04.Executive Information System

At executive level you NEED the data to find answers to your managerial question and to planning the next steps.

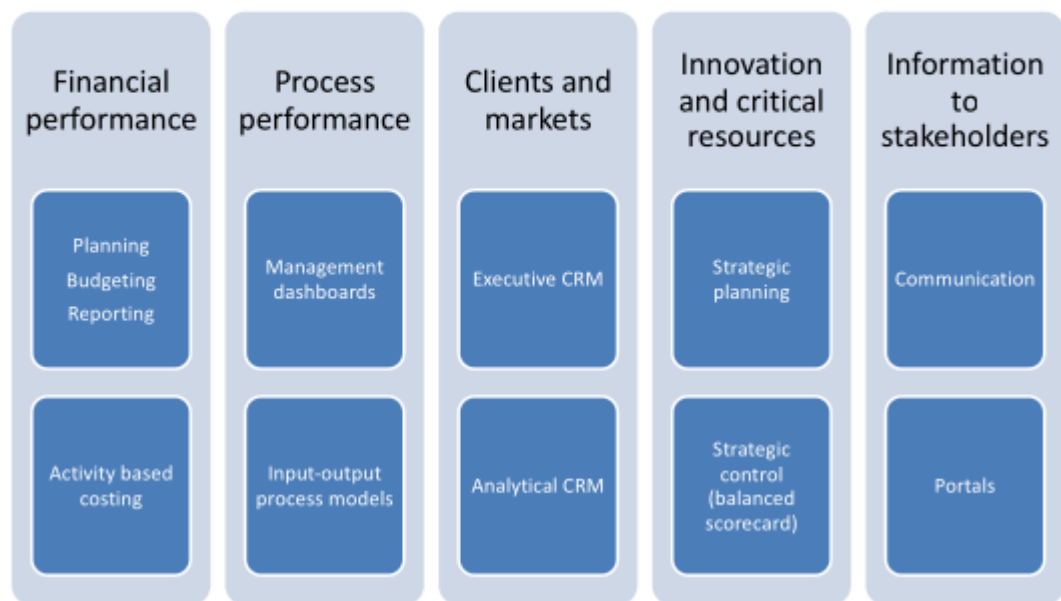At strategic level managers decide what they want to do, which client listen to. There is a production clumps. They are always based on sales/demands predictions/projections(Variables are aggregate margins/markets). They make high level plans based on aggregation information. Management control has to manage the resources to enable the plans of the strategic level. Their main resources is budget, they manage financial information and costs(It is all about budget managing).

At Operational control level manager plans what the production is going to do(What to produce for what market).
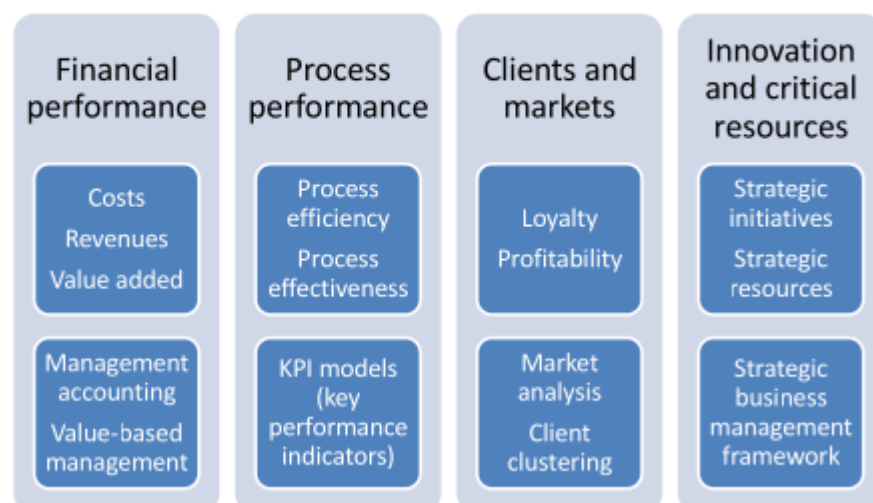
They operate on various dashboards as they are implemented for different business/market. Information is created at operational level in a structured electronic format natively to help analysis in a dashboard. If it is not in a structured electronic nature there is a need to transform it to not loose it. You need people that create the data entry/information in electronic format. This is feasible BUT it is not economically acceptable. Also data entry is error prone. Decision has to be made on facts and information and not following feelings and guts(You should look at the data but not get overloaded from the data).

