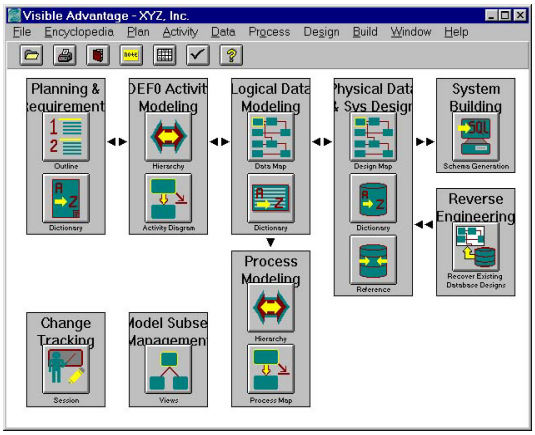
Heriot-Watt University
Edinburgh

Department of Computing & Electrical Engineering

Information Systems Methodologies



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Submitted by: Fotios Bassayiannis

Abstract

This paper will present the Information Engineering methodology. IE is a popular Information Systems Development Methodology that follows the task-oriented paradigm. IE originated in the IBM labs during the 70s and has been successfully tackling the information systems needs of large organizations ever since. Over the time, IE evolved and matured considerably.

The paper will culminate with a case study that will attempt to apply IE on a real problem situation. The case study will assume that there is no automated information processing infrastrucure at all and will progress through all the stages involved in designing and implementing a computer-centric information system, from scratch, using the IE methodology.

The Information Engineering (IE) Methodology

Definitions

in-for-ma-tion:
1. The communication or reception of knowledge or intelligence
2. Knowledge obtained from investigation, study, or instruction

En-gi-neer-ing:
1. The activities or function of an engineer
2. The application of science and mathematics by which the properties of matter and the sources of energy in nature are made useful to people in structures, machines, products, systems, and processes.

(The above definitions courtesy of Webster's Ninth New Collegiate Dictionary and referrenced resources)

In-for-ma-tion En-gi-neer-ing:

1. The set of interrelated disciplines which is needed to build a computerised enterprise based on today's data systems (James Martin, 1984).
2. A full life cycle approach to planning, defining, designing, and constructing information systems, using integrated views of the business as a basis for designing and building those systems (The Authur Young Practical Guide to Information Engineering, 1987).
3. The discipline of structuring data according to the global business needs of the enterprise. At the heart of information engineering is the recognition of the commonality of data and processing across a global set of requirements, and the management of both commonality and uniqueness of data and processing (Bill Inmon, Information Engineering for the Practitioner, 1988).
4. Information engineering represents an integrated set of strategic development methods. It produces documentation that allows users to review the correctness of data definition. Then this documentation can be automatically translated into detailed database designs, computer systems specifications and accurate program code (Clive Finkelstein, An Introduction to Information Engineering, 1989).

Introduction

With all the technological advances that have made their way to the business place in recent years, much emphasis has been placed on the question of "How can we use automation to speed up our current office procedures to be quicker and more cost efficient?" Perhaps the question that truly needs to be asked is one that addresses a company's bottom line and increases in importance as information needs and technological capabilities grow and advance; "How can we use Information Systems to improve our business procedures to be more successful?"

Information Engineering strives to achieve just this, determining the best methods to glean the true relevance from the mountains of data a company can generate. This can be achieved in various ways, from actions as simple as improved data gathering techniques, to new information systems applications and processes, to the more comprehensive re-engineering of a business.

Historical Perspective

The origins of information engineering are not exactly known. Some say that Ian Palmerand and colleagues at CACI Inc. at London were the ones that came up with the original ideas. Others say that it was James Martin of IBM that created IE.

Yet the most advertised version of truth on the Internet these days is that while associated with IBM in the early 1970s Clive Finkelstein realized that the power of relational theory could be combined with emerging strategic planning concepts to create a new business management approach. He believed that the key to organizational success lays in breaking down the growing barriers between corporate management and IS staff responsible for developing and implementing information systems. This gave rise to IE as we know it today.

From 1983, Clive Finkelstein and his company, IES, focused on integrating IE with strategic business planning at all management levels. This later work strongly moved IE to the business-driven variant used today by corporations and governments worldwide to produce higher quality systems that are able to change easily, and rapidly, in order to support the changing business environment of the 1990s and beyond.

The IE Methodological Tenets

Thus two variants of Information Engineering exist today:

- The Data Processing-driven variant.
- The Business-Driven variant which has evolved from the DP variant and whose main adherent is Clive Finkelstein

IE's framework is basically a project management mechanism, a fact which reflects information engineering's philosophical outlook of "Practicality and Applicability". Information Engineering provides a framework for successful business re-engineering, by integrating corporate strategic planning with information systems development. As a result, systems are fully aligned with the mission and direction of the organisation.

There are a number of philosophical beliefs underpinning information engineering, the main one being that the heart of an information system is the data, or rather the types of data. Hence, IE declares that a methodology that successfully identifies the underlying nature and structure of the organization's data has a sound foundation on which to build information systems.

IE follows the Top-Down design paradigm. It begins with the top management overview of the enterprise as a whole and then, as progressively more and more detail is derived, decisions concerning which areas to concentrate upon are made. This approach of dealing with the complexity of IS development is termed as "Divide & Conquer".

IE Structure

While an Information System is being developed, communication within the methodological framework is accompliced through the use of diagrams. The diagrams are of a standard form and simple enough to understand by everybody involved, so this helps ensure that their requirements are achieved.

