

A QuickStart in management software skills

Second edition



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1. Introduction

Information consists of diverse representations of reality. These representations may be data, models, perspective or views, perceptions, and methods and techniques for problems solving. In organizational contexts, we encounter these diverse information types, and they all require different ways of management and software tools to help on this. This Quickstart is written for understanding the link between different concepts of information -as explained in Wijnhoven (2009) (Wijnhoven 2009)- and practical information management tools so that you learn to manage, study and use different sorts of business information with modern software tools. We use the following assumptions for compiling this Quickstart:

1. There is only one way to understand software tools from a user's perspective: making assignments.
2. This Quickstart is written in collaboration of many students, because they know better than a 20 years experienced professional what the experiences and frame of reference of their colleagues are.
3. We assume that information is a meaningful representation of reality, which can have many shapes, as debated in the philosophy of knowing (see Wijnhoven, 2009).

The design of the QuickStart is based on the structure of Wijnhoven, 2009 (see table 1.1).

Chapter Wijnhoven 2009	Assignment	QuickStart
2. The Lockean inquiring system and databases	A1	Chapter 2
3. The Leibnizian inquiring system and decision models	A2	Chapter 3
4. The Kantian inquiring system and multiple perspectives	A3	Chapter 4
5. The Hegelian inquiring system and information politics	A4	Chapter 5
6. The organizational context of information	A5	Chapter 6
Table 1.1: Information concepts, assignments and QuickStart		

As a generic approach to information management, we follow a method of informing which starts with perceived problems and questions and end with answers, solutions and capabilities. This is a pragmatic approach to information. The problem solving and design logic that we propose resembles design sci-

ence (also see Wijnhoven 2009 chapter 7, and (Hevner et al. 2004; Peffers et al. 2007). Between these two ends, there is (1) scoping of the area of interest, (2) analysis and modeling of the problem situation, (3) design of a solution, and (4) the realization of an informing solution using software and human skills (see Figure 1.1).

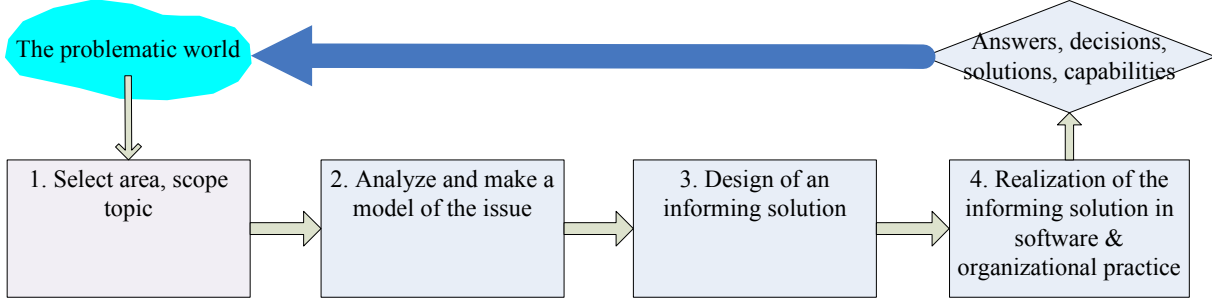


Figure 1.1: A generic model of informing and information management

This Quickstart uses the fictitious case of a Grand Café as a running case. Grand Café The Palace is a restaurant and café established in London. They can host a maximum of 175 people. To serve its guests, Grand Café has hired staff. The staff is located in 4 departments (see table 1.2):

Department	Employees and jobs
Kitchen	<ul style="list-style-type: none"> o 5 cooks (full-time) o 8 assistant cooks (part-time). o 4 students (part-time). Washing the dishes.
Service	<ul style="list-style-type: none"> o 6 waiters (full-time) o 12 waiters (part-time) o 4 waiters on call. For events or very busy days.
Cleaning	<ul style="list-style-type: none"> o 4 cleaners clean the building on each morning before the Café opens
Management	<ul style="list-style-type: none"> o 1 manager (full-time) o 2 assistant managers (full-time). They do the planning, purchasing, personnel administration and handle legal issues. o 1 assistant manager (part-time). For the administration, including the financial administration.

Table 1.2: Departments and jobs in a Grand Cafe

The kitchen closes every day at 9:30 p.m. This does not mean that the staff is free, because they still have to clean-up and help guests. The kitchen-staff is free when the kitchen is clean. The waiters are

free on Tuesday, Wednesday and Sunday at 11:00 p.m. in the evening. On Thursdays and Fridays they finish at 2 a.m. (see table 1.3).

Day	Open	Closed
Monday	10 a.m.	10 p.m
Tuesday	10 a.m.	10 p.m
Wednesday	10 a.m.	10 p.m.
Thursday	10 a.m.	0 a.m.
Friday	10 a.m.	1 a.m.
Saturday	10 a.m.	1 a.m.
Sunday	11 a.m.	10 p.m

Table 1.3: Opening times

With this short piece of information, we will invite you to all kinds of assignments for understanding the diversity of information and ways of managing information. See Table 1.4 for some key questions related to each inquiring systems.

Wijnhoven 2009	Key questions
A1. The Lockean inquiring system and databases	What data do managers/people need? What are the relations between these data? What reports are most useful for whom? How can we use software to maintain data (consistency) and reporting easier?
A2. The Leibnizian inquiring system and decision models	What are the causal relations between parameters? What parameters are important to predict and forecast reality (e.g. number of expected clients; availability of waiters; specialisms, qualifications and experiences of cooks and waiters?). How to solve long waiting times?
A3. The Kantian inquiring system and multiple perspectives	Who are involved in what processes? What is the input and output of what processes? How are tasks divided in the department? Is it possible to make processes more efficient and lean?

A4. The Hegelian inquiring system and information politics	What are correct performance measure and indicators? How should one correctly interpret indicators (e.g. a waiting time score)? Is it correct what is said by the media and the market about us or others?
A5. The organizational context of information	What departments and persons need what information system? What are the relation among the systems? What is a useful information plan and strategy for the company?

Table 1.4: Information concepts, assignments and QuickStart

The text should be evaluated on its *practicality* in developing entrance level psychomotoric skills for undergraduate management students. We have not aimed at a fully scientific foundation for what we presented and for that we refer to several sources in the text and the end of this book. We also have not aimed at a fully well drafted texts; several sentences may need improvements and the layout is not fully perfect. To do so, we need more efforts and the professional support of a publishers, but because all of these imperfections we are able to offer this book for free to you. From this practicality perspective the readers and especially the *users* of this text are much invited to send suggestion for improvement to fons.wijnhoven@utwente.nl.

2. Empiricism, datamanagement and databases

2.1 Locke and databases

Empiricism (based on the philosophy of Locke) is a theory of knowledge emphasizing the role of experience, especially sensory perception, in the formation of ideas, while discounting the notion of innate ideas. The Lockean inquiring system is based on John Locke (1632-1704) (Uzgalis 2010), who postulated in his first book on “An Essay Concerning Human Understanding” that there are no innate ideas that form our understanding of the world. In book II, he states that the mind is a "blank slate" or "tabula rasa"; that is, contrary to Cartesian or Christian philosophy, Locke maintained that people are born without innate ideas. In book III, he states that language is a key element in forming and codifying understandings, and that we need to share common meanings to make knowledge sharing feasible. Locke recognizes that ordinary people are the chief makers of language and that scientists have the task of checking if the connections made between properties in reality in this language are actually true or not. In book IV Locke states that man should try to use reason, i.e. a combination of observation, experience and rationality in finding truth. But, people have limitations in reasoning, because many issues are too complex (for the time being), and in such cases it is reasonable to *believe*. So revelation comes in where reason cannot reach (Uzgalis, 2008: 25) (Uzgalis 2010). Following Gregor’s (Gregor 2006) classification of theories, the Lockean inquiring system produces *descriptive* accounts of regularities and the *predictions* people (i.e. a community of experts) share. According to this inquiry system, knowledge is an intersubjective true representation of the world and believed to be “objectively” true by consensus in the community of its owners. Information failure in this context results in a lack of *correspondence with reality*.

Empiricism (Locke’s approach) emphasizes true facts about reality as the key to understanding the world. Our senses are a data collection mechanism, and the data we collect should be more or less directly understandable and be shared with other people to develop a collective understanding. Data collection and knowledge creation, though, require substantial work of the mind. The mind for instance will have to develop interests in specific areas (trying to collect all data about everything is obviously impossible) related to specific challenges and goals (Berger and Luckmann 1967). These interests and goals thus delimit the boundaries of the universe of discourse, which in turn specifies the data needed and the mechanisms by which these data can be efficiently and effectively acquired (Halpin and Nijssen 1995). These data need interpretation and analysis to create relevant information for decision making and problem solving, but an important bias is already created by the sensory mechanism itself (Berger and Luckmann 1967). A universe of discourse description contains meaningful coding and words (so called semantics) for representing relevant phenomena (see further e.g., (Halpin and Nijssen 1995)). The Lockean inquiring system thus focuses on the representational veracity, completeness and meaningfulness of primary data, i.e. data that are direct representations of reality.

According to the Lockean inquiring system at least four steps are required to make data meaningful (see Figure 2.1):

1. Scoping and identifying the objects in the world about which data have to be registered.
2. Data definitions as the descriptions of labels of objects and for standardization of the meaning of data in a database.
3. Data models for an efficient way to deal with data, preserve consistency between data and maintain the data;
4. Reporting mechanisms that allow to (quickly) produce relevant reports from (large amounts of) data.

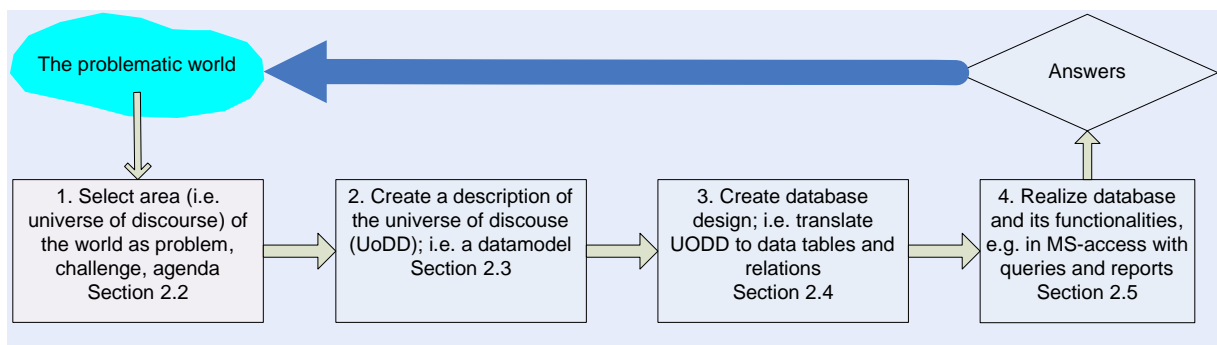


Figure 2.1: An empirical model of data management using databases

These points mean in practice that a database is needed. A database is an explicitly logically structured collection of data. When using MS Access, you can relatively easily make a database. However, first it is important to design the database in a number of steps. Note that following the four steps mentioned above the relation between people's observations and sensations and the actual creation of data which may be managed by a database is intermediated by sensory mechanisms and their labels. This is also explained by the following chart from http://heasarc.nasa.gov/docs/swift/about_swift/mission_flow/, which explains how initial observations are collected and transformed to data that astronomers can analyze and interpret as, e.g. gamma ray bursts at a specific location, with a certain strength, length and duration (see Figure 2.2). In this chart, SWIFT is the telescope, thus the sensory mechanism, which sends out *unlabeled sensations* via satellites to ground stations, where the *signals* are next *labeled* as gamma ray bursts (or something else) and connected with time, location, duration and other attributes to make an analysis of what actually happened. These analyses also can be used by scientists to create knowledge on:

- Determine the origin of gamma-ray bursts.
- Classify gamma-ray bursts and search for new types.

- Determine how the burst evolves and interacts with the surroundings.
- Use gamma-ray bursts to study the early universe.
- Perform the first sensitive hard X-ray survey of the sky

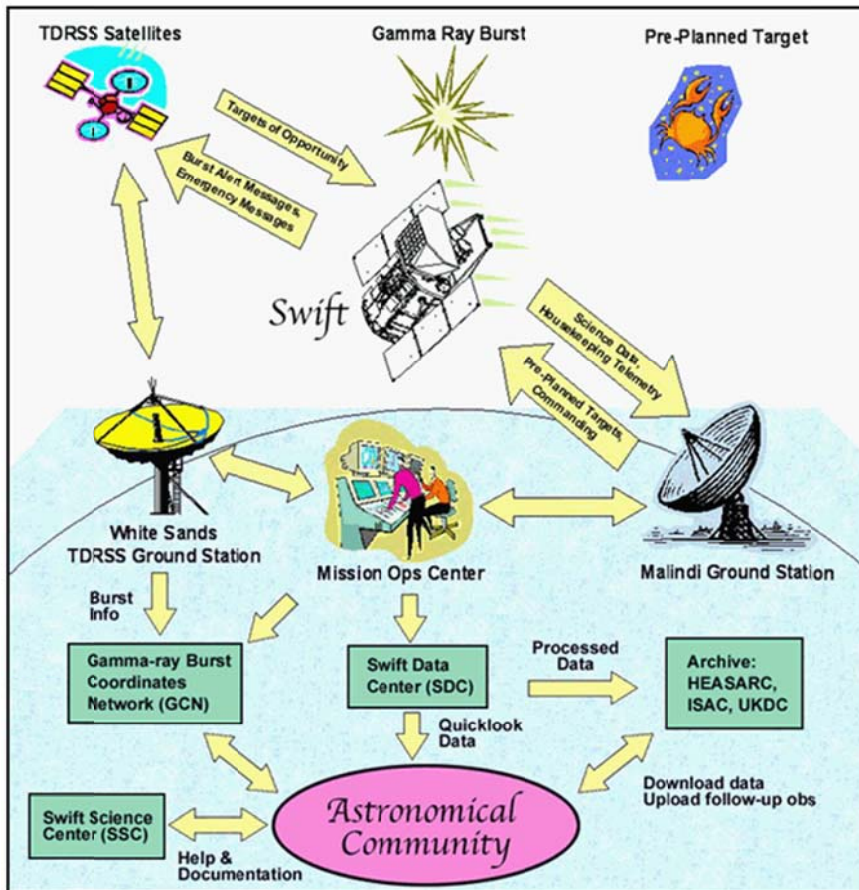


Figure 2.2: From event, signal to information: the example of gamma ray bursts (source: NASA 2010).

A similar *mediated* situation between organizational events and understanding of them exists. For example, a purchase has many necessarily related entities to understanding it, like a moment of time, a type of product or service that is bought, a prices, a volume, a place, a sales person, a buyer, and a payment. All these entities need attributes to register them. A sales person can be registered via his or her name and employee number. A price must be expressed in a number of money of some type. A buyer can be registered by an account number, name, and address.

2.2 Goal of this chapter

Taking the empirical view on information (read the book carefully), we conclude that we need databases. This chapter will explain how to make a database and how to generate a report using a database. To realize this we discuss the following:

- The Universe of discourse (UoD) as a coherent set of entities (see section 2.3).
- The Universe of discourse description (UoDD) as a set of entities with attributes (see section 2.4).
- The Database design using MS Visio (see section 2.5).
- Implementing the Database design in MS Access (see section 2.6)
- Making of a report (see section 2.7)

Note that if the UoD or UoDD are incomplete, it will be impossible to make complete reports. However, if the UoDD includes too much, it will become very expensive and complicated to maintain its quality and consistency, and none becomes happy with too much irrelevant data.

The universe of discourse is that part of the world that is central to the problem for which the database is needed. The problem is for example that a Project Manager has no overview of his current staff. Then the universe of discourse consists of information objects like an employee, hour rates, and departments. By this you describe the *information need* of the manager. The universe of discourse determines the scope of the problem and consists of a number of objects (and excludes a lot more objects of the world). These objects are the *core* things over which data is collected. These objects are logically linked to each other.

The information objects are....

1. **Entities**, i.e. phenomena of reality, like persons, cars, and countries. The whole set of relevant entities and their *logical* relations is what we call the Universe of Discourse.
2. **Attributes** are characteristics of these entities, like age, size and geographic location.
3. **Entities and attributes have logical relations**. For example China **has** a population of 1.3 billion people; Netherlands **has** a population of 16 million people.
4. **Entities can have relations as well**. For example China and the Netherlands **collaborate on** the exchange of students.
5. **Attributes can have relations**. Having a higher income may **correlate** with a better health condition or *if* your income is below X, you may apply for a study allowance larger *than* Y.

The set of entities, attributes and logical relations is what we call the Universe of Discourse Description (UoDD).

2.3 Making a UoD using MS Visio

MS-Visio offers some very useful tools for expressing a UoD. You only describe the entities and the relations between them here. So, attributes are not mentioned in an UoD.

- Open MS Visio
- Visio has a lot of *templates*, which are sets of related shapes for making any kind of model. For example, there are templates for floor maps (with shapes like doors, desks, and chairs) for organization charts, and for business process maps. The template we use for this UoD is the ORM-diagram. You can find it at 'Software and Database'. ORM means object-role modeling. *[ORM is a semantic modeling approach that describes the world in terms of objects and the roles that they play]*
- You get a worksheet/drawing page with on the left side a bar with diverse *shapes* (including entity, value, binary and connectors). *Entities* are the oval circles with the unopened line. When you want an *entity-shape* on your worksheet, you have to drag an *entity-shape* from the left bar to the right side of the screen (your worksheet). While the *shape* is still selected, you can change the name of it (e.g. employee). All entities have a single name (e.g. employee instead of employees). A guideline for the number of entities is a minimum of 3 and a maximum of 6. More than 6 entities will be problematic with the implementation of the database later, so scope is a vital issue in database and information systems design!
- When all entities are on the drawing page, it is time to connect them. You have to know which entities are *logically and meaningfully related*. Connect the entities with a 'connector' (in this case a line without an arrow at the end). Put the end of the connector (■) at the connection point from the entity (×). If the end turns red, the connection is successful. The entity now can move, without breaking the connection. Now connect the other end from the connector with another entity. After all entities are logically connected, the first step of database design is completed. An example of the UoD of the case Grand Café The Palace is given here.

See an example of a UoD in Figure 2.3.

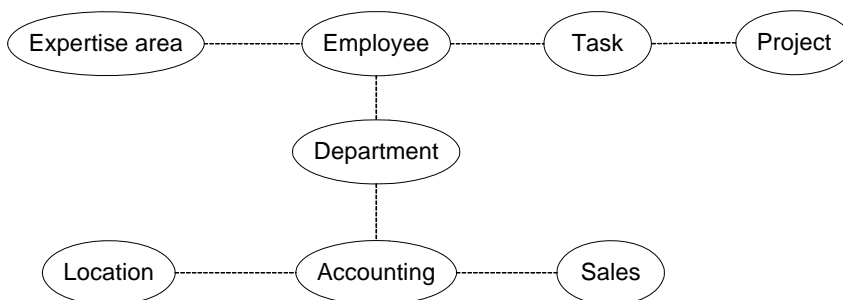


Figure 2.3 Example of a UoD.

The information need is the Personnel Manager's need for information about staff. The Personnel Manager may ask what employees do we have? What is their expertise? To which department do they belong? What tasks do the employees perform? For which projects are the tasks done at what particular moment? For example: if Grand Café The Palace has clients to celebrate a wedding, they have to arrange a wedding cake and a chic décor. Which of these tasks are performed by whom?

2.4 Universe of Discourse Description (UoDD)

A universe of discourse description (UoDD) is a specification (i.e., a precise disambiguous description) of the UoD. In a UoDD, attributes (also called values) are connected with the entities, which describe the type of information that will be registered in the database. The UoDD further specifies relations between entities and attributes to be able to quickly retrieve information, generate reports and maintain consistency among the different data stored.

The entities are already created in the UoD. These entities have attributes or values. Attributes describe the characteristics of an entity. For example, a student has a unique student number, a name, a telephone number, e-mail address, etc. All these are characteristics of values which fit with you as a student. Your unique student number is called an *identifier (primary key)* in database language. When one types this number in the database, only your record will be retrieved, because you are the only student with that number.

When we search using your name, there is a possibility we will also find other people with the same name. It is very important that every entity has a *unique* identifier. In business, for example, client numbers, order numbers, supplier number, and part number have to be unique. (Just imagine what would happen if it would not be so).

Furthermore relations exist between an entity and corresponding attributes and among entities. Using ORM, we can create these relations as follows:

- Open the UoD diagram (mentioned above) in Visio.
- Click in the Visio menu bar on 'insert' and 'new page'. Name this page (e.g. UoDD/ERD). Now you have a new drawing page, but you still work in the same map.
- Copy the entities from the UoD on this worksheet. First you have to connect the entities in the same way as you did in the UoD. But, the connectors now will have another shape, because you also have to describe the *logical relation*. These relations are called *cardinalities*. *The cardinalities between the entities can be 1:1, 1:N, or M:N.*

With Visio's *ORM Template*, there is a specific way to display the relations between entities. A brief explanation by type:

- *1:1 relation* between entities. For instance a *passport* must uniquely identify an individual *person*. Mobile phone companies mostly allow only one *person* to be the licensed user of a *phone number*.

Although a person can have multiple phone numbers, many administrations allow only registering one mobile phone number for a person. In that way, this administration has a 1:1 relation between persons and mobile phone numbers.

- *1:N relation*: you pronounce it as a one-to-many relation. A department can contain more employees, while employees can be member of only one department. In Visio, you can make this 1:N relation as follows: the entities employee and department are already made (copied from the UoD). Between these two entities you put a 'role'. This is similar to columns of a table. We only use binary roles in our simple example, so tables with two columns (see Wijnhoven, 2009, figure 2.5). Connect the one side of this role with the first entity (e.g. department) and the other side of the role with the second entity (e.g. employee). This can done by the role connector (the unopened line without arrows). We only use this connector in the ORM, because this is the simple one. We ignore the text below the role. What you see now is this:

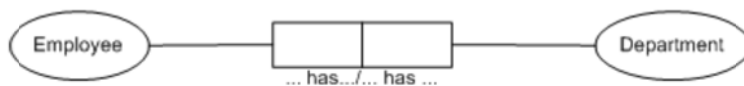


Figure 2.4

In the worksheet, there are three crosses shown above the role, see the next figure:

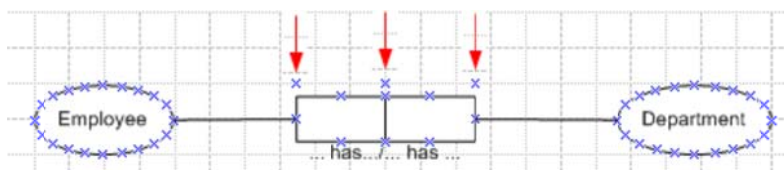


Figure 2.5

To put arrows between these crosses we represent the type of relation. These arrows are uniqueness constraints, and can be point to the left, right, or both sides. For example, a department can contain more employees, while employees can be member of only one department. In this 1:N relation, you have to place the arrow as below. The arrow has to point to the N-side of the relationship:

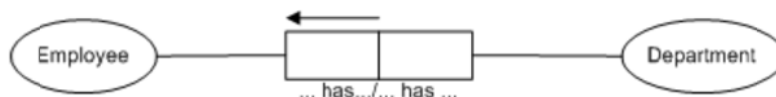


Figure 2.6

- *M:N relation* is named a “many-to-many relation”. Think for example about a relation between a task and an employee. An employee can work at several tasks, and several employees can work at

one task. Such a relation we can display in the Entity relationship diagram (ORM template from Visio) as follows:

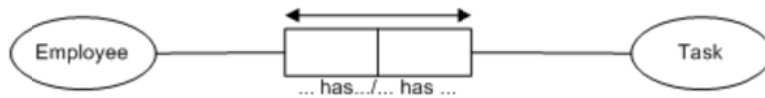


Figure 2.7

The difference now is the arrows above the role. The next figure is the UoD and UoDD/ERD from the information need from the Personnel Manager:

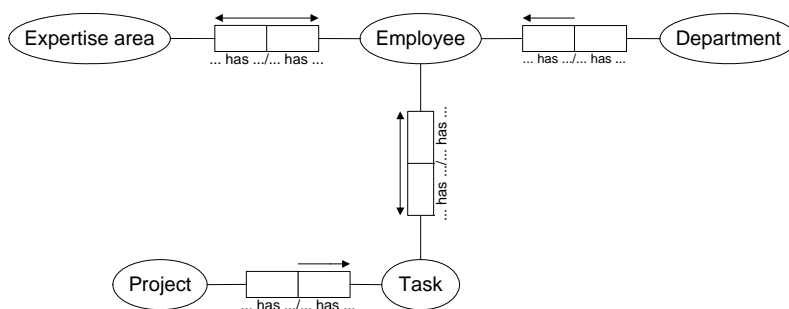


Figure 2.8

The entities are now mutually related, but the entities have also, as mentioned earlier, attributes. First it is handy to write all the attributes from entities down. This is done for the example above:

- Employee: employee number (identifier), employee name, phone number, address
- Department: department number (identifier), department name
- Expertise area: expertise code (identifier), expertise name, hour rate
- Task: task number (identifier), task name, start date
- Project: project number (identifier), project name, starting date, ending date

In MS-Visio attributes are connected to entities in the same way as entities are related to each other, so using the 1:1, 1:N and M:N relations.

For creating the corresponding attributes for the entity department in the ERD, drag two 'value shapes' along the drawing page, and give the right names: department number and department name.

Then insert a role between the entity department and the attribute department number and do the same thing for department name. Then we connect them with the role connectors again. This will look like this:

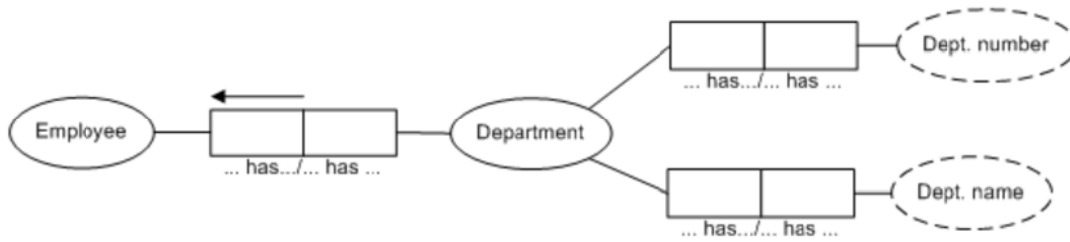


Fig. 2.9

Also between entities and attributes arrows should be placed above the role, just like we have done with the relationships between the entities. The rules for this are....

- Above the role of an identifier (1:1 relation) come two arrows (to the left and to the right –two arrows apart of each other). For example the relationship between the entity department and the attribute department number is given in Figure 2.10.

Figure 2.10

Figure 2.11

- Above a role from a non-identifier (1:N relation) comes one arrow which points to one side (the arrow has to point to the N-side of the relationship, see Figure 2.11):
- Above a role from a non-identifier (M:N relation) comes two arrows (attached to each other, just like with the M:N relation arrow at the entities).

