



HOW TO USE CBML

VERSION 1.1

11 TH MARCH 2009

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## 1. INTRODUCTION

1. For many years data modelling has been the predominant activity for describing users requirements. Because of its nature, this modelling has been performed by 'technical' people who have a very good understanding of what the final implementation is going to be. Users therefore, have not taken responsibility for their requirements, and this is made much worse by the data models being constrained by implementation issues.

2. Businesses and people do not use data, they use information, and therefore it follows that user requirements should be defined in information terms not data terms. This will allow the user to 'own' their requirements, and maintain them independently of the implemented systems that support their business.

3. By keeping this independence, the business can change its information needs as the business processes demand and pass the resultant new information needs to the implementers to choose whatever implementation method they deem appropriate.

4. In order to achieve this situation the Corporate Business Modelling Language (CBML) has been developed. CBML defines information, not data, and is completely independent of how any future systems will be implemented.

5. Through tool support, the structures that are required for the implementation of CBML information models may be created automatically by the application of a prescribed set of rules to the information definition.

### TARGET AUDIENCE

6. This guide is aimed at people who will be involved in the definition of the information used within a business domain often, but not exclusively, for the development of an Information System.

### DOCUMENT STRUCTURE

7. The approach taken in this document is to have a central theme running throughout, and this is based on the 'Theme Park Ombudsman Service' (TPOS). This service is fictional and is used purely to demonstrate how, once full understanding of the information needed to support the business has been achieved, this understanding can be documented in a precise, objective and unambiguous way.

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## 2. GETTING TO KNOW CBML

### WHAT IS CBML?

1. CBML is a set of concepts for the specification of the various types of information by which real-world objects are described. It allows this to be done with great precision in a manner that is entirely free of influence from any present or anticipated technology or implementation design.
2. The differences between modelling information and the modelling of data structures are:
  - a. Data structures define how data needs to be organised to provide the data needed to enable functionality: usually within a prescribed information system.
  - b. Information structures define the information needed to perform the required functionality of a prescribed business.
3. In complex businesses a number of systems are required to meet the needs of a number of business domains. By modelling information rather than data used in information systems the reconciliation of these diverse perceptions becomes possible.
4. The set of CBML concepts are sufficiently comprehensive to ensure that all possible information structures may be defined; and sufficiently restricted to ensure that there is one and only one way to correctly model a set of information. This presumes that the analysis that defines the information to be modelled is consistent.

### DIFFERENT PERCEPTIONS OF INFORMATION

5. The need to reconcile information leads to a requirement for an enterprise wide common understanding of information structures that is capable of representing the whole scope of the business. This is achieved by modelling information with the full rigour of the syntax rules of CBML. This does not prevent alternative names and descriptions for elements of the model but the structure of the information elements that form the model may not change.
6. Within different business domains there will be diverse perceptions of information that will be reflected in the information model for that business domain. These perceptions will be influenced by how information is used and, possibly, by the data structures used in information systems used by the business domain.

### USING CBML FOR RECONCILIATION

7. The underlying principles are:
  - a. Reconcile the business domain information model to the enterprise wide information structure.
  - b. Reconcile the business domain information model to the information system data structure.
8. This will enable the reconciliation of all information models.

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### **3. THE THEME PARK OMBUDSMAN SERVICE (TPOS)**

1. The Theme Park Ombudsman Service (TPOS) is a hypothetical organisation that has been developed solely to act as an example for the purposes of explanation within this document.

#### **PROCESS OVERVIEW**

2. The TPOS is responsible for investigating complaints made by members of the public regarding the services and safety of theme parks in England and Wales. Complaints may also be made on behalf of members of the public by a legal representative should they so desire. Throughout the remainder of this scenario the term 'complainant' will be used to describe the aggrieved member of the public.

3. When a complaint is received it is initially dealt with by an Assessment Group who review all incoming complaints. All valid complaints are registered and they are then forwarded to an allocations officer who is responsible for allocating them to an individual investigator. Once a complaint has been allocated to an investigator they are responsible for the totality of the investigation, until it is closed. When a complaint falls outside the Ombudsman's jurisdiction the Assessment Group notifies the complainant in writing that this is the case.

4. The investigator examines the relevant documentation to see if there are sufficient grounds for an investigation to take place. Further papers may be sent to, or requested from, the complainant and/or the Theme Park involved. If sufficient grounds for an investigation cannot be established, or the complainant withdraws the complaint, then the case is closed and the complainant is advised of this in writing. An investigator has a remit to close a case within 10 weeks.

5. If there are sufficient grounds for the complaint then the investigator will open a case file and may create a draft report. The Ombudsman reviews the draft report before it is forwarded to the Theme Park concerned. The Theme Park is required to respond within 5 days.

6. The investigator reviews the response from the Theme Park and the draft report is updated accordingly. The complainant is then notified in writing as to whether or not the complaint has been upheld.

7. The complainant has 7 days to respond to the draft report. If there is a response then the investigator reviews it and updates the draft report as necessary before a final report is created and issued.

8. The investigation is closed when the decision letter and the final report have been issued. The case is closed when the Theme Park has confirmed the implementation of any changes required. The case may be re-opened, or a new file created, if new evidence is received that warrants further investigation.

9. The TPOS will select completed case summaries for inclusion in the TPOS annual report.

#### **ADDITIONAL INFORMATION NEEDED TO SUPPORT THIS REQUIREMENT?**

10. The process of analysis needs to be carried out in order to identify the information needed to support this area of business. A checklist of things to remember is given at Annex B.

11. Details of the information required to support this scenario are given at Annex C.

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## 4. CREATING INFORMATION MODELS IN CBML

1. Having identified the information needs for a given business domain or enterprise, and having gained full understanding of that information, then that understanding needs to be fully documented in CBML. The first step in this process is to identify those real world things that the business is interested in. In the case of the TPOS they are interested in:

- a. Complainants
- b. Complaints
- c. Theme Parks
- d. Case Files

2. In CBML each of the above is called an **entity class**.

3. As is **entity class** in paragraph 2, all the CBML terms used in this document are shown in bold type. The definition of all of the CBML terms is given in the Glossary at Annex D.