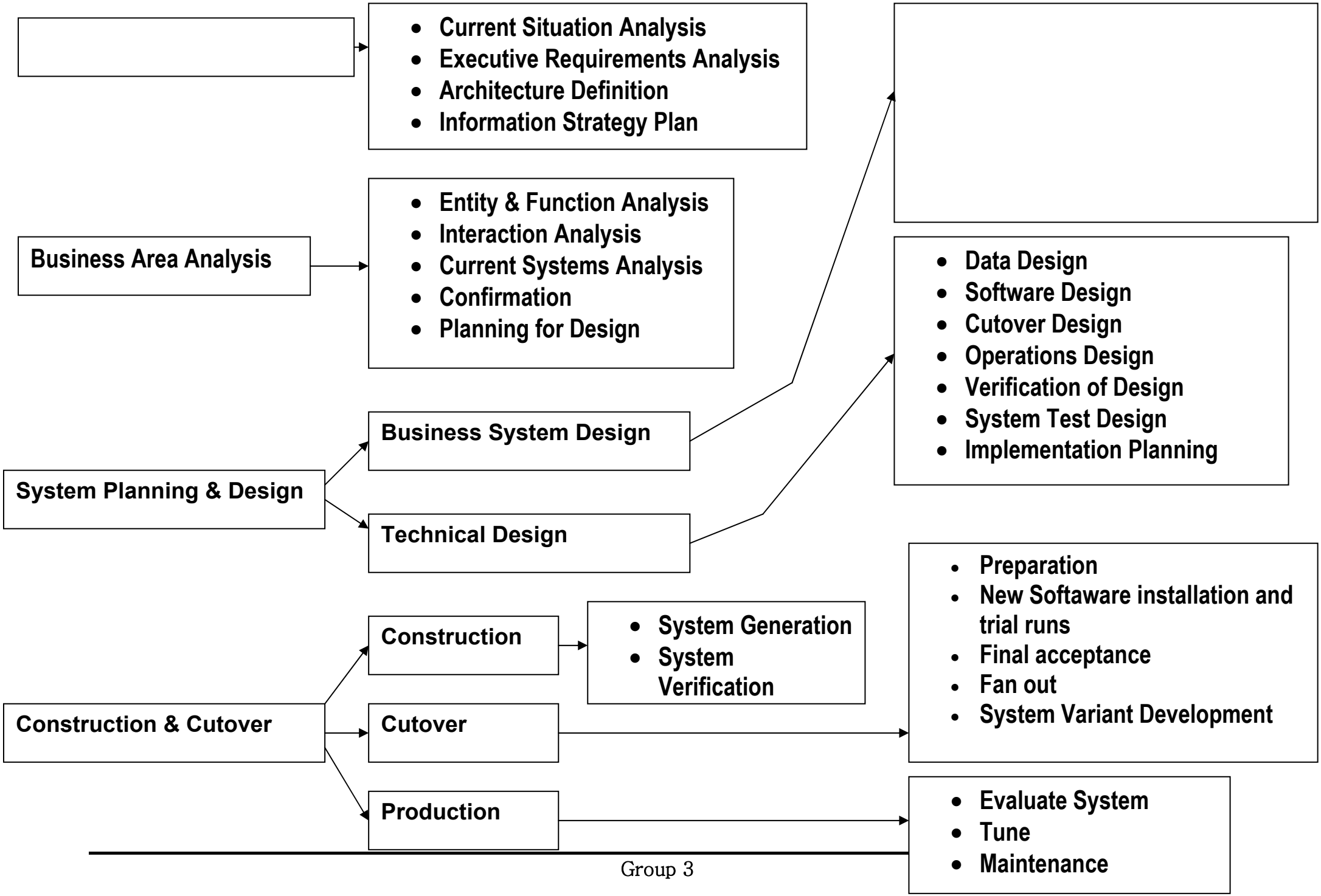
Also, the use of an appropriate CASE tool is identified as a basic requirement for the methodology.

There are four basic layers in the IE methodology:

1. Information Strategy Planning: Construct an info architecture and a strategy which supports the overall objectives and needs of the organisation.
2. Business Area Analysis: Understand the individual business areas and determine their system requirements.
3. System Planning & Design: Establish the behaviour of the systems in a way that the user wants & that is achievable using technology.
4. Construction and Cutover: The objective here is to build and implement the systems as required by the previous 3 levels.

These layers are further subdivided into sub-layers that define the specific tasks that have to be performed in each layer. IE is not just another flavour of the waterfall model though, because some of its layers-tasks can be performed in parallel under certain circumstances and using certain techniques. IE is increasingly dependent on CASE tools mainly because of the complexity involved.

The complete IE layer structure is depicted on the next page.


Current Situation Analysis
Executive Requirements Analysis
Architecture Definition
Information Strategy Plan
Business Area Analysis
Entity & Function Analysis
Interaction Analysis
Current Systems Analysis
Confirmation
Planning for Design
System Planning & Design
Business System Design
Technical Design
Data Design
Software Design
Cutover Design
Operations Design
Verification of Design
System Test Design
Implementation Planning
Construction & Cutover
Construction
System Generation
System Verification
Cutover
Production
Preparation
New Softaware installation and trial runs
Final acceptance
Fan out
System Variant Development
Evaluate System
Tune
Maintenance

Information Engineering Case Study

The problem situation

You happen to be a young newly appointed Army Reserve Officer with an IT background. Right after your graduation from the ROTC (Reserve Officers Training Corps) you are sent off to a post close to the country's northern borders, whose main mission is to provide swift support in ammunition and supplies to the fighting forces in the front in the case of a major incident. During peacetime the vehicles are used for various ammunition and supply transports as well as other generic military transport functions.

The Unit's camp basically consists of underground ammunition and supplies storage areas and a fleet of all-terrain vehicles.

Your CO (Commanding Officer) in the Unit has come to realise that the vehicle administration system of the Unit has serious problems. Vehicle Administration's main data sources, the **Vehicle Activity Sheets** and the **Vehicle Maintenance Calendar**, require far too much manual processing, which has transformed his officers into constant office dwellers. He would like to see them take a more active supervisory role in the workings of the Unit and he would like them to have time to concern themselves with various other problems that the Unit has.

Your CO has thus decided that the routine data entering and calculation processes of the Unit need to be automated so that the following can be achieved:

- Time savings
- Error reduction
- Better vehicle maintenance – Longer Vehicle lifetime (through timely repair-maintenance sessions and early mechanical malfunction detection)
- Increased personnel security (Well kept vehicle, means safe vehicle)

Opening your file he finds out that you are IT literate and that in fact you have taken a course in Information System Methodologies with Dr. MacKinnon at Heriot-Watt University. So, after he thanks the good Lord for his fortune he calls you in his office and he assigns you the dirty job.

Requirements Gathering

You take a stroll around the camp, constantly exchanging salutes, and you try to put your thoughts in an order:

1. "Why, oh why did I have to take that course?"
2. "I need enough information to develop an initial proposal and submit it to my CO."
3. "I need to find the most appropriate persons to extract this information from."
4. "I need to find out what software and computing facilities are available in the Unit."
5. "How much money would the CO authorise to be spent on the project for hardware/software requirements?"
6. "Which IS methodology should I use?"

Continuing this mental dialog you begin to answer those questions. The first question seems too hard and not of practical importance so you immediately skip it. In order to address the second issue you decide that you will need to arrange a "facilitated client discussion" with the right persons so that you can get additional details. Wishing to address this issue right away you direct yourself towards the command's office complex and knock on the door of "Vehicle Administration".

After you get acquainted with the 5 officers of various ranks being occupied with the excessive amount of paperwork you find out that one of them has been doing this same job for over 10 years and that his expertise on the field has gained him the title of the "guru of vehicle administration and maintenance". You immediately decide to include this person in the facilitated client discussion as well as the CO himself. His knowledge along with the CO's general experience and managerial skills should be enough to give you all the information you need.

You also get a chance to take your first look at the "legendary" Vehicle Administration Sheets, and the Vehicle Maintenance Calendar:

Vehicle									
Date	**Vehicle Type**	**Driver**	**Km out**	**Km in**	**Diff**	**Fuel Reading out**	**Fuel Reading in**	**Diff**	**Mobilisation Order Authorised by**

Vehicle Administration Sheet

Date			
Vehicle Plate	**Engine Oil**	**Transmission Oil**	**Brake Fluid**

Vehicle Maintenance Calendar

Looking around the office you discover a PC computer system which as you find out has a complete copy of MS Office 97 installed along with various action and adventure games that are used to kill those slow-passing end-of-day hours. This has been the sole purpose it has been serving up to now. You decide to put this PC in good use and mess up those people's fun. You also think that it would be nice if you had another PC so that when the system becomes computerised it will have the capability of two different data input/retrieval tasks being performed at the same time.

You leave the office and continue your meditated stroll around the camp. Issue number 5 is left off till the facilitated client discussion, and you finally tackle the last issue: What methodology?