Below we present an example of an UoDD (NOTE that this is the same picture as in Wijnhoven (2009) page 21 and so this picture is not consistent with the example we used here. We just used this picture to give you an indication of how an UoDD looks like):

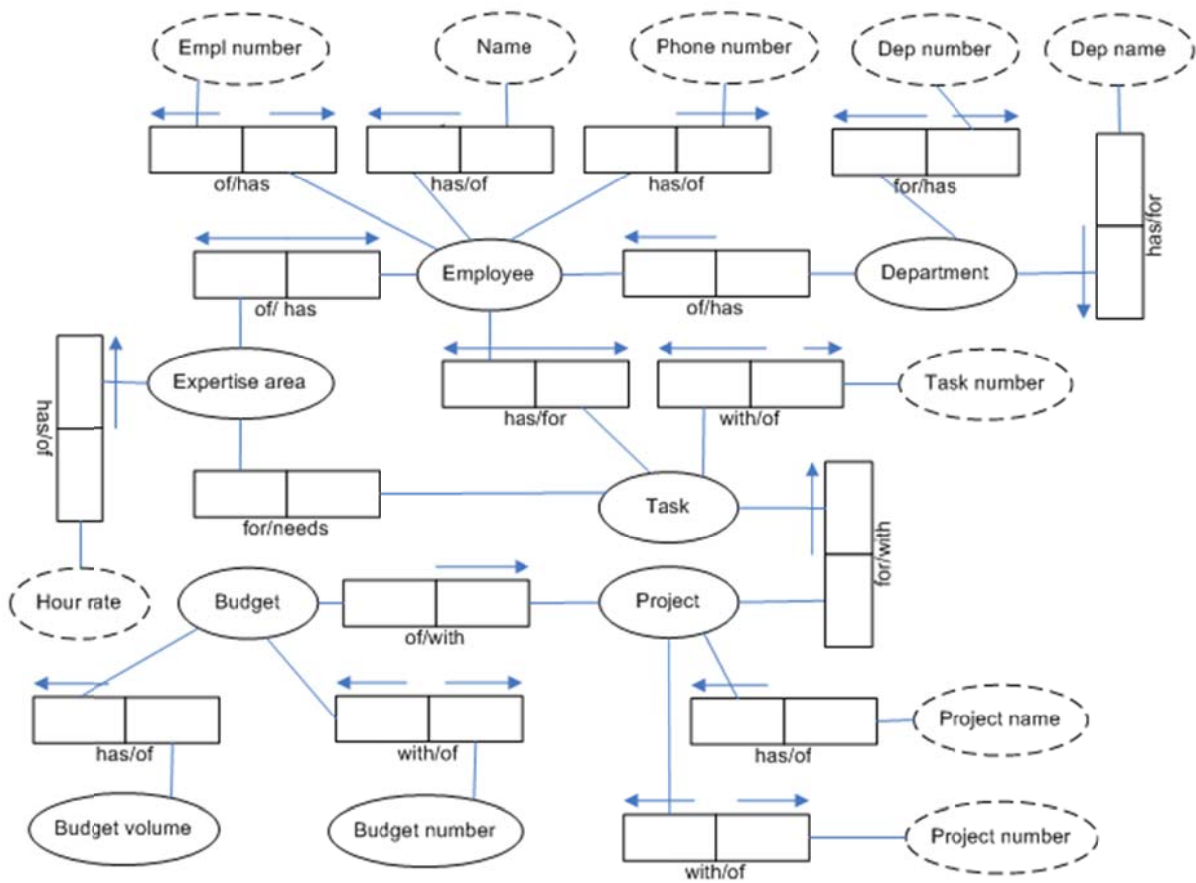


Figure 2.12

Now you have a full Universe of Discourse Description. The UoDD/ERD must meet the following requirements:

- *Use correct shapes for entities and attributes;*
- *Consistent with UoD: use of the same entities and mutual relations are the same;*
- *Attributes/values are defined;*
- *The relations among the entities and the entities and attributes are logical and made with the right method. Therefore roles with arrows above are used.*

2.5 Database design

The next step of developing a database is making a *database design*:

- Open MS-Visio and choose 'database model diagram' (you can find it under software and data-base). There is something new in this worksheet, namely a bar with database properties beneath the worksheet.

- Start with dragging a table (entity) to the worksheet for your first entity from your UoD and UoDD. While this table is selected, you can name the table (e.g. employee). You can do this in the bar with database properties beneath the worksheet.
- The arrow (below categories) is on “Definition”. Move this arrow to Columns.
- Type all attributes (the same attributes as used in the UoDD/ERD), and ensure the box under PK (which stand for primary key) is checked for the identifier (PK). So employee number has a PK, and is therefore automatically required (req'd). Beneath ‘data type’ something will automatically be placed. As yet, we are ready with this table, which will look like Figure 2.13.

Employee	
PK	<u>Employee number</u>
	Employee name Adress Phonenumber

Figure 2.13

If the PK notation in your table looks different, something went wrong. If it went well, do the same for all entities. Now you have as many entities in your worksheet as in the UoD and UoDD. In the example the model has 5 entities:

Expertise area	
PK	<u>Expertise code</u>
	Expertise name Hour rate

Employee	
PK	<u>Employee number</u>
	Employee name Adress Phonenumber

Department	
PK	<u>Department number</u>
	Department name

Project	
PK	<u>Project number</u>
	Project name Starting date Ending date

Task	
PK	<u>Task number</u>
	Task name

Figure 2.14

The hardest part follows now: creating the relations between the entities. We drag ‘relations’ (arrows) to the worksheet to create ‘foreign keys’ (FK). Foreign keys are the identifiers from one entity that

will be placed in the table of another entity. For example: the foreign key 'department number' has to be in the table 'employee', because every employee has a department number. Note that FK's are also attributes of a specific entity, so you have to mention them too in you UoDD.

In MS-Visio, we realize FK's by dragging a 'relationship' from the left toolbar to the entity "department". The department table will turn red and will look like this:

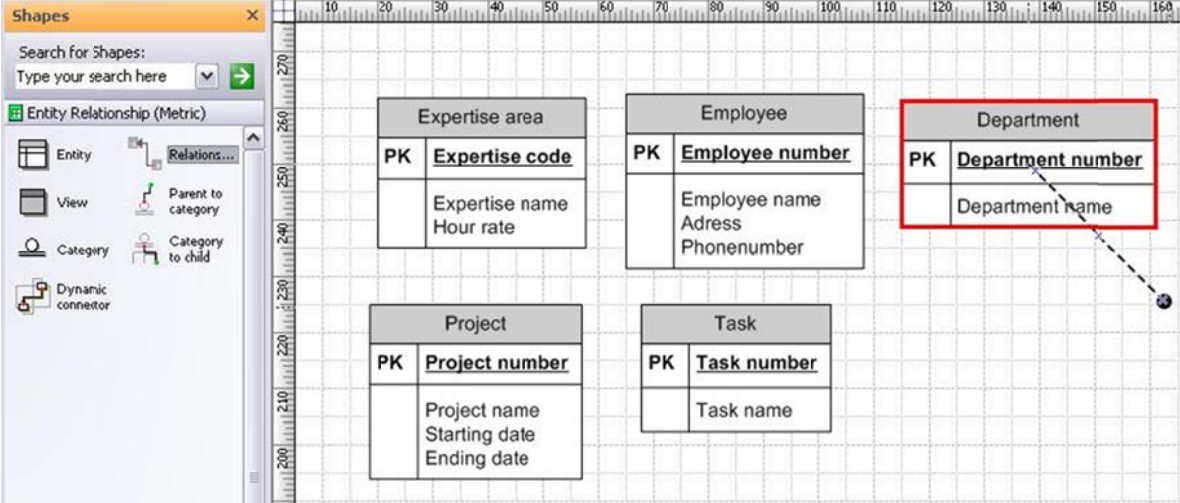


Figure 2.15

Release the end of the relationship-arrow (just like in the picture) on the PK, in this case on department number. Then drag the green closingpoint of the arrow to the middle of the employee table until it is red and release:

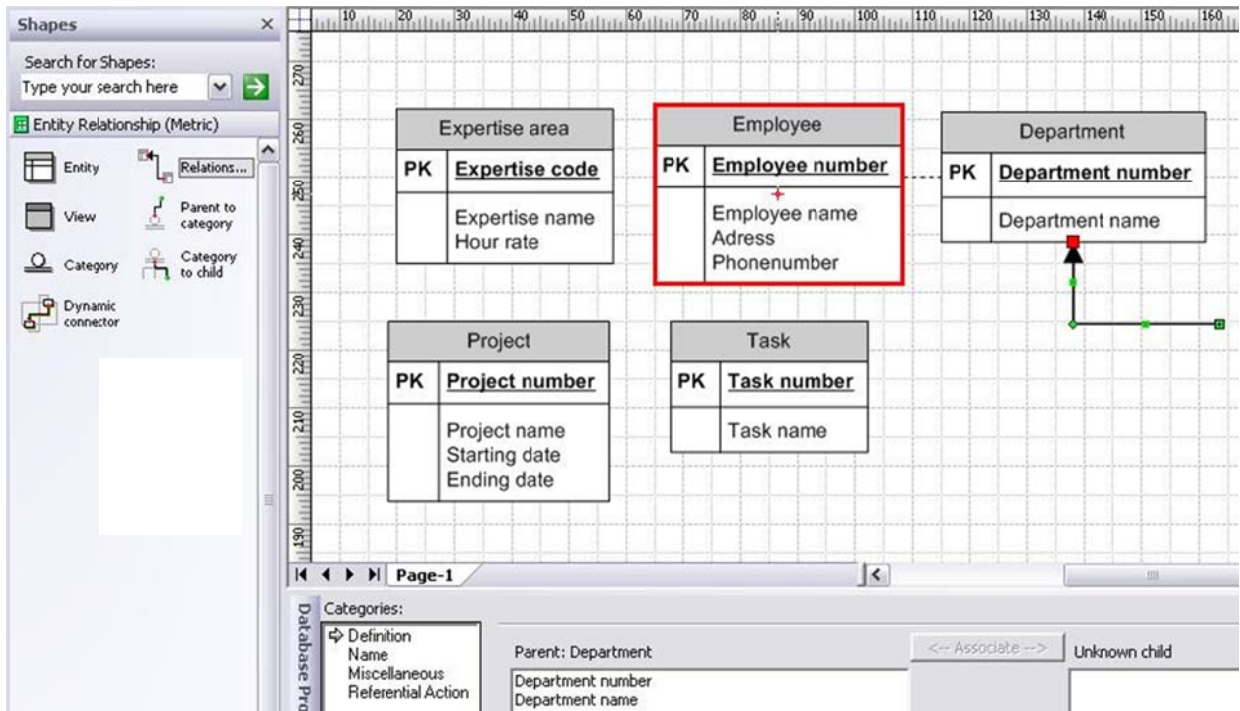


Figure 2.16

The result is a FK in the employee table:

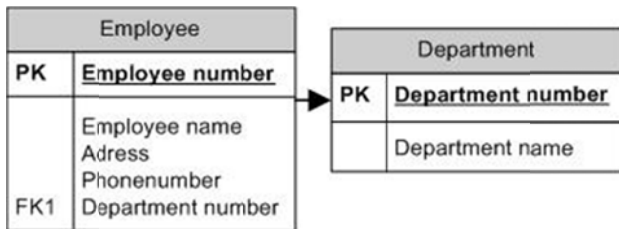


Figure 2.17

Do this for all relationships. The model will look like this:

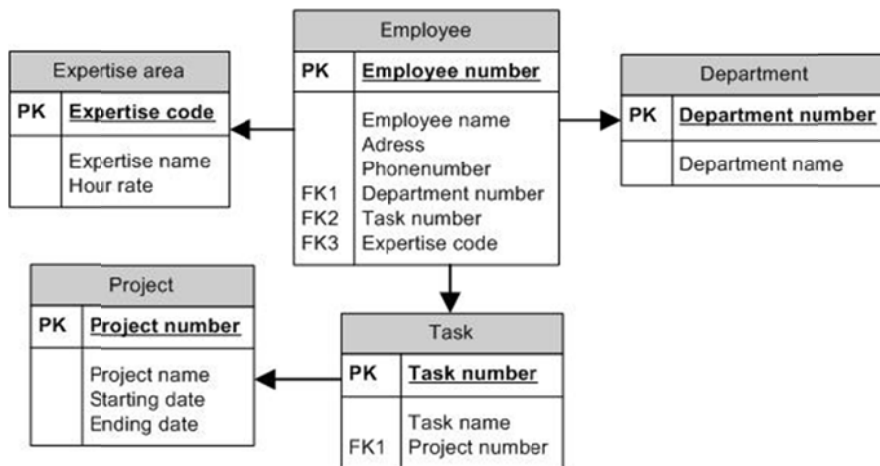


Figure 2.18

The relationships between the entities in this model have to be the same as the relations in the UoD and the UoDD made before! Thus in general you have to compare a Visio model with you UoD and UoDD; the relations have to be the same. So again, do not compare this model with the UoDD given before; this was just an example we used from Wijnhoven (2009) to illustrate what an UoDD will look like. The relationships, entities and attributes are slightly different as in the example we used in the Quickstart.)

The resulting UoDD must meet the following requirements:

- *The MS-Visio ‘database model diagram’ template is used.*
- *For all entities from the UoD and UoDD/ERD tables are created. These tables have received the correct titles and the attributes are filled in the tables.*
- *An identifier is indicated for every table.*
- *The tables are logically connected to each other. Hereby foreign keys arise.*

2.6 Implementing the database design in MS Access

Now, we can implement the database design in the database management software (like MS Access):

- Open MS Access.
- Open an empty database and name it (e.g. database Personnel Manager). We do not use a standard template in Access because we already made our own database design.
- Create tables. Every entity or table from the database design needs also a table in MS-Access. In MS-Access 2007 you will have the screen of Figure 2.19.

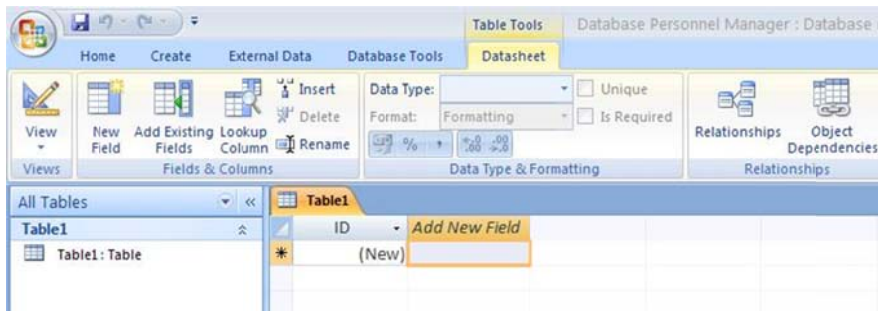


Figure 2.19

Click on View and Design View (see Figure 2.10).

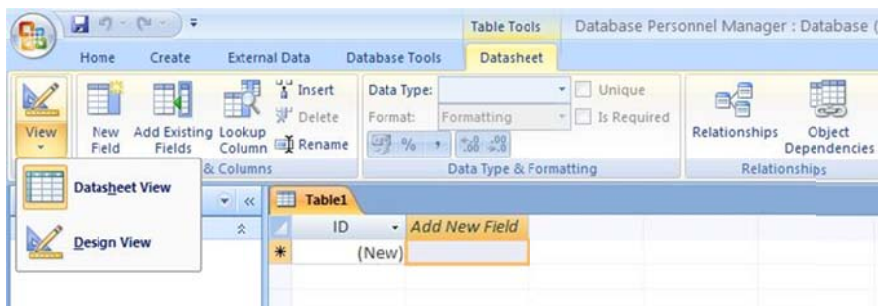


Figure 2.20

You will have the following message of Figure 2.21.

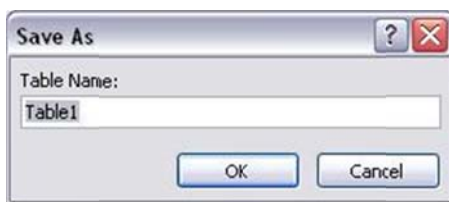


Figure 2.21

- Name the table, e.g. Employee, and click on OK.
- Type (under “field name”) all attributes, beginning with the primary key. In our case this is an “employee number”. Also type all other attributes in the MS-Access field. These attributes have to match with the concerning table from the database design made in MS-Visio. So you have to type the foreign keys as well! The employee table now looks like this in the database design:

Employee	
PK	Employee number
	Employee name
	Adress
	Phonenumber
FK1	Department number
FK2	Task number
FK3	Expertise code

Figure 2.22

In Access it looks like this:

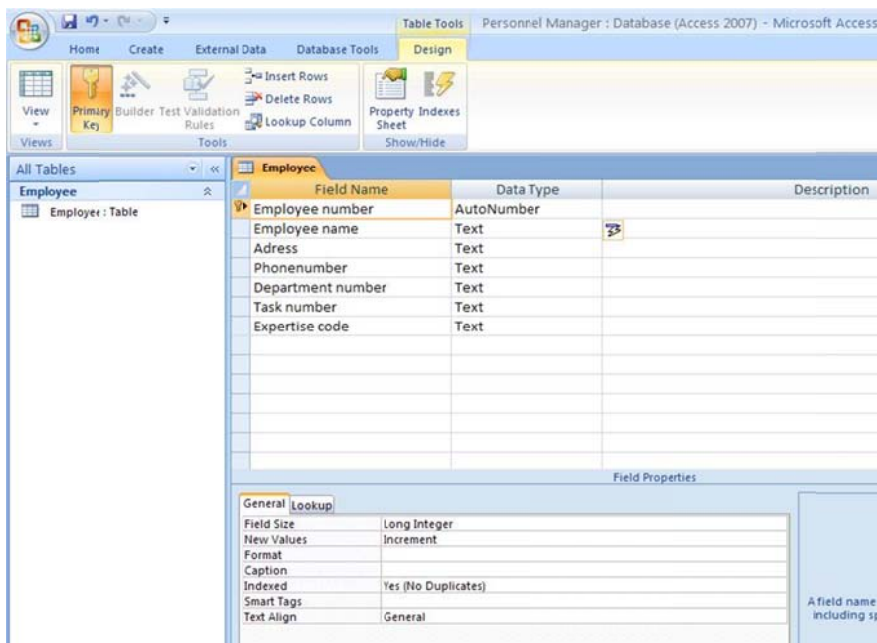


Figure 2.23

In the table below you can read the explanation MS-Access gives about the second column of the table: data type. The attribute Data Type can have the following settings:

DATA TYPE	USED TO STORE	LIMITATIONS/RESTRICTIONS
Text	Alphanumeric data (text and numbers)	Stores up to 255 characters.

Memo	Alphanumeric data (text and numbers)	Note that adding 2GB of data causes your database to operate slowly. If you enter data manually, you can enter and view a maximum of 65,535 characters in the table field and in any controls that you bind to the field. When you create databases in the Office Access 2007 file format, Memo fields also support rich-text editing.
Number	Numeric data	Number fields use a Field Size setting that controls the size of the value that the field can contain. You can set the field size to 1, 2, 4, 8, or 16 bytes.
Date/Time	Dates and times	Access stores all dates as 8-byte double-precision integers.
Currency	Monetary data	Stores data as 8-byte numbers with precision to four decimal places. Use this data type to store financial data and when you do not want Access to round values.
AutoNumber	Unique values created by Access when you create a new record	Stores data as 4-byte values; typically used in primary keys.
Yes/No	Boolean (true or false) data.	Access uses -1 for all Yes values and 0 for all No values.
OLE Object	Images, documents, graphs, and other objects from Office and Windows-based programs	Stores up to 2GB of data (the size limit for all Access databases). Adding 2GB of data causes your database to operate slowly. OLE Object fields create bitmap images of the original document or other object, and then display that bitmap in the table fields and form or report controls in your database. For Access to render those images, you must have an OLE server (a program that supports that file type) registered on the computer that runs your database. As a rule, you should use Attachment fields for your .accdb files instead of OLE Object fields.

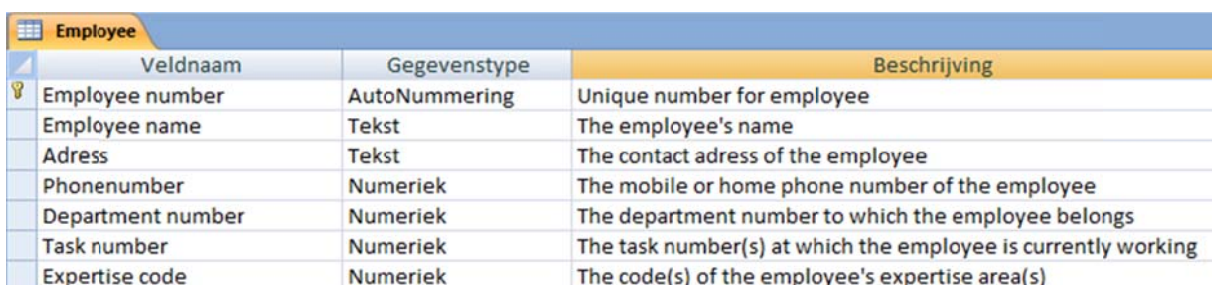
Hyperlink	Web addresses	Stores up to 1 gigabyte of data. You can store links to Web sites, sites or files on an intranet or Local Area Network (LAN), and sites or files on your computer.
Attachment	Any supported type of file	You can attach images, spreadsheet files, documents, charts, and other types of supported files to the records in your database, much like you attach files to e-mail messages. You can also view and edit attached files, depending on how the database designer sets up the Attachment field. Attachment fields provide greater flexibility.
Table 2.1: Data types in MS Access		

We use AutoNumber for an identifier, because this is a unique sequential number (that increases in steps of 1) or a unique random number, that is allocated to every new record which is added to a table. Fields from the type AutoNumber cannot be updated.

For other attributes from employee itself we use 'Text'.

For foreign keys we do not use Text but Number ("Numeriek"), because this has to be equal to the settings in the other tables (otherwise there will be problems when you have to make connections). 'Text' means that the field automatically has a size from 255 characters. For something like a phone number you only need 10 characters. It is easy to change the field size to 10, this will also prevent you from filling in a too long phone number for example. Enter at the bottom 10 at field size. You can do the same with for example a zip code.

A next step is to give descriptions to all attributes:



Veldnaam	Gegevenstype	Beschrijving
Employee number	AutoNummering	Unique number for employee
Employee name	Tekst	The employee's name
Adress	Tekst	The contact adress of the employee
Phonenumber	Numeriek	The mobile or home phone number of the employee
Department number	Numeriek	The department number to which the employee belongs
Task number	Numeriek	The task number(s) at which the employee is currently working
Expertise code	Numeriek	The code(s) of the employee's expertise area(s)

Figure 2.24

Now we have one table for 'Employee'. However, we have to make five tables (for every entity one):

1. Click in the menu bar on 'Create' and then on 'Table'
2. Go to the design view again (left top 'View' and 'Design View').
3. Name the table and repeat all the above also for this entity.

Because of the tabs at the top you can easily switch from the one to another table:

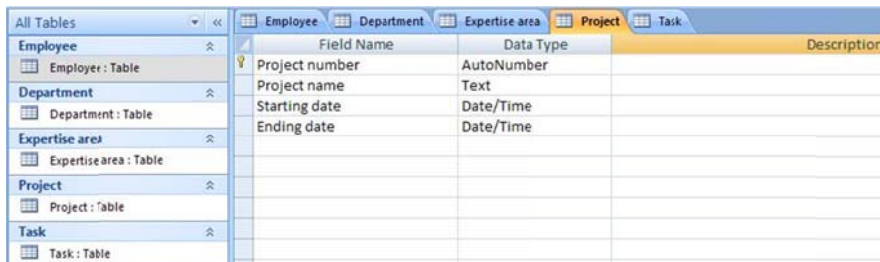


Figure 2.25

The next step is creating connections among the tables:

1. Go to 'Database tools' ("Hulpmiddelen voor databases") and choose 'Relationships':

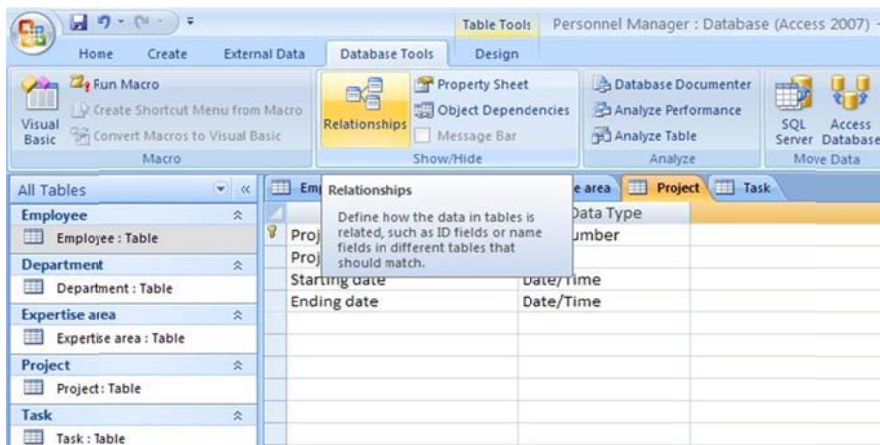


Figure 2.26

2. Add the tables by selecting them and click on 'Add'. They pop up in the back of the screen.
3. When tables are added, click on 'Close'.

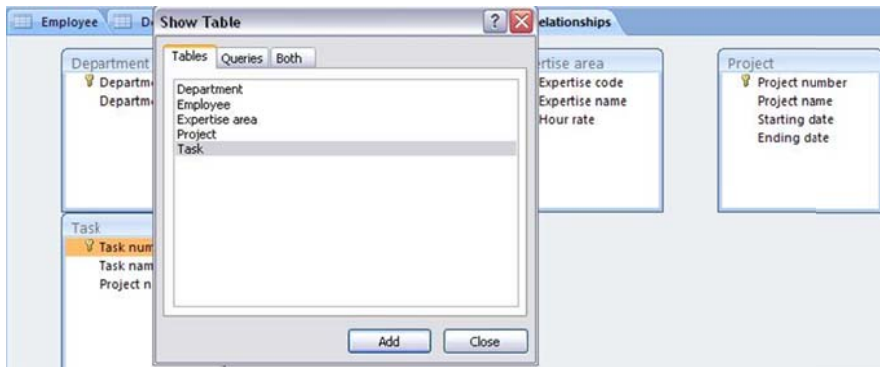


Figure 2.27

4. Save all the tables at the background (right mouse click on the tab of the table and ‘Save’)
5. Close all tables at the background (right mouse click on the tab and ‘Close’). Otherwise we can’t make connections.

Now we are in the screen with only the tab ‘Relations’, and the five tables. Now we have to implement the connections between the tables:

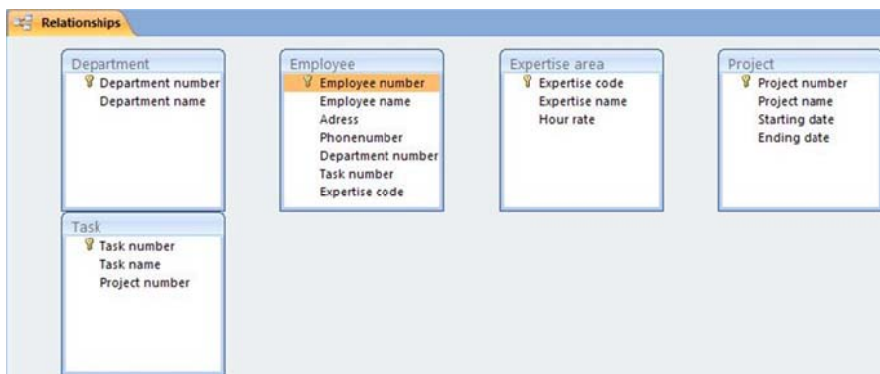


Figure 2.28

- 1 Drag the identifier from the one table on top of the foreign key from the other table. *Click for example on ‘department number’ from the table ‘department’ and keep the mouse pressed. Go to ‘department number’ from the table ‘employee’ and release.*
- 2 In the screen you get, you have to check ‘Enforce Referential Integrity’ (“Referentiële integriteit afdwingen”). Check also the other two boxes. The screen now looks like this:

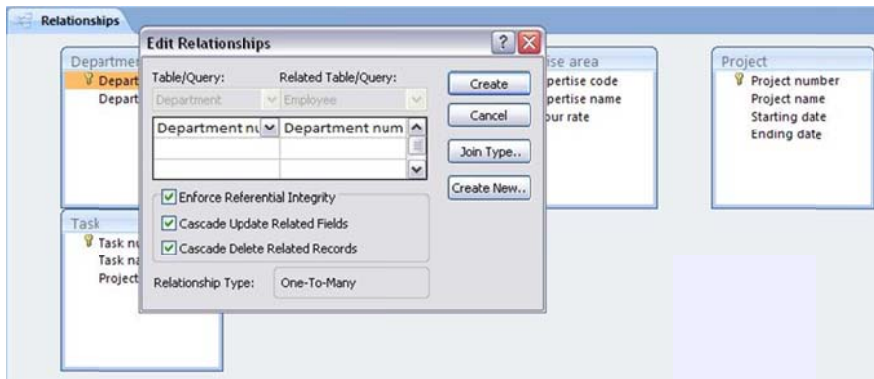


Figure 2.29

3 Next, click on ‘Create’.

Now there is a line between the two tables with on the one side a ‘1’ and on the other side the infinite character “∞”. This means a 1:N relation.

5. Repeat this for all the tables. In our example it looks like this:

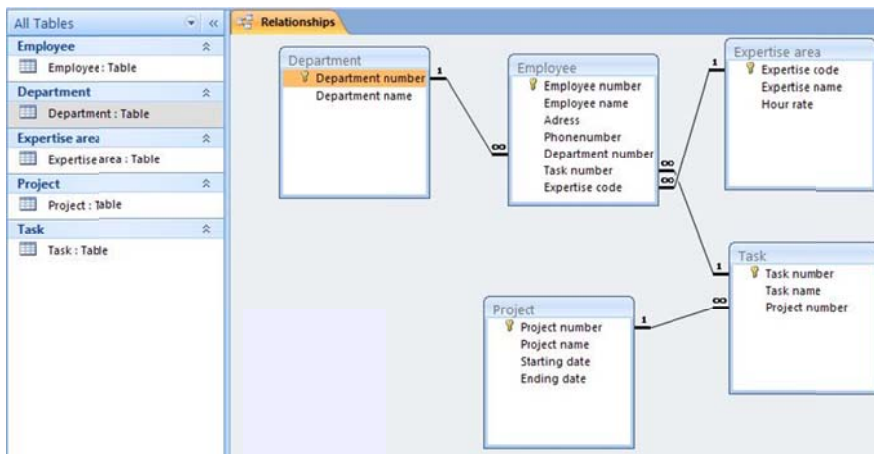


Figure 2.30

All the relations in this example are 1:N. MS-Access only allows a M:N relation by inserting a third table. This is the so-called connection table. To this table you have to insert the primary-key fields from the two connected tables.