Functional map of executive information systems

Financial performance	Process performance	Clients and markets	Innovation and critical resources	Information to stakeholders
Planning Budgeting Reporting	Management dashboards	Executive CRM	Strategic planning	Communication
Activity based costing	Input-output process models	Analytical CRM	Strategic control (balanced scorecard)	Portals

Company always have new products and new markets. You need to do the difficult job of predicting if a project is successful (You will do a market test). There is times where companies are "milking their cows" and only invest in their successful product and not innovate. A way to do innovation is through money(Finance startups and then buy out the successful ones). You have to aggregate information to support a multi-dimension analysis.

Control models and variables

Financial performance	Process performance	Clients and markets	Innovation and critical resources
Costs Revenues Value added	Process efficiency Process effectiveness	Loyalty Profitability	Strategic initiatives Strategic resources
Management accounting Value-based management	KPI models (key performance indicators)	Market analysis Client clustering	Strategic business management framework

Different types of information. For each instances there are different types of information. You have to pay attention to critical success factor to individuate the critical information in your dataset.

Innovation and critical resources

Strategic planning	• Definiton of strategic position tables (e.g. feature-benefit table of new products) • Definition of model for value-based management • Simulation tools for strategic scenarios • Definition of budget, schedule and deliverables of strategic initiatives • Definition of links with other systems (e.g. Balanced Score Card, Planning, Budgeting, Reporting)
Strategic control (balanced scorecard)	• Monitoring of actions and strategic indicators (balanced scorecard) • Monitoring of relationships among different indicators in the balanced scorecard (simulation) • Report analysis • Report summary and sharing • Continuous negotiation of management objectives • Incentive distribution (consistent with strategic objectives)

Financial performance

Planning, budgeting and reporting	• Definition of control system: organizational structure of cost/profit centers, report definition and scheduling • Top-down budget allocation to organizational units • Definition of criteria for bottom-up aggregation of costs • Continuous budget adjustment • Budget simulation in different scenarios • Reporting for strategic management • Report sharing
Activity-based costing (ABC)	• Cost allocation to activities • Definition of standard costs • Reporting and data analysis • Reporting

Process performance

| Management dashboards (e.g. CIO dashboard, COO dashboard)	• Selection and definition of KPI (*Key Performance Indicators*) • Definition of objectives and service levels • Data normalization and reporting • Data analysis and continous process improvement • Data are different depending on organizational function and related operating activities.
Input-output process models	• Process modeling and simulation. Examples: load balancing models in data centers, production models embedded in CIM systems for machine usage optimization, ...

Clients and markets

Executive CRM	• Selection and definition of customer KPI (*Key Performance Indicators*) • Definition of objectives and service levels towards customers • Data normalization and reporting • Data analysis and continous service improvement
Analytical CRM	• Customer profiling • Data mining • Identification of new KPIs • Visualization tools (recent)

Information to stakeholders

Communication	• Communication to customers • Communication to shareholders • Communication to suppliers • Communication to authorities (e.g. stock exchange) • Communication to press • Communication to employees • Management of events
Portals	• Web site design • Web site continuous update • Web/social media reputation management through portal