Considering the fact that your CO has given you the impression that he is in a hurry for the new system to be deployed ASAP and the fact that your limited experience in the field will probably yield a first system that will need quick changes

and re-designs in order to really work, you decide that your chosen methodology will need to be able to produce results real fast and be flexible and responsive to change.

Also, it would really be nice to have some kind of visual tool which will help you - since you are going to be working alone - organise all the gathered information and deploy the system according to the methodological mandates in a quick, efficient and complete way.

Thus, the selected methodology would have to consist of a series of well defined steps through which information needs are defined clearly based on management input and can thus be effectively and directly translated into systems that truly support the Unit's strategic plans as expressed by it's general mission statement and the CO. The need for those "statements" to be pervading the resulting system as a whole is also apparent.

You think for a while and you decide to use IE as your methodology in deploying this system as it seems to be complying with these requirements. Your decision is reinforced by the fact that you know of a visual tool that is distributed by the IES company as a free trial download (Visible Advantage 7.2), that could help you single-handedly start, manage and finally deploy the new system while ensuring that the methodology is followed closely each step of the way. You wonder if you could manage to persuade your CO to authorise purchase of this tool so that you can use it for longer than the 21-day trial period.

As, you conclude your deep-thinking session you realise that you have just passed in front of a visiting 4-star General without saluting! The next day you find out that you have been given a 4-day (one for each star) detention order because of that but you do not feel too bad about it since you would spent these days working anyway. The one thing that bothers you though is that you have to sleep in the camp's facilities during the night, on a bed that is full of bugs.

First you sing a lullaby to yourself… Finally you manage to go to sleep trying to recognise a pattern in the sounds that the bugs make. While sleeping you dream that you are on a kangaroo-hunting safari with Clive Finkelstein (The "Father" of the Business Driven variant of IE).

Facilitated Client Discussion

You begin your day by making a few phone calls around camp to arrange the meeting with the CO and Major Pliers (the vehicle administration-maintenance guru), and giving everybody inferior than you a hard time. Then you take one of the Jeeps and head off for the nearby village where you:

- Buy a ten-pack of diskettes
- Sit in an Internet Café and download the latest version of Visible Advantage from Clive Finkelstein's site in Australia, while drinking a delicious Banana Daiquiri! (Yes, the Unit does not have an Internet connection nor the cook knows what a Daiquiri is!)

You head back to the camp where the meeting eventually starts. At the start of it you ask the usual open-ended question of "How do you describe/find the Vehicle Administration's organisation and work?" and you let the two participants free-flow. The point here is to get the "big picture" of how these two officers perceive the Unit and its mission as a whole and what they feel the general problems are.

From what is said you are able to identify the following goals:

- Reduce the time it takes for the Vehicle Activity Sheets and the Vehicle Maintenance Calendar to be manually filled (names, vehicle plate numbers, kilometres shown on the dashboard counter before and after each trip, etc.) and for the needed calculations (averages per car, driver, etc.) to be performed.
- Reduction of data entry errors
- Better tracking of vehicle's service times (when they have to have their oils changed, etc.)
- Allow building of a Vehicle Administration & Maintenance History database.
- Automatically report each day which vehicles are overdue in their service times and the responsible driver (his name should be forwarded to the command so that he is appropriately disciplined).
- Automatically calculate mileage per vehicle type, per each individual vehicle and per driver. (Drivers may drive more than one vehicle during peacetime but no vehicle is shared by two or more drivers)
- Improve safety by not letting an officer authorise (i.e. sign and stamp with the Unit's official stamp) a mobilisation order (this document is used by the vehicle's driver in order to gain permission to exit the camp by the military police officer at the camp's gate) if the vehicle requesting it is overdue in its service check.

The CO re-emphasises his feeling that data processing is taking much more time than the Unit can afford and is limiting his officers' time to promote the well-being of the Unit in more tangible matters. He also makes it clear that under no circumstances whatsoever he wants a vehicle on the streets that has not had its brake fluids checked and changed properly.

Next, the conversation moves toward some of the operational issues of the business; how things are done (processes), and how things are organised (structure). The main daily responsibilities for the "Vehicle Administration" officers are:

- Manual data entry (i.e. writing in big ugly books) in:
  - Vehicle Activity Sheets
  - Vehicle Maintenance Calendar
- Calculation of:
  - Vehicle mileage
  - Driver mileage per Vehicle type
- Checking the appropriate books and logs in order to authorise mobilisation orders

This is when you start scribbling on your notebook a preliminary model of the Unit's business (You notice the CO and Major Pliers look at you admiringly – if they only knew you just don't have a clue yet about how you are going to specifically design this system!). This is a high level diagram at this point, the goal being to identify the main business areas (Entities) and understand the relationships between

them. While the CO and other Major Pliers may not understand all the symbols and relationships detailed in the model, they are helpful in identifying the subject areas and interactions involved. This discussion also yields further insights as to how the CO views his Unit and the goals he has for the new system.

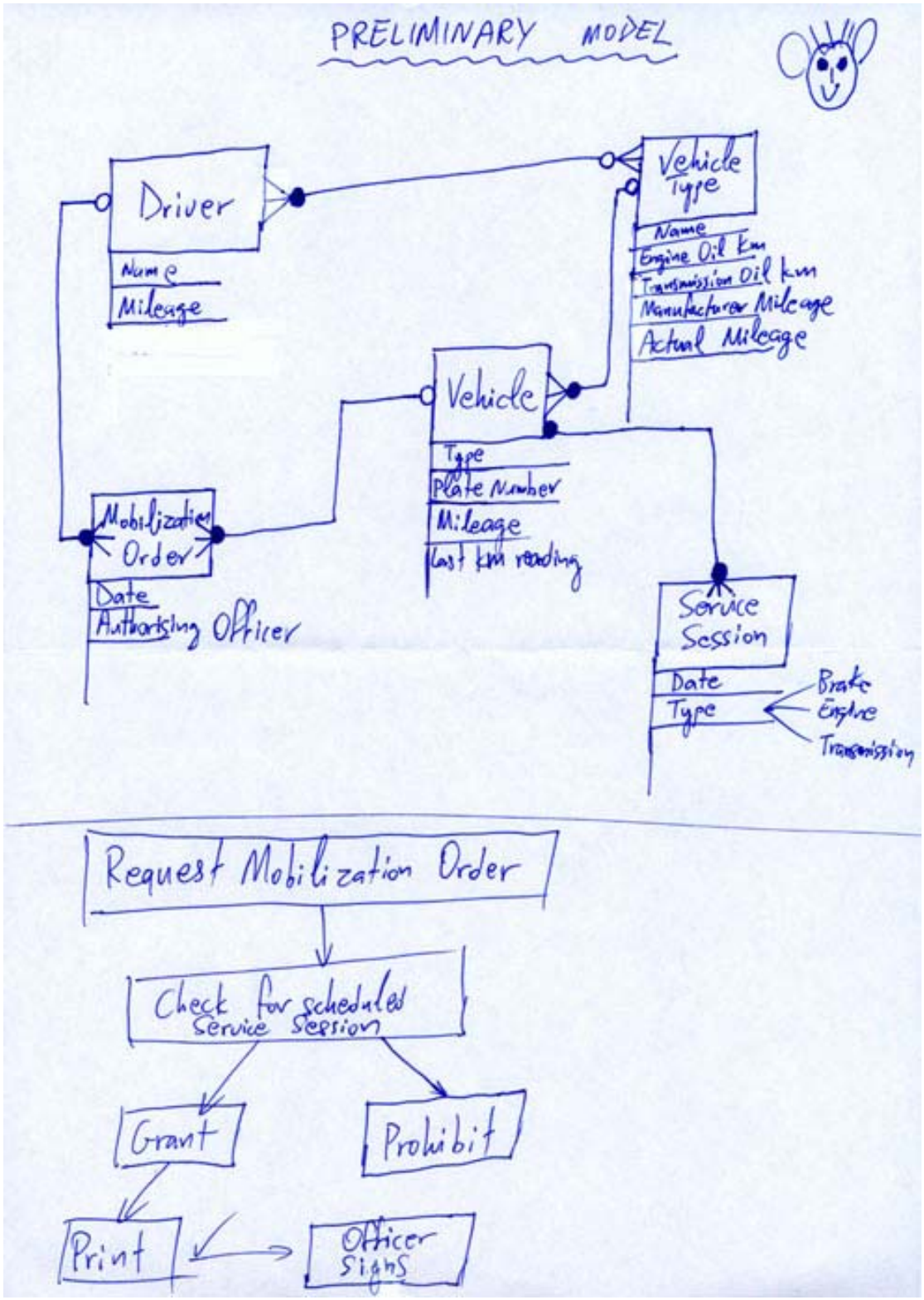
While you were in the Internet Café you actually had time to read the Visible Advantage's tutorial (a tedious 150 page behemoth read and digested in about 90 minutes – Not surprising since you are a Heriot-Watt graduate) and you know that the first step in the system development process according to IE is to gather the business rules the Unit operates under and supply them to this wonderful CASE tool as Statements that will be linked to the appropriate model entities. These business rules are basically those that the CO had mentioned in your very first meeting (when he called you to his office), but it is very important that they are articulated accurately before anything else begins. So you decide that it is worth to have a second run at them and see if anything changed. In order to make the conversation rich, you bring up the following subjects in respect to the "business rules" of the Unit:

- Historical problems (e.g. driver activities that create operational problems)
- The Unit's chain of command and organisational structure.
- How are reports produced (if there are any reports). The answer, surprisingly, is that there are no reports but when one wants a report he can review the books!)
- Some physical implementation issues are also addressed, like the need for a second PC and the possibility for the two to be networked. You specifically ask the CO if he would like a networked system of he would prefer to have his officers enter the same data twice (once in each computer), to which he immediately answers that he wants them networked.

You bring up the issue of buying the Visible Advantage tool and possibly dedicated software for the type of business that the Unit is into (Drivers, cars, etc) but you are told that there is money just enough for another PC and the networking kit. You decide at this point that you will use the MS Access as your database development system and that you will have just 21 days to finish with the development of the new system using Visible Advantage (trial period).

You now have enough information to develop the initial proposal and flesh out the preliminary model that you started scribbling while in session with the CO and Major Pliers.

The Preliminary Model



The Initial Proposal

Vehicle Management System (VMS)

387-0TM (0 Time Mobile) Front Support Unit

Colonel Murdock, CO

Somewhere in the mountains

Valhalla, UTOPIA

Submitted By:

A Good Officer

I. Requirements

Business modelling is a technique used to capture, record and communicate business information. It is a technology independent abstract representation of the business, a corporate information blueprint. The data model allows managers to gain a strategic perspective by identifying the various parts of the business operations, known as entities. It also allows managers to recognise the data relationships throughout the business, creating an excellent foundation for integrating software and streamlining databases.

The Business Model and Entity definitions for 387-0TM's Vehicle Administration represents the events, rules and objects which govern the day to day operations of the vehicles and the related Unit's services. The inter-relationships of the entities are clearly diagrammed in the business model.

The 387-0TM high-level business model was developed as part of this proposal effort applying the information gathered during the undersigned's initial meeting with Colonel Murdock and Major Pliers. The derived requirements/goals for the Vehicle Management System (VMS) for 387-0TM are, but not limited to:

1. Improve integrity and accuracy of the information
    - Eliminate manual data entry as much as possible (Reduction of data entry errors.
    - Rules based data integrity checking.

2. Reduce the time it takes for the Vehicle Activity Sheets, and Vehicle Maintenance Calendar to be manually filled (names, vehicle plate numbers, kilometres shown on the dashboard counter before and after each trip, etc.) and for the needed calculations (car mileage, driver mileage, etc.) to be performed.
    - Offer available options in menus.
    - Smart field entry filling with previous values (e.g. previous post-mobilisation kilometre reading for a car is the same with the new pre-mobilisation one)
    - Automatically calculate mileage per vehicle type and per each individual vehicle and driver.

3. Better tracking of vehicle's service times (when they have to have their oils changed, etc.)
    - Automatically report, each day, which vehicles are to be serviced.

4. Building of a Vehicle History database, which will include all information recorded about the vehicles, in a format that will be upgradeable, easily manageable, industry standards based (SQL) and scaleable.

5. Improve safety by informing the officer authorising a mobilisation order if the vehicle requesting it is overdue in its service check.

6. Maximise Vehicle lifetime.
    - Timely service sessions.
    - Early mechanical problems diagnosis (through decreased mileage detection)

The undersigned believes the most effective solution - given the financial situation of the Unit - for this effort would be the use of the existing Microsoft Access DBMS for the in-house development (by the undersigned) of a vehicle administration database and the sharing of it on a peer network consisting of two PCs.

This would enable 387-0TM to maximise the use of existing hardware and virtually eliminate the expense of costly data base development by a specialising company or purchase of specialised software.

II. Hardware Requirements

The anticipated hardware requirements for the new peer network are:

1. One new PC system:

   Intel Pentium Celeron or II, 400 MHz minimum or greater
   Windows NT 4.0, Workstation or Server (Recommended)
   128MB RAM
   8 GB of hard disk space
   SVGA Graphics/Monitor (Color)
   Keyboard, mouse, CD-ROM drive
   Monochrome Laser printer

   *This PC will be used as the server for the database

2. PC Ethernet networking kit (for 2 PCs)

III. Recommendation

Installation

The undersigned will conduct extensive market probing for the best offered price on the recommended hardware configuration and will then order the selected hardware on behalf of 387-0TM. The undersigned will then proceed to install the newly purchased hardware as required.

Training

The undersigned will train the 387-0TM officers on the resultant VMS (Vehicle Management System).

Entity Definitions

VEHICLE
This can represent any of the Unit's vehicles. It is the most basic entity around which the Unit's business revolves. It has such attributes as plate number and mileage.

VEHICLE TYPE
This entity represents the various vehicle types that comprise the Unit's vehicle fleet. It has attributes such as manufacturer recommended number of kilometres for engine and transmission oil changes and manufacturer declared mileage.

DRIVER
Represents a vehicle driver. Drivers posses driver's licenses for certain vehicle types only. They have such attributes as name and mileage.

MOBILISATION ORDER
Represents a specific paper signed by an officer with mobilisation order issuing authority. It has such attributes as a unique identification number, a certain date and the name of the authorising officer.

SERVICE SESSION
This entity represents a scheduled, for a certain vehicle, brake fluid change and/or engine or transmission oil change. It of course has a unique id number and a certain date, as well as the type(s) of service to be performed, as its attributes.