When all the connections are made, you have to fill the tables. First we fill all tables that do not have FK’s. These are department, project and expertise area. Next we fill out the “task” and after that the “employee” table. This is because MS-Access immediately makes links to other tables. If underlying

data is not yet made (for example in the case of a department number), MS-Access cannot make these connections. For this...

1 Double click on a table left under 'All tables' (so first the department, project or the expertise area table)

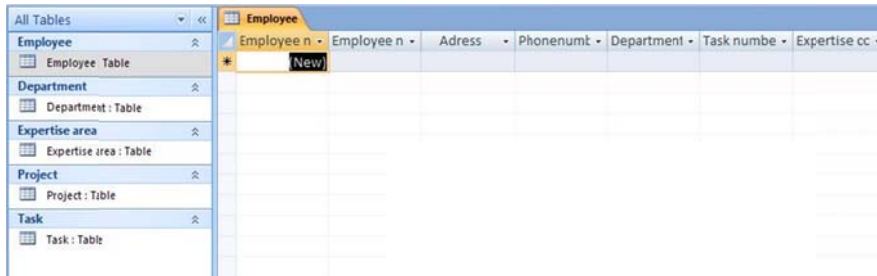


Figure 2.31

2 Enter data in the input screen.

At AutoNumber we do not have to enter anything; the numbering will be done automatically (therefore 'auto' number). Further, for example, we insert at the table department the department names. We do this just for all the fields that we made.

It is much work to maintain consistency. For example, you cannot fill in '100' at task number in the employee table, because that means you have to define at least 100 tasks (because the AutoNumber starts at '1'). It is your own choice how much data you insert, but to make a useful report, you have to insert at least 5 records everywhere. Here are some examples from five completed tables.

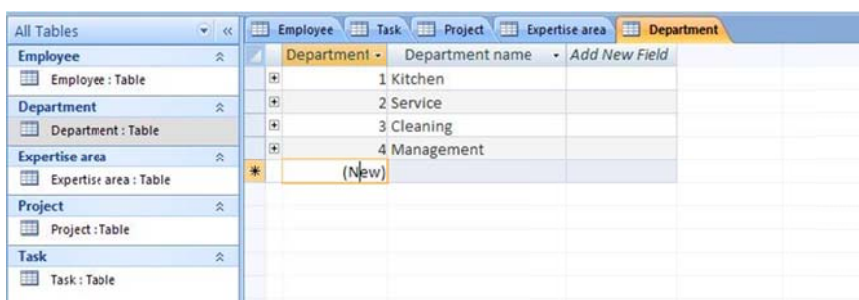


Figure 2.32

Project num	Project name	Starting date	Ending date
1	Wedding	24-11-2010	24-12-2010
2	Birthday party	4-1-2011	7-11-2010
3	Bachelor party	9-2-2011	13-2-2011
4	Pubquiz	17-11-2010	18-11-2010
5	Theme party	21-2-2011	23-2-2011
6	Company party	14-3-2011	17-3-2011
7	Business meeting	9-5-2011	11-5-2011
8	High tea	24-5-2011	26-5-2011
*	(New)		

Figure 2.33

Expertise code	Expertise name	Hour rate
1	Logistics	24
2	Cooking	27
3	Housing	25
4	PR and advice	20
5	Contract	30
6	Budgeting	28
7	Administration	35
8	Marketing	33
*	(New)	

Figure 2.34

Task numbe	Task name	Project number
1	Prepare food	1
2	Prepare delicacies	8
3	Lay tables	8
4	Bring drinks	4
5	Tap beer	3
6	Decorate café	5
7	Make coffee	7
8	Clean	2
9	Make buffet	6
*	(New)	

Figure 2.35

Employee name	Address	Phonenumber	Department number	Task number	Expertise
1 Smith, D.	Addlestreet 4	0634405928	1	1	1
2 Jones, M.	Arlingtonstreet 23	0647239499	1	2	2
3 Hatter, K.	Dowstreet 1	0625299421	1	2	2
4 Cell, A.	Marlystreet 88	0628384783	1	1	1
5 Harley, S.	Towerstreet	0681974928	1	6	6
6 Pallew, M.	Ave Maria lane 3	0689742897	2	4	4
7 Rose, B.	Fair Street 52	0689732458	2	4	4
8 Hilton, N.	Seasonstreet 2	0693874597	2	7	7
9 Molly, A.	Mark Lane 16	0612325565	2	5	5
10 Cock, R.	Milford lane 76	0698349274	2	5	5
11 Eagan, W.	Fetter lane 3	0692874375	2	7	7
12 Williamson, U.	Patrick lane 13	0698237432	3	8	8
13 Waldorf, M	Mayfair 62	0697692750	3	8	8
14 Carton, T.	Park Place 5	0689375982	3	8	8
15 Daens, N.	Villiers street 24	0667928472	3	8	8
16 Edwards, A.	Ivy lane 8	0621398329	4	3	3
17 Fieret, B.	Pont Street 12	0689273489	4	3	3
18 Jacobs, J.	Vigo Street 35	0687624662	4	6	6
(New)					

Figure 2.36

3. Save everything.

2.7 Making a MS Access report

Now we are ready to make a report. In MS-Access it is very easy to make a report:

1. Click in the menu bar on 'Create' and 'Report Wizard':

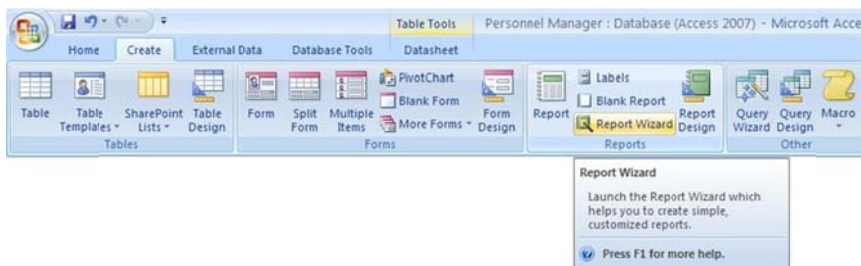


Figure 2.37

2. Insert 'fields' (attributes) (A) from different tables (B), due to the attributes you need for your report.

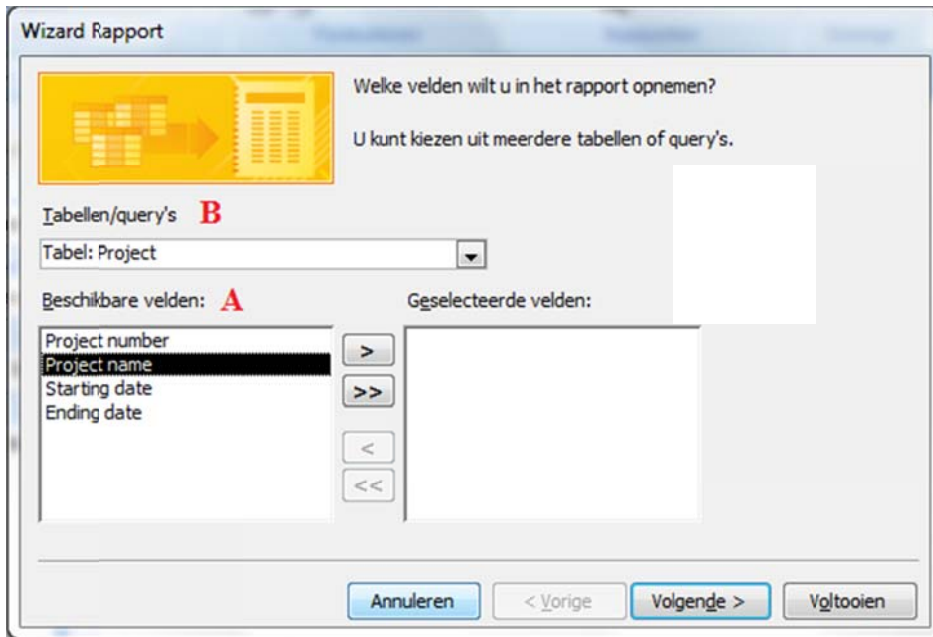


Figure 2.38

Suppose the Personnel Manager has a question: which employees have performed what tasks? He wants to know this, because something went wrong. He selects project name, task name, employee name and telephone number so he can contact the employee rapidly:

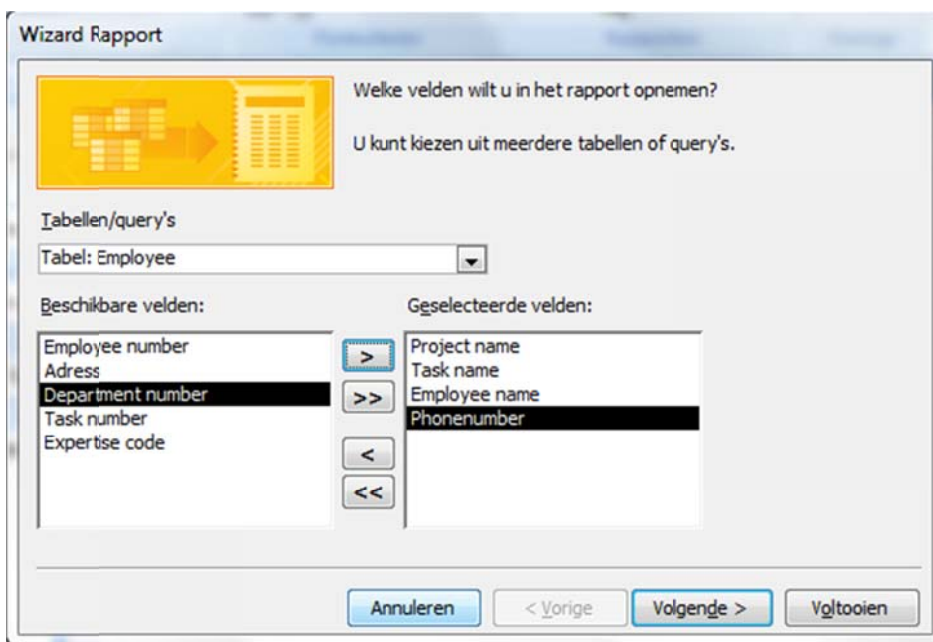


Figure 2.39

3. Click 'Next'

4. The next step is to sort things out. One can choose one of the options in the left white box. In our case it is logical to put project name on top, then the task name and eventually the name of the employee:

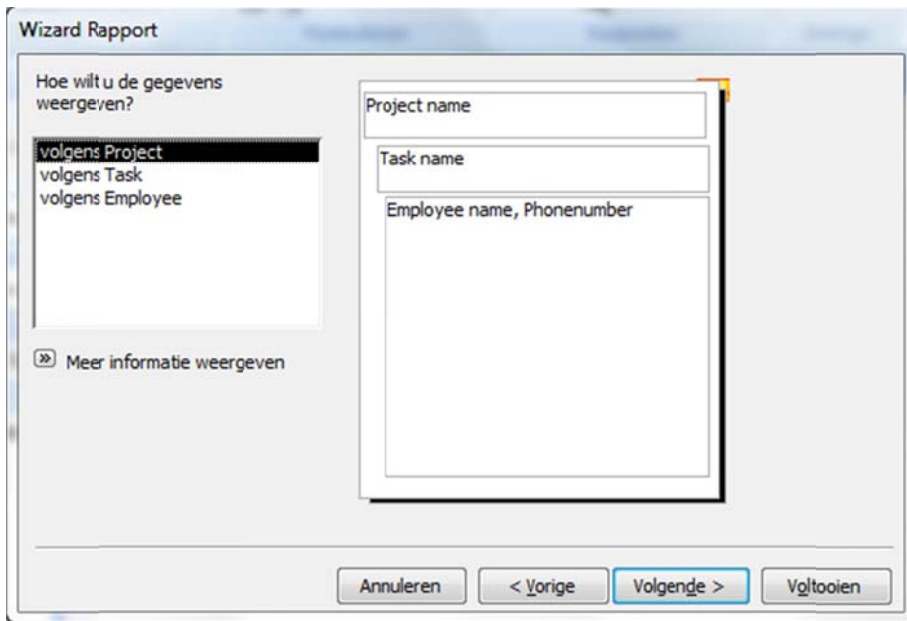


Figure 2.40

5. Click 'Next'

6. This next step is optional. Here you can add 'groepeerniveaus', just to sort things out. Try yourself to see what this will look like.

5. Click 'Next'

6. This step is also optional, but sometimes it will become clearer. You can sort the detail records, for example in order of employee name. You could better try it yourself and see what the report looks like.

7. Click 'Next'

8. In this step you can make up the report. Make sure, you check the box 'veldbreedte aanpassen zodat alle velden op een pagina passen'

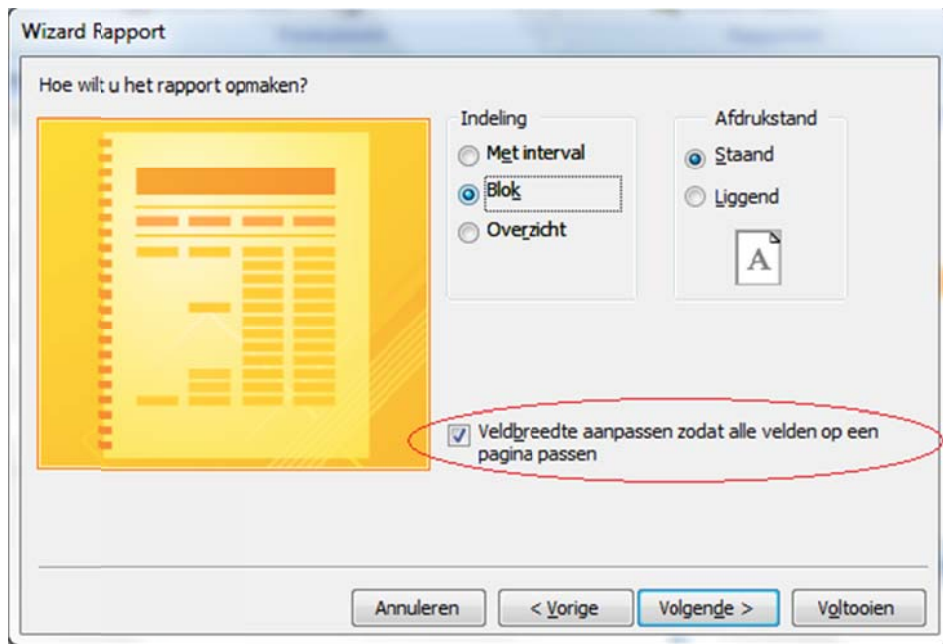


Figure 2.41.

9. Click 'Next'

10. Choose a style

11. Click 'Next'

12. Name the report

See an example below:

Project

Project name	Task name	Employee name	Phonenumber
Wedding	Prepare food	Cell, A.	0628384783
		Smith, D.	0634405928
Birthday part	Clean	Carton, T.	0689375982
		Deans, N.	0667928472
		Waldorf, M.	0697692750
		Williamson, U.	0698237432
Bachelor part	Tap beer	Cock, R.	0698349274
		Molly, A.	0612325565
Pubquiz	Bring drinks	Pallew, M.	0689742897
		Rose, B.	0689732458
Theme party	Decorate café	Harley, S.	0683974928
		Jacobs, J.	0687624662
Business mee	Make coffee	Eagan, W.	0692874375
		Hilton, N.	0693874597
High tea	Prepare delicacies	Hatter, K.	0629299421
		Jones, M.	0647239499
	Lay tables	Edwards, A.	0621398329
		Fieret, B.	0689273489

Figure 2.42

If you know that there are complaints about the delicacies at the high tea, you can call Jones or Hatter what went wrong.

Now we are ready in MS-Access. This assignment consisted of two parts: implementing a simple database design and making a report which answers a certain problem or information need. Moreover, this is only a small part of Access, the program offers a lot of other things.

The Access file must meet the following requirements:

- For all entities from the database design, tables have been created, and for all attributes from the database design, fields are made in Access;
- The primary keys are the same as the keys in the database design, as well as the relations between entities (tables) and thus the foreign keys;
- For each attribute data is filled in, otherwise there cannot be a report;

- There is a report where attributes from various entities are linked (in the example you see for example that the employee belongs to a certain task);
- The report is clear, and you understand yourself what the report means.

2.8 Further study

This chapter introduced elementary concepts of database software. Database management is a separate profession and the database industry is extensive. For further study we recommend e.g. J. Hoffer, M. Prescott and F. McFadden (2002) *Modern Database Management*, Upper Sadle River (NJ): Prentice Hall. Market leader in the database industry is the Oracle corporation with an eponymous product. Oracle makes it possible to many people to approximate, update, delete and make data available, while all the rights and privacy policies will be monitored by the database management system.

2.9 Exercises

1. Create a database on a topic of your preference. If you lack inspiration, do it for a football club (teams, players, coaches, team leaders, support, administration, maintenance) or for a flower shop (suppliers, sales staff, inventory, sales reports, client card information).
 1. Set up the UoD and UoDD using ORM.
 2. Design the database
 3. Realize the database in MS Access
 4. Create reports

Do this job preferably with at least one other person.

2. Just a small final question: What is the difference between data managed via a structured database and data managed via social software?

3. Causal models and spreadsheet for decision support

3.1 Leibniz and spreadsheets

According to Leibniz there are two kinds of truths. The “truth of reasoning” and the “truth of fact”. “Truth of fact” –which is the empiricist perspective- is discussed in the previous chapter on databases. According to Leibniz, “truth of fact” alone will result in total chaos of understanding or as a maximum some correlations may be found. Following our understanding of Leibniz, what people really need is *explanations* and *predictions* so that they know what happens if certain actions would be taken. If we are not able to produce such explanatory or predictive insights, we people will not be much more effective than dogs, who do understand regularities like performing certain tricks and the reception of sausages. People are not dogs, and the main thing that distinguishes people from animals is our reasoning capability, that is the capability of *understanding if-then or what-if relations*. Causal knowledge of this kind is obviously a very specific kind of knowing that can be well *represented* (and thus becomes information) by causal *models*.

This view on truth leads to a number of implications for information management. For example: computers cannot make logic connections without people who actually know causal relationships. That means it is essential to point out causal relationships before computers can help us with reasoning and decision making (and they can very well!). Data in the empirical sense may be input and output of causal models. Poor data input, may result in garbage output (the so-called garbage-in, garbage-out or GIGA effect), but sometimes reliable input data do not exist and still reasoning under given assumptions (named simulation) may be very useful for well-reasoned decision making (especially in strategic decision making which has to reason about not yet existing futures). Causal models have a calculating mechanism to infer impacts of states of substances on the states of other substances. Spreadsheets are very suitable for implementing causal models for analyzing the impacts of certain inputs on certain outputs. The inputs can be representations of future objects (like profits) and the model may reason back to the required means (which are the model’s output) to achieve them, or the inputs may be representations of existing conditions (like the number of clients or the existing financial resources) by which certain decisions may result in certain impacts in the longer run (and thus are the model’s outputs). A spreadsheet is a computer application for calculations with the help of a fixed structure, namely: columns and rows. These columns and rows can contain numerical data, but they can also contain formulas. Additionally, spreadsheet have great opportunities of visualizing data.

For going from problems scopes to effective use of software (MS Excel in this case), we apply a variant of the general model of informing introduced in chapter one, named the rationalist model for decision support (see Figure 3.1; Source Wijnhoven 2009).

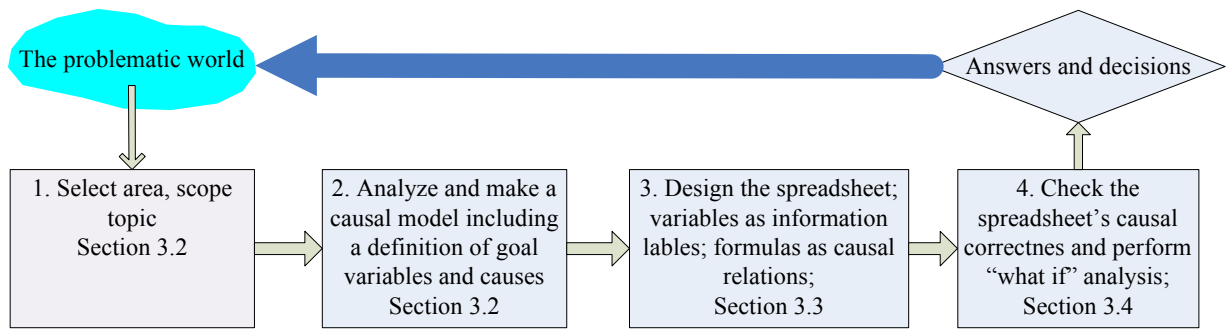


Figure 3.1: The rationalist model for decision support

3.2 Goal of this chapter

Following our understanding of Leibniz, what people need are explanations and predictive models so that we know what happens if we take certain actions. This we can achieve through the making of causal relationships and implementing them in the automatic reasoning tool MS Excel. MS Excel also has many excellent tools for analyzing data that are a good addition to a database. Therefore this chapter will present the following...

1. First a description of MS Excel and its opportunities to perform descriptive statistics in section 3.3.
2. Second we explain how one can represent causal reasoning into causal model by using MS-Visio in section 3.4.
3. Third, we explain how one can implement causals models in MS Excel in section 3.5 so that in Excel one can work with and make calculations using the causal structures identified.

Ultimate goal: Understanding of the Leibnizian view of information as causal models that can be processed by computers to speed up reasoning and decision making.

3.3 Elements of spreadsheets and producing descriptive statistics

A spreadsheet is a table with columns (labeled by letters in alphabetic order) and rows (labeled by numbers), which allows to perform calculations. The input of data in a spreadsheet is realized by putting data in the cells. They are just numbers that do not have a function other than input variables. Causal relationships give the data a function and make sure the cell has a goal. For example, the causal relation makes a connection between the revenues on the one hand and the expenses on the other. This is what makes a profit or loss. The causal models in MS-Visio have to look similarly in your spreadsheet. The variable labels are text in a cell mostly on top of a column or left in a row.

Making a spreadsheet book

MS-Excel works with books which wear the extension ‘.xls’ or ‘.xlsx’ just like a Word document wears the extension ‘.doc’. An Excel book consists of one or more tabs. Excel names these tabs auto-

matically Sheet1, Sheet2 and Sheet3, but these can be renamed by clicking on the right button of your mouse and choose 'Rename'. You can also add or remove Sheets by clicking 'Insert' or 'Delete' in the menu named earlier. A Sheet exists of rows (1, 2, 3,...) and columns (A,B,...,AA, AB,...). To select a cell in Excel, click on it.

Series

Imagine you want to insert a series of numbers from 0 till 1 with a 0.01 difference between each cell. Inserting them all by hand takes much time. There is a more simple solution:

- Type '0' in cell A1, '0.01' in cell A2 and '0.02' in cell A3.
- Select these three cells.
- Click on the square in the right down corner of the selected cells (it will then turn into a cross) and drag it downwards. You will see that Excel fills the selected cells automatically.

See Figure 3.2.

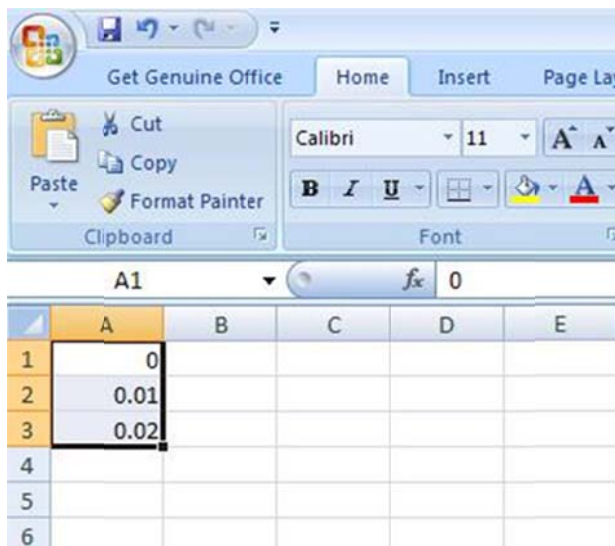


Figure 3.2

Sorting

You can sort data by clicking on data in the toolbar. When you press 'Sort' you can choose the feature on which you want to sort your data. See Figure 3.3.

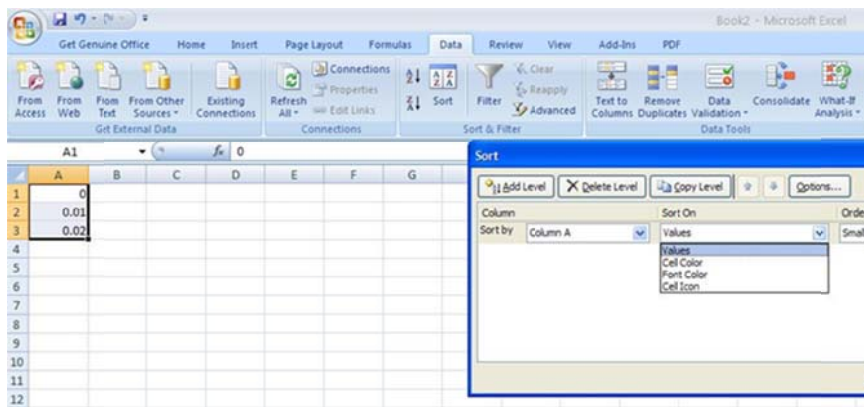


Figure 3.3.

Formulas

For the use of many functions you can use the tool 'Insert function'. You will find this tool when you click on 'Formulas' in the toolbar. See Figure 3.4.

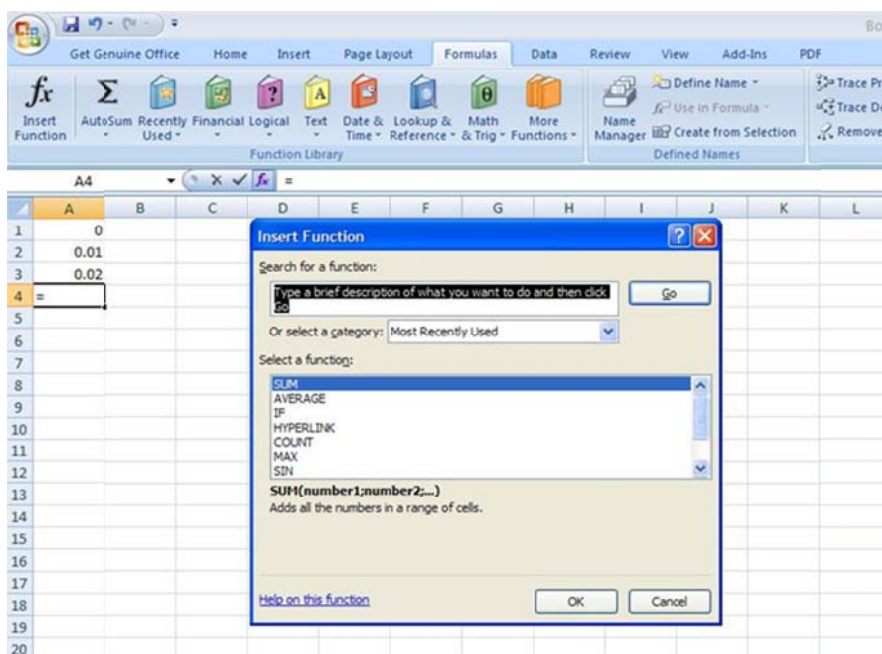


Figure 3.4

Under Formulas you can also find some other options, which are mostly shortcuts. Note that formulas in MS-Excel are always preceded by a "=" sign. Thus the formula for the sum of the data in cells A1, A2, and A3 is: =sum(A1+A2+A3) or shorter =sum(A1:A3).

Layout of an Excel worksheet

In Excel you can give numbers a continual layout. This happens when you select the cell and press the right button of your mouse so that a menu appears. For this, choose the option 'Format Cells'. With

this screen you can edit the features of the cell, like the font, color, thickness of the borders, etc. This can come in handy when you want to keep your sheet organized. See Figure 3.5.