### THE ENTITY CLASS MODEL

4. An **entity class** represents a real world object, something that is tangible to a business area. It is the thing that information describes. In the graphical notation used in a **CBML model** an **entity class** is represented by the graphic shown in Figure 4.1.

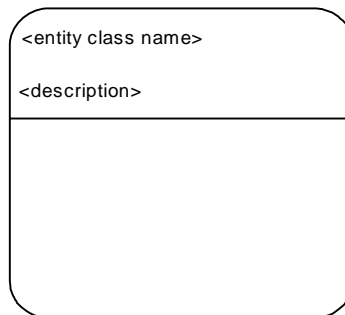


Figure 4.1. Generic entity class graphic

5. As shown in Figure 4.1, an **entity class** has a name and a description. This description needs to be meaningful and conform to the business understanding of the **class**. In the case of the TPOS, the first **entity class** will be called 'Complainant'. In the case of the 'Complainant' **entity class** the description is 'A party that makes a complaint against another'. Figure 4.2 shows the 'Complainant' **entity class** with name and description.

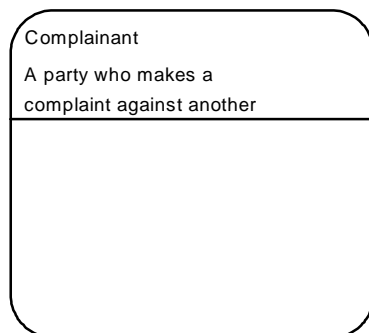


Figure 4.2. Complainant entity class with name and description

6. The next stage is to refer back to the analysis and identify those things that describe a 'Complainant'. This information is shown in detail in Annex C and summarised in the following list:

- a. Surname
- b. Forename(s)
- c. Gender
- d. DOB
- e. Age Group
- f. Address
- g. Town/City
- h. Postcode
- i. Tel Contact
- j. Email
- k. Additional Information

7. In CBML the items in the list above are known as **characteristics**.

#### CHARACTERISTICS

8. The purpose of **characteristics** is to define the intrinsic **types** of information relevant to an **entity class**.

9. A **characteristic** describes a single piece of information known as an **information element** that has a value, or set of values, ascribed to it when used to describe an actual thing in the real world.

10. An **information element** is a single piece of information even though more than one value may be required to define that single piece of information.

11. An **information element** that manifests a **characteristic** is made up of **characteristic fragments** that have a specific **composition**.

12. A **composition** is a combination of **data type**, **composition qualifying detail**, and **composition constraint on value**; and of a name for identification. The **composition** must consist of a single **data type**. The **data types** that have been defined in CBML are shown in Table 4.1.

Table 4.1 CBML data types

Data type	Characteristic fragment type description
<b>character</b>	A sequence of characters
<b>numeric</b>	A real number in the range of minus infinity to plus infinity including zero but excluding plus and minus infinity
<b>boolean</b>	A value of true or false only
<b>time</b>	A position or period in the continuum of time
<b>referential</b>	A pointer to one of the following: <b>class</b> , <b>scheme</b> , <b>category</b> or <b>set</b>

13. The shorthand that is used in diagrams to represent these **data types** is as follows:

- a. STR: **character**
- b. NUM: **numeric**
- c. DTG: **time**
- d. BOL: **boolean**
- e. REF: **referential**

14. These are termed **simple fragments** and can have no further structure. They represent a single piece of data.

15. There are 2 other types of **characteristics**, referred to as **complex characteristics** and they are:

- a. **Complex - CPX**
- b. **Common Reference Quantity – CRQ**

#### COMPLEX CHARACTERISTICS

16. A **complex characteristic** consists of two or more **simple fragments** and it represents more than one piece of data. An example of this is the latest format of a vehicle registration number where the first two letters represent the area in which the car was first registered, the two numbers represent the period of the year that it was first registered, and the last three letters represent a random set of letters to make the number unique.

17. Some **complex characteristics** have a predefined structure such as **quantity**. This is made up of a reference to the **class**, **scheme**, **category** or **set** that the quantity applies to, and a **numeric simple fragment** that will hold the appropriate value. This structure will be seen when we define 'Complaint'.

#### WHAT CHARACTERISTICS DESCRIBE

18. **Characteristics** are used to describe Types and **instances** of Types, and these are referred to as **class characteristics** and **instance characteristics**.

19. An example of a **class characteristic** is:

- a. The 'design weight' of a particular model of vehicle. The value applied to it would apply to all vehicles of that type.

20. An example of an **instance characteristic** is:

- a. The 'Surname' of a Person. When a value is assigned to this **characteristic** than it is applicable to an **instance** of Person.

#### CONSTRAINTS THAT CAN BE APPLIED TO CHARACTERISTICS

21. Each **characteristic** of a **class** or **instance** has a number of rules associated with it. These are known as **usage rules** and define the constraints on the use of the **characteristic** within a **CBML model**.

22. The **usage rules** that are applied are shown in Table 4.2. This table also shows the graphical notation that is used to represent these rules in a **CBML model**.

Table 4.2. Usage rules for characteristics

Rule	Meaning	Graphical Notation
<b>Optional</b>	Indicates that a value for a <b>characteristic</b> may not be required	-----
<b>Mandatory</b>	Indicates that a value for a <b>characteristic</b> is required	_____
<b>Single</b>	Indicates that there is only one concurrent value for a <b>characteristic</b>	—————
<b>Multiple</b>	Indicates that there may be more than one concurrent value for a <b>characteristic</b>	—————>>
<b>Fixed</b>	Indicates that once a value has been assigned to a <b>characteristic</b> it cannot be changed	●
<b>Variable</b>	Indicates that once a value has been assigned to a <b>characteristic</b> it can change with time	○

23. Based on the information given in Annex C the **characteristics** that the user wishes to use to describe 'Complainant' can now be defined.

24. As all of the **characteristics** describe an individual person, they are called **instance characteristics**. In accordance with the conventions used in a **CBML model**, **instance characteristics** are placed below the line in the **entity class** graphic as shown in Figure 4.3.