++

A Good Officer

CASE Tool Statement Generation

After you finish typing the Initial Proposal you put it in a big fancy manila folder and you submit it to the CO via the Unit's internal snail-mail system, although his office is next door to yours. "Formal they want…formal they will get" you think to yourself, chuckling. Your CO responds to you with two hand-written notes, also delivered to you via the internal mail system:

- In the first he says that he totally agrees with the proposal and so does Major Pliers who came to his office to check the initial proposal too. He also gives you the "green light" to commence the building of the proposed Information System.
- In the second note he says that you have just received another 4 days of detention for not taking the time to come to his office and deliver the initial proposal personally.

"This is really bad!" you think to yourself. "My girlfriend was coming to visit me this weekend!" You call her up and tell her the bad news. Hanging up the phone you "discipline" a passing soldier with a 2-day detention penalty for not having his shoelaces tied according to regulation 2-22-P8C4.6 (Title: Official Utopian Soldier Shoelace Tying Schemes).

Our Good Officer having a "friendly conversation" with a driver who neglected to change his vehicle's transmission oils

Then you direct your troubled mind back to business. The next step is to clearly express the CO's intentions in a Statement form that is appropriate for entry in the Visible Advantage CASE tool. These Statements will help define Entities in the model, which will in turn define Process models in later stages.

After taking a look at the business requirements/goals stated in initial proposal you decide that they need a bit of restructuring although they are detailed and refined enough.

The main changes you make involve the expression of a formal 387-0TM "mission statement" and a better differentiation between business goals and business policies supporting those goals. You also decide that one of the initially stated requirements/goals is not needed as it is actually covered by a different one (Specifically: the "Better tracking of vehicle's service times" requirement, is actually covered by the "Maximise Vehicle lifetime" one). A little later you find out that the "Building of a Vehicle History database" statement is also irrelevant to the methodology purported by the tool and cross that out too.

You then type the resulting Statements neatly on a new MS Word document (using that old full-of-games PC) and decide that it is time to install Visible Advantage and begin using it. At some point you have to stop typing and stand at attention in front of your desk because you hear the trumpet signalling the sunset lowering of the Utopian National Flag.

387-0TM Business Requirements

387-0TM is a military Unit retaining a large fleet of all-terrain vehicles that are employed in daily ammunition and supplies transits and that have to be maintained in good working order at all times.

1. Improve integrity and accuracy of the information
    - Rules based data integrity checking.

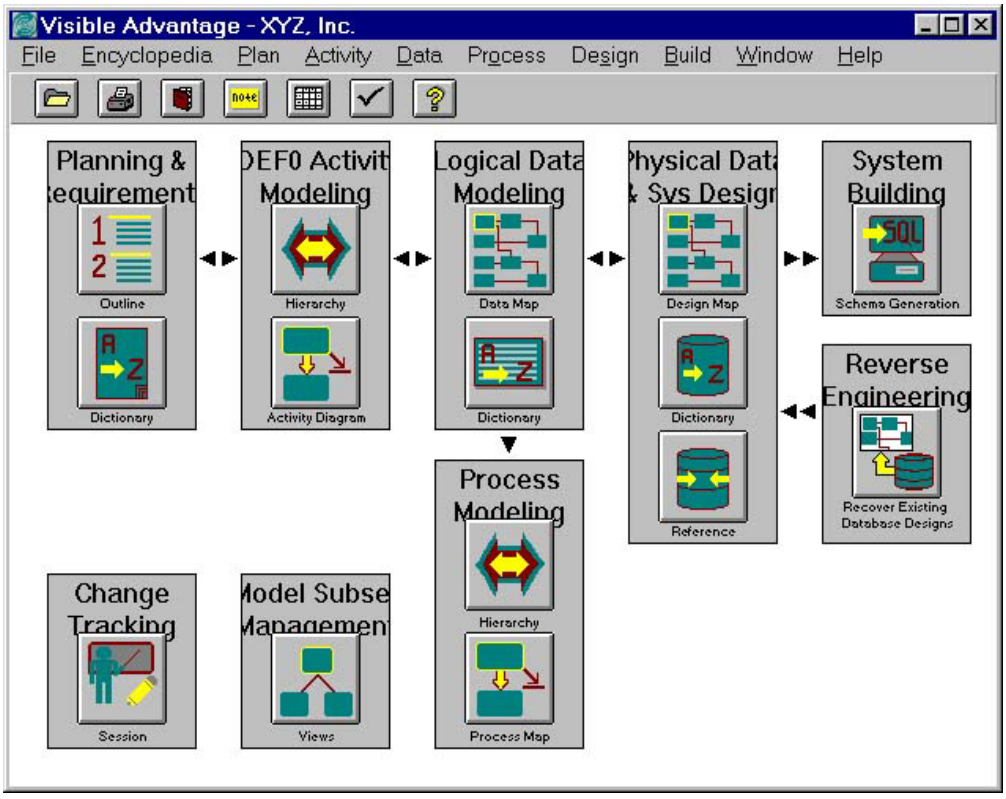
2. Reduce the time Data Entry and related calculations take.
    - Offer available options in menus.
    - Smart field entry filling with previous values (e.g. previous post-mobilisation kilometre reading for a car is the same with the new pre-mobilisation one)
    - Automatically calculate mileage per vehicle type and per each individual vehicle and driver.

3. Improve personnel safety and general safety.
    - Monitor Mobilisation Order Requests (Inform the officer authorising a mobilisation order if the vehicle requesting it is overdue in its service check.)

4. Maximise Vehicle lifetime and Operational Readiness (via timely service sessions and early mechanical problems diagnosis.)
    - Schedule next day service sessions.
    - Automatically report consistently decreased vehicle mileage.

Using Visible Advantage

As a tool, Visible Advantage is used in conjunction with a series of workshop sessions in which an organisation's business and information requirements are determined. Both business experts and information systems professionals participate in workshops with different focuses such as business planning and requirements, activity modelling and activity based costing, data and process modelling, and systems design. The output of these sessions forms the input to Visible Advantage. Modelling sessions are interactive in nature and depend upon a number of factors, including job responsibility and experience of the participants, as well as the nature of the business being modelled.



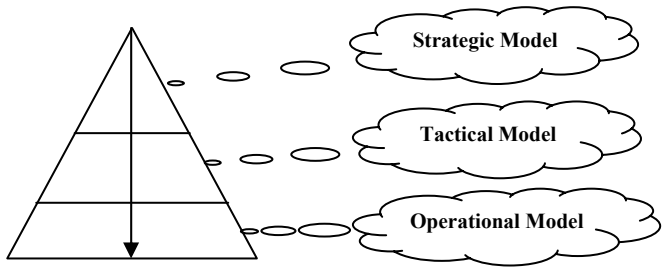
This is the main screen of the Visible Advantage CASE tool. It shows a diagrammatic representation of the IE methodology structure. This structure guides the analyst/programmer through the methodology's well defined steps from the high level (managerial) specification of a new IS right down to the specifics of SQL.

While you busy yourself with entering and correctly interconnecting the statements into VA (Visible Advantage), you have continuous business-model review sessions with Colonel Murdock (CO) and Major Pliers.