Design a Dashboard

Technology architecture of executive information systems
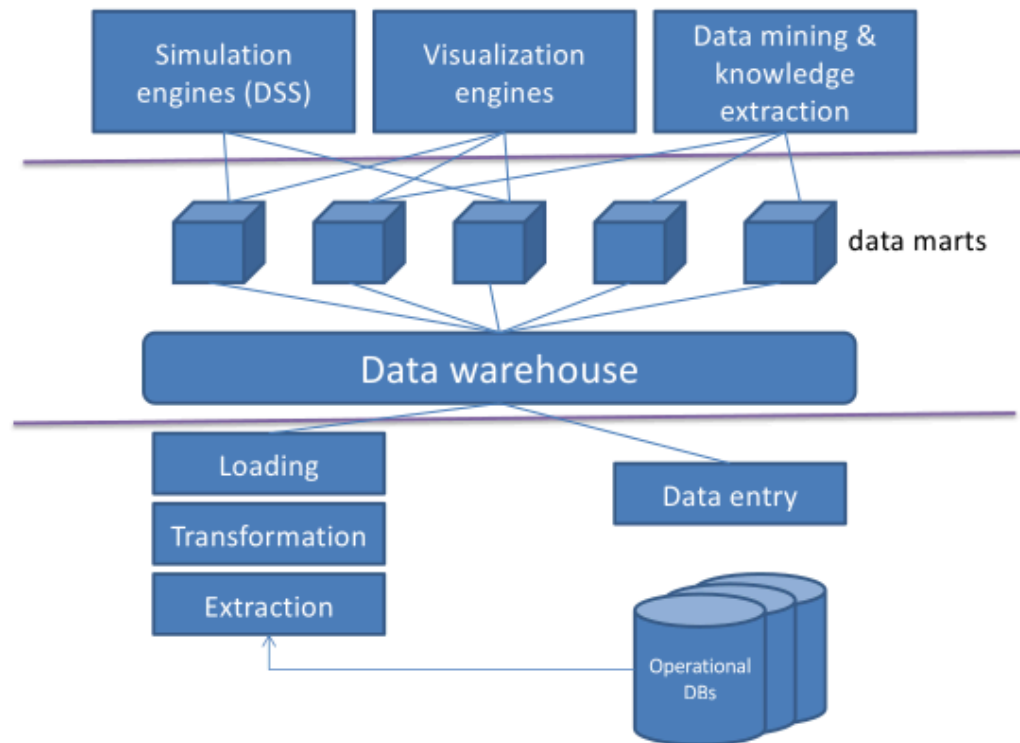
A dashboard will always evolve to stay on par with the new technologies.

You usually have to use and adapt to something someone else has done. Simplicity is the keyword, manager make decisions on the outcome of the dashboard so complex analytics have to be made simple. The query don't have to be made directly to the operational database because they are time expensive and occupy all the database capacity. The transaction is immediate and requires query and database processes so it is needed to separate them. We use the night to do query as the transaction are done usually/in the most part during date time. This type of query are called ETL(Extraction Translate Loading, query are done on yesterday data).

Key Performance Indicators(KPI), i.e. aggregate information providing a summary evaluation of a set of production activities or performance parameters. Indicators have a value defined by different dimensions, including:

- Time (extension and granularity)
- Organizational unit
- Customer
- Product
- Process and activity
- Other dimensions such as channel, geographical area, project…

  KPI are used to measure the performance of a product. They comprehend indicators of performance, they are measurable, they have a units, names, labels, tags. The tags are needed to give a meaning to the indicator. You store the higher level of details/lower level of abstraction of the indicator in the data warehouse. There can be multiple tables in a data warehouse. The points is denormalize to avoid joins so you speedup the execution time.

Managers want to scan all the database and have an answer in millisecond time. This is not feasible if you don't put a lot of limitations.

Design steps of executive information systems

- Business requirements (key performance indicators)
- Information sources
- Information transformation
- Information storage
    - Table of facts
    - Table of keys
    - Data warehouse design
- Processing level
  - Presentation and reporting
  - Decision support engines
  - Visualization engines
  - Knowledge extraction engines

  Now we need to design a dashboard. Having quasi real time queries. You need to understand information sources, you have to build your tables. A table of keys help to maintain a hierarchy and to build queries automatically. Need one table of keys per dimension. Need to find an aggregate index that tells me how the product is doing in the market. You want to make simulation modifying the weights in the constrains. These way of operating can lead to sub-optimal decision.

