results

Problems of SMEs - related Perspectives & KPIs

Problem	Related Perspective / KPI
Access to working capital, investments, financing costs.	<u>Financial perspective</u> Net profit margin, Operating profit margin, EBITDA, Return on equity (ROE), Debt-to-equity (D/E) ratio, Cash conversion cycle (CCC)
Over-taxation with direct and indirect taxes and employee insurance costs.	<u>Employee perspective</u> HCVA
The difficulty of expanding the customer base, especially in foreign markets (e.g. EU).	<u>Customer perspective</u> Customer retention rate, Customer turnover rate <u>Marketing & Sales perspective</u> Brand equity, Social networking footprint
High bureaucratic compliance costs and tax regulations that bring disproportionately high costs to smaller businesses.	Outside the scope of analysis (Subjective measurement, Depends on time, market, legislative and financial environment)
Unfair competition and malfunctioning of control mechanisms, especially in cases of tax evasion, undeclared work, illegal imports, etc.	Outside the scope of analysis (Subjective measurement, Depends on time, market, legislative and financial environment)
Lack of technological upgrade of products and services, R&D, innovation, productivity and competitiveness. Need for competitive business models with simple management structures & lower running costs	<u>Operation processes perspective</u> ROI ² , Six Sigma level, Project schedule variance (PSV), Time to market

State of the art

Business Intelligence

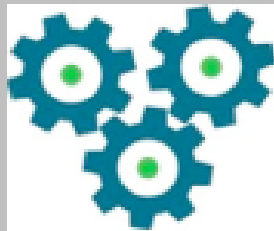
- The concept of Business Intelligence as first appeared and described by Howard Dresner in 1989 refers as: “concepts and methods to improve business decision making by using fact-based support systems.”
- The term is used in combination with the Competitive Intelligence, Strategic Intelligence and Knowledge Management.
- **Competitive intelligence** is focusing more on the company's industry and the competition of the company in the industry, whereas while Business Intelligence has more internal role focusing on the tools and systems that play vital role in the strategic planning process of a company.
- **Strategic Intelligence** incorporates the application of Knowledge Management (KM), Business Intelligence (BI) and Competitive Intelligence (CI). In order to operate successfully Strategic Intelligence, the organization must collect and consolidate information fast and feed the appropriate users constantly (24x7) to facilitate the strategic decision making.
- All these form a company's **Organizational Intelligence**. Organizational intelligence is a collection of value added benefits derived from the organization's intangible assets such human capital, structural, relationship and competitive capital [Jay Liebowitz - Strategic Intelligence_ Business Intelligence, Competitive Intelligence, and Knowledge Management- Auerbach Publications (2006)] .

Building Blocks of BI solution

Integrate &
Cleanse Data
from Multiple
Sources

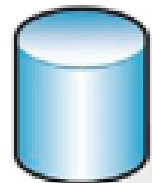
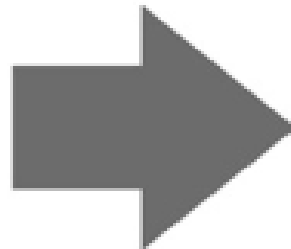
Store
Integrated
Data