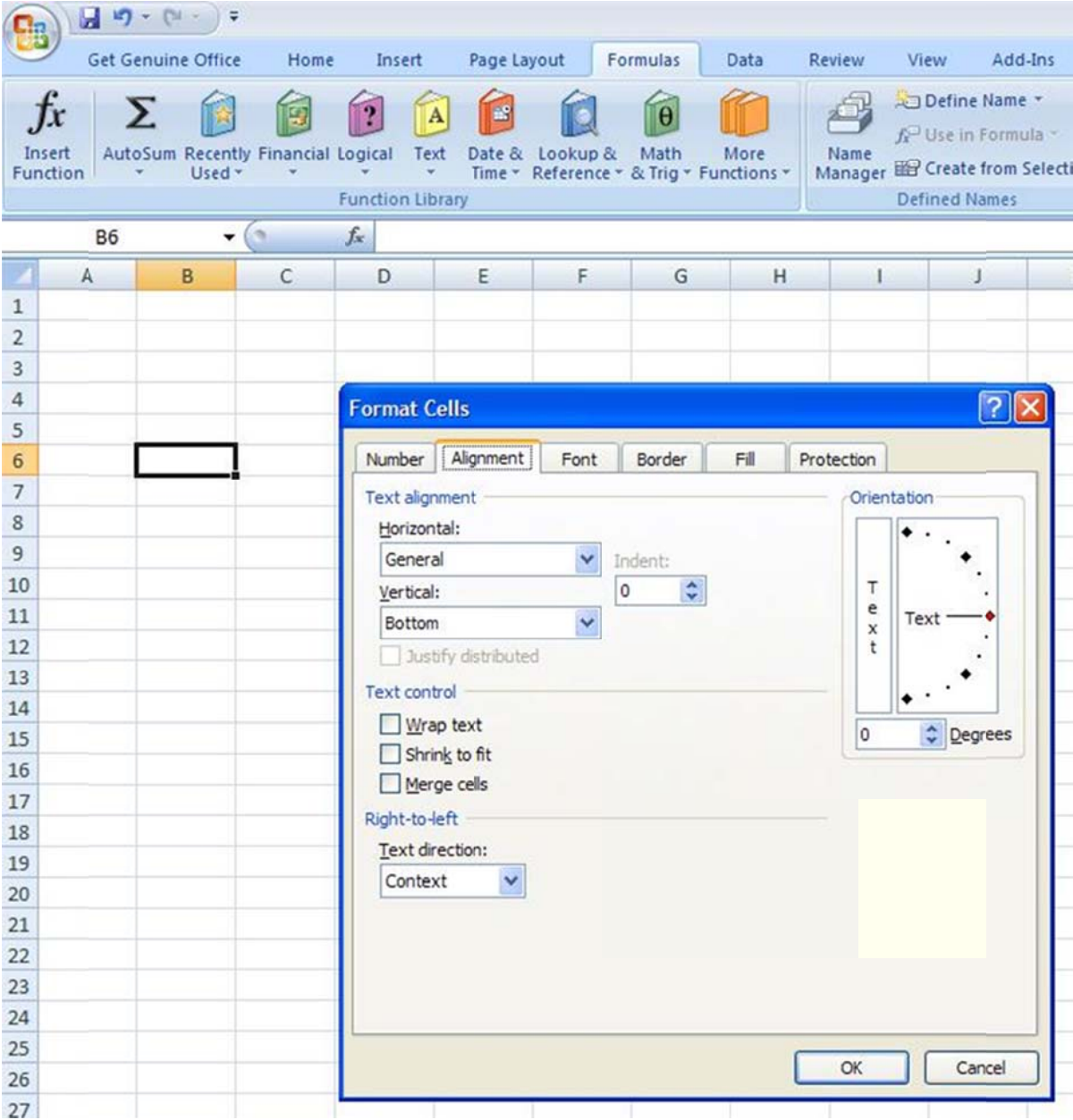


Figure 3.5.

You can also adjust some features regarding to how the input is shown in the cells, for example the automatic adjustment of the cell size to the amount of text in the cell. This particular feature you can find under 'Format cells..', the tool: 'Alignment'.

Making Graphs

MS-Excel enables to produce graph with the help of the input in the cells you selected. One can find the graphs under 'Insert', in this version of Microsoft Office they are called 'charts'. In the section 'charts' you can choose the kind of chart you want. After that, you can just follow the steps MS-Excel gives. See Figure 3.6.

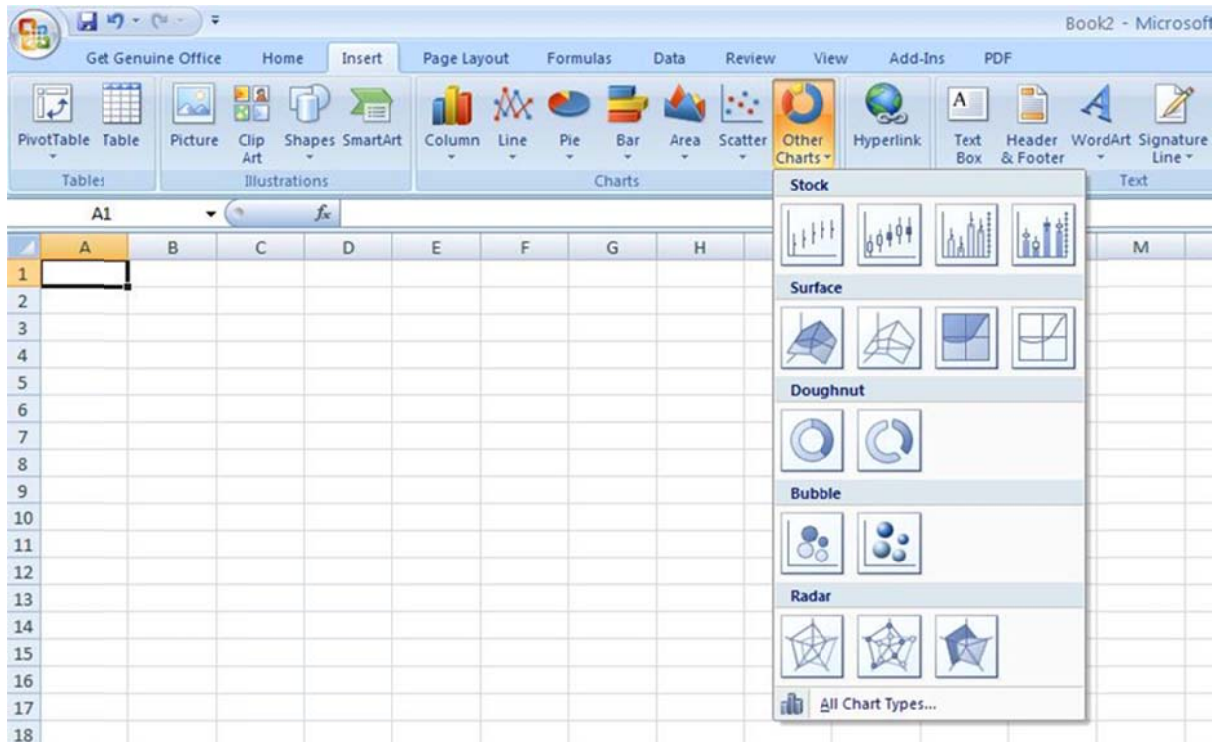


Figure 3.6

Negative numbers

One can apply the automatic red color to numbers below 0 (or any other trash hold). Now you can easily see what aspects cost much. Go to 'Format cells' again and choose 'number'. Instead of 'General' choose 'number'. Now you see 4 options, choose the option which shows a number under 0 as red.

References to other sheets in one book

What if you have two different calculations on different sheets and you want to know what the ultimate conclusion is. For example: add cell A2 of sheet 1 on cell A2 of sheet 2. Type in the cell where you want the answer '=SUM(A2;Sheet1!A2)' and press enter. The answer now appears in the cell. See Figure 3.7.

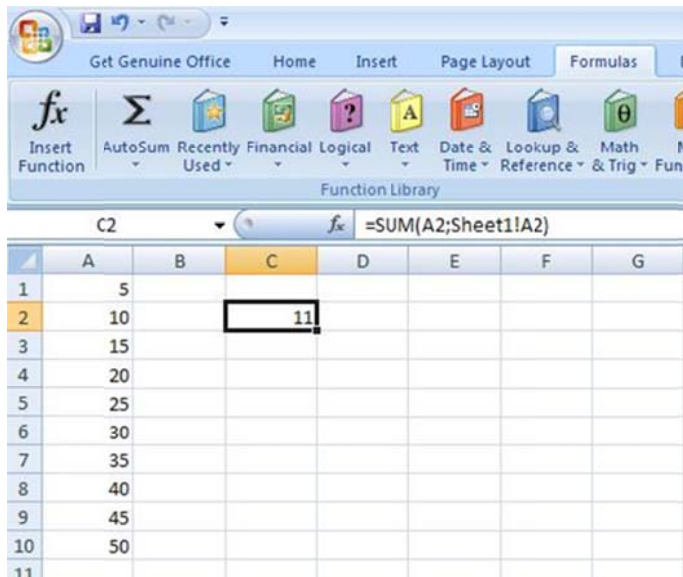


Figure 3.7.

Importing data from MS Access

There are various ways to work with Database data (MS-Access) in Excel. Databases are useful for persistent and structured storage of large volumes of data. Excel is useful to analyze the data, create charts, perform various calculations, what-if analyses etc.

There are various ways to achieving this (check your Excel help file Importing data from Access for an overview). The preferred way is to create a connection to the Access query containing all merged data. Updates in your database will now be reflected in your Excel datasheet. However, note that you cannot create a connection when the database is still open in Access. You can create a one time export in Access of the query data and import the data in Excel but note that all updates will be lost.

Create the connection in Excel (Data Connection) as shown in Figure 3.8.

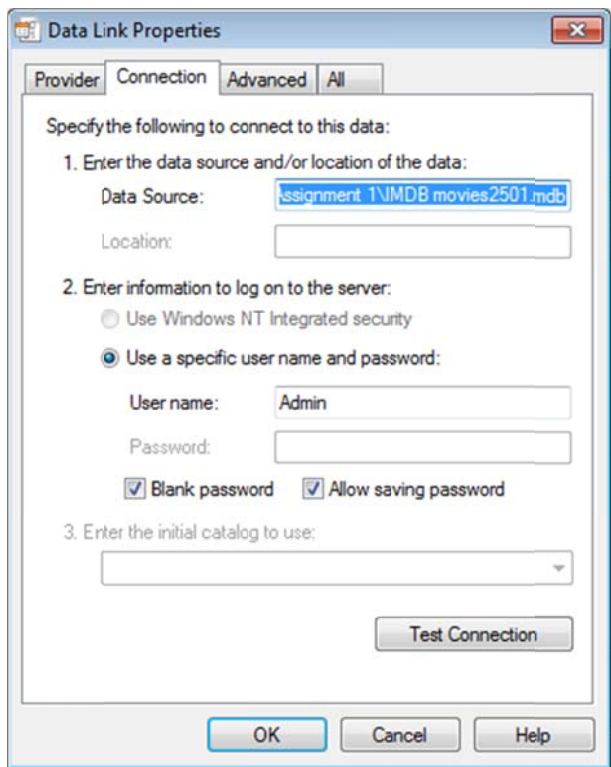


Figure 3.8

If the connection is successfully created you will be allowed to insert data through an existing connection. If your version of Excel does not support this simple import, you also can export the Query data from Access to an Excel file.

Descriptive statistics

Means and standard deviations can be easily calculated in Excel by selecting the proper list of data and the formula. With frequencies this is a bit more complex, because it requires new table being produced from calculations of another table.

Frequencies; see Figure 3.9. Note that a frequency table and correlations both are not just formulas but combinations of different data.

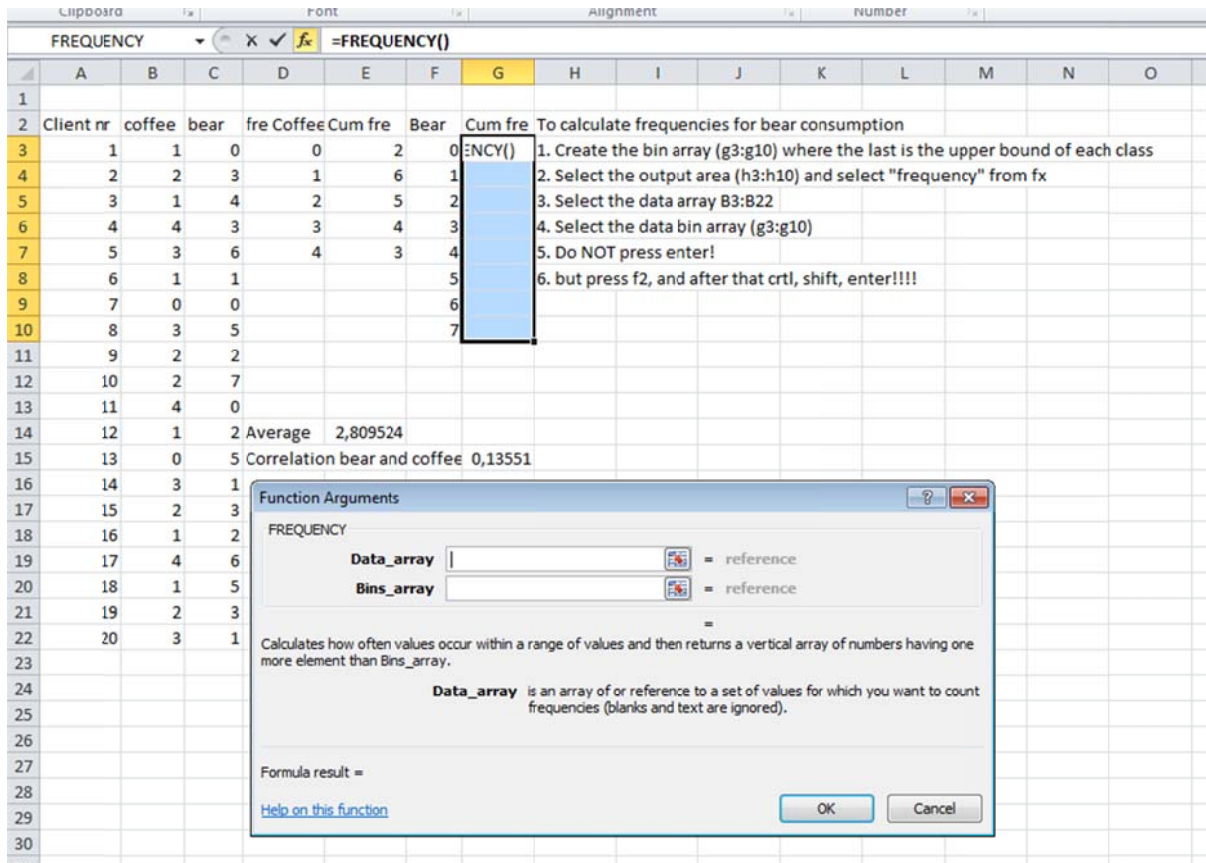


Figure 3.9.

Pivot tables

For typical data entry and storage, data usually appear in *flat* tables, meaning that it consists of only columns and rows. While those data can contain a lot of information, it can be difficult to get summarized information. A pivot table can help quickly summarize the data and highlight the desired information. The usage of a pivot table is extremely broad and depends on the situation. A pivot table usually consists of *row*, *column*, and *data* (or *fact*) fields. See an example and how to convert tables to pivot table in Figure 3.10.

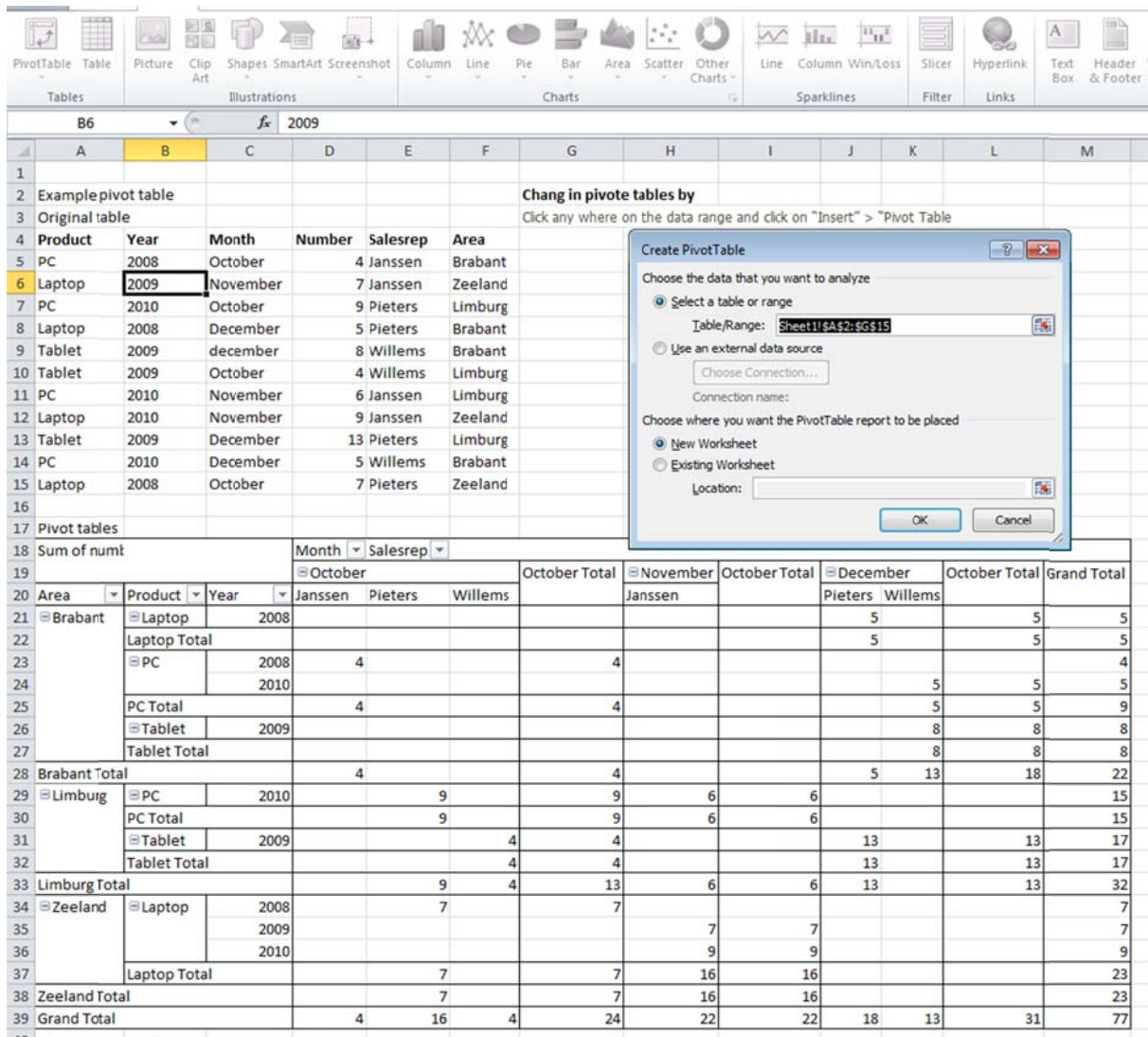


Figure 3.10.

3.4 Causal models and MS Visio

If a spreadsheet should help in decision making and reasoning, we first need a good causal model that describes the decision problem. A causal model has variables, which contain data values, and their relations, which transform the values of an independent variable to a value for the dependent variable. In a spreadsheet both these data and transformational relations (formula) can be stored. First, however, we discuss how causal models can be made. For this, we use Visio again:

* Select from the general templates 'Block Diagram'. This is a template by which one can represent values as blocks and causal relations as arrows. See Figure 3.11.

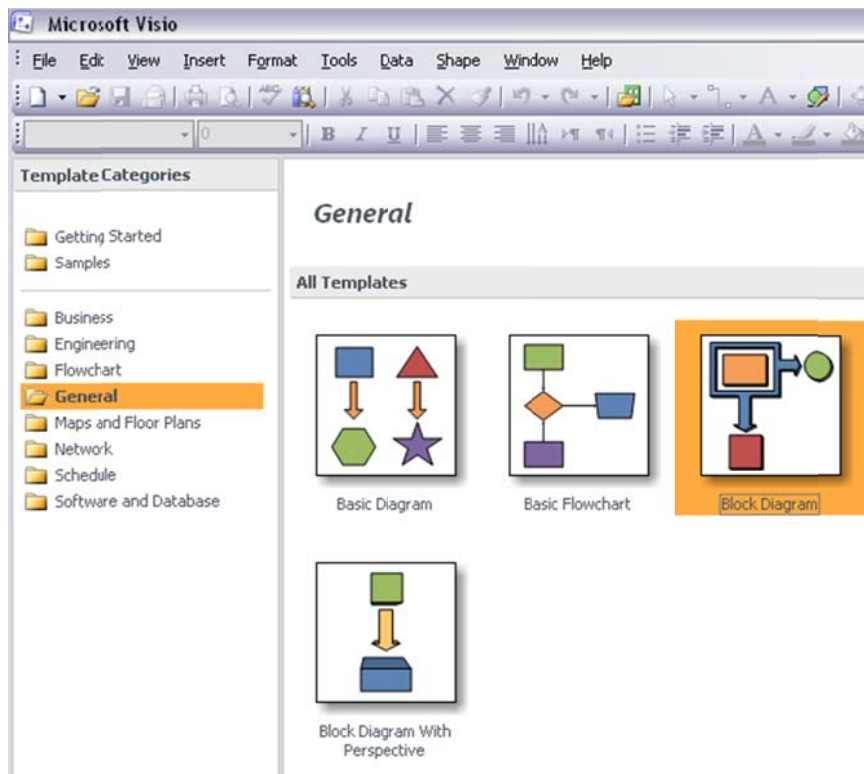


Figure 3.11.

This design contains data components and relationships. For Grand Café The Palace, profit is the main dependent variable, and costs have negative impacts on profit, whereas revenues have positive impacts on profit. There are three categories of fixed costs:

1. Electricity, water and gas
2. Management and administrative salaries
3. Housing (rent) and insurances.

There are several variable costs like:

1. Salary costs of cleaners, waiters and kitchen personnel
2. Purchasing costs of the drinks, meals and snacks.
3. These variable costs are highly dependent on the number of guests.

The revenues consist of

1. Drinks. Grand Palace has three categories here: cheap drinks, medium drinks and expensive drinks, with different sales prices and different purchasing costs.
2. Meals. Like the drinks, Grand Palace offers three categories here.
3. Snacks. Grand Palace offers different snacks, but all for the same price.

When you choose Block Diagram, you can use the different connectors and blocks to build a clear model. An example for Grand Café The Palace. See Figure 3.12.

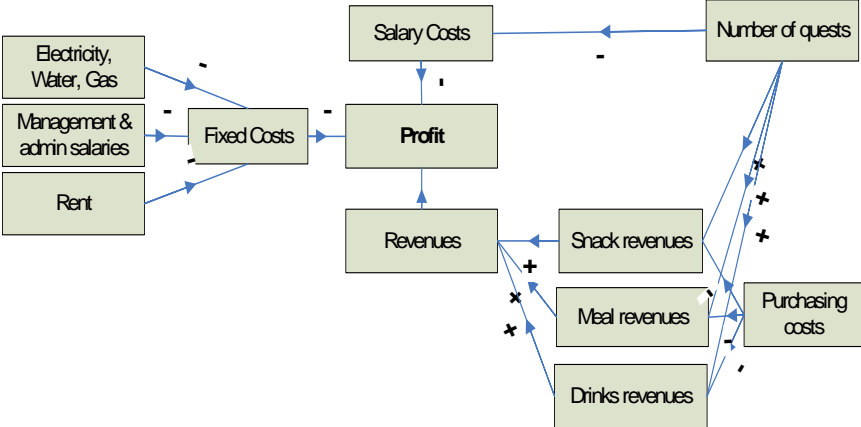
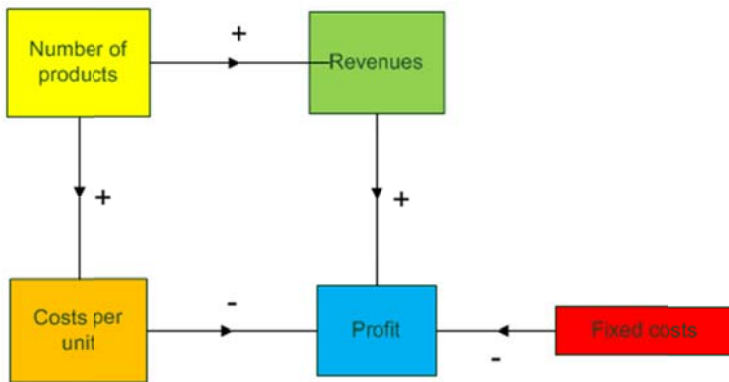


Figure 3.12

Note that a + stands for a positive relationship and a – for a negative relationship. A positive relationship means that when the box on the one side of the arrow becomes more, than the box on the other side of the arrow becomes also more or when the box on the one side of the arrow becomes less, than the box on the other side of the arrow becomes also less. A negative relationship means that when the box on the one side of the arrow becomes more, than the box on the other side of the arrow becomes less and the other way around.

Of course one can extent the model by adding a decision point or use the room left for comments under the model for the pointing out of some important aspects. In this example we chose to focus on showing the clarity of the causal relationships. Immediately you can see what kind of effect an input factor has on the final profit.

To see the link between the causal diagram and an Excel spreadsheet, look at the following, simplified example in Figure 3.13, where each variable reappears as an item in the spreadsheet. Next formulas are given that express the causal relations between the (input and output) variables.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Fixed Costs	10												
2	Costs per unit	2												
3	Number of products	1	2	3	4	5	6	7	8	9	10			
4	Revenues	5	10	15	20	25	30	35	40	45	50			
5	Profit	-7	-4	-1	2	5	8	11	14	17	20			
6														
7	COMMENTS:													
8	The fixed costs of 10 are independent of the number of products													
9	they negatively influence the profit.													
10	The costs per unit are dependent of the number of products and they will rise													
11	in proportion to the rise of the number of products (so a positive relationship).													
12	The costs per unit influence the profit negatively (when the costs per unit rise,													
13	the profit will decrease).													
14	The number of products are given in this example, so this is a independent													
15	variable. The number of products positively influence the costs per unit and the													
16	revenues.													
17	The revenues are dependent of the number of products. This is a positive													
18	relationship. This will become clear when we look at the used formula													
19	(see the inserted comment).													
20	The revenues positively influence the profit.													
21	The profit is dependent on the costs per unit, the revenues and the fixed cost.													
22	These relationships are respectively negative, positive and negative. This													
23	will become clear when we look at the used formula (see the inserted formula).													

Gebruiker:
Formula used:
=\$B\$4*K3

Gebruiker:
Formula used:
=K4-\$B\$1-K3*\$B\$2

Figure 3.13.

If the models are well expressed in the spreadsheet structure, more advanced what-if analysis is possible to support reasoning and decision making. As stated in the beginning of this chapter, MS excel (and spreadsheet in general) are excellent tools to help people making decisions on basis of causal understandings of relevant goals and means. A couple of examples are: How many employees do I have available for how many hours per month, and how much do they cost per month? What are the start-up costs of a certain machine and what is the payback time? How much can a project cost and what are realistic margins? What we like to see is *what* happens *if* something changes (e.g. the salary of the personnel). What is the impact of salary costs on the company's profitability? Or how dependent is the

organization on the number of visitors? For our case, Grand Palace wants to analyze what would happen if more or less guests are present, or if people start consuming cheaper meals and drinks. To be able to do so, we need to present the causal relations mentioned in the beginning of this chapter in a spreadsheet design. This spreadsheet needs to present the fixed and variable cost parameters of the causal diagram, the revenue variables, the variable “number of guests” and we need to be able to define the strength of the causal relations between these variables. These variables and their parameters are given in Figure 3.14.