  A data mart is a materialization of a smaller database used for a specific needs or they are not materialized but handles a small number of users.
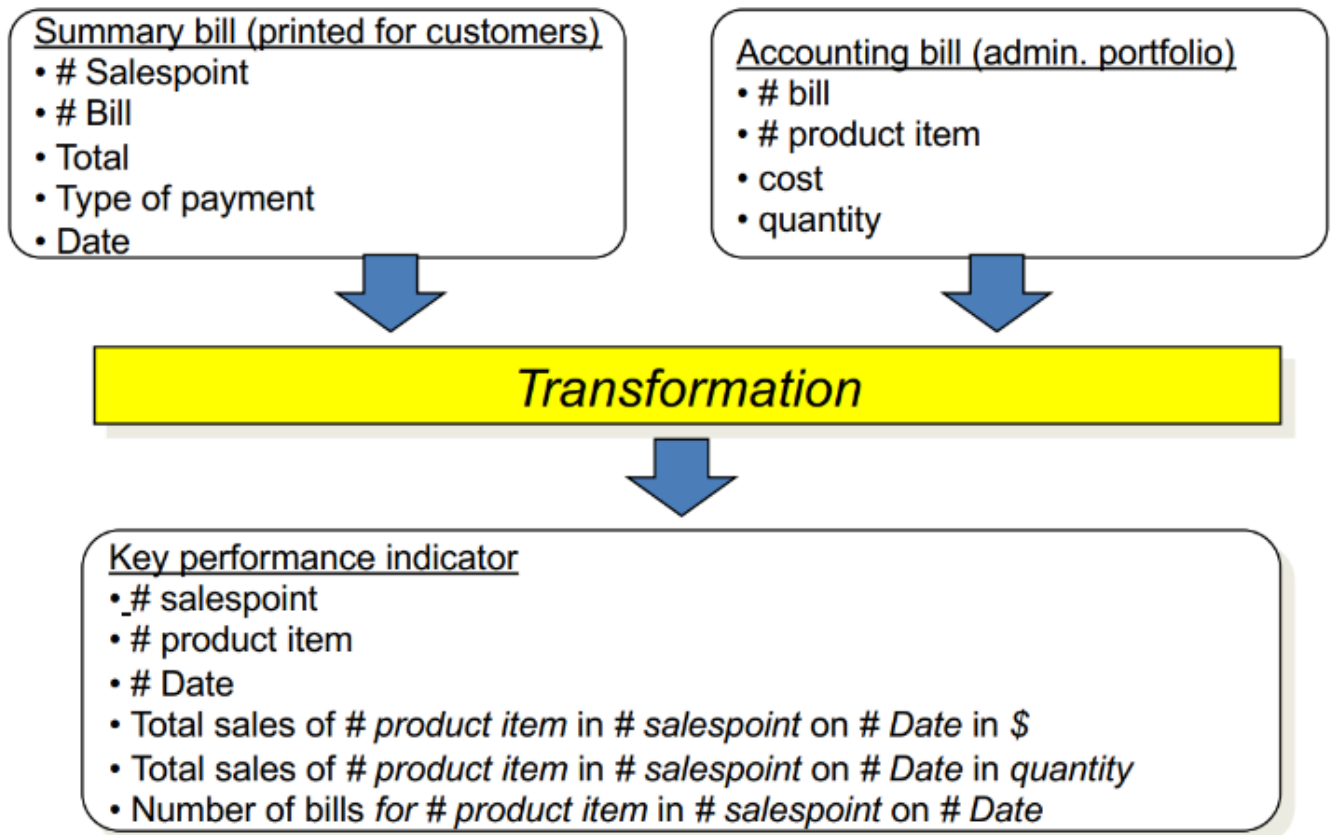
Information transformation

1. Selection of source data
2. Data quality control and data cleaning
3. Data integration
4. Data aggregation

   There have to be reverse engineering on the data to understand the meaning behind them. Tries to not change the data in the table too much in time otherwise you can't know the theoretical value of the elements inside the tables. Reverse engineering is difficult so sometimes is more useful doing only some statistical computation that gives an estimation of the phenomena(you still want information that are dependable).