Present &
Analyze
Information



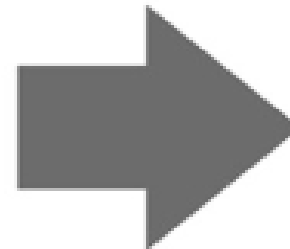
DATA

INTEGRATION



DATA

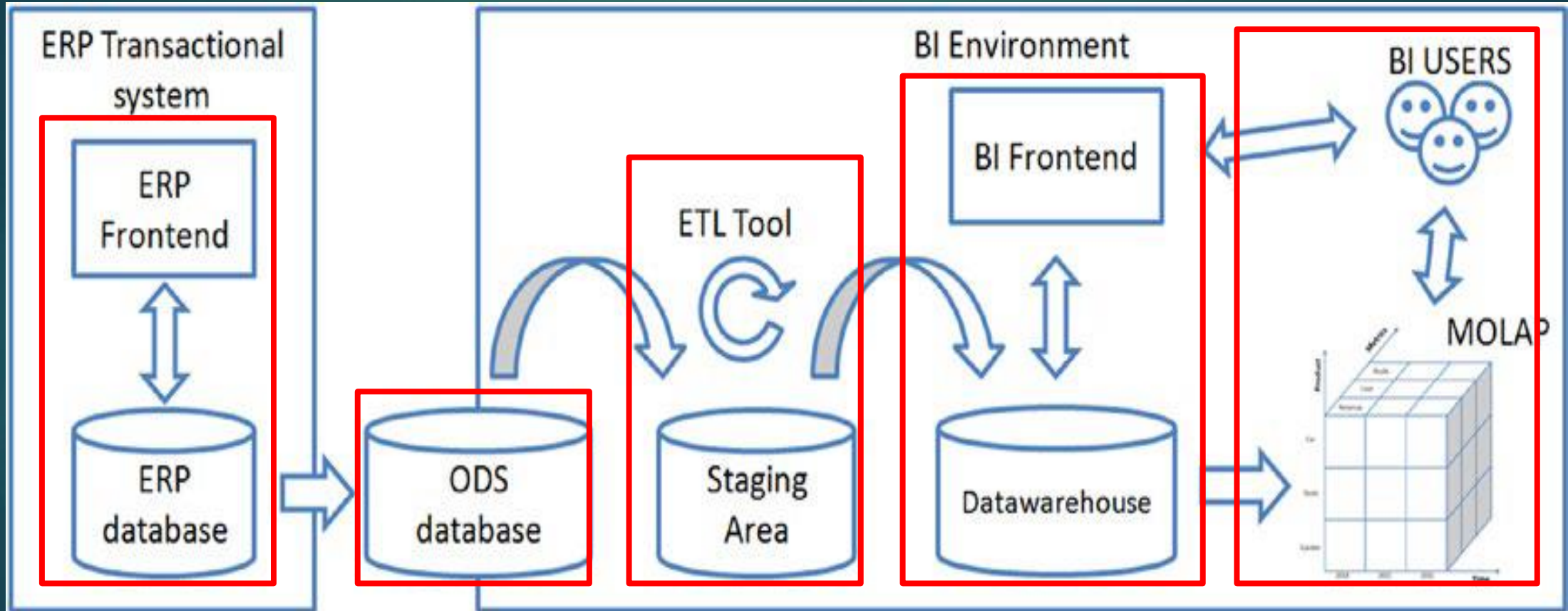
WAREHOUSING



BUSINESS

INTELLIGENCE

Components of BI solution



The typical source of information for a Business Intelligence solution is a transactional system such as an **Enterprise Resource Planning (ERP)** that is used to control company operations.

The communication interface connecting to **ERP database** is responsible for extracting and storing the data in the **Operational Data Storage – ODS**, inside the BI solution environment. There are different parameters that need to be considered for building an effective communication interface, namely the method of communication, structure of ODS, data availability, load periodicity, backup policy of collected data, etc. The analysis of these parameters is outside the scope of this study.

ODS acts as an intermediate repository before data stored in the Data Warehouse. The **ETL tool** which stands for Extraction, Transformation and Load, adapts the information structure into the one required by the Data warehouse, performs transformations and store information to the data warehouse. During the ETL process, temporary tables can be used to optimized the calculation and transformation process, this is called the **Staging Area** that can be located in a separate database or alternatively within the data Warehouse. The **Data Warehouse** is the basis of a BI system and stores all data from multiple sources, ensure its integrity, consistency and completeness.

Finally, **Multidimensional OnLine Analytical Processing (MOLAP)** uses multidimensional databases loaded from the data warehouse and give the capability of drawing various scenarios suitable for what-if analysis.

Dashboards

- ▶ Dashboards are a complete business information system based on Business Intelligence and data integration infrastructure
- ▶ Dashboards are essentially three applications in one with corresponding monitoring, analysis and management functions.
 - ▶ Monitor: transmits critical information using timely and relevant data, usually using widgets.
 - ▶ Analysis: allows users to analyze and investigate data in multiple dimensions and at different levels of detail
 - ▶ Management: promotes communication between executives, executives and staff and provides ongoing feedback on a range of critical activities, guiding executives make decisions
- ▶ Dashboards can be divided into three types: operational, tactical and strategic (ie monitoring, analysis and management).