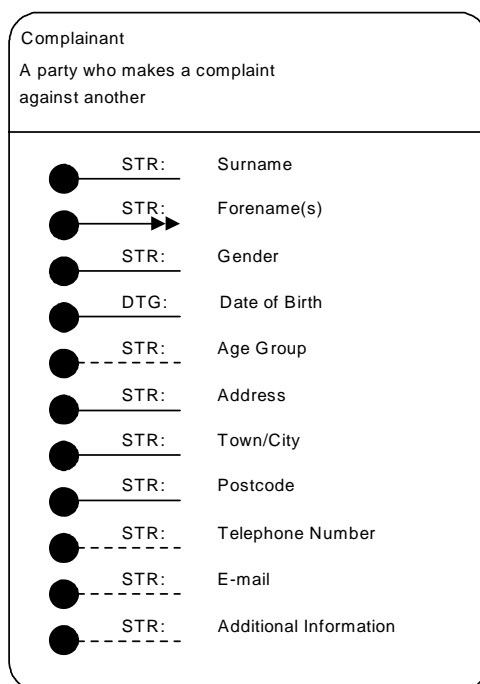


Figure 4.3 Complainant entity class with instance characteristics added

25. Note that the recorded **usage rules** shown in Annex C have been converted into graphical notation using the notations shown in Table 4.2.

26. The values associated with 'Gender', that is, Male and Female, can be considered as 'Domain Values'. These are the values that can be applied to this **characteristic**.

27. The values for 'Age Group' can also be considered as 'Domain Values'. However, they can also be modelled in a more precise way, because what is actually being said is that 'A complainant IS A complainant by Age Group of eighteen to thirty five years, etc. In CBML, when an 'IS A' relationship is identified, it is called a **categorisation**. **Categorisations** are discussed in the following paragraphs.

### CATERGORISATION

28. As mentioned earlier, different areas of business have different ways of viewing the same thing. The purpose of the **categorisation of classes** is to classify **classes** in all the ways necessary to provide all the required information about the **class**. When a **class** is categorised it takes on all the features of the **category** it is categorised as. For example, when a Complainant is categorised as being a complainant by Age Group then the Complainant takes on all the features of that Complainant by Age Group type. These features only remain as part of the description of the Complainant for as long as the **categorisation** is in place.

### CONSTRAINTS THAT CAN BE APPLIED TO CATEGORISATIONS

29. Each **categorisation** has a number of rules associated with it, known as **usage rules** that define constraints on its use within a **CBML model**. These are the same as those that apply to **characteristics** and, for ease of reference, are repeated in Table 4.3. This table also shows the graphical notation that is used to represent these rules in a **CBML model**.

Table 4.3. Usage rules for categorisations

Rule	Meaning	Graphical Notation
<b>Optional</b>	Indicates that a value for a <b>characteristic</b> may not be required	-----
<b>Mandatory</b>	Indicates that a value for a <b>characteristic</b> is required	_____
<b>Single</b>	Indicates that there is only one concurrent value for a <b>characteristic</b>	_____→
<b>Multiple</b>	Indicates that there may be more than one concurrent value for a <b>characteristic</b>	_____⇨
<b>Fixed</b>	Indicates that once a value has been assigned to a <b>characteristic</b> it cannot be changed	●
<b>Variable</b>	Indicates that once a value has been assigned to a <b>characteristic</b> it can change with time	○

30. Figure 4.4 shows the 'Complainant' entity, categorised as a 'Complainant by Age Group', as it would appear in a **CBML model**. Note that the **intrinsic characteristic** 'Age Group' is no longer shown within the 'Complainant' entity graphic and has been used to link the entity graphic to the **categorising set**.

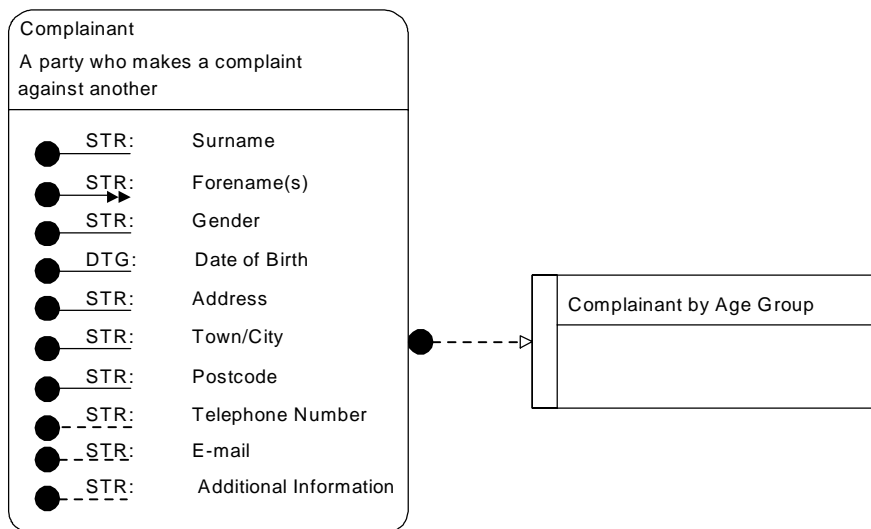


Figure 4.4. Categorisation of complainant as a complainant by age group

31. What the rule shown in Figure 4.4 states is that 'Each instance of complainant may be categorised as one, and only one, member of Complainant by Age Group that cannot change'.
32. **Categorisations** are valid from:
- instances** of a **class**, as shown in Figure 4.4, to a **categorising set**. This means that all **instances** of the **class** can have a **categorisation** defined for them.
  - a **specialising scheme** to a **categorising set**. This means that all **members** of the **scheme** can have a **categorisation** defined for them.

### CATEGORISING SETS

33. In CBML the graphical representation on the right of Figure 4.4 is called a **categorising set**. The **members** of that **set** are 'First Age Group - Up to 10 yrs', 'Second Age Group - 10 to 18 yrs', etc., and these are called **categories**. These **categories** form a semantic library, which is one of the key features of CBML. **Categories** have their own graphical notation and an example is shown in Figure 4.5.