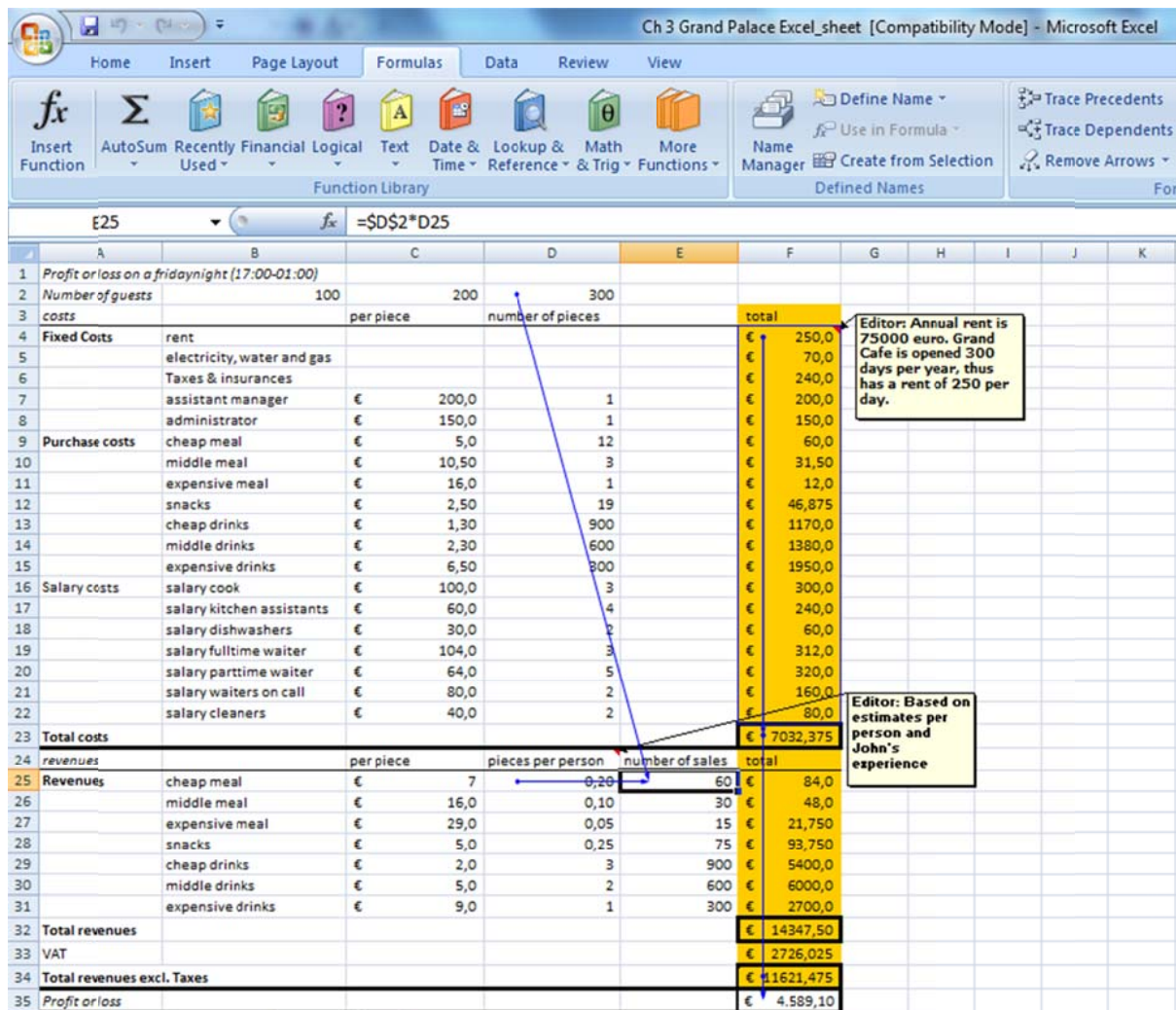


Figure 3.14.

In Figure 3.14 we see the following....

- The blue arrows, called “trace precedents”, show the causal relations in the spreadsheet. To see these arrows in MS Excel do the following:
 1. Click on a cell in which you entered a formula

2. Click on the tab ‘formulas’
 3. Click on ‘Trace Precedents’ (Dutch: “broncellen aanwijzen”). The arrows show where the output in the selected cell comes from/are based on. The other way around, if you want to show which cells are dependent of a specific cell, than:
 4. Click on that specific cell
 5. Click on ‘Trace Dependents’ (Dutch: “doelcellen aanwijzen”) (under the tab ‘formulas’)
- In cell E25, we reuse the parameter of the number of guest as given in cell D2. This cell has \$ signs before the column and row indicators (\$D\$2) so that the same number can be reused in E26 till E31 (if you copied the formula of cell E25 to E26 till E31). If we would not have done so, copying the formula from E25 to E26 would have change D2 to D3 etc. This also named *absolute cell addressing* (default is thus relative cell addressing). When one changes a selection of cells which contains formulas, the formulas also change. For example: when you have the formula ‘=SUM(B2:B10)’ in cell B11 and you move this to cell F51, the formula changes to ‘=SUM(F42:F50)’. This happens because the cell directions are connected with the position of the cell which holds the formula. In this case you must use absolute cell directions. You can do this by putting dollar signs before the coordinates (the row and the column indicators) in the original formula. That means that the formula from the example will be ‘=SUM(\$B\$2:\$B\$10)’. When you copy this formula from cell B11 to cell F51 the formula will not change. But when you copy the formula ‘=SUM(B\$2:\$B\$10)’ to cell F51 (so, only dollar signs before the rows), the formula will change to ‘=SUM(F\$2:F\$10)’. Only the coordinate with the dollar sign in front of it, stays the same when copying the formula.
 - As you see in the picture, one can insert comments for explaining your assumptions. You can use this for to explain why you have chosen a particular value or why a particular value is so high or low:
 1. Select the cell and press the right button of your mouse.
 2. Choose ‘Insert Comment’.
 - In this spreadsheet, you calculate the profit or loss on an Friday evening. This particular evening is a normal Friday night. But *what happens if* it suddenly becomes very quiet in Grand Café The Palace; e.g. only 100 guests? For this, copy the whole sheet to another page, and change D2 into B2 for cell E25. You will also probably need less waiters, less cleaners, and less kitchen personnel.
 - Another option of MS excel is to perform a “*What If*” *analysis* using a specific goal variable. Take the following example (see Figure 3.15). Jacqueline and Peter want to hire the Grand Palace to celebrate their 10th year of being together. They want to invite 200 guests, but do have only a budget of 8500 euros. So what are the possibilities?

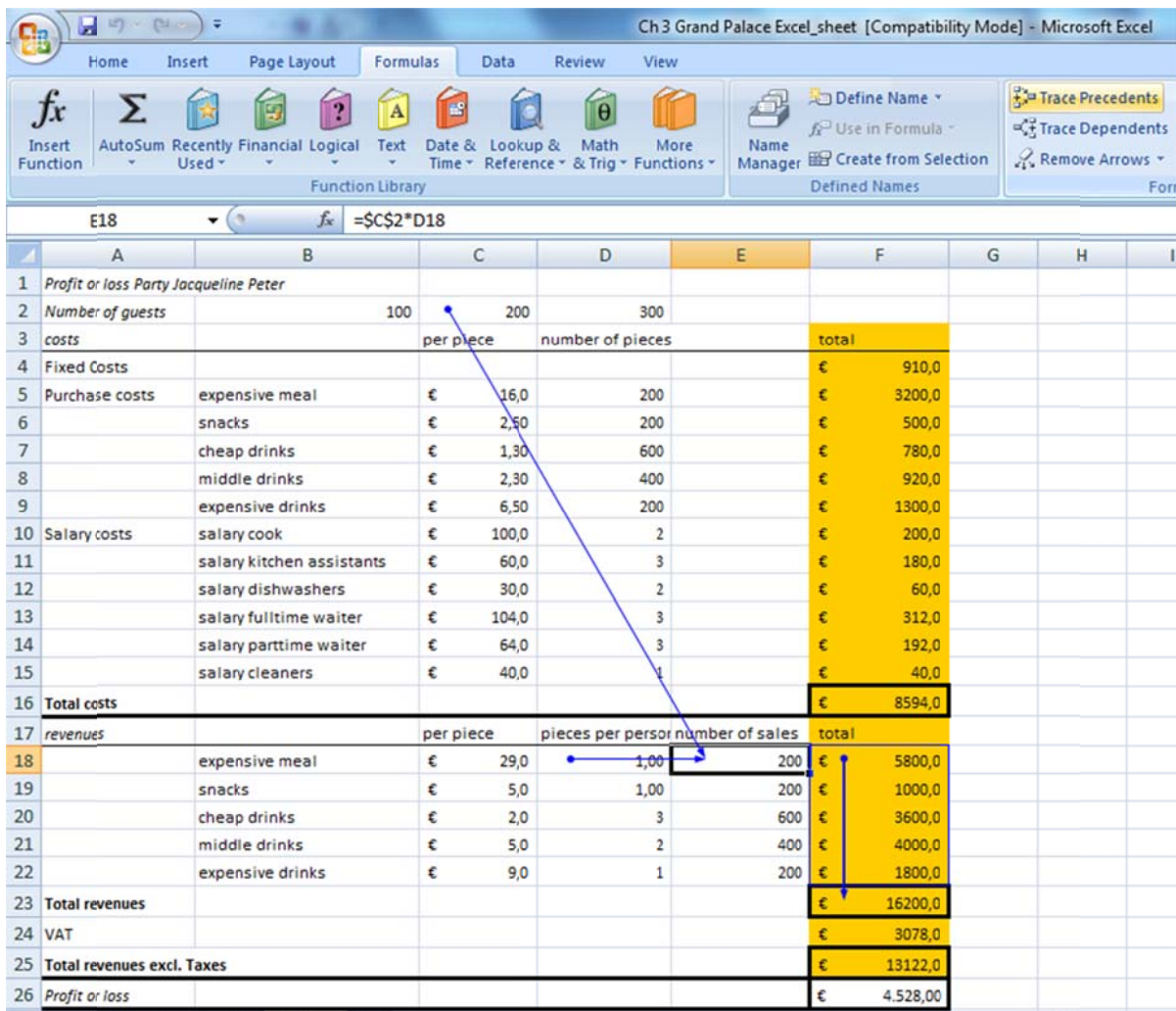


Figure 3.15

Jacqueline and Peter want to treat their friends very well by offering a good meal. Because the number of guests will be 200 (instead of 300 normally), less waiters, cleaners and kitchen personnel are needed than on an average Friday night, but still the price will be over 16,000, which is far above what Jacqueline and Peter can effort. John le Grand is willing to reduce the price by 1,000 euro, but still Jacqueline and Peter cannot make it. They do not want to reduce the 'service level' to their visitors and consequently, they propose to reduce the number of visitors. For this, they performed a What-If-analysis (see Figure 3.16) by:

1. Click on 'Data'
2. Click on 'What-if-Analysis' and choose Goal seeking
3. Fill out the small screen in figure 3.16.

Note you fill in 8500 instead of 7500, because they get 1000 euro discount).

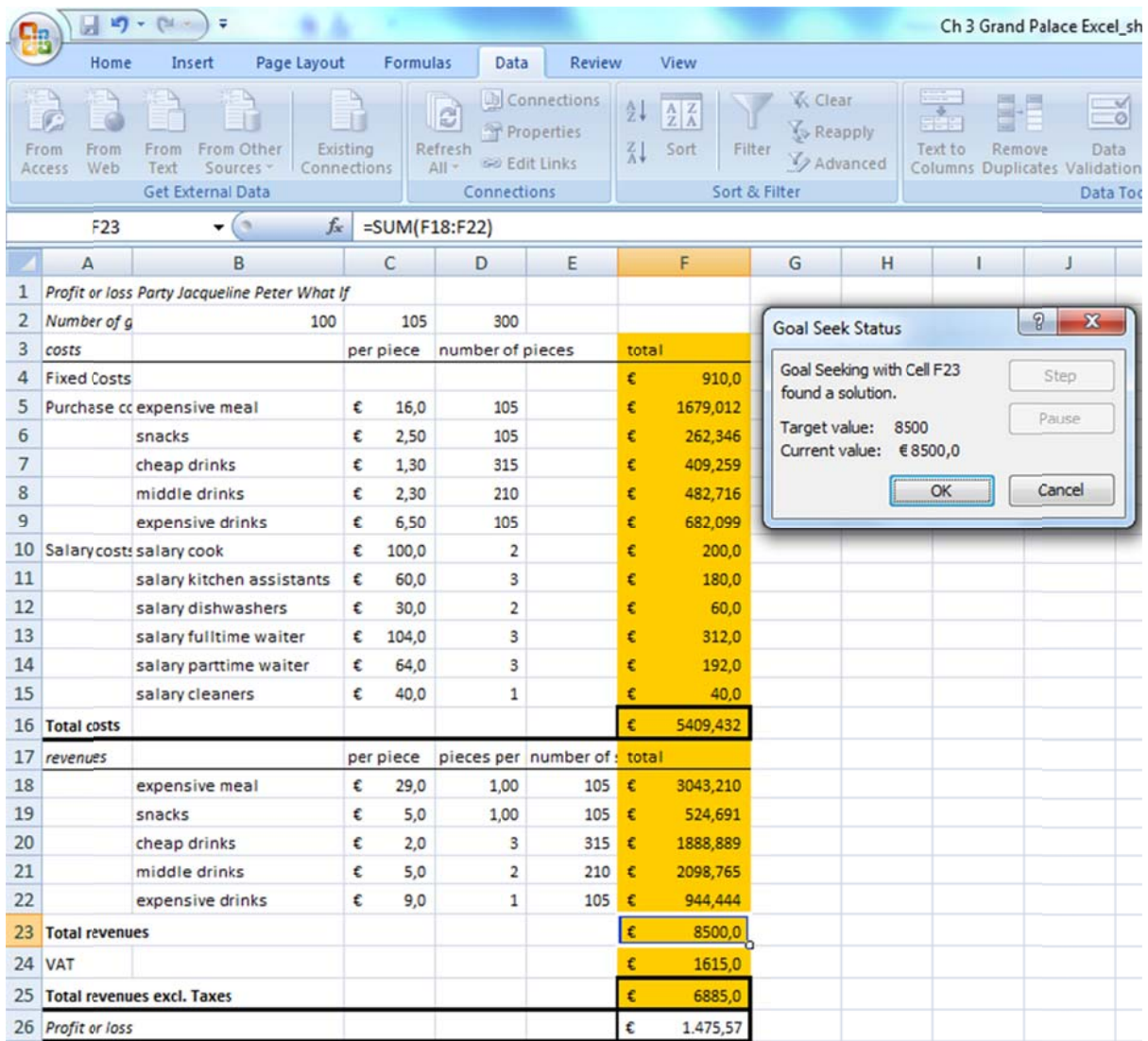


Figure 3.16

The result is that Jacqueline and Peter will have to leave 95 friends at home. John, however, said that with 105 guests, he has less costs, because he will not need the parttime waiters and only needs 1 kitchen assistant. Jacqueline's and Peter's parent's decided each to sponsor the event by 1,000 euro. So if you have the spreadsheet well organized, you will be able to quickly calculate the number of people they can invite.

3.5 Further spreadsheet study

There are excellent practical books written about spreadsheets which can help with the development of advanced use. We recommend Tennet and Friend's (Tennet and Friend 2005), Guide to business modeling. For a more advanced study we recommend books on decision support systems and business

intelligence (e.g. (Turban, Aronson, and Liang 2005)). There are several tools suppliers in the industry. For example: Microstrategy, www.microstrategy.com.

3.6 Exercises

1. Printing or e-readers? Imagine an editorial office with 250 people, who produce articles and read a lot for their research. At the moment people mostly read articles after having downloaded them and having them printed out. An average employee reads about 7 articles a week and reads also about 10 draft manuscripts from colleagues a week. An average article is 10 pages. There is only one very fast network printer for the whole group. This printer needs a new toner after 2,000 pages, costing 100 euros. One person is fully occupied managing this printer (salary costs 45000 per year). Printing out takes only 10 seconds, however, people have to walk to the printer (about 1 minute for each print out), and there is a average cue of 1 minutes per each print. Paper costs are about 10 euros per 500 pages. The average salary cost of the editorial office is about 60000 per year. Assume that one works 1600 hours per year. John Michels considered giving all employees an iPad for 600 euros a piece for free for each two years. He assumes that this will result in at least 75% less printing. Calculate what the costs and benefits are of this idea for the office. Also test this idea using different assumptions regarding % of print reduction, time spend on printing, and number of prints per person.
2. Cash forecasting. SmileYou is a specialist fashion company, started by Mary-Ann, who was previously a top fashion model but quit the business a few years ago. Her designs are very popular and the business is growing fast. At the moment the return per year is 30 million, and the company grows each year over 20 percent in volume and returns. Production is outsourced to companies in China, Turkey and India, who all demand pre-payment before delivery. The relation between production costs and sales price is 0.5. The net sales costs (including logistics and warehousing) are about 30% of the sales price. The time gap between payment of producers and payment by customers is 3 months. Calculate the cash flow for needs for SmileYou for the next two years, given an 8% interest level and fixed costs of 10 million that increase each year by 10%. Also calculate alternative situations, e.g. higher and lower growth rates, and higher and lower interest rates. Also make graphics for the next 5 years regarding cash flow needs. How much of the growth will have to be funded by banks or stocks?
3. Just a finishing questions: Why do we need causal models before developing a spreadsheet-based decision support tool?

4. Analytic thinking and multi-perspective business modeling

4.1 Kantian view and MS Visio

Following Kant, observing anything (and thus also collecting information and data) is enabled by some key *analytic a priori*. Thus we are enabled to describe phenomena and desired states only by these analytic constructs. All these analytic a priori can be integrated into a more or less coherent analysis and design language, which we name *synthetic a priori* (after Kant) (Hartnack and Hartshorne 1967). These synthetic a priori often have a view of the world at its root, which we name an ontology (note for example that the word “profit” may comprise and exclude different categories depending on the fiscal policy of an organization and that competing firms will offer different activities for a similarly named service) and for business (process) modeling different software tools offer different tools and features (e.g. for business modeling ARIS, Bizagi and Petrinets offer very different sets of analytic a priori’s). For analyzing organizational and business processes, several a priori are important: time (when), space (where) (both dimensions are from Kant), what, how, who and why (these final four are from Sowa and Zachman , (Sowa and Zachman 1992)). Each model gives a different view of the phenomenon and the selection of the a priori’s is therefore an important decision. Each decision here implies certain *opportunities and limitations*. Nowadays there are many software tools to describe and analyze a phenomenon by mapping and modeling different perspectives and then integrate the perspectives. Several of these multiple perspectives are discussed in this chapter, and we offer a Kantian information management model as starting from scope definition, going to analysis using different a priori’s, next aiming at integration of these perspective, for the final purpose of supporting organizational change. See Figure 4.1.

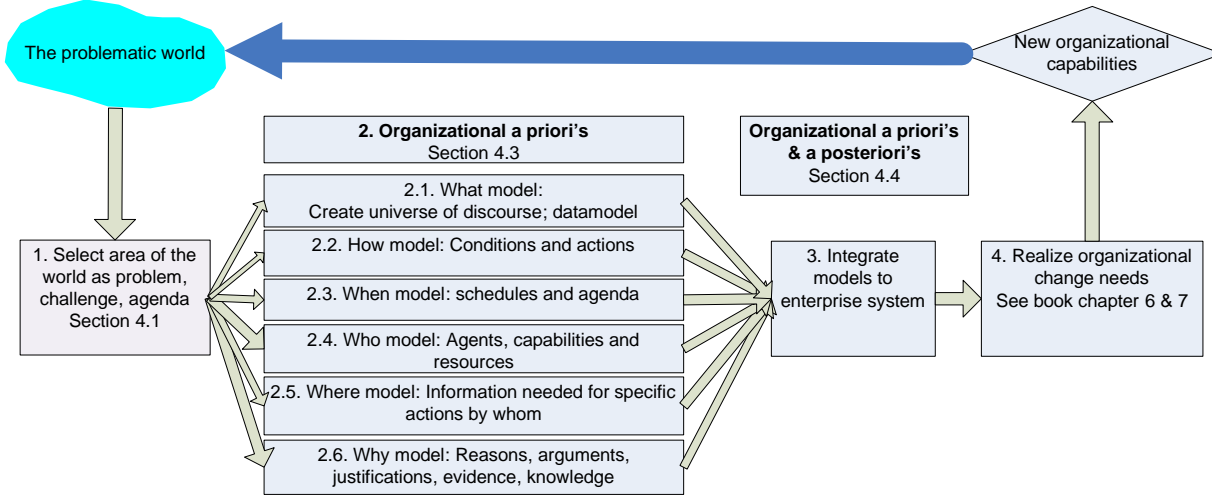


Figure 4.1: The Kantian information model (Wijnhoven, 2009)

4.2 Goal of this chapter

People are able to make empirical observations, named a posteriori propositions, following Kant, by using (analytic and synthetic) a priori as spectacles to observe the world. However, this spectacles may enable viewing, they are necessarily biased and incomplete. These biases are not always wrong, because people are not able to observe everything and depending on scope and purpose some bias is required. But, if we are biased, we have to be aware that we are and thus intentionally should select a bias or understand it and adopt other perspectives to be integrated. This implies that the concepts we use for acquiring and organizing data (like data models and calculations models) are a priori propositions and that the data in our databases and the outcomes of our spreadsheet calculations are a posteriori propositions.

In this chapter, we first describe elements of MS-Visio as a huge set of a priori's among which we will need capabilities to choose for being able to use them successfully in section 4.3. More specifically for organizational modeling (yes, we need models as *representations*, thus information, again for storing and exchanging insights!) we will use the following a priori's and related MS-Visio tools: “What models”, “How models”, “When models”, “Who models”, “Where models” and “Why models” with MS Visio (the last being introduced earlier in this QuickStart). These will be introduced in section 4.4. Finally, we are going to integrate the models to an enterprise system, by which we can realize organizational change needs. This will be the subject of section 4.5.

Before reading further, we strongly recommend to first read the chapter in Wijnhoven (The Kantian view and multiple perspectives) before starting this chapter, so you have a better idea what you are doing in this chapter.

4.3 Basic skills of MS Visio

MS Visio is a business modeling tool by which one can create drawings, flowcharts and other reports of relevance for organizations and business. The program includes many templates which create a simple starting point for your design. From there you can easily insert various forms and subjects in your drawing.

When you start with MS-Visio, first the start screen of Figure 4.2 comes up. In this screen, you can choose which model you want to create.

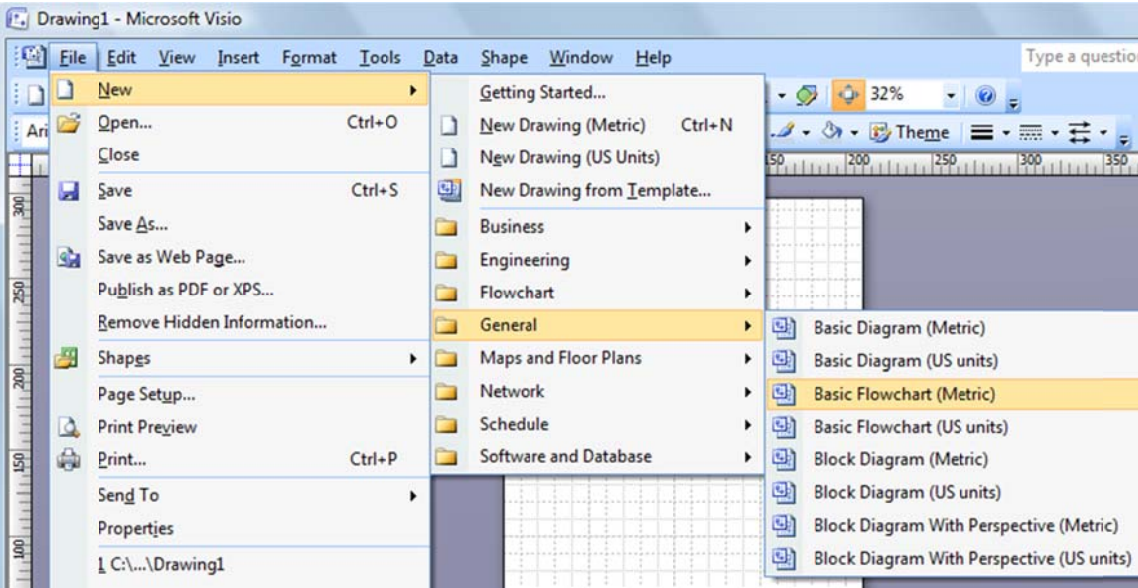


Figure 4.2

In addition to these standard templates, there is also the possibility to download templates from the Internet. For example, you can download templates from the Microsoft Office site. When you click on 'Template' under 'More on Office Online', you can choose between many templates. It is also possible to choose another template by creating a new diagram. When you choose a template, it appears on the left side of the drawing page. This template (also named "stencil" by Visio) contains all shapes you need for a specific chart. Templates includes, beside these shapes, also certain styles, settings and tools

needed for that chart. But how to open a template when you are no longer in the opening screen? For this click on “File”, move the mouse to 'New', stand on it, choose the category and click on the template you want to use. See Figure 4.3.

Figure 4.3.



In this example we open a ‘Basic Flowchart’. After opening it, we see our drawing environment with menus, toolbars, stencil shapes, etc. The drawing environment provides a 'grid', so it’s a bit easier to post shapes. Shapes contain connection points when you place them on the grid (drawing paper). By printing the drawing the connection points, grid etc. will disappear.

Suppose we want to make a building plan. The next step is to insert 'shapes'. If you open a template, you get an empty sheet, which is similar to the other Office programs, like Word. Now, draw by using different shapes. See Figure 4.4.

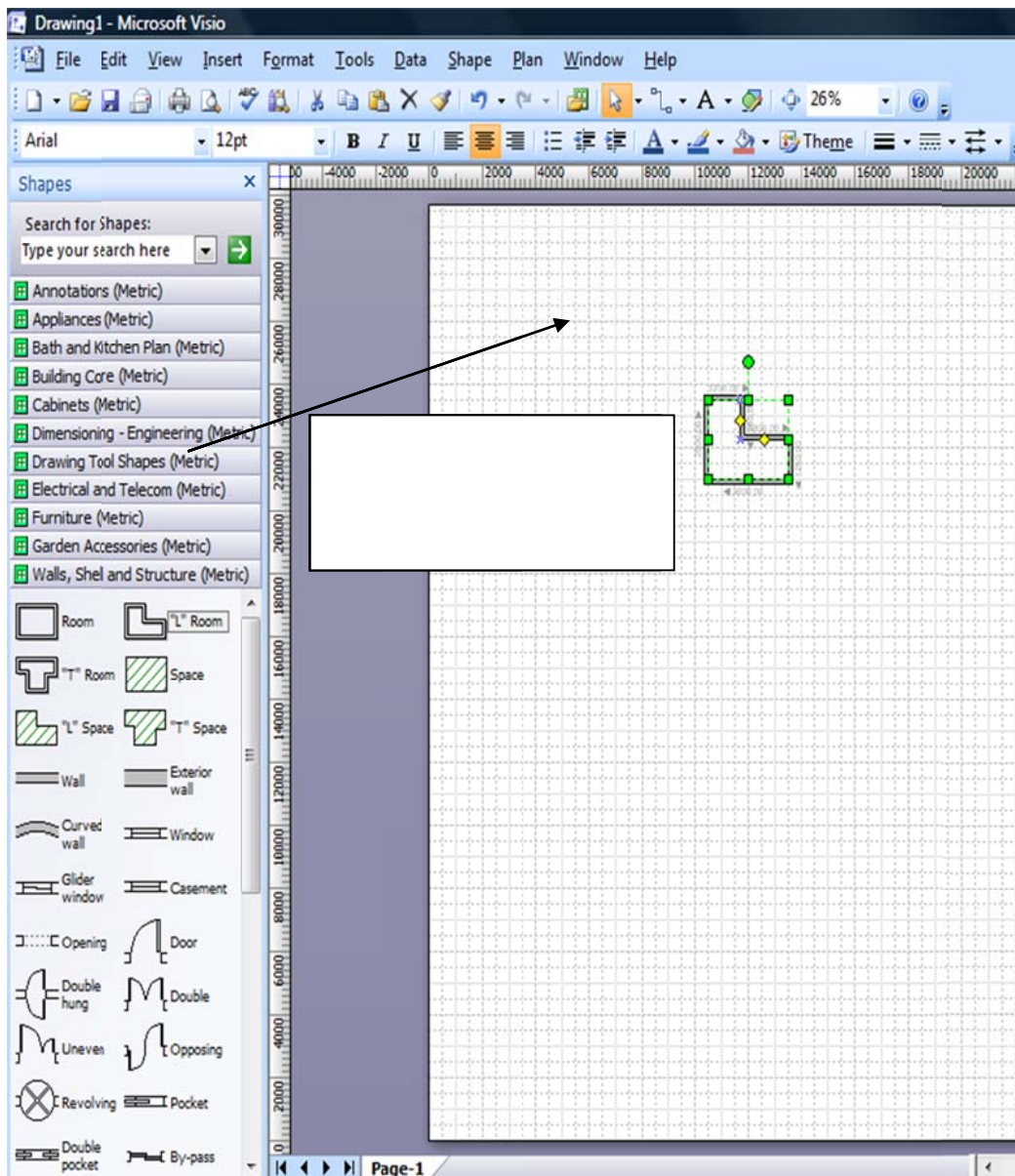


Figure 4.4.