Problems of SMEs and related KPIs



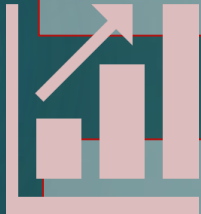
Access to working capital, investments, financing costs

- Net profit margin,
- Operating profit margin,
- EBITDA,
- Return on equity (ROE),
- Debt-to-equity (D/E) ratio,
- Cash conversion cycle (CCC)



Over-taxation with direct and indirect taxes and employee insurance costs

- HCVA



The difficulty of expanding the customer base, especially in foreign markets (e.g. EU)

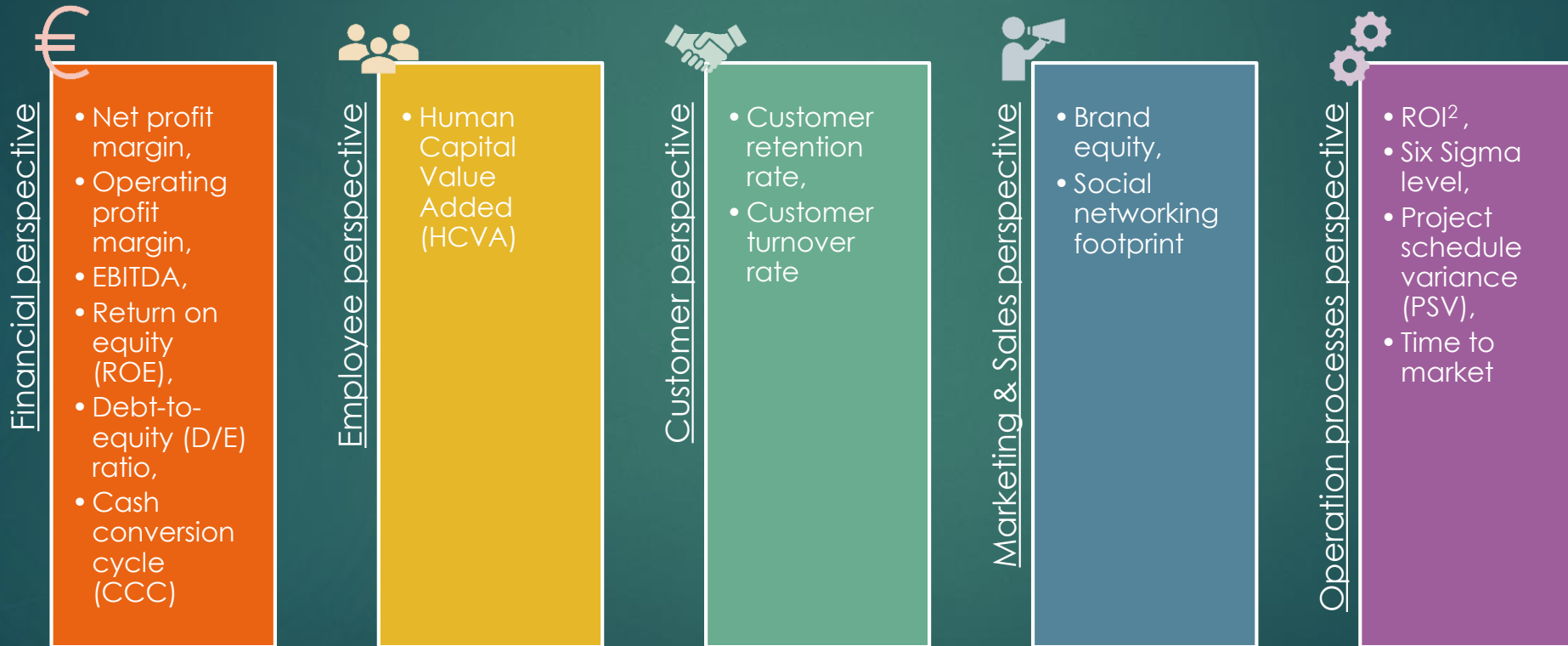
- Customer retention rate,
- Customer turnover rate
- Brand equity,
- Social networking footprint



Technological upgrade of products / services, R & D, Innovation, Productivity & competitiveness