In these sessions, the model is slowly refined/progressed into a more "tactical" level. This "Tactical" organisation of information is basically an expanded view of the Strategic model, with entities including not just basic data-type entities but other entities expressing specific business processes like "Accepting Mobilisation Order Requests" or "Filling out Vehicle Activity Sheets". These "Business Processes" will have to be appropriately mapped into the CASE tool and will of course be supported by "Data Access Processes". These "Data Access Processes" will make explicit the logic of accessing the defined Data Entities for manipulating (read, write, etc.) the data required for the completion of the Business Processes invoking them.

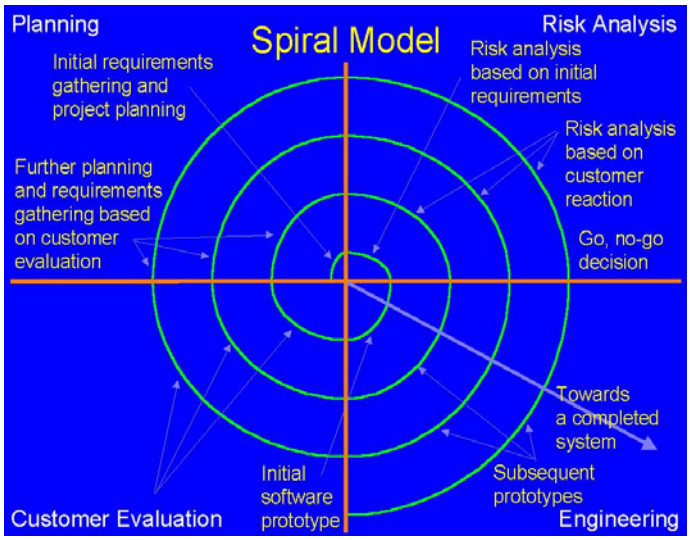
As you work your through building the new IS inside the VA CASE tool you realise that this whole process roughly involves the following steps:

1) Enter and logically interconnect the Business Statements
   a) Give them appropriate priorities
   b) They should roughly be in the form of Goals and Policies, where Policies support the purported Goal.
2) Enter the basic Data Entities and their Attributes and form Relationships (Associations as the VA tool calls them) between them.
3) Link Entities and Associations to related Business statements
4) Define basic Data Access Processes in the form of flowcharts that logically depict what a Vehicle Maintenance Calendar lookup involves.
5) Define Business Processes that make use of those Data Access Processes.
6) Link Business Processes to related Business Statements.
7) Test and debug the resulting logical web that represents the business model of the IS you are trying to develop.
8) Finally, have the CASE tool automatically create a basic Database Schema in the form of a series of SQL statements that you have of course to then feed into a DBMS system that will create your actual database. (MS Access in this case)



This "Modelling Process" continues over the next weeks, following the methodology that the VA CASE Tool supports and you as a "Good Officer" have chosen. A large part of this involves further definition of the business initiatives at levels that go beyond the Strategic perspective, moving toward the Tactical level of Modelling.

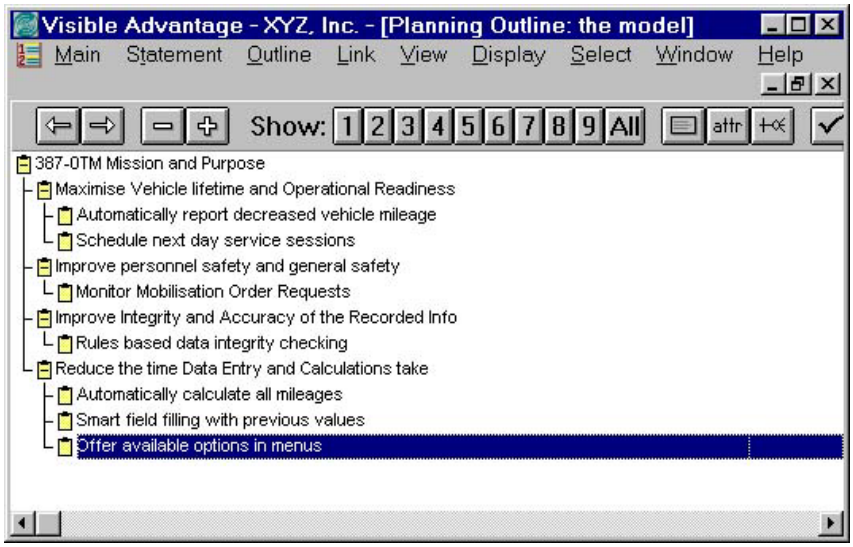
The modelling process includes defining purposes, assigning attributes, making sure keys and relationships between the Entities are correctly defined, etc. This modelling process finally leads to the "Operational Model" which lies at the base of the Information Modelling "pyramid". This pyramid graphically depicts the top-down IS design paradigm followed by the IE methodology in general and the VA CASE tool in particular. Of course you slowly yet efficiently map all these changes and/or additions to appropriate VA artefacts.



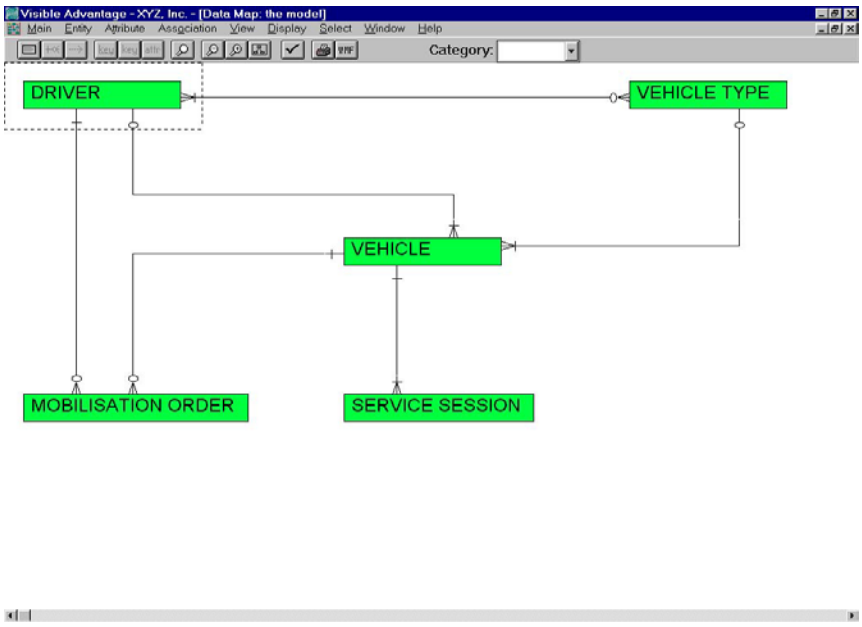
At some point an initial database schema is created using VA. This marks the first step in the production of a series of "prototype" versions of the software system that are further tested, evaluated and analysed. This analysis is cyclical in nature, as each modelling iteration is used to compare the developed prototype software to the proposed model and the specific insight that the explicit nature of programming offers is used to further evaluate the model for completeness and accuracy.

When discussing the iterative nature of the analysis, it is interesting to note how the model developed drives the software evaluation, and the software evaluation drives the modelling. This is nicely depicted in the picture above.