Sometimes you are looking for a shape which is not included in the list. Then you can use the search engine of MS-Visio, for finding that specific shape. Type in the search part a description of the subject that you want to use and click on enter. The search part is at the top of the 'shapes bar'. When you search for 'door', the following options are shown. See Figure 4.5.

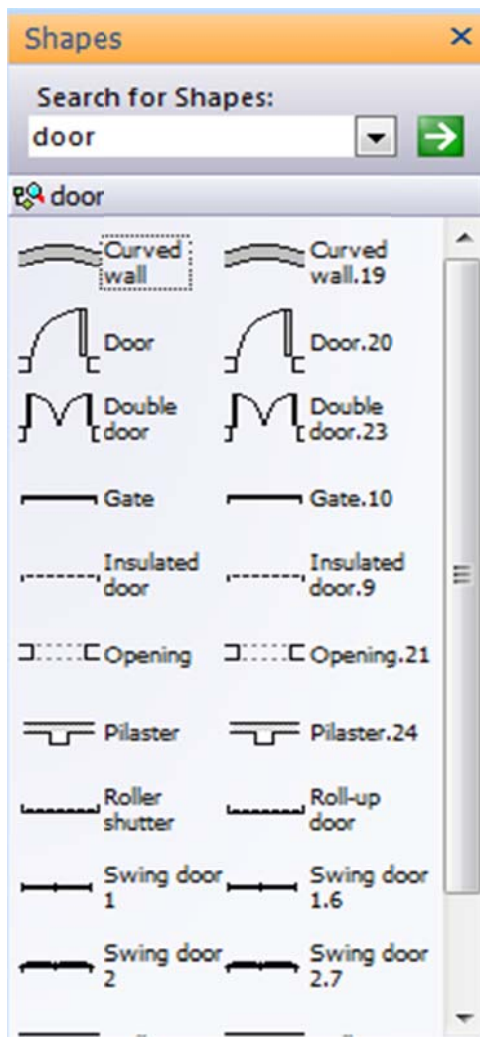


Figure 4.5

One can also open a new stencil in the same template. Go in the menu bar to 'File', then 'Shapes', and find the shapes you want in the drawing page.

Adjusting Shapes

If you added a shape in your drawing, you may also want to adjust it. There are various ways:

1. Move the mouse on one of thboxes, and pull the shape to the right size as given in Figure 4.6.

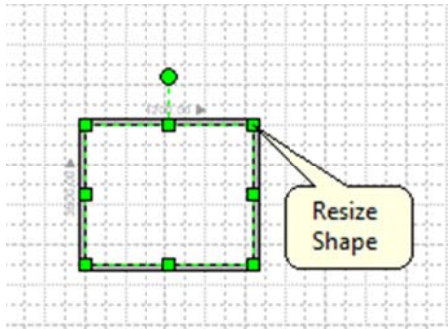


Figure 4.6

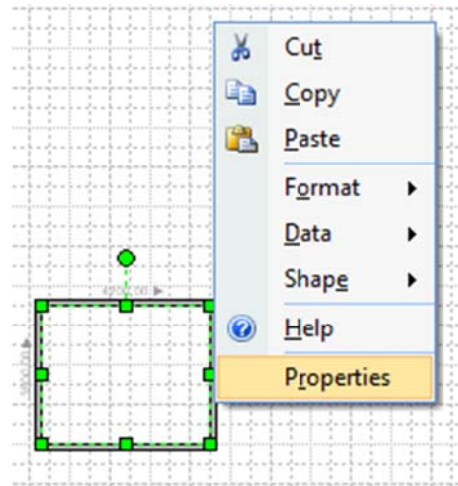


Figure 4.7.

2. Right click on one of the lines, then choose 'Properties' See Figure 4.7. Here you can specify the right size of the shape. You can fill the size in millimeters for the length and width See Figure 4.8.

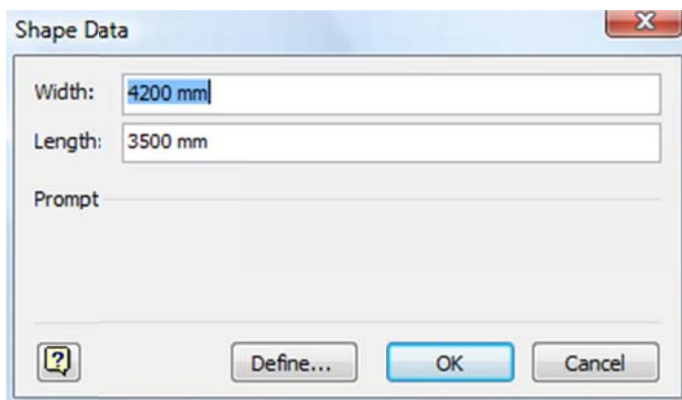


Figure 4.8

Other options of Visio

You can affect a lot in Visio, but not all options are visible. Sometimes you do not want this, but it is useful to know where you can find these opportunities. Go to 'View', then choose 'Toolbars' and finally choose the toolbars you want at the top of your screen. Sometimes the template does not have the right size. It is useful to know how to edit in that case. Choose 'Insert', then 'New Page'. You will see the option 'Page Setup', in the different tabs you can specify exactly what you want. See Figure 4.9.

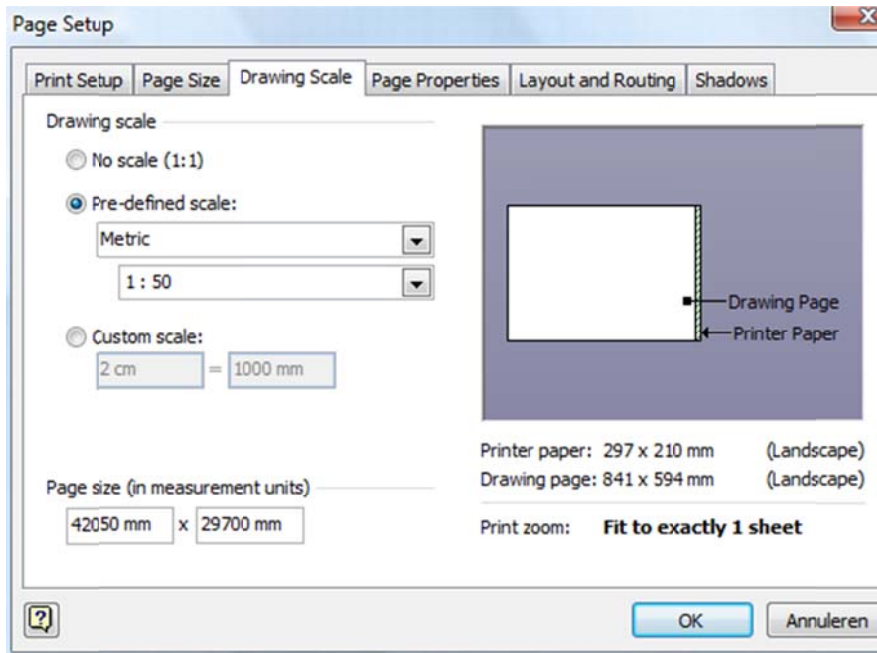


Figure 4.9

As in any program, there are many Visio features that are invisible, but you can change this. Go to the 'Tools' button in the menu bar and then choose 'Options'. See Figure 4.10.

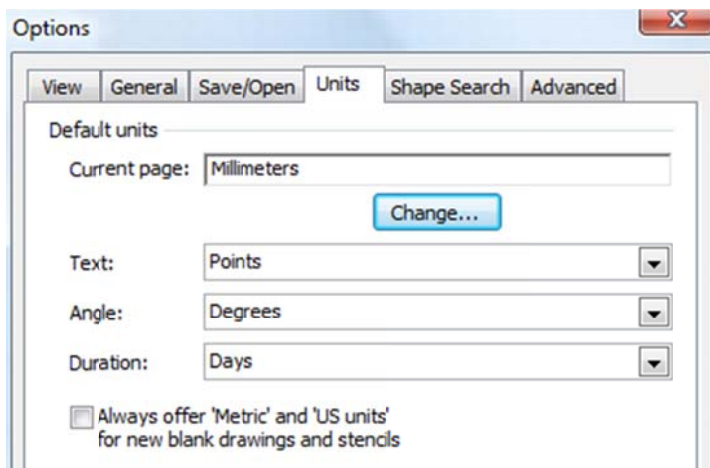


Figure 4.10.

Text can be added to the shapes. Click on a shape and start typing. Visio zooms automatically to the shape, so you can read what you are typing. If you want to delete text quickly, double-click the shape. This makes the whole text in the shape selected. Then delete it, or type a new text. In addition to text in shapes you can insert loose text in Visio. This can be done with a textbox. Just click on the text tool

on the toolbar, and make a square or rectangle with a single click on the drawing page and then drag. Thereafter you can insert the text and edit it. For example you can underline or italicized the text.

Connecting Shapes

For connecting the shapes with each other, MS-Visio has the 'Connector Tool'. Put your mouse on a junction of the shape, click on it, and connect it with the other shape. The junctions will be red, when the shapes are connected. When the junction turns red, the connection continues by moving the shapes.

There is also another way of connecting the shapes. Select the shapes you will connect. Go in the menu bar to 'Shape' and then 'Connecting shapes'. You will see that there are different connections, 'Straight', 'Right-Angle', 'Curved'. See Figure 4.11.

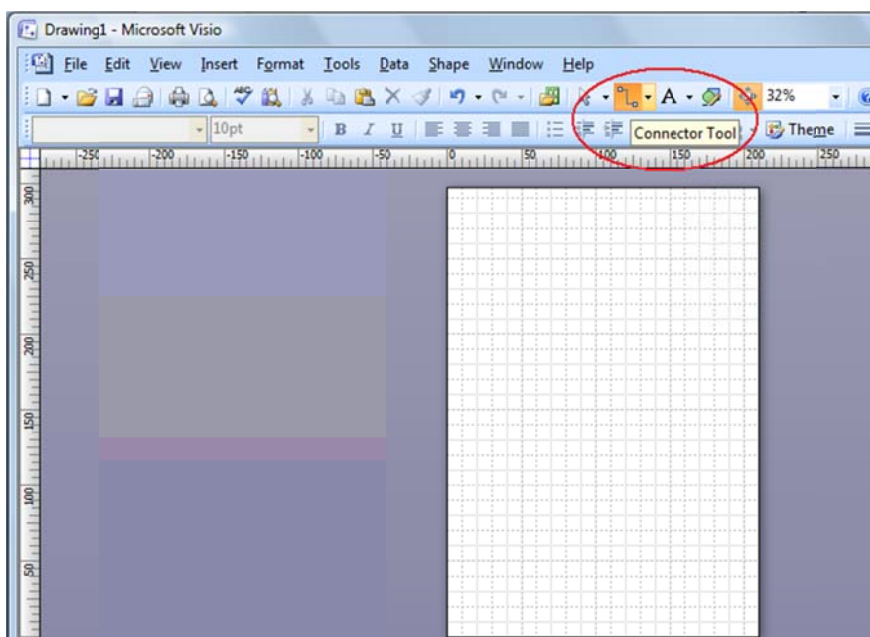


Figure 4.11

Editing shapes

Like the 'Text Tool' and 'Connector Tool' there are also a number of possibilities to change the color of the shapes and lines. See Figure 4.12.

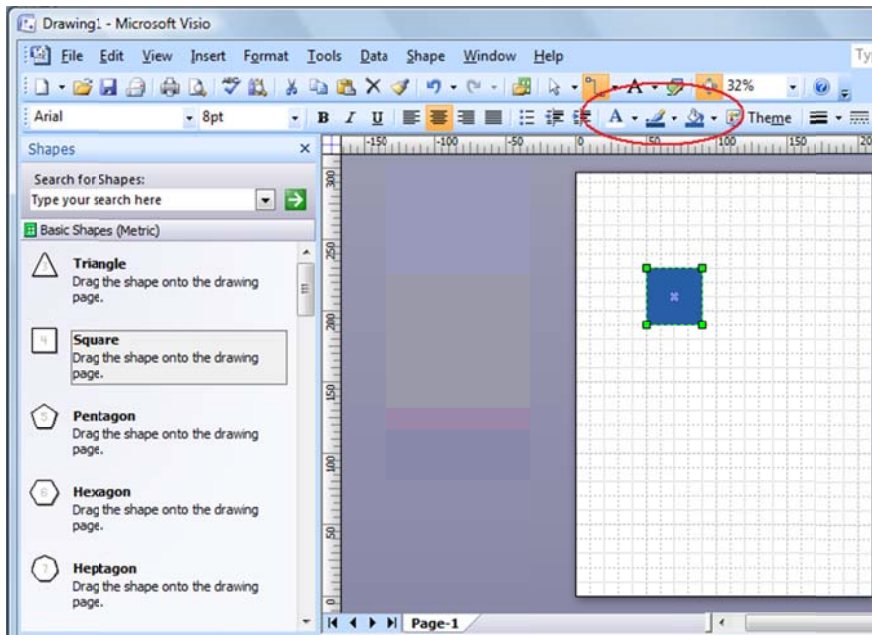


Figure 4.12.

Add a diagram or shape to an other Office-program

Frequently you will add the drawing to a MS Word file. There are a few ways to insert a drawing in Word.

1. You can save the drawing as a JPEG or Bitmap. Then open the Word file click in the menu bar on 'Insert', and 'Picture'. Find the file on the location you saved it, and click on 'Insert'. See Figure 4.13.

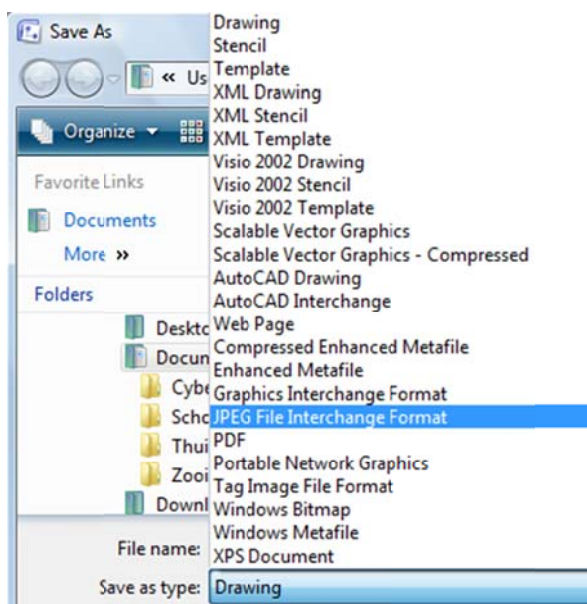


Figure 4.13.

When you save a shape as a JPEG, you cannot change that shape in Visio anymore. Per default, MS-Visio saves the shapes as a drawing (.vsd). So when you want to change the shape in the future, you must save your file as a drawing.

2. The other way is to select the model, or a part of it, and use ‘copy’ and ‘paste’ to insert it in the Word file. The advantage is that you can change the drawing in Word by a ‘double-click’.

4.4 Multi-perspective business process modeling using MS Visio.

After the short introduction of MS Visio, we will discuss the assignment. As marked in the introduction of this chapter, Kant’s epistemology emphasizes different a priori’s which result in different models. One can create the models in separate Visio pages, but in the same ‘Visio book’. For the different perspectives we need different templates. The relationship between shapes and certain templates fits well with the theory of Kant. For instance a certain shape like a process, may belong to a template such as a flowchart. Following Kantian reasoning, a business process would be a *synthetic a priori*, consisting of multiple analytics a priori’s like activity, time, sequence, information flow and actor (depending on the ontology, of course more can be included or excluded). The template *represents* a ‘*synthetic a priori*’, in which the various shapes are related.

‘How’ Perspective

The first model discusses the ‘how’ perspective. This is a roadmap that describes what must be done in certain situations. After opening MS Visio, you must choose a template. For this perspective we chose the Basic Flowchart template under MS Visio “business”. Name the page before you start. You can rename a page in the same way as an Excel-sheet. In the bottom of your screen you see the tab ‘Page’, click with the right mouse-button, and type a proper name (e.g. how) at ‘rename page’. The next step is to create a model by connecting the right shapes. A brief legend of the shapes is needed to describe the meanings of the shapes., like in Figure 4.14.

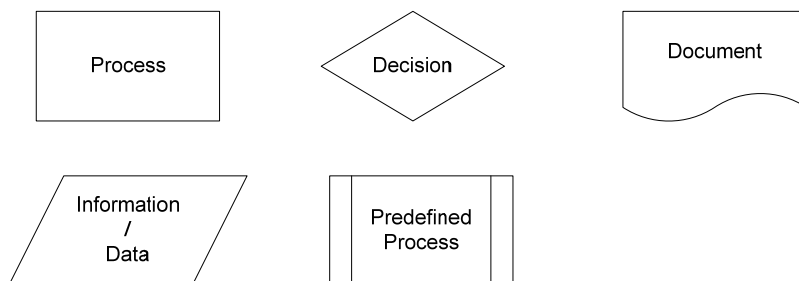


Figure 4.14.

We do not give a step by step description of how to make a ‘how’ model. There is a guide of building a ‘how’ model in the book of Wijnhoven (2009). An example of a “how model” is given in Figure 4.15.

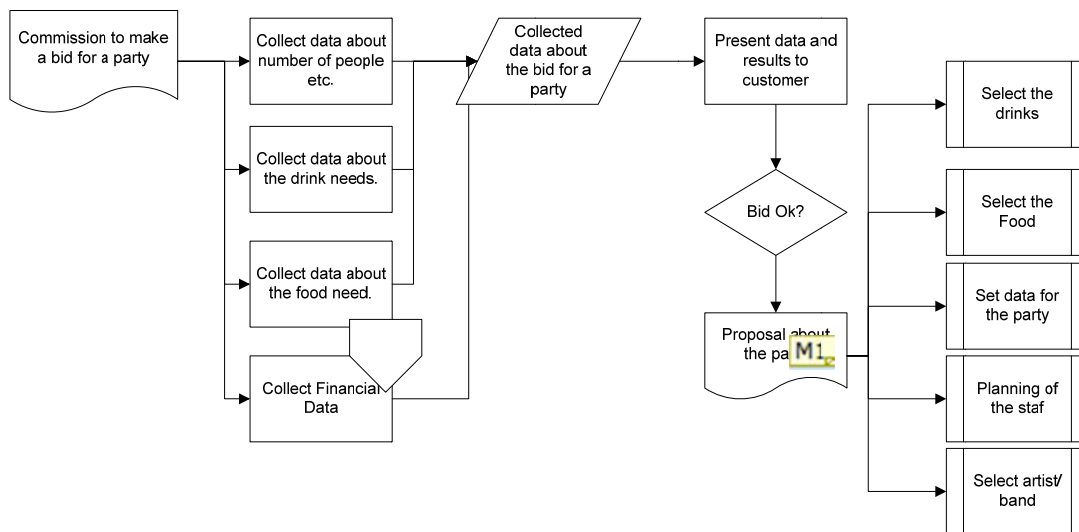
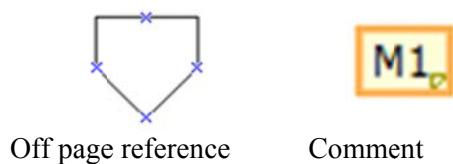


Figure 4.15

In the model are 2 unusual objects namely (1) the ‘off page reference’, which when double-clicked links directly to another model (We discuss this later by the integrated workflow model) and (2) the commentary or a remark object, which can be created by clicking on ‘Insert’ in the menu bar, then clicking on ‘Comment’. For both, see Figure 4.16. One can also add colors to the shapes to clarify the meaning of the different shapes.



Off page reference

Comment

Figure 4.16

‘Where’ Perspective

This is an important perspective. The 'where' perspective shows the communication needs between departments if a project is under construction. The 'where' perspective consists of two parts. So open two new pages in your Visio-workbook (‘Insert’ → ‘New Page’ → ‘Name’).

The first step of the 'where' model is to create an 'Organization Chart' in which the sections are displayed briefly. Just make sure you choose the right template namely 'The Organization Chart Template'. For opening this template click on 'File' in the menu bar, followed by 'Shapes', then 'Business' and click on 'Organization Chart'. See Figure 4.17 for an example of an Organization Chart.

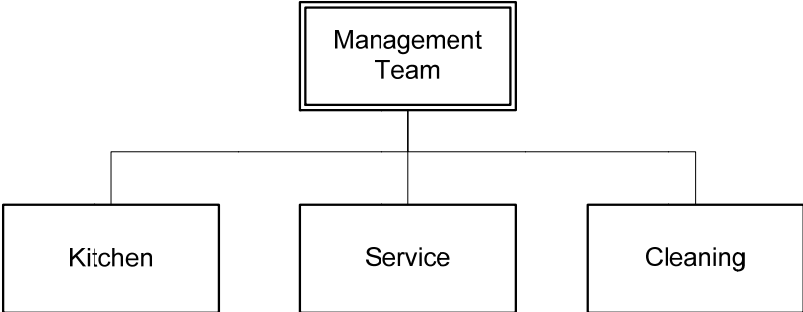


Figure 4.17

The second part of this perspective consists of an integrated model, which related the first part of the 'where' perspective to the 'how' perspective. Create it by using "swimlanes", which is called a 'Cross Functional Flow Diagram' in Visio. Open a new page in the corresponding set of shapes by clicking on 'File' → 'Shapes' → 'Flow Chart' → 'Cross functional flowchart shapes'. There are 2 shapes in the left column of the worksheet. Drag the 'Functional band' on the drawing page. See Figures 4.18.

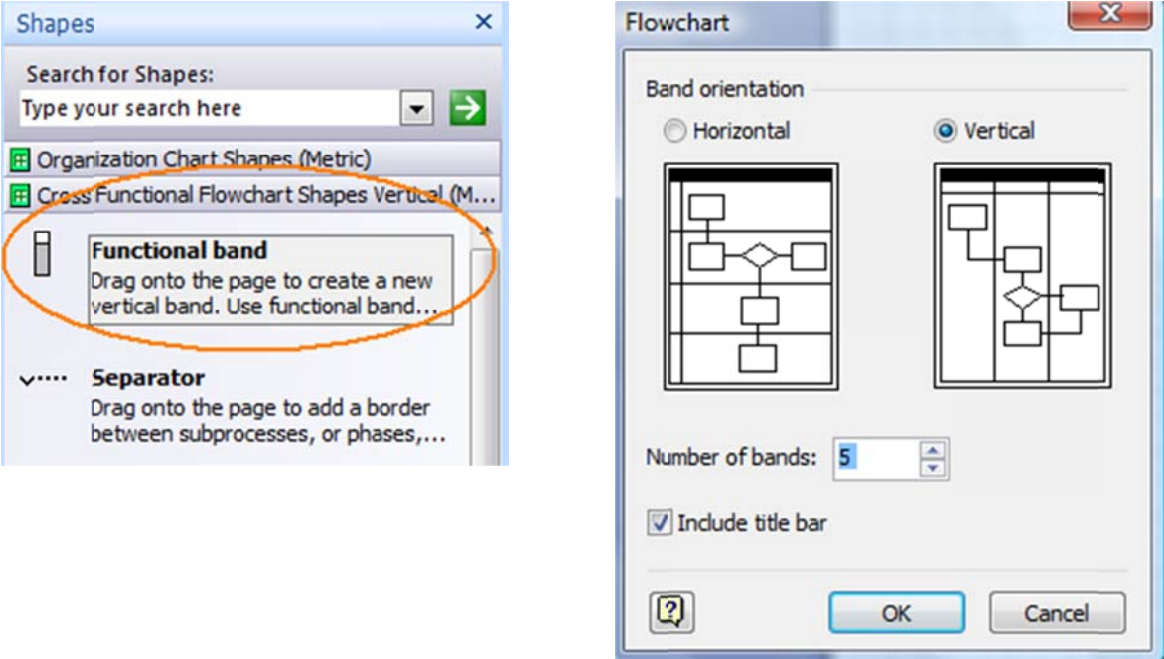


Figure 4.18

Then we get the next screen of Figure 4.19. Choose 'Vertical' (or horizontal) and enter by 'Number of bands' the number of departments. You defined the number of departments in the first part of this perspective. Click on 'OK' and the framework of the model appears on your drawing page. Enter a title and fill in the department names in the columns. It is now just a question of exactly replicating the 'how' model, and decide which department makes which step. So copy the 'how' model, and place each department in the right department. Connect the shapes in the same way as in the 'how' model.

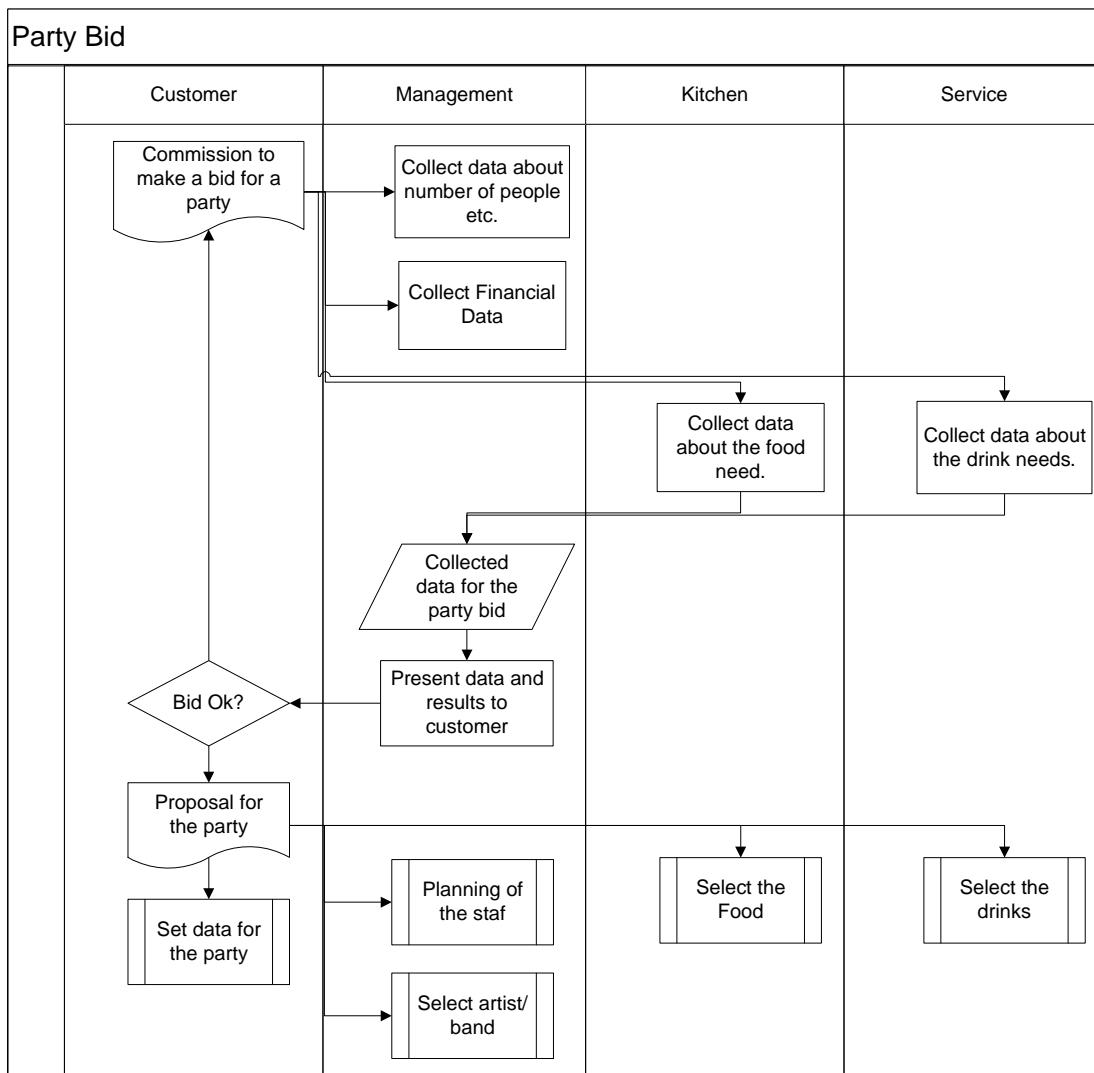


Figure 4.19.

'Who' Perspective

The 'who' perspective shows the interrelationships between actors, activities and resources. For modeling this perspective, we use the 'Basic shapes' template ('General' → 'Basic Shapes'). The meaning of the shapes are given in Figure 4.20.

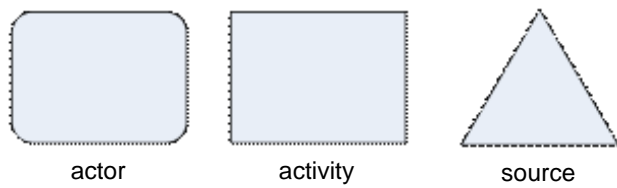


Figure 4.20.

The idea is as follows: an actor performs in a particular business and executing it, therefore s/he needs some resources. Choose the 'Basic Shapes' template. See Figure 4.21.