- ROI2,
- Six Sigma level,
- Project schedule variance (PSV),
- Time to market

Perspectives – Key Performance Indicators



Financial Perspective - KPIs

Key Performance Indicator	Calculation
Net Profit Margin	$\text{Net Profit Margin} = \frac{\text{Net Profit}}{\text{Revenues}} \times 100$
Operating profit margin	$\text{Operating Profit Margin} = \frac{\text{Operating Profit}}{\text{Revenue}} \times 100$ <p>Where: Operating Profit = operating income from regular business operations (not revenue from taxes, interests, long term liabilities, etc)</p>
Earnings Before Interests Taxes Depreciation and Amortization (EBITDA)	$\text{EBITDA} = \text{Revenue} - \text{Expenses (excluding interest, tax, depreciation, amortization)}$
Return on Equity (ROE)	$\text{ROE} = \frac{\text{Net income (period } t)}{\text{Average shareholders equity (period } t)} \times 100$ <p>Where: Average shareholders' equity = Total assets – Total liabilities</p>
Debt to equity (D/E)	$\text{Debt – to – equity} = \frac{\text{Total liabilities}}{\text{Total equity}}$
Cash Conversion Cycle (CCC)	$\text{CCC} = \text{DIO} + \text{DSO} - \text{DPO}$ <p>Where: DIO: Days Inventory Outstanding, DSO: Days Sales Outstanding, DPO: Days Payable Outstanding</p>

Employee Perspective - KPIs

Key Performance Indicator	Calculation
Human capital value added (HCVA)	$HCVA = \frac{Revenue - (Total\ costs - Employment\ cost)}{FTE}$ <p>Where:</p> <ul style="list-style-type: none">• Total Costs = Revenue - Profit Before Taxes (operating profit)• Employment Costs = Pay + Benefits• FTE stands for average number of full-time employees (or full-time equivalent)
Human capital value added (HCVA)	<p>Simplified version:</p> $HCVA = \frac{Operating\ Profit + Pay + Benefits}{FTE}$

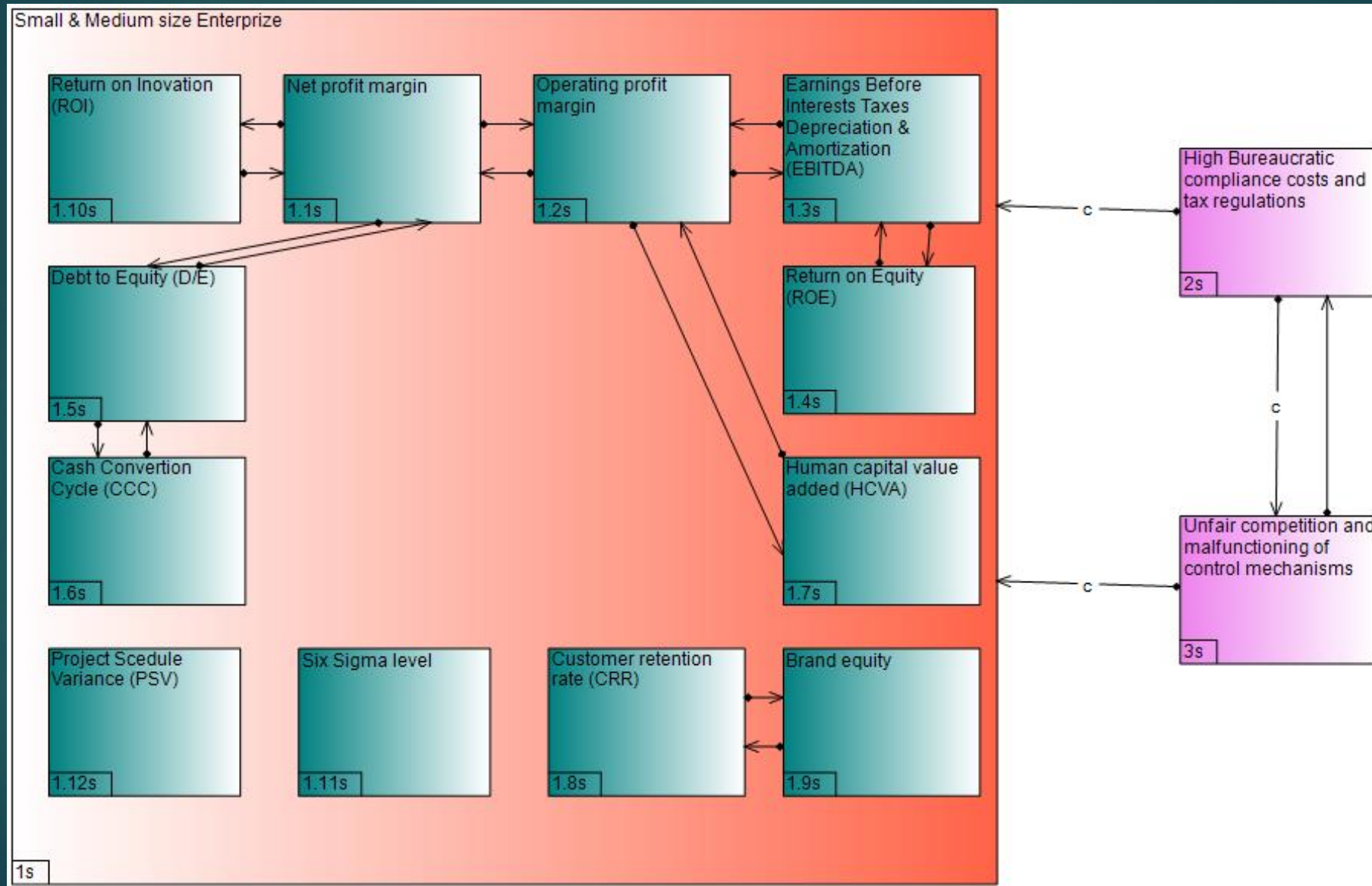
Customer, Marketing & Sales Perspective - KPIs