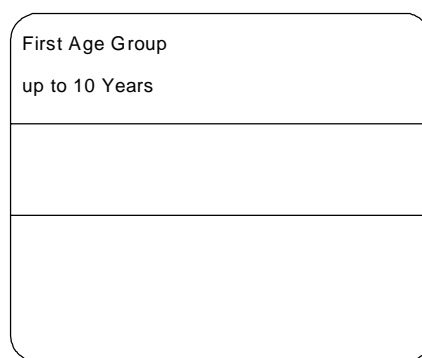


Figure 4.5. Example of the graphical representation of a category

### THE COMPLAINANT BY AGE GROUP MODEL

34. The 'Complainant by Age Group' **model** would be as shown in Figure 4.6.

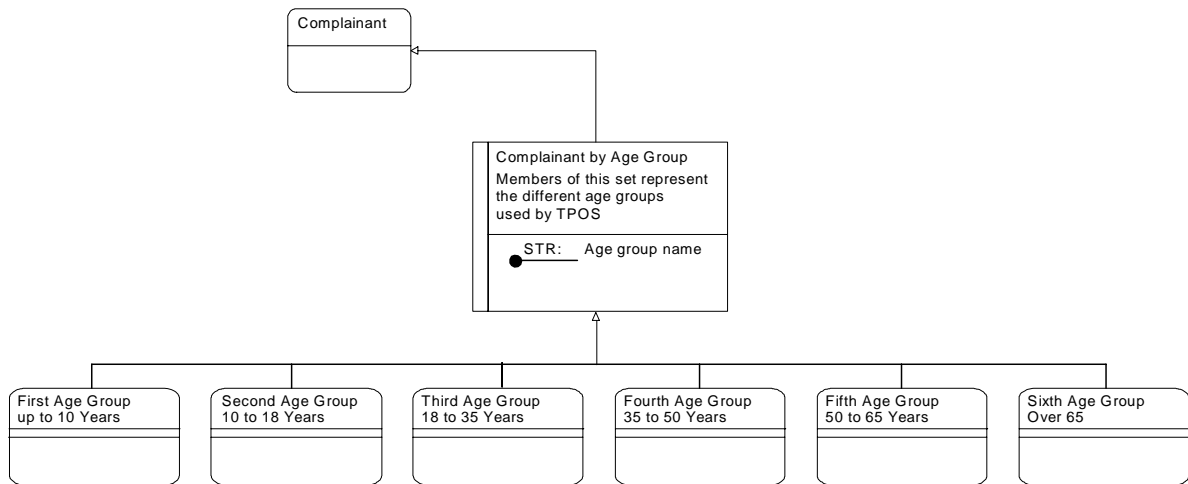


Figure 4.6 Model of complainant by Age Group

35. Every **categorising set** must have a **scope**, and this could be either a **class** or a **category**. Usually it will be a **class**. In Figure 4.6 the 'Complainant' **entity class** is the **scope** of the **categorising set** 'Complainant by Age Group'. The **scope** of a **categorising set** is represented graphically in a **CBML model** by a right-angled line with an 'open' arrow pointing to the **class** or **category** that is the **scope** as exemplified in Figure 4.6. This graphical representation is known as a 'scoping line'. These may be added to a CBML diagram to give added clarity but their use is not mandatory.

36. An **entity class** can only be categorised to **categories** in **categorising sets** that it is the **scope**, or **owner** of.

37. As with **entity classes**, **characteristics** can be defined for **categories**, and they can be defined within a **category** itself, or within a **categorising set**, dependent on what the **characteristic** describes. The position of the **characteristic** determines what it is defined for. Their position and meaning are as shown in Figure 4.7.

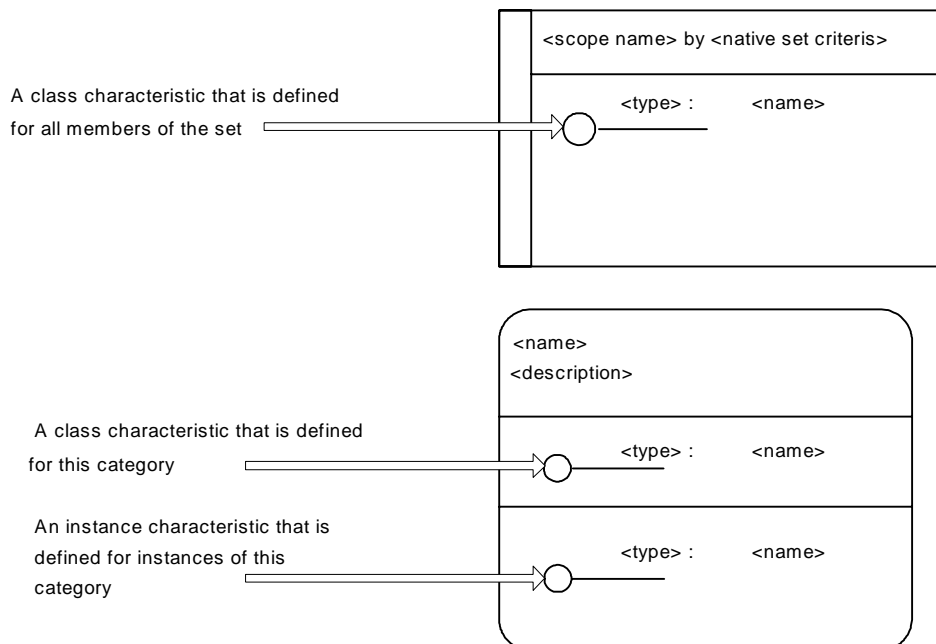


Figure 4.7. Characteristic positions in categorising sets and categories

38. It must be remembered that when a **class** is categorised to either a **categorising set** or a **category**, then any **class characteristics** that have been defined for the applicable **category(s)** will

become part of the definition of the **class** being categorised. Likewise, with **instances** of **classes** and **instance characteristics**.