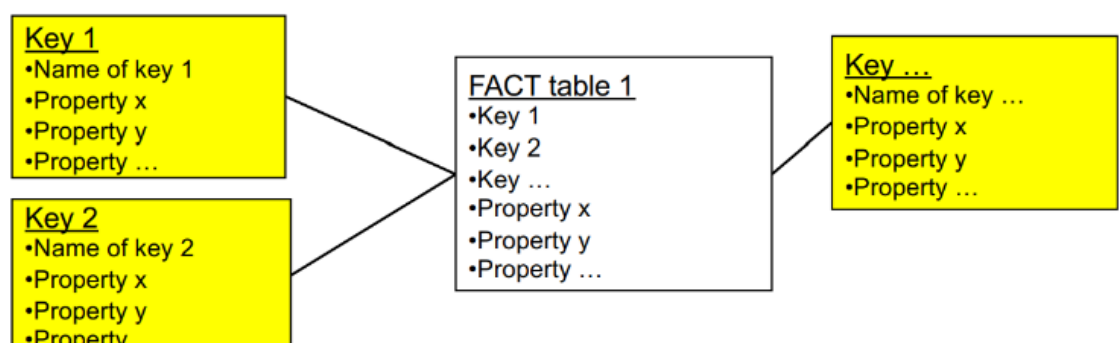   One way to make something efficient and not error prone is Standardising everything, less customisation.

Example

Summary bill (printed for customers)
• # Salespoint
• # Bill
• Total
• Type of payment
• Date

Accounting bill (admin. portfolio)
• # bill
• # product item
• cost
• quantity

Transformation

Key performance indicator
• # salespoint
• # product item
• # Date
• Total sales of # *product item* in # *salespoint* on # *Date* in $
• Total sales of # *product item* in # *salespoint* on # *Date* in *quantity*
• Number of bills *for # product item* in # *salespoint* on # *Date*

Information storage

1. Load is periodical, e.g. daily in our running example
2. Data are loaded in a datawarehouse and subsequently copied in a smaller database called data mart to improve time performance
3. Datawarehouses and data marts may have different schemas and involve an additional transformation step

Facts (KPIs) and keys (dimensions)

Key 1
•Name of key 1
•Property x
•Property y
•Property …

Key 2
•Name of key 2
•Property x
•Property y
•Property …

FACT table 1
•Key 1
•Key 2
•Key …
•Property x
•Property y
•Property …

Key …
•Name of key …
•Property x
•Property y
•Property …

1. Fact tables store the value of indicators
2. Keys represent the dimensions that can describe facts
3. The properties of keys are described in key tables

To give a data warehouse all the table it has to compute on you have to denormalize to obtain a single table even if it is not efficient by a data-design view but it keeps query simple.

CSF method

How we get an understanding in the BI of a company.

- CSF stands for Critical Success Factor.
- A critical success factor is a business decision variable critical for the success of the whole company, i.e. a must for success(necessary condition)
- The CSF method is a requirements analysis and specification method for executive information system
  Understand what KPI put in the data warehouse. Need to keep under control what cannot fail/it's a big trouble if it fails.
  The CSFs depend on the industry, they are abstract concept but are the factor that make a company competitive. They correspond to multiple KPIs(Similar to performance that is composed by multiple KPIs). Another example is discount as they have to be balanced to have the most revenue. If you have prior experience on a product as you worked for a competitor you can have advantage as you already have a idea/plan/modus operandi and this is why you sign a NDA/you cannot talk about competitor but you can talk about other roles in the industry similar to yours.

CSF method – steps

1. Predefinition: desk analysis, analyse the company your are going to talk to at an high level and extract the key information(what they are thinking, what they are worried about...) so you ask better questions
2. Interview: with top managers, aimed at identifying CSFs. Usually the talk is about high level managerial concern(what is important know). A good question is Can I have a sample of data with the avaialble documentation.
3. Robustness analysis: aimed at selecting KPIs. Understand the data to do a better job. This operation is to calculate the cost of KPIs and understand what are the beneficial ones(if not in the database they are really costly).
4. Refinement and documentation: presentation to customer, possibile modifications, specification (written, but informal). The customer will say his opinion on the robustness analysis and so the result of the combination of Customer input and Robustness analysis is the input that the IT will receive.