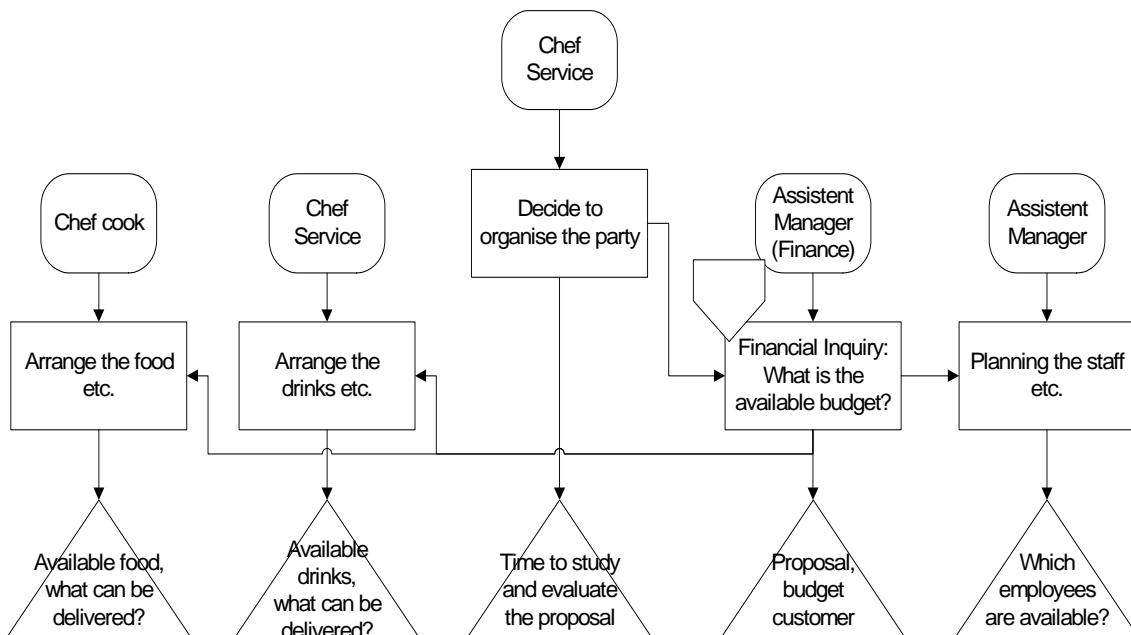


Figure 4.21.

'What' Perspective

The 'what' perspective considers the needed data and information. For this perspective we need an Entity-Relationship Diagram, which we have seen in chapter 2.

'When' Perspective

As the name suggests, the 'when' perspective is about modeling of time dimensions, which can be done by PERT and Gantt charts in Visio. Add for this perspective also a new page in your current workbook, and name it. Then open the correct template. For the 'Gantt'-chart, click on 'File' → 'Shapes' → 'Schedule' → 'Gantt Chart Shapes'. The following screen will appear, se Figure 4.22.

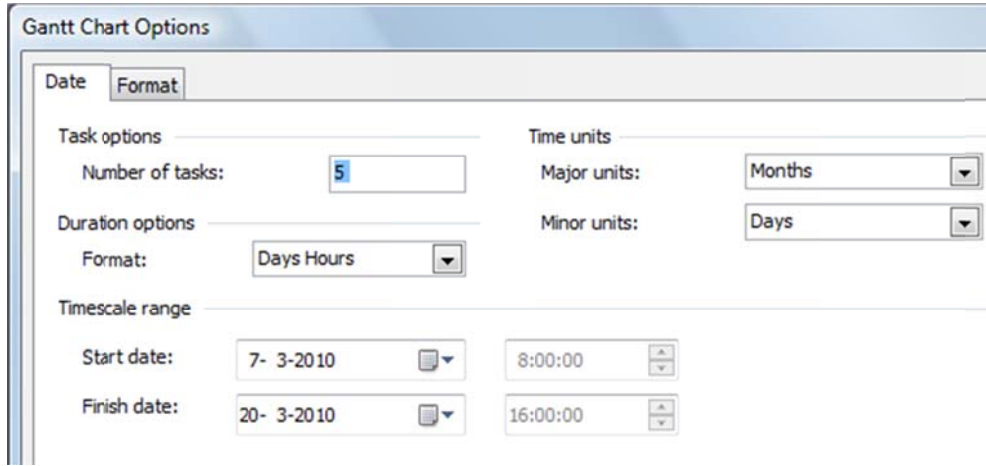


Figure 4.22

Before all kinds of options are introduced, we must think about why the 'when' perspective should be made. Is this an example of a project with a number of tasks, or is this a whole year with all sorts of projects? So think about the purpose. It is even better when a Gantt chart is made for both options.

When we choose to display the timing of a project, we must first determine how many jobs this project encompasses. Suppose there is a project with six tasks, we fill in 6 by 'Number of tasks'. Then we set the time dimensions. For a project the major units may be months, and minor units are days or possibly weeks. We must also determine in which time units the duration of a task is kept. Finally, we indicate when the project starts and ends. When everything is filled out click on 'OK' and we have an 'empty' Gantt chart as given in Figure 4.23.

ID	Task Name	Start	Finish	Duration	mrt 2010				apr 2010				mai 2010		
					7-3	14-3	21-3	28-3	4-4	11-4	18-4	25-4	2-5	9-5	
1	Task 1	8-3-2010	8-3-2010	1d											
2	Task 2	8-3-2010	8-3-2010	1d											
3	Task 3	8-3-2010	8-3-2010	1d											
4	Task 4	8-3-2010	8-3-2010	1d											
5	Task 5	8-3-2010	8-3-2010	1d											
6	Task 6	8-3-2010	8-3-2010	1d											

Figure 4.23

'Shapes' → 'Business' → 'Brainstorming' → 'Brainstorming shapes'. Wijnhoven (2009) gives an example of a 'why' perspective in his book on page 64.

This is a great way to make an informed decision, which weighs the pros and cons against each other. Add a 'central topic' to the page for the arguments pro, and add a 'central topic' for the arguments against a particular topic. Then add these arguments to both 'central topics'. Try to find at least 3 pros and 3 cons. Connect these arguments with arrows to the 'central topic'. An example of this perspective is given in Figure 4.26.



Figure 4.26

But this is not the end, because we must integrate the models and perspectives to one coherent view.

4.5 Model integration

There are various methods to integrate models. We discuss the most obvious methods of Visio.

Meta-Language

Meta-language is a method to integrate different models by ensuring the shapes and lines in the different models are consistent with each other. So when you use a rectangle to show an activity or process in a model, the rectangle must propose also an activity in the other models. For clarity to the use of meta-language, in addition to similar shapes, similar colors can also be used.

Off-page reference

We have seen the 'Off-page reference' already, in the 'how-perspective'. Off-page references, are links that, when double-clicked, links directly to another model. In this way, different perspectives are related to each other. The off-page reference shape can be used to link full pages, or to link certain shapes from one perspective to a similar shape in a different perspective. In the first case it does not matter where the off-page reference shape is placed. In the second case, the off-page reference must be placed on or beside the appropriate shape. How do we get these off-page references inserted in the

workbook? The 'Off-page reference' is situated under the 'Basic Flowchart' template. See Figure 4.27.

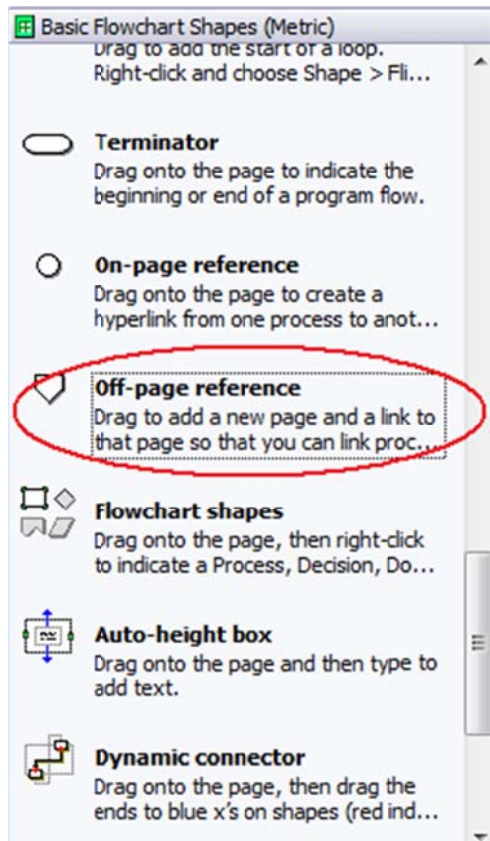


Figure 4.27

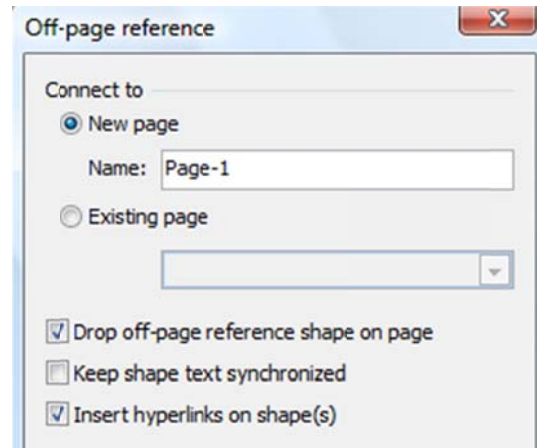


Figure 4.28

Click on it, and drag it to the right place and the next screen appears (see Figure 4.28). To link the different perspectives to each other, choose for 'Existing page' under 'Connect to'. Then indicate to which page the link should be made. Do not change the other marks, and click on 'OK'. On the page, chosen under 'Connect to', will appear the same 'Off-page reference'. When you connect two shapes, drag the icon to the appropriate shape. Now the connection is done. What have we achieved? Double click on the off-page reference shape. Right now, you see the shape/page to which the off-page reference attached.

As an example, we have named the process 'Collect Financial Data' in the 'how' perspective. In the 'Who' perspective is a 'Financial Inquiry'. These two are clearly related to each other. An 'off-page reference' works fine for showing this connection. See Figure 4.29.

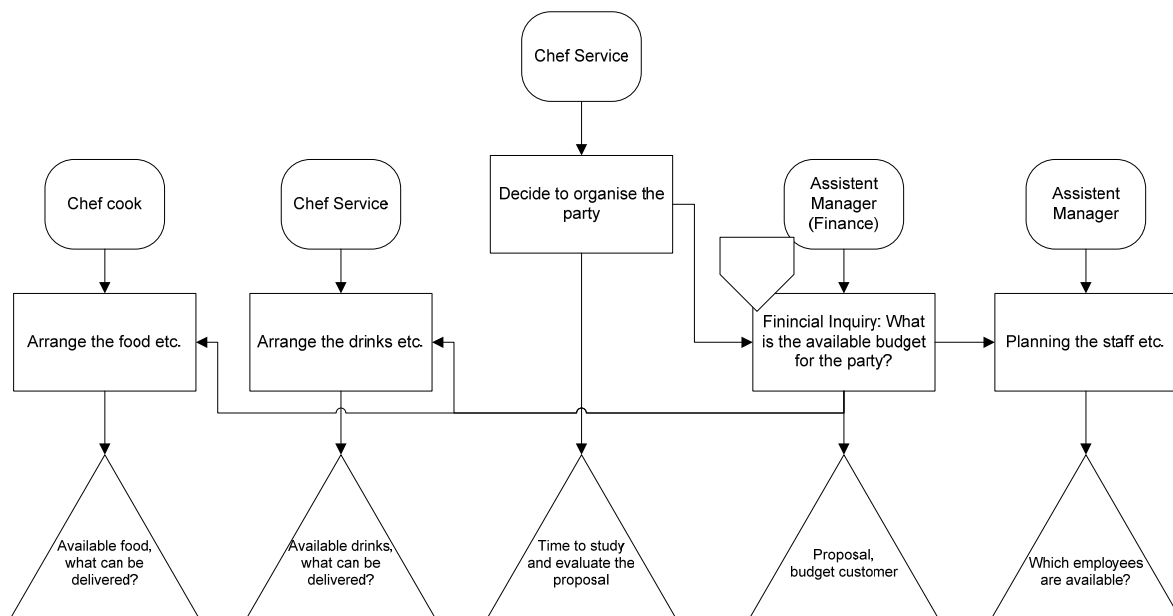
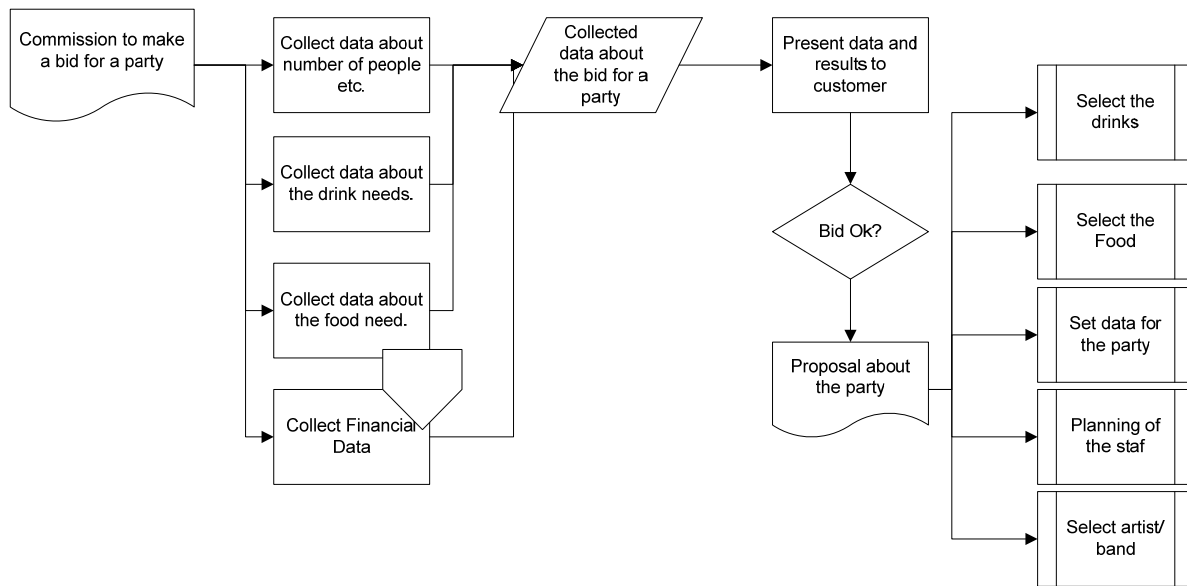


Figure 4.29

It is possible that there are different ‘off-page references’ in one model. Different shapes of different models could be related to each other, but also complete models/pages could be connected in such a manner. It is also possible to create an index of the different perspectives. This may look like Figure 4.30.

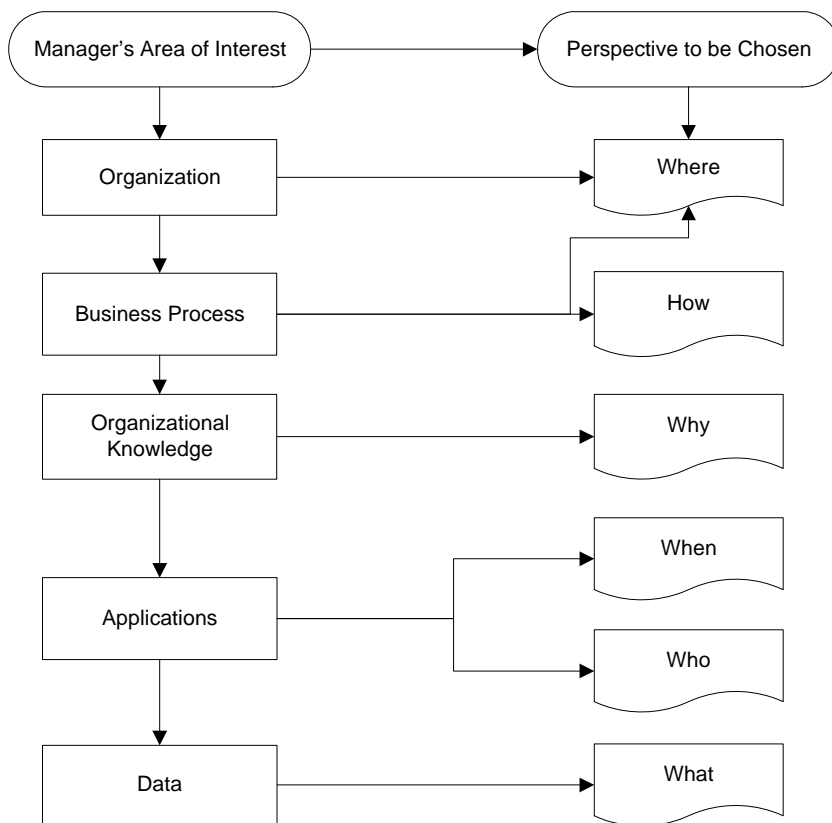


Figure 4.30

4.6 Further study

The computer science has developed various modeling tools in recent decades, which facilitated to systematically describe an organization, diagnose and define how information systems can contribute to a better process. In this context, one of the most cited books is of Scheer (Scheer 2000) where Scheer presents the ARIS method, which is owned IDS which performs studies for the implementation of SAP (the world leader in business software). For a discussion on the usefulness of modeling languages see Recker et al (Recker et al. 2009).

4.7 Exercises

1. SmileYou. Mary-Ann's fashion company contracts production to producers in China, Turkey and India. For this procurement managers specify products, negotiate and contract with producers. Each season volumes of end products will be delivered to SmileYou warehouses in Western Europe, Northern America and the Middle East. In 2010 over 30 million euros of production orders were released. After some checking of what finally entered the shops, there is an estimate that almost 10% of all the products never arrived at the shops; a loss of 3 million. Consequently, Mary-Ann wants to have the logistic processes from manufacturer to shop carefully documents, and

wants concrete solutions of the problem by organizational measures, process designs, information systems and data where possible.

2. Student administration. Describe the organizational measures, knowledge needed, processes, information and systems that are needed to select applicants for 10 different university bachelor programs. What will be needed for an average university (about 25000 students, 5000 applicants per year) to process candidates within 2 weeks?
3. Just three questions for reflection: What is the relation between an ontology as a philosophical understanding of the essence of things and a priori's and modeling languages? Why is knowledge on a priori's not empirical knowledge? How can it become empirical knowledge and what is the role of a posteriori's here?

5. The Hegelian perspective and information triangulation

5.1 Hegel and critical information analysis

The Hegelian inquiring system suggests that information is mainly subjective and contextual, and that each statement (thesis) may be easily countered by an antithesis on the same or different evidence. The major job for people is to know the evidence on which each (anti-)thesis is based, criticize it and develop a plausible synthesis on top of this reasoning and evidence. For information management this means that there is data which reflects a trend, antithesis which reflect a countertrend, and synthesis which combine the two trends to a new entity. This has major consequences for Internet information, which mostly lacks control over the truth. Think for example of any person who would want to communicate negative views about Grand Café. He could tell on the internet (via social software) about his “experience” and exaggerate some minor weak points, tell that the food was bad only because the potatoes were a bit cold (this is named the thesis). If anybody reads this review s/he will think twice about going to Grand Café. It is important to check in this case who has been the author of the review and what has been his viewpoint. Is it a complete picture of the dinner or does he only talk about the negative things? Of course, the owner of Grand Café could respond and state how terrific they are (and thus states an anti-thesis), but who should the reader believe and trust? Only by asking the right of critical questions an information consumer (named information slave here), can find out that maybe the thesis or anti-thesis is incorrect and starts believing one of them. Often, however, both thesis and anti-thesis are hard to reject and have considerable good evidence in support. In that case, the information slave must emancipate and build his own opinion on topic of the good elements of the thesis and anti-thesis, which is named the synthesis.

According to Hegel a society has dialectic forces caused by the tension between so-called “masters” and “slaves”. Via these tensions a society evolves to different historical stages. Following this idea, Wijnhoven states (following (Churchman 1971)) that there are information masters and information slaves in information society. The master produces the information which will be shown to the information consuming information slave. On the Internet and public media, we are led to believe a certain view of the world (thesis). Although the supportive information may be correct, the information is necessarily not complete and biased towards the support of a particular view. This is obviously so, because reporters and writers can never be complete and are selective to serve the particular interest of their funding organizations (mostly the newspaper shareholders, the real information masters) and their information slaves. Alternatively, as information slaves, we mostly lack the tools, time and means to critically check the veracity of the information that is presented, but some basic insights and skills to do so can help a lot. Therefore we present the critical information triangulation method later in this chapter.

It is often stated that Internet information is by definition biased and unreliable, but one may ask if officially well-developed information systems in organizations do meet high reliability demands. The answer to this is sometimes yes, but often no, because the realization of reliable information by systems is very complex as well. Many information systems are developed to deliver management information. The main difference with Internet information is that there is no counter evidence in an information systems context, making it actually more sensitive to sources of unreliability. Management information must of course represent correct measures of business performance and should help management to make the right payment and investment decisions. This sounds simple, but it is extremely difficult to realize in an objective and non-biased way. The biases may be caused by problems with five key parameters of management information systems mentioned by Hofstede (Hofstede 1981) before:

1. Are the effects of the intervention known or is it impossible to overlook all the effects of the intervention completely?
2. Are the actions of the managers routinely or are they uncommon? And is it possible to be judged by an expert then?
3. When the effects are unknown, decisions will be made based on intuition or trial and error. Here databases can play an important role to identify the best action.
4. Information systems become especially important when it is possible to measure the output.
5. Output measurement is very hard, though, because there is an ambiguity of goals. When this ambiguity can't be solved, decision making will be degraded to political business. However, legitimacy will be obtained by informing. But with this information we cannot expect a useful understanding of the decision making.

When you follow this model it possible to find out what kind of control is present within a company and thus of an information system is able to produce relevant and objective information. When you go along these parameters, you will find the appropriate kind of control and information use (see Figure 5.1).

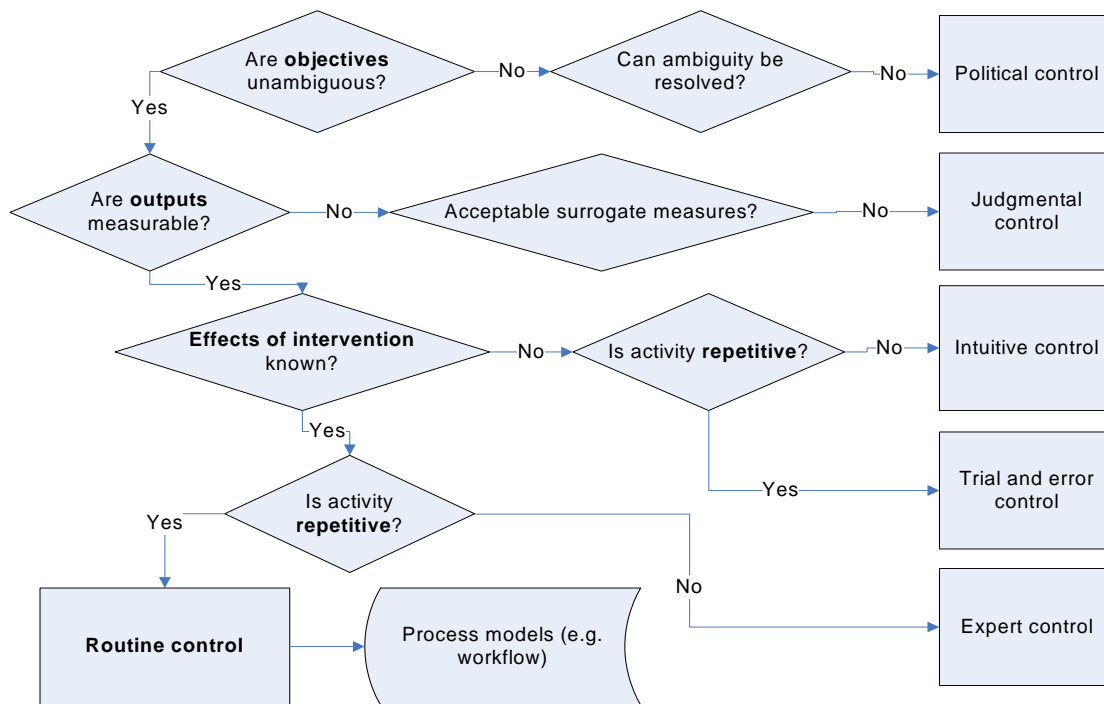


Figure 5.1

Of course, we want to avoid information errors the Internet and information systems contexts, which I would like to name low versus high content and publishing control respectively. However, full control and errors and unavoidable, and consequently, we will focus in this chapter on the information slave, and emancipating this slave by giving him or her the right kind of key critical information triangulation tools for both low and high content creation control contexts, i.e., the Internet and information systems.

5.2 Goal of this chapter

We estimate the value of information through Internet information triangulation (the comparing of data and opinions) in section 5.3 and information systems information triangulation (also named assumptions checking in Wijnhoven 2009) in section 5.4. For this we apply a variant of the general information management model as described in chapter 1, that starts with scoping, finishes with actual understanding of the world and has two different contexts of triangulation. See Figure 5.2.

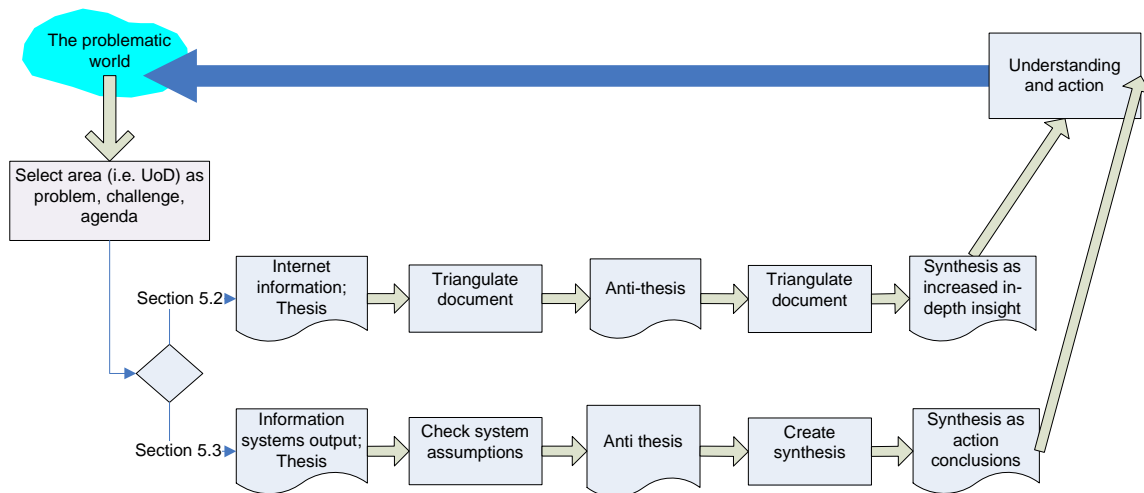


Figure 5.2: The Hegelian information management model.

Ultimate goal: You can estimate the value of information through information triangulation and information assumptions checking.

5.3 Internet information triangulation

Triangulation is about information values. There are four kinds of triangulation, which Wijnhoven took from Denzin (Denzin 2009) (Wijnhoven, 2009 p. 82-84);

- Data triangulation focuses on the verification of data which is acknowledged in the source. An example is the climate report from the IPCC, which contain a few errors which were discovered later. These mistakes were discovered by comparing the data in the IPCC report with the data in other sources.
- Investigator triangulation focuses on the author. In the IPCC report (Wijnhoven 2012), three commissions are housed, for convenience 1, 2 and 3. Commission 1 may only point at pure scientific and licensed publication. Commission 2 may only point at everything which is already known and written about the climate. Commission 3 focuses only on the effects of the climate and the models people use for this. Because of this, the report is filled with scientific and non-scientific data. So it is essential to distinguish what is said by commission 1 and 2. Who says what and what is the concern of somebody to say something. These are questions you have to ask with investigator triangulation.
- Theoretical concept triangulation. You can see the IPCC report in different ways. A skeptical opinion is to think that the report is only in benefit of the environment. An economic concept is to see the possibilities of climate change for the development of previously infertile or not exploitable bottoms. IPCC information can also be regarded from a political scientist perspective by explaining its publications and debate from energy geo political perspectives.