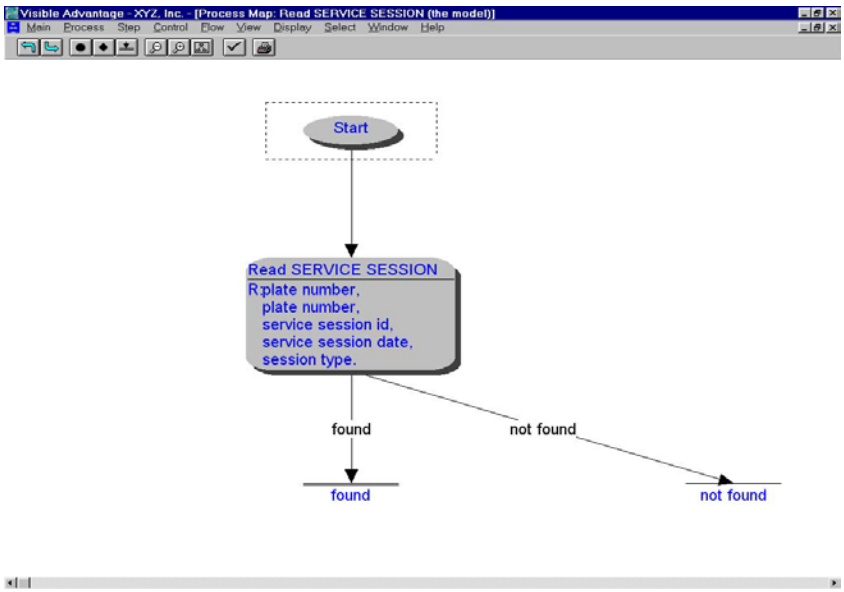
Visible Advantage Specifics



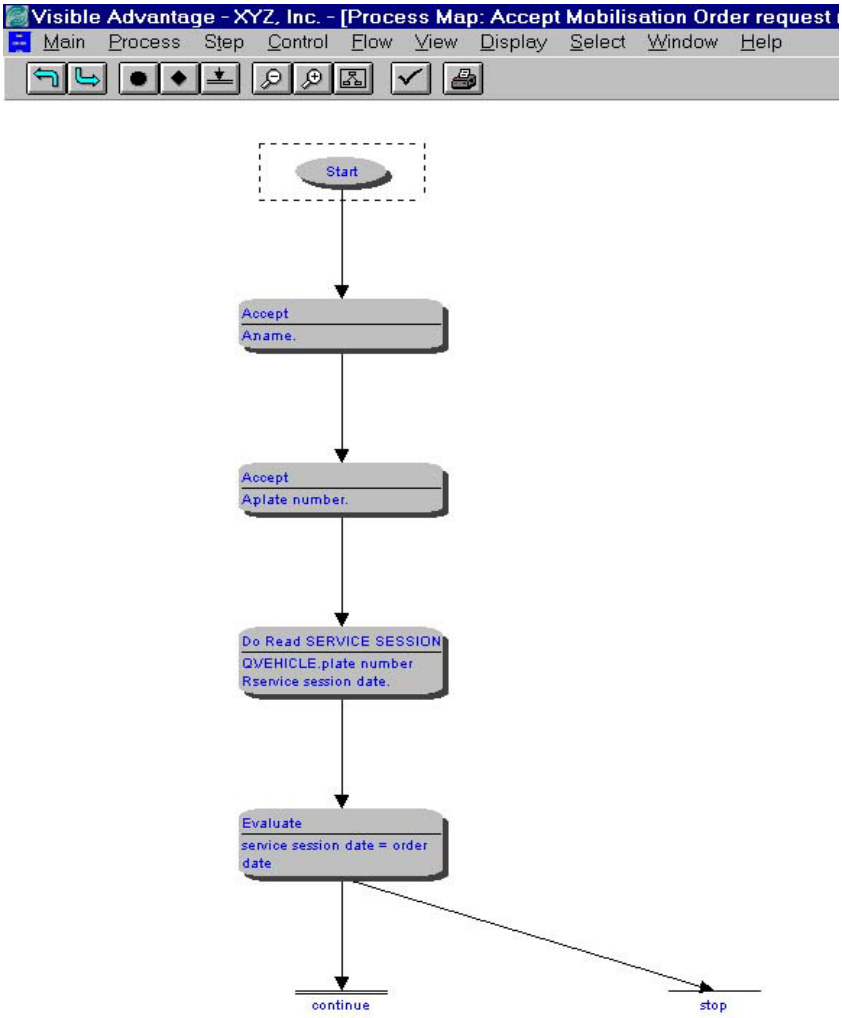
This screenshot shows how the business statements of 387-0TM are organised into Mission Statements, Goals and Policies that have priorities and are part of a hierarchy that supports their linking with appropriate business processes and data entities in a logically explicit manner.



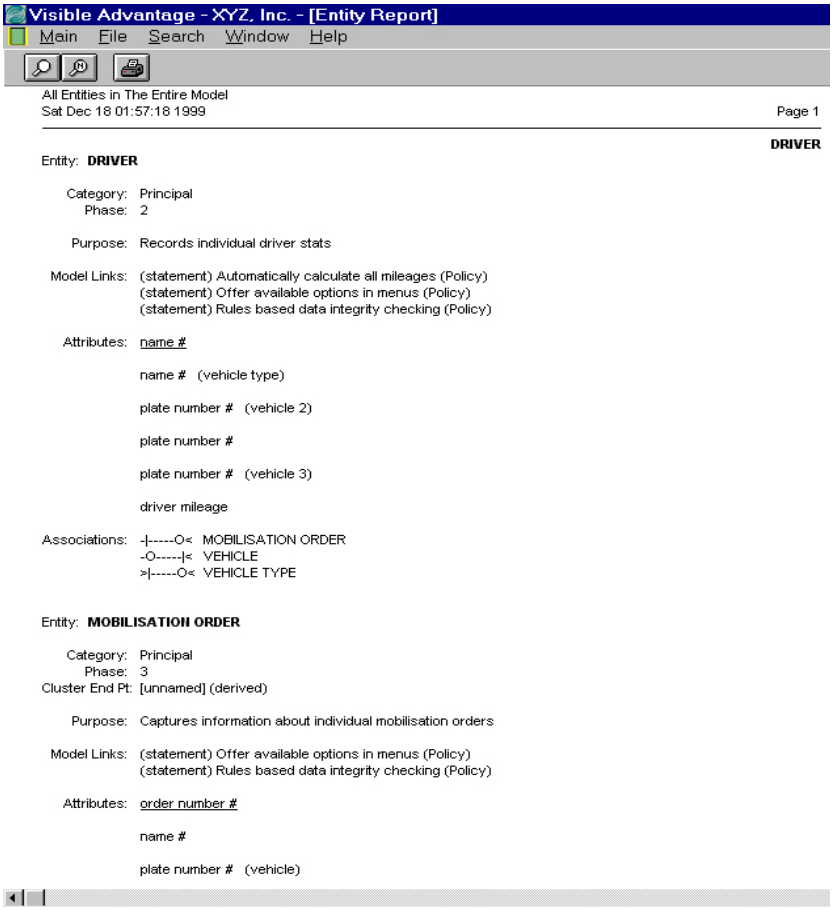
This is a the graphical representation that the VA tool uses to depict the data entities and their associations (relationships if you like). The tool does actually take care of the relational implementation of a relationship in the form of a secondary key once this relationship is defined by the user.