SPECIALISING SCHEMES

39. In certain circumstances, **characteristics** are defined for a **class** in what are called **specialising schemes**. As well as being where **class characteristics** are defined, **specialising schemes** are also used to show how a **class** fits into a hierarchy of other **classes**. An example of a **specialising scheme** is shown in Figure 4.8.

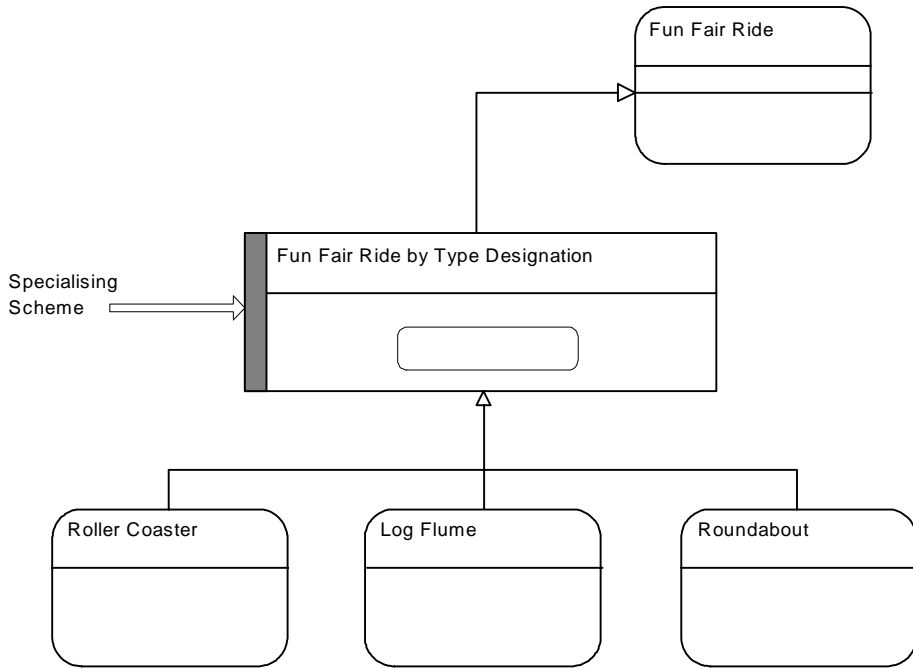


Figure 4.8. Example of a specialising scheme

40. When **characteristics** are defined in a **specialising scheme** they have the meaning shown in Figure 4.9.

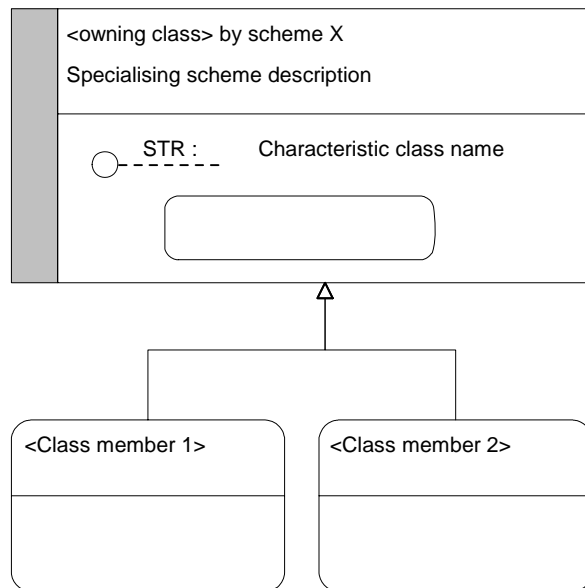


Figure 4.9. Specialising Set Scheme

41. Each **member** of the **specialising scheme** may have a string value for **characteristic class** name that may change.

## OTHER TYPES OF CHARACTERISTICS

42. The references to 'Injury' and 'Hospital' are conditional on the answer to a question being Yes. There is also a requirement to state that, if treatment was administered, whether it was under the NHS or privately, and if it was privately what the cost was. In order to model this correctly two other types of **characteristic** need to be examined.

### GROUP CHARACTERISTIC

43. A **group characteristic** (GRP:) consists of more than one **characteristic** where one or more of the **characteristics** can change their value without affecting the other(s). An example of a **group characteristic** is shown in Figure 4-10.

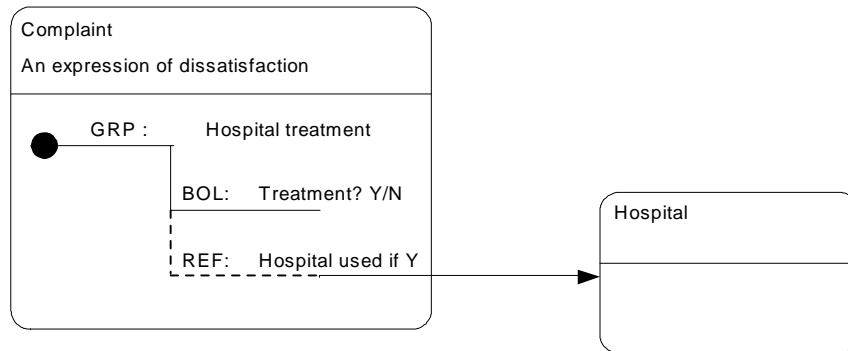


Figure 4-10 Example of a group characteristic

44. The **BOL: characteristic** and the **REF: characteristic** need to be grouped together and it is done as shown in Figure 4-10. If no treatment was required then no reference to Hospital is made. If however, treatment was required, then a reference is made to the Hospital that was used. The same structure is used for 'Injury'.

### THE XOR CHARACTERISTIC

45. An **XOR characteristic** is an 'exclusive OR', which means that there are a number of alternatives, but only one can be selected. This applies to the type of treatment that was received; was it either NHS or Private, but not both. An example of an **XOR characteristic model** is shown in Figure 4-11.