- Methodological triangulation is divided into four species of data used to develop evidence:
 - A. Empirical data the IPCC reports is for example the evidence that states that glaciers are melting and getting shorter
 - B. Interpretive data: for the IPCC report it is important to completely understand on what and why people react on the report. If there is something really negatively stated, it is necessary to gauge the reaction in advance to see what kind of effect a certain statement has.
 - C. Historical data. Although thermometers are relatively new human inventions, temperatures can also be estimated by the size of tree rings. You can see in the past temperature also raised. The question is whether the current increases are more abnormal and extreme than the historical increases.
 - D. Critical data. This is data on the impact of IPCC data on society and human behavior. Critical data may show for example that global warming has disastrous effects on the abilities of whole populations and countries to survive, and the data may show the cause being human or not. Well if the cause is human, people have to change and the political consequences will be huge. If the cause is not human, people may want to continue living the way they always did and just wait till disaster happen (or hopefully not). This is exactly the debate between climate doom thinkers and climate skeptics or between the interests of the environmental movement and the car industry.

Wijnhoven (Wijnhoven 2012) has the following steps in dialectic triangulation of evidence (see Figure 5.3).

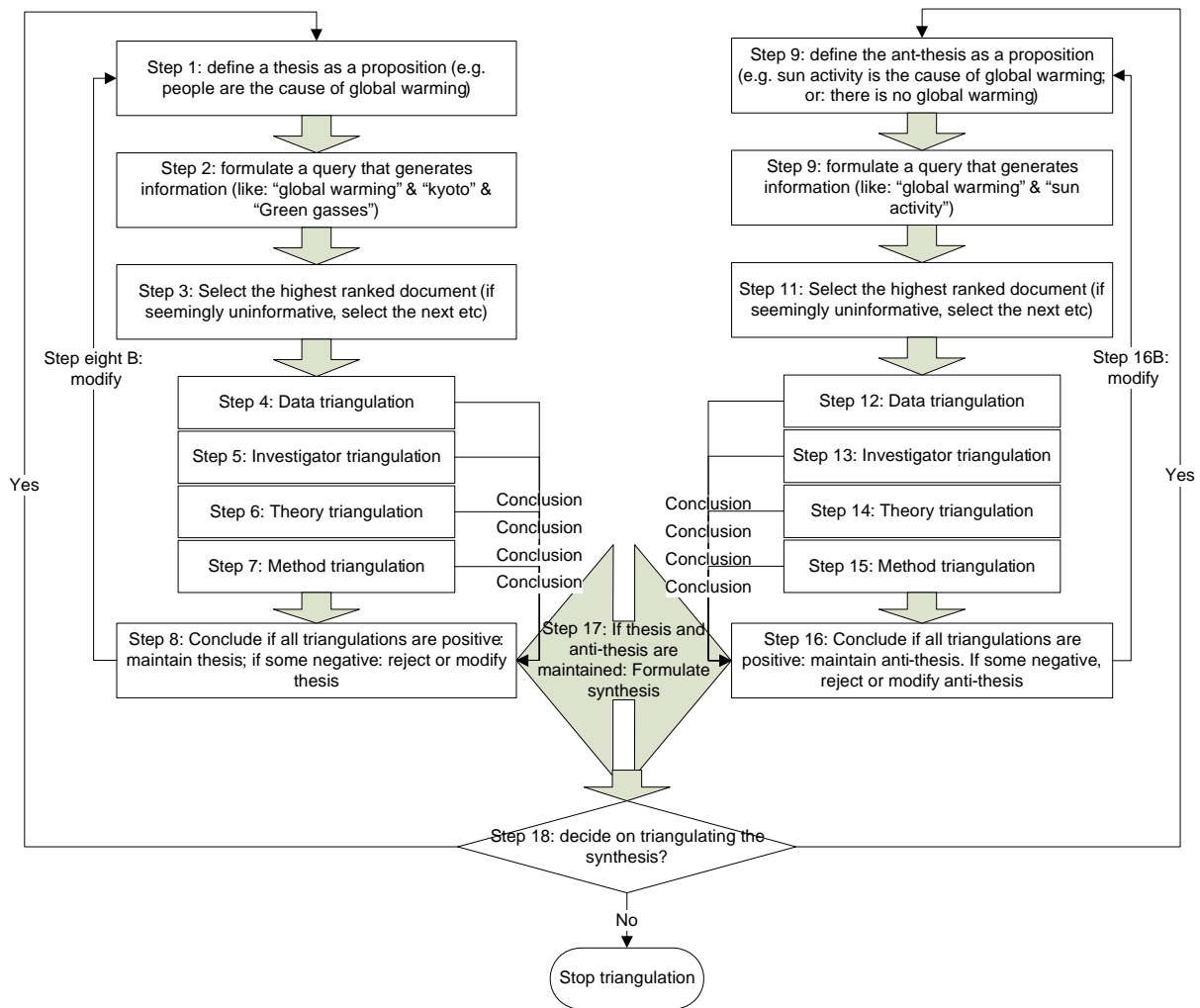


Figure 5.3

The aim of dialectic information triangulation is to be critical, but constructive as well by aiming at higher levels of understanding and avoiding cynicism regarding human possibility to achieve more depth and awareness of problems.

5.4 Systems information triangulation and assumption detection

Exactly the same questions as with Internet information can be raised regarding information systems output. To explain this, let's give the example of triangulation management reports.

- Context: The annual report of 2009 in company X reports a poor sales results for this year. The Top management shows concern and holds as **THEORY** (*thesis*) that the Sales department is not well working, inefficient, and that a solution (*intervention*) of the problem is needed by cutting down its size by 20%.

- The Sales department head holds as **THEORY** (*anti-thesis*) that they have been working fine, but the economy is down, a new competitor took market size and so they need more support (intervention) to beat the competition and be prepared when the economy is better again.

For both Thesis and Anti-Thesis, data, investigator and method triangulation is possible to increase insight in the situation. (Note that the detection of Thesis and Anti-thesis itself is already theory triangulation).

Thesis triangulation:

- *Data* for inefficiency of sales department (*output* measurement), which needs an agreement on *objectives* and measures like sales versus cost. Achieving a high Sales versus costs rate can be recognized as a very short term view on a Sales department's objectives.
- *Investigator*: The "Company controller" has an assignment from the top manager to create the data and cannot act independent of the Top management assignment.
- *Method*: The observations only consist of "Registered sales figures" and "department costs figures" included in the "SAP database".

Anti-thesis triangulation:

- *Data* for *success* (number of new clients, feedback on promotion & brand name, number of sales, market-size figures (Nielsen), macro-economic data (CBS/CPB). The Anti-thesis thus includes a much richer and especially a longer term perspective of the Sales department's objectives. *Objectives* definition: sales/costs is too restricted short term for the moment.
- *Investigator*: Department head and market consultant. Both are of course not biased (Top management is not biased as well).
- *Method*: Market & macro-economic figures, feedback forms and website statements after promotions and fairs. Scenario of market growth and sales people needed. This includes a much richer set of data, aiming at longer term views of the sales department.

Well, how to create a synthesis? Need for developing a short term and longer term perspective of Sales. If that decision is taken, in fact the Top management gives in. The Top management did not want to lose face and investors were becoming very nervous. The Head of the Sales department did not want to give either, because this would result in overloaded people and poor sales services. At the end the Head of Sales was fired and replaced by a younger less experienced person. The company lost substantial market share, lost substantial market capitalization in the two year after that, and was taken over by its main competitor.

5.5 Further study

Currently, there is actually remarkably little written on this subject. Therefore, you are invited to participate in a bachelor and/or master thesis of the teacher. Also see Wijnhoven (2012) and Hofstede (1981).

5.6 Exercises

1. IPCC. The IPCC is the United Nations International Platform on Climate Change. Its reports have been debated heavily in the last few years. Debate the report that states that half of The Netherlands will be under water at the end of this age using the triangulation method rigorously. Do this exercise with at least another person. Use Internet resources as much as possible.
2. Sales. Catherine Malone is the head of the sales department of SmileYou. She is responsible for 10 sales persons that regularly visit companies and national headquarters of SmileYou, but which also does all the PR and even participates in product design and product decisions at SmileYou. Catherine has a base income of 30000 euro per year and an additional payment that can up to 90000 depending on the net profit of the firm. This year was not very well, and Catherine was not offered a salary supplement. Additionally, the department's costs will have to be reduced by 20% (two people out), although the workload will remain the same. Catherine is furious. How can she make a well grounded and convincing alternative view on the situation?
3. Company X was advised after a short informal visit of an organization consultant to outsource its financial affairs to KPMG. KPMG has an excellent demonstration of their capabilities in processing all administrations (human resources, pay roll, client transactions, and internal bookkeeping and control). How can the Company triangulate KPMG's offering?

6. Organization and IT alignment

6.1 Organization and information

You can draw an organization chart to display the organizational structure. You can also do this for the information management of an organization, which is called an information-architecture diagram. There are multiple methods to draw an information architecture. In this chapter we teach you how to use ArchiMate (on a basic level).

After having understood some of the major conceptualizations of information and their practical implications, we now discuss information management in its organizational context. For discussing this, Wijnhoven’s alignment model is chosen. This alignment model focuses on the relevance and contributions of IT investments for organizational strategic and operational requirements. Most organizations can only keep existing when the strategic policy, the IT-policy and the IT-systems of an organization are well aligned. In some cases the IT and systems policy does not correspond with the strategic policy or organizational processes. In those cases the organization does not work efficiently and effectively. To solve this problem, the coherence of IT and organization has to be analyzed and second the internal structure of the IT resources has to be organized via an architecture design. For we developed the organizational information management model of Figure 6.1.

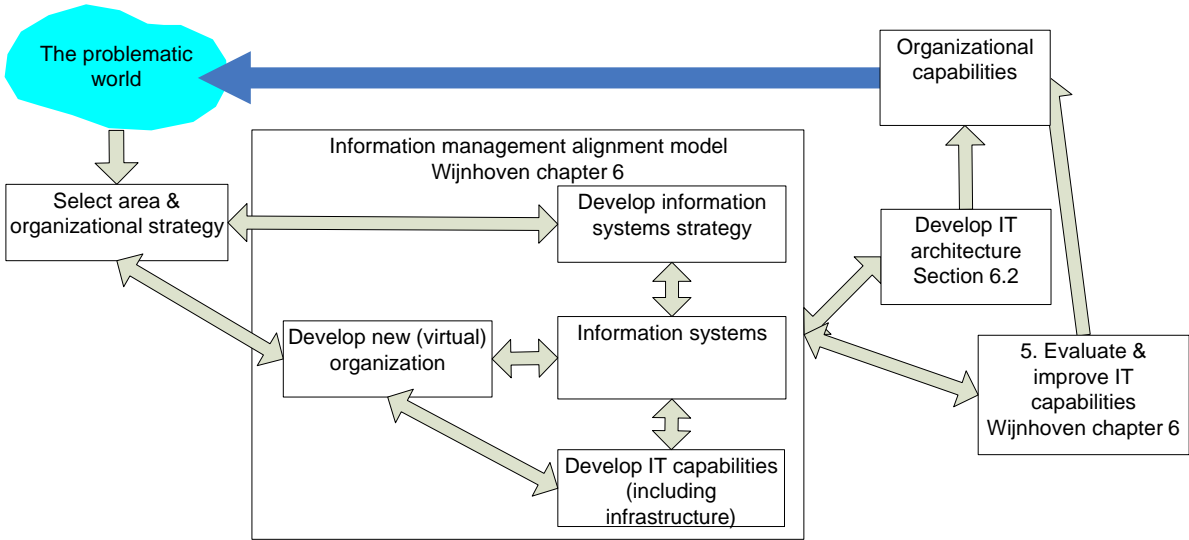


Figure 6.1

6.2 Goal of this chapter

The goal of this chapter is not to learn to use ArchiMate in detail (though it would be a very good case to do), but to understand the idea behind ArchiMate and the basics of it. With ArchiMate you can ana-

lyze the coherence of IT and organization and you can also organize the internal structure of the IT resources via an architecture design (and use this information for different purposes). Overall, you get a view of the different layers (structure) of the IT in an organization and the alignment of it.

6.3 Basics of Archimate

ArchiMate is a language which you can use to map and describe an organization. This means that you can easily find out what the essential factors are within your organization and how dependent you are on certain applications or databases.

To make a model in ArchiMate you need the stencils of Visio. You can download them at www.opengroup.org/archimate/doc/ts_archimate/apdxa.html. On this page the different symbols of ArchiMate are explained and at the bottom you can click 'ArchiMate information web site'. On the next page that pops on to your screen choose 'Downloading ArchiMate 1.0 as a non-member'. Then follow the logical steps. If this may not work for some reason you can try to visit <http://www.archimate.org/en/home/>. Here you click on 'Start Using ArchiMate' on the left side of your screen and download the ArchiMate stencils.

Layers

There are three different layers in ArchiMate: the business layer, the application layer and the technical layer.

- The business layer provides products and services to consumers and clients. In business administration terms we call this the front-office. This layer consist of, for example, a number of products and services. This layer also has a number of supporting systems. These must also be put in this layer. For example: with the production of bicycles you could have a sales process and a supporting process, like a HRM policy to ensure the availability of the best people.
- The application layer supports the business layer with application services which are realized through software. As an application you could have a HRM service with as supporting system a HRM application. For example an Access database with all the records of sold products, scatter, sales accomplishments of the sales persons.
- The infrastructure layer consists of all the infrastructural services which are needed to run these applications. For example: the HRM database needs room to store its data, this means physical storage capacity. You also need communication which makes it easier to add new data to the database, security, privacy and networking.

See Figure 6.2 for the ArchiMate layers.

- Service is a unit of functionality that some entity (system, organization, department) makes available to its environment
 - Example: "Health Check" is a service offered by a physician
- When combined with layers, we create a layered view of the enterprise
- Layers make services available, which are used by other layers in the hierarchy

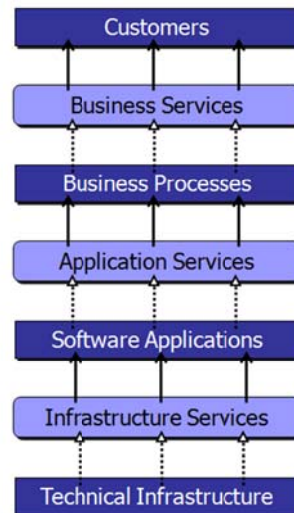


Figure 6.2.

Aspects

Next to the horizontal layers are vertical aspects. These aspects are: the information aspect, the behavior aspect and the structure aspect.

- The information aspect takes care of the information objects and the data structures. This is also called the passive structure and is placed at the left of the model.
- The behavior aspect organizes the actions that transform information to meet the information need. This aspect is placed in the middle.
- The last aspect is the structure aspect. It contains an organized group of persons, applications and information technology which perform the behavior that is necessary to fulfill the information need. This aspect is on the right side of the model.

The ArchiMate window

When you follow the above mentioned structure you will have a matrix with 9 cells, because you have 3 horizontal layers and 3 vertical aspects; see Figure 6.3. Each of these cells have to be added to get an organized matrix. Like above mentioned the information aspect on the left, the behavior aspect in the

middle and the structure aspect on the right.

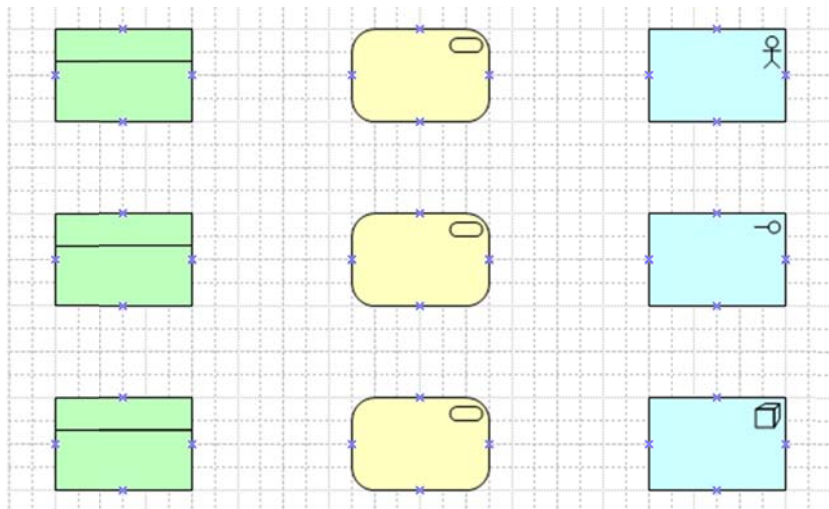
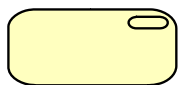


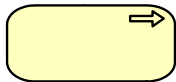
Figure 6.3

Specific ArchiMate representation techniques

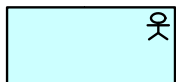
The different structures within ArchiMate are given in Figure 6.4.



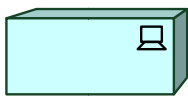
First the symbol for a service. You can only use this one to represent a service, for example a website.



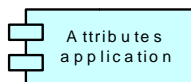
This symbol stands for a process, for example a customer service but also the service of bringing the drinks to the table in the case of the Grand café.



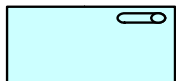
This symbol represents an actor. It means that the product in the end has to solve the information need of an actor.



This symbol represents a device, in this case a database. It contains all the information needed to get processes going and to support them.



This symbol stands for an application. An application can realize a service.



This symbol stands for a role. This can mean for example the middle management.

Figure 6.4

A list of more representation objects and their location in the framework is given in Figure 6.5.

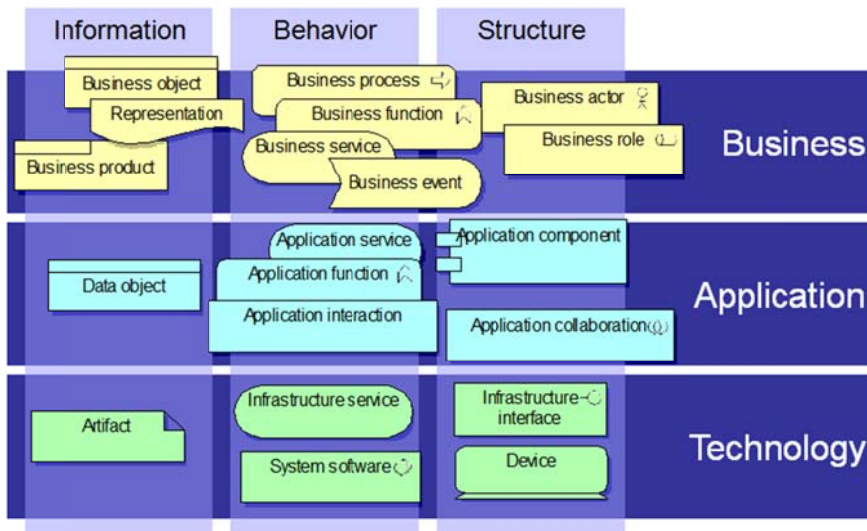


Figure 6.5

These are the most important structures which you can use. There are more options available and you can use your own creativity to make it more detailed or expand the model.

Extra

ArchiMate has many more constructs for modeling IT architectures. A key idea behind ArchiMate is that the aspect and layers component have causal relations to each other, and thus impact each other. The “used-by” and “realization” relations are represented by different causal arrows. ArchiMate has two other (causality) representations, triggers and information flows. Additionally one can represent relations between architecture components also in terms of parts and whole. Some a list of some key (not all) ArchiMate relation representing objects. See Figure 6.6 for an overview of ArchiMate relations.

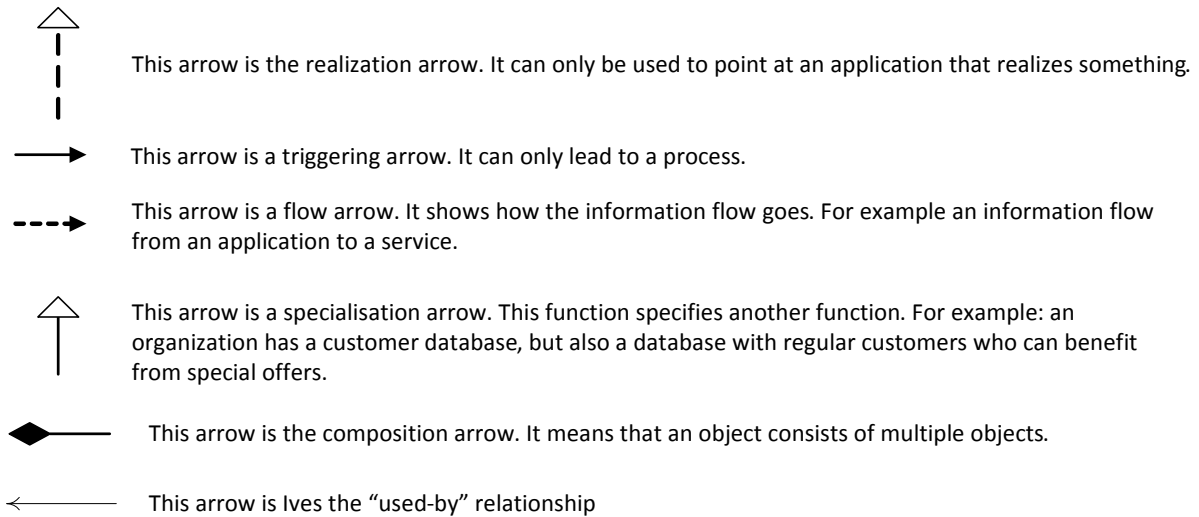


Figure 6.6

An advice for ArchiMate modeling is that one should not begin too broadly at the bottom and that you have several actors or roles at the top. When you end up with a pyramid shaped model you probably did not design the model functionally. An example of an insurance service is given in Figure 6.7.

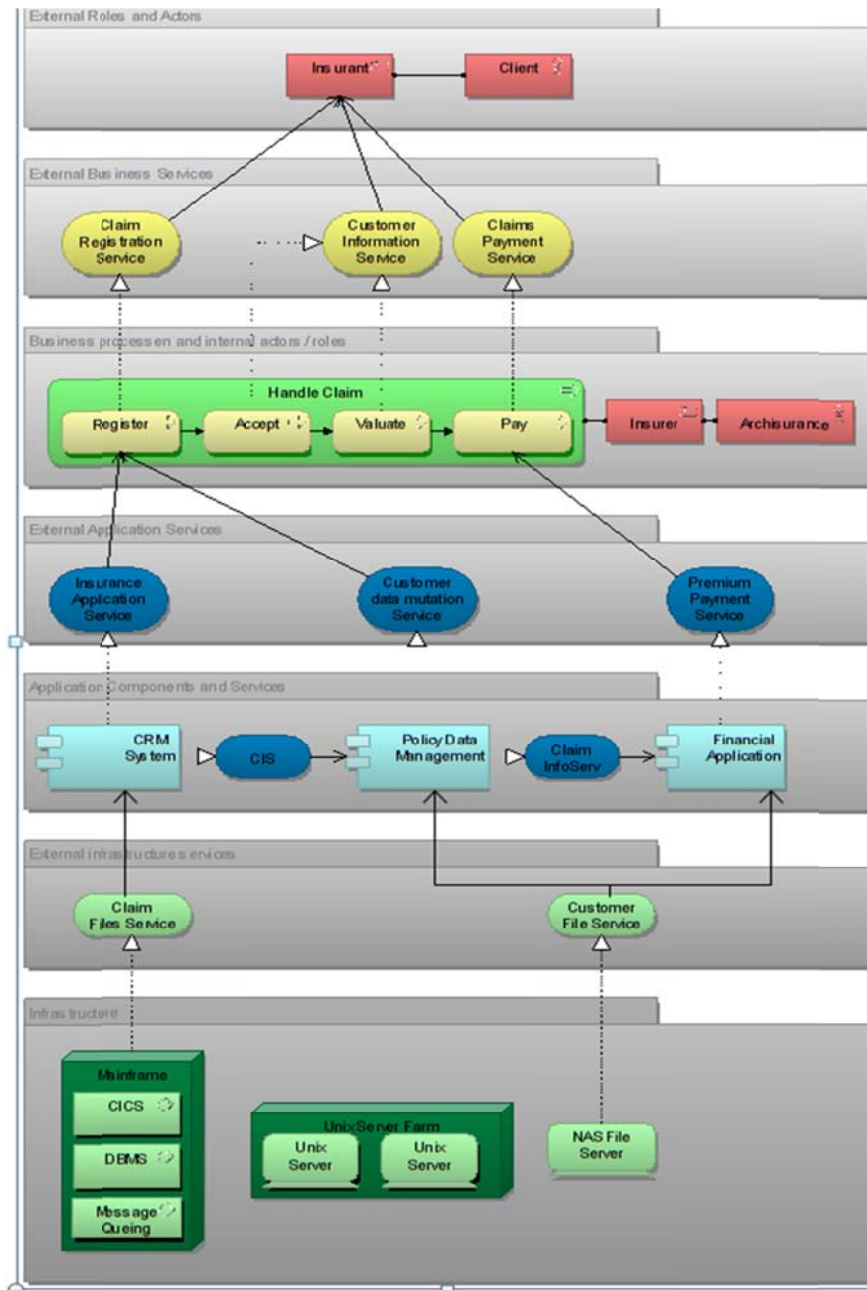


Figure 6.7

For the practical identification of required applications, processes and infrastructure components for Grand Cafe, the following chart will show that already a lot has to be checked and planned to make an effective information management organization for Grand Cafe. Because of this complexity, we leave the differences between several layers out of the diagram. We also do strictly follow the ordering of the aspect (passive, behavior and structure), but we do use several of the representation objects that below to them. See Figure 6.8.

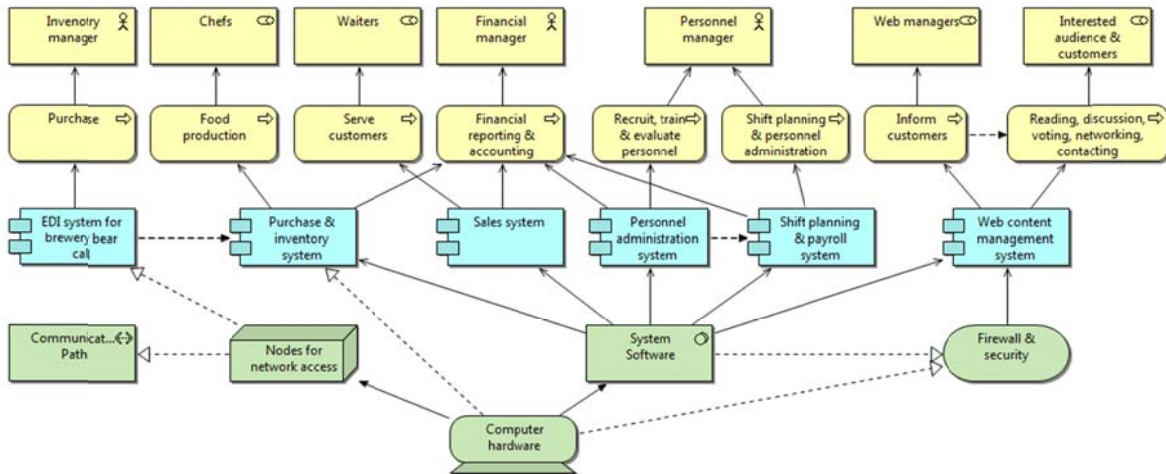


Figure 6.8

Above you see the ArchiMate model for Grand Café The Palace. As you, many business processes are taken by different actors, who need several applications to let them run well. The bear ordering application is owned and managed by the brewer, who is also responsible for its security, and thus Grand Cafe only needs to set up the network access to the brewer to realize efficient ordering processes. The transaction information from the ordering system is send over to the purchase and inventory system, which next is used by the financial manager to check the bills and integrate the data in the financial reporting. Grand Cafe allows external to view information that Grand Cafe publishes on its website and Grand Cafe also allows its audience to discuss and interact virtually. This requires setting up a firewall and security service to be realized by several kinds of system software.

6.4 Further study

Lankhorst et al (Lankhorst 2009) gives an good overview of the ideas and applications of ArchiMate. A clear practical tool and explanation is given by archi.citis.ac.uk. ArchiMate is the result of a project from the Telematica Instituut, nowadays called Novay, and several services on basis of this are delivered by www.bizzdesign.nl. Architecture thinking is also essential for assessing the business value of IT.

6.5 Exercises

1. SmileYou is growing fast, but as an organization is has not much coherence yet and may fall apart soon. Consequently Mary-Ann wants to develop an organizational strategy that aims that tighter coherence of all shops and warehouses in all countries. The in each country, one shop and one warehouse will be set up as one firm (the importer) that acts as an intermediate level between SmileYou headquarters in Amsterdam and the local shops. Given this a new organization diagram is

needed and a specification of the systems that are needed at each shop, warehouse, importer and headquarter needed. Make such a structure following Wijnhoven's alignment model and next create the related ArchiMate diagram.

2. At a university a large set of different information systems each, like the e-learning system, the student registration system, the grading system, the course planning and room planning system, and the budget and payment system. Create a relevant ArchiMate diagram for this situation that also aims at maximum reuse of the different systems resources, data and functionality.

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