Key Performance Indicator	Calculation
Customer retention rate	$CRR = \frac{\text{No of Customers (beginning of period)}}{\text{No of those Customers remained (end of period)}}$
Customer turnover rate	$\text{Customer Turnover} = \frac{\text{No of Lost Customers (period } t)}{\text{No of Customer (end of period } t)}$
Brand equity	<p>Can be measured on a firm, product or consumer level – in approximate way.</p> <p>Firm level = Market capitalization – tangible assets – measurable intangible assets.</p> <p>Product level = Price (branded product) – Price (private-label product). The products should be the same/ equal</p> <p>Consumer level = awareness/ brand image (tangible/ intangible attribute attitudes, intentions)</p>
Social networking footprint	<p>There are different methods for measuring, one is Digital Footprint Index that measures:</p> <ol style="list-style-type: none"> the quantity of content & conversation regarding the brand (channels, blogs, forums) the width i.e. how much the consumers interact across all channels the depth i.e. the level of sentiment/ passion & tone of users' interaction

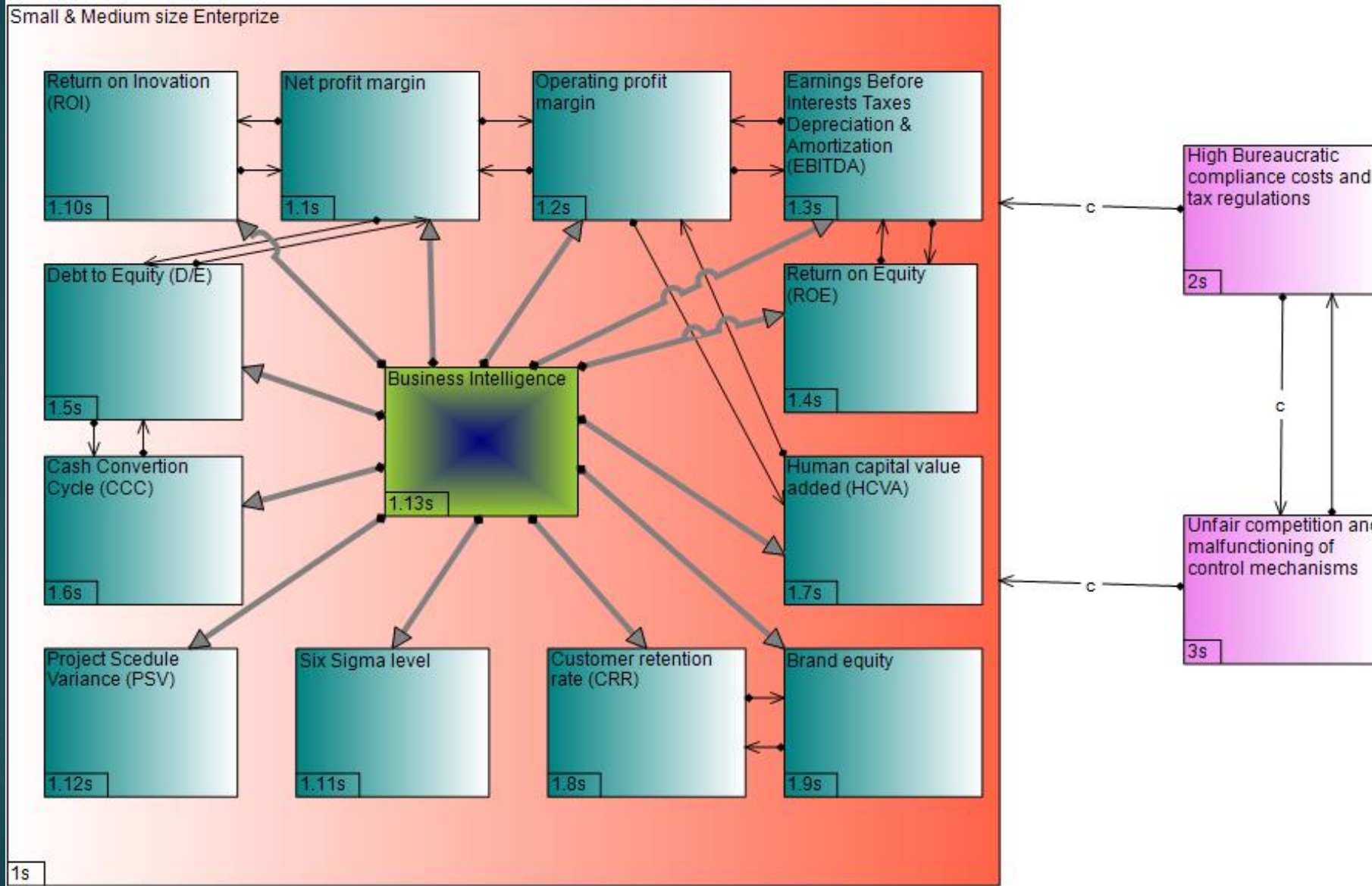
Operation processes perspective - KPIs

Key Performance Indicator	Calculation
Return on Innovation Investment – ROI ²	$ROI^2 = \frac{\text{Net profit} - \text{Innovation costs}}{\text{Innovation costs}}$ <p>Where: Net Profit: The Net profit from new products and services Innovation Costs: The Innovation costs for the new products and services</p>