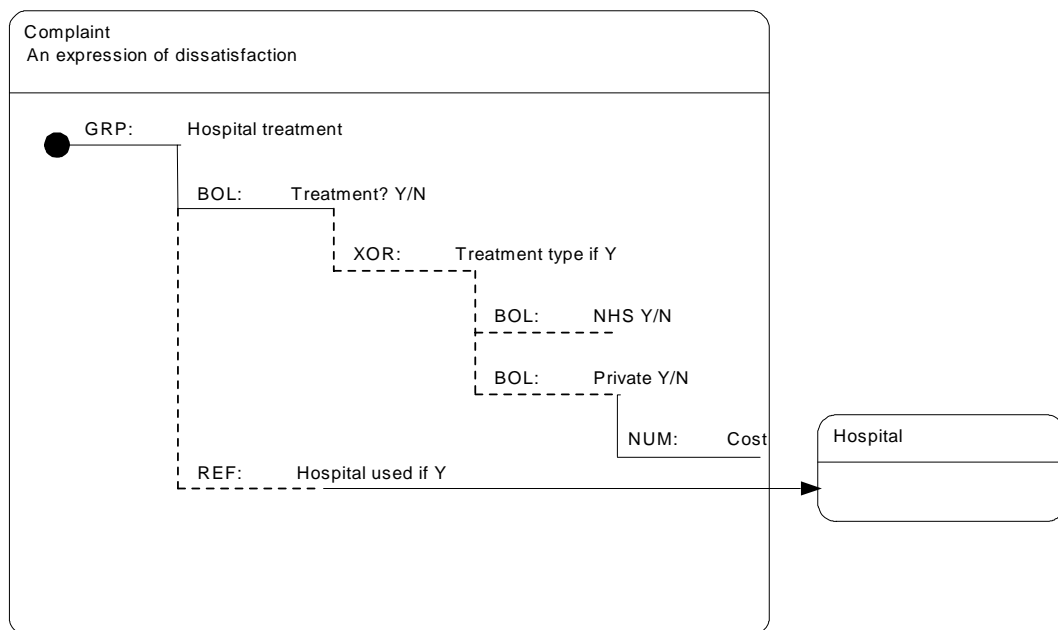


Figure 4-11 Example of an XOR characteristic

46. The **model** shown in Figure 4-11 says that if treatment was given then it was either under the NHS or privately and, if it was privately, what was the cost.

47. The other similar **characteristic** is the **OR characteristic**.

#### THE OR CHARACTERISTIC

An **OR characteristic** means that there are a number of alternatives and one or more can be selected.

## 5. TPOS SCENARIO

### THE COMPLAINT MODEL

1. The next stage is to refer back to the analysis and identify the information that describes a 'Complaint'. This information is shown in full in Annex C and summarised in the list below.

- a. Complaint Type
- b. Date of Complaint
- c. Complaint Details
- d. Did an Injury Occur?
- e. **If so**
  - (1) The Name of the Injured Person
  - (2) The Forenames of the Injured Person
  - (3) The Gender of the Injured Person
  - (4) The Date of Birth of the Injured Person
  - (5) Type of Injury
  - (6) Sub-Type of Injury
  - (7) Number or Persons Injured
- f. Was Hospital Treatment Required?
- g. **If so**
  - (1) Type of Treatment
  - (2) Hospital Name
  - (3) Hospital's Address
  - (4) Hospital's Town/City
  - (5) Hospital's Postcode
  - (6) Hospital's Tel Number
- h. Theme Park Name
- i. Investigator's Name
- j. Investigator's Telephone Extension

2. The CBML **elements** that would represent each of the items in the above list are shown in Table 5.1.

Table 5.1. CBML elements used to model the Complaint entity

Item	CBML Element	Comments
Complaint	<b>Entity class</b>	
Complaint Type	<b>Categories</b>	Each Complaint is of a given type
Date of Complaint	<b>Intrinsic characteristic</b>	Part of the description of a Complaint
Complaint Details	<b>Intrinsic characteristic</b>	Part of the description of a Complaint
Did an Injury Occur?	<b>Intrinsic characteristic</b>	Part of the description of a Complaint
Name of Injured Person	<b>Intrinsic characteristic</b>	Describes the Person who sustained the injury
Forename(s) of Injured Person	<b>Intrinsic characteristic</b>	Describes the Person who sustained the injury
Gender of Injured Person	<b>Intrinsic characteristic</b>	Describes the Person who sustained the injury
DoB of Injured Person	<b>Intrinsic characteristic</b>	Describes the Person who sustained the injury
Type of Injury	<b>Categories</b>	A way of categorising an injury
Sub-Type of Injury	<b>Categories</b>	A way of further defining an Injury Type
Number of Injured Persons	<b>Quantity</b>	Making reference to Person
Was Hospital Treatment Required	<b>Intrinsic characteristic</b>	Part of the description of a Complaint
Treatment Type	<b>Intrinsic characteristic</b>	Either NHS or Private, if Private then what was the cost
Hospital Name	<b>Intrinsic characteristic</b>	Part of the description of a Hospital
Hospital Address	<b>Intrinsic characteristic</b>	Part of the description of a Hospital
Hospital Town/City	<b>Intrinsic characteristic</b>	Part of the description of a Hospital
Hospital Postcode	<b>Intrinsic characteristic</b>	Part of the description of a Hospital
Hospital telephone Number	<b>Intrinsic characteristic</b>	Part of the description of a Hospital
Theme Park Name	<b>Intrinsic characteristic</b>	

Item	CBML Element	Comments
Investigator's Name	<b>Intrinsic characteristic</b>	Part of the description of an Investigator
Investigator's Telephone Extension	<b>Intrinsic characteristic</b>	Part of the description of an Investigator

3. The 'Complaint' **entity class** is described by the following **characteristics**.

#### COMPLAINT INTRINSIC CHARACTERISTICS

- c. Date of Complaint (M) (S) (F)
- d. Complaint Details (M) (S) (F)

#### COMPLAINT CATEGORISATIONS

- a. **Categorisation** to 'Type of Complaint'.