This screenshot shows a simple flow diagram that depicts the logic of a specific Data Access Process. This Data Access is used to read a specific Service Session record once given a Vehicle Plate Number. This is needed by the business process depicted on the next page.



This is the flow diagram of the business process needed for issuing a requested mobilisation order. It accepts a driver name and a vehicle plate number. Then it checks if the vehicle involved in the requested mobilisation order is scheduled for a service session that day. If yes it stops (and informs the issuing Officer). If there is no problem the process continues normally (finally printing out the requested mobilisation order for the issuing Officer to sign). Visible Advantage uses expert system rules to determine the process logic for data access processes. For business processes, this is not possible. You must define each step of the process. Also, we need to define Data Access Processes before we can define business processes that use them.



Visible Advantage - XYZ, Inc. - [Entity Report]

Main File Search Window Help

All Entities in The Entire Model
Sat Dec 18 01:57:18 1999 Page 1

DRIVER

Entity: **DRIVER**

Category: Principal
Phase: 2

Purpose: Records individual driver stats

Model Links: (statement) Automatically calculate all mileages (Policy)
(statement) Offer available options in menus (Policy)
(statement) Rules based data integrity checking (Policy)

Attributes: name #

name # (vehicle type)

plate number # (vehicle 2)

plate number #

plate number # (vehicle 3)

driver mileage

Associations: -|-----O< MOBILISATION ORDER
-O-----|< VEHICLE
>|-----O< VEHICLE TYPE

Entity: **MOBILISATION ORDER**

Category: Principal
Phase: 3
Cluster End Pt: [unnamed] (derived)

Purpose: Captures information about individual mobilisation orders

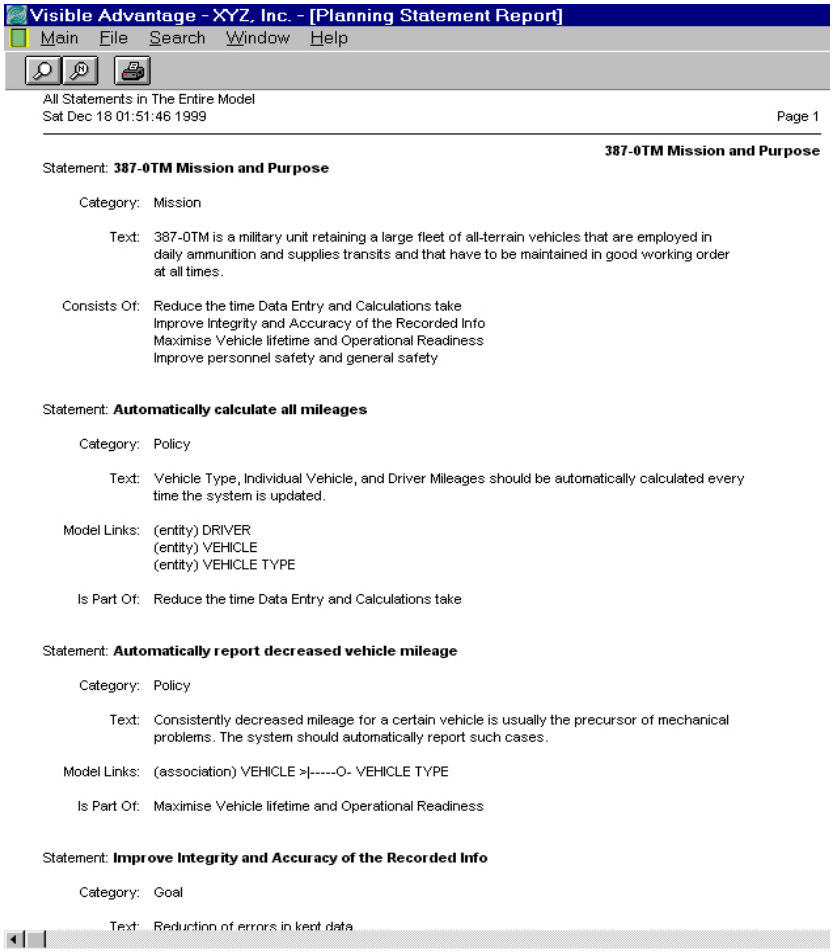
Model Links: (statement) Offer available options in menus (Policy)
(statement) Rules based data integrity checking (Policy)

Attributes: order number #

name #

plate number # (vehicle)

Here we can a see a sample screenshot of one of the basic (out of a multitude) reports that the VA CASE tools produces automatically. This is the Entity report which basically describes the defined entities and their attributes, links, associations., etc. VA reports are prolific because it is the philosophy of the Business-Driven variant of IE that documentation that allows users to review the correctness of data definition is of central importance to the methodology.



Visible Advantage - XYZ, Inc. - [Planning Statement Report]

Main File Search Window Help

All Statements in The Entire Model
Sat Dec 18 01:51:46 1999 Page 1

387-0TM Mission and Purpose

Statement: **387-0TM Mission and Purpose**

Category: Mission

Text: 387-0TM is a military unit retaining a large fleet of all-terrain vehicles that are employed in daily ammunition and supplies transits and that have to be maintained in good working order at all times.

Consists Of: Reduce the time Data Entry and Calculations take
Improve Integrity and Accuracy of the Recorded Info
Maximise Vehicle lifetime and Operational Readiness
Improve personnel safety and general safety

Statement: **Automatically calculate all mileages**

Category: Policy

Text: Vehicle Type, Individual Vehicle, and Driver Mileages should be automatically calculated every time the system is updated.

Model Links: (entity) DRIVER
(entity) VEHICLE
(entity) VEHICLE TYPE

Is Part Of: Reduce the time Data Entry and Calculations take

Statement: **Automatically report decreased vehicle mileage**

Category: Policy

Text: Consistently decreased mileage for a certain vehicle is usually the precursor of mechanical problems. The system should automatically report such cases.

Model Links: (association) VEHICLE >|-----O- VEHICLE TYPE

Is Part Of: Maximise Vehicle lifetime and Operational Readiness

Statement: **Improve Integrity and Accuracy of the Recorded Info**

Category: Goal

Text: Reduction of errors in kept data

Here is another very basic VA report. The planning statement report. We can easily see the information pertaining to the hierarchy of the various Statements in an explicitly written form (i.e. a statement “is part of”, or it “consists of”).

Conclusion

Although, the IE project with 387-0TM is still not over, our Good Officer can see successful, positive steps already completed. While the project is complete as to its Analysis Phase, there are still other aspects to be considered, like User Training and production of good Documentation (very important, yet not too hard since this is one of the strongest points of the Business-Driven IE variant that we are using).

Still our Good Officer feels good about himself and he knows that things from now on will be relatively "smooth" as the project has taken the right direction. As he puts his feet on top of his standard issue desk he feels somebody whispering to him: "Pssst! It ain't over till it's over boy!" "Probably right!" he answers, "if anything goes wrong in the final implementation of the system I may have to rethink the aspects of the Analysis Phase". Yet, our Good Officer has no fear, as he now has the experience and knowledge to tackle such a case swiftly and effectively.

He smiles to himself and realises that his detention penalty period is now over. He sees his girlfriend waiting for him at the camp's gate. "Damn, life is sweet!