Six Sigma level	$DPMO = \frac{\text{No of defects} \times 1.000.000}{\text{No of units} \times \text{No of opportunities}}$ <p>Where: DPMO: Defects per million opportunities No of units: Number of units produced No of opportunities: Number of ways to generate defects</p>
Project Schedule Variance (PSV)	$PSV = SCT - ACT$ <p>Where: SCT : Schedule Completion Time (in time intervals , e.g. days or weeks) ACT : Actual Completion Time(in time intervals , e.g. days or weeks)</p>
Time to market	The time it takes from the conceptualization of a product idea to the time it is ready to be distributed. No standard way, differences in defining the start and / or end of the period.

Current situation – A DCSYM approach



Improved situation with DCSYM



Conclusions

- ▶ Key Performance Indicators are vital instruments utilized by CEOs and managers as means to monitor the performance and decide the strategy and the objectives, that it aims to achieve on the path of the company.
- ▶ Business Intelligence as a technological approach combines data from different sources, cleansing, storing and staging it to a data warehouse. Where it is transformed into information for business people, ready to use it to gain knowledge and make strategic decisions.
- ▶ The introduction of Systemic theory, using DCSYM, help us to create a conceptual model of the “ whole” Business Intelligence solution that describes the integral entity of metrics, how KPIs interact with each other and how they can be effectively incorporated into everyday business operations.
- ▶ The use of BI can facilitate the analyst to make interventions in the business strategy and investigate how KPIs results vary in what-if scenarios.