#### COMPLAINT REFERENTIAL CHARACTERISTICS

- a. Reference to 'Injury Type' if answer to 'Did Injury Occur?' is Yes
- b. Reference to 'Hospital' if answer to 'Was Hospital Treatment Required?' is Yes
- c. Reference to 'Theme Park'.
- d. Reference to 'Complainant' who is the originator of the complaint.
- e. A second reference to 'Complainant' as they can at any stage withdraw the complaint.
- f. Reference to a 'Case File' as it is through the 'Case File' that the complaint is dealt with.
- g. Reference to an 'Investigator' who is the person that deals with the complaint should there be sufficient grounds to carry out an investigation.

#### COMPLAINT QUANTITY CHARACTERISTICS

- a. A **quantity characteristic** referencing a Person to state the number of Persons, if any, that were injured.

4. The **entity class** 'Complaint' can be built by adding each of the **characteristic types** in turn. Note that there is no set sequence for adding **characteristics** to a **model**; it is only done here to build the **model** gradually. The First step is to add the **intrinsic characteristics** as shown in Figure 5.1.

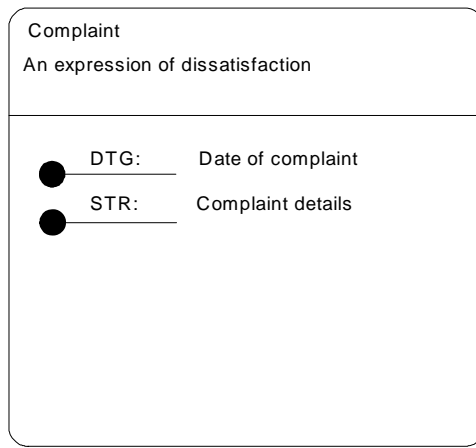


Figure 5.1. Complaint entity model Step 1 - intrinsic characteristics

5. The next step is to add the **categorisation** that states what type of complaint it is. The **model** will then be as shown in Figure 5.2.

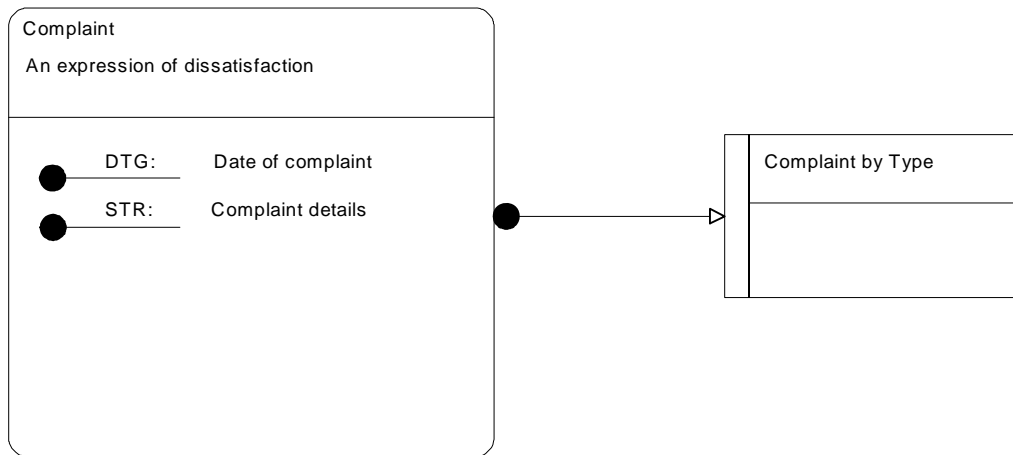


Figure 5.2 Complaint entity model Step 2 - categorisation

6. The next step is to add the **referential characteristics**. The **model** will then be as shown in Figure 5.3.

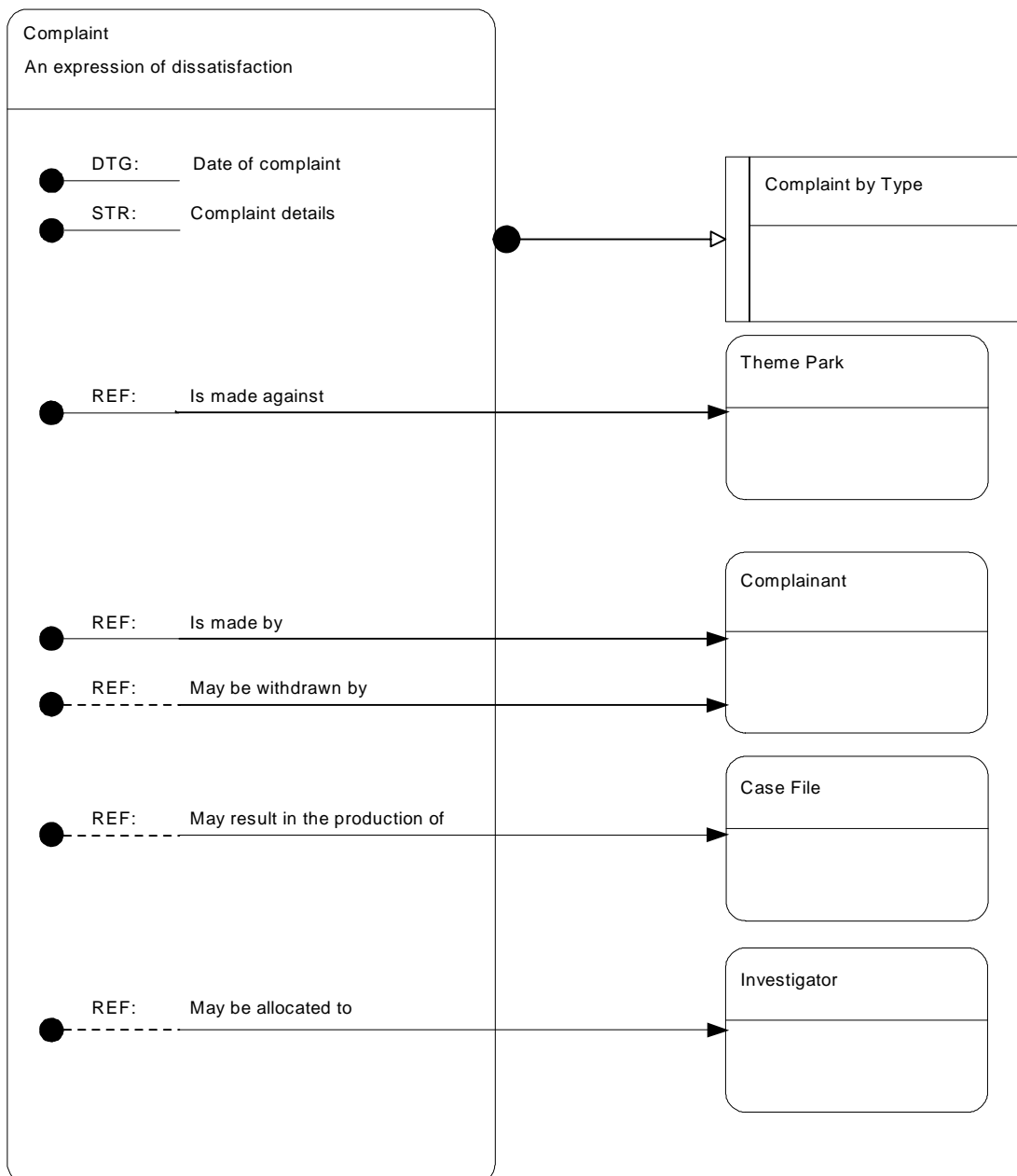


Figure 5.3. Complaint entity model Step 3 - referential characteristics

7. A worthwhile approach to working out the 'link' phrases on the **referential characteristics** is to make a sentence. For example:

- 'A complaint **"is made against"** a Theme Park'.
- 'A complaint **"is made by"** a Complainant'.
- 'A complaint **"may be withdrawn by"** a Complainant'.
- 'A complaint **"may result in the production of"** a Case File'.
- 'A complaint **"may be allocated to"** an Investigator'.

8. It is essential that the 'link' phrases are meaningful within the business domain that is being modelled; it makes it much easier for a Subject Matter Expert (SME) to agree with your understanding and the representation of your understanding.

9. The **group characteristics** can now be added as shown in Figure 5.4.

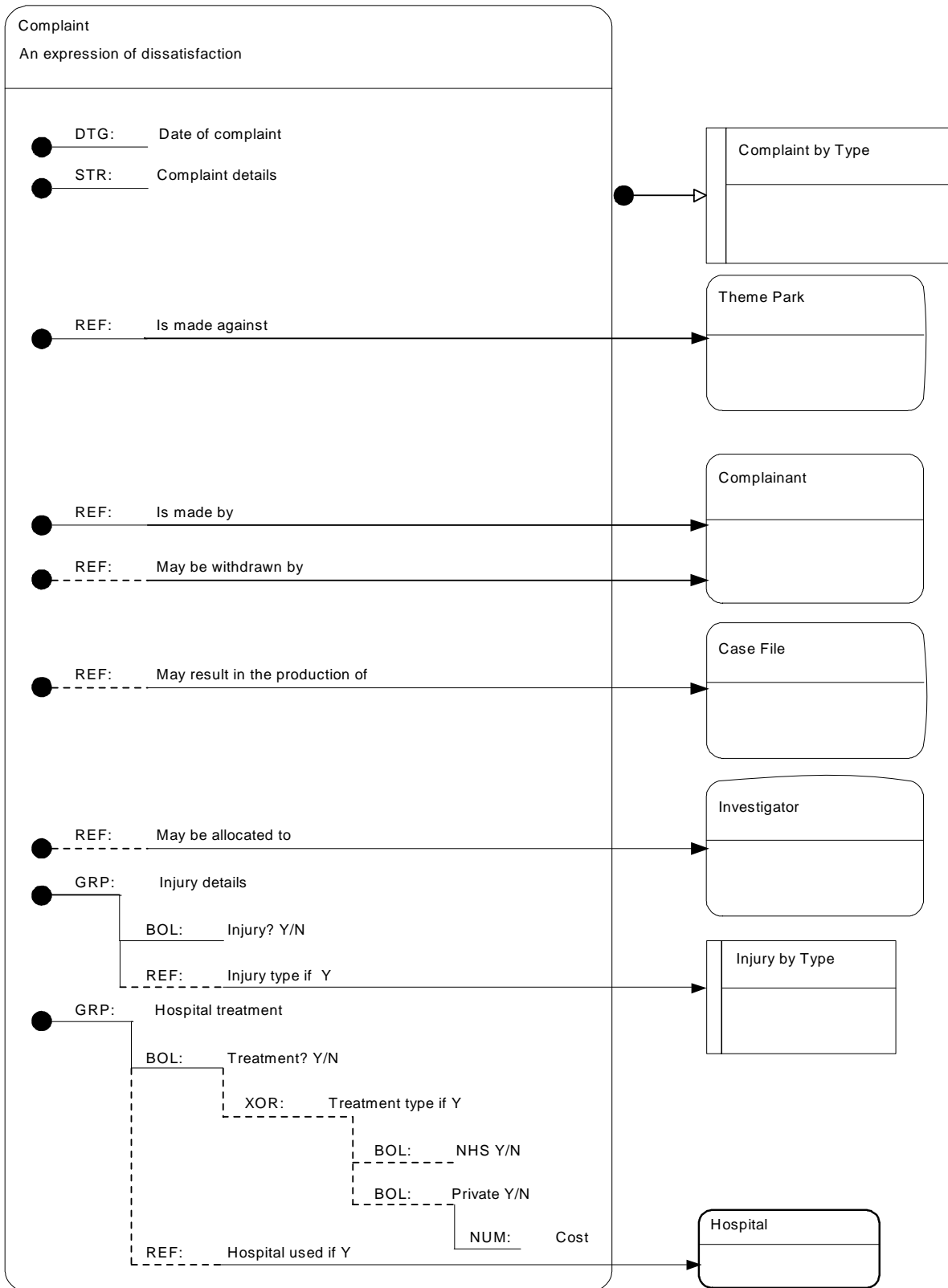


Figure 5.4. Complaint entity model Step 4 - group characteristics

10. Finally the **quantity characteristic** can be added as shown in Figure 5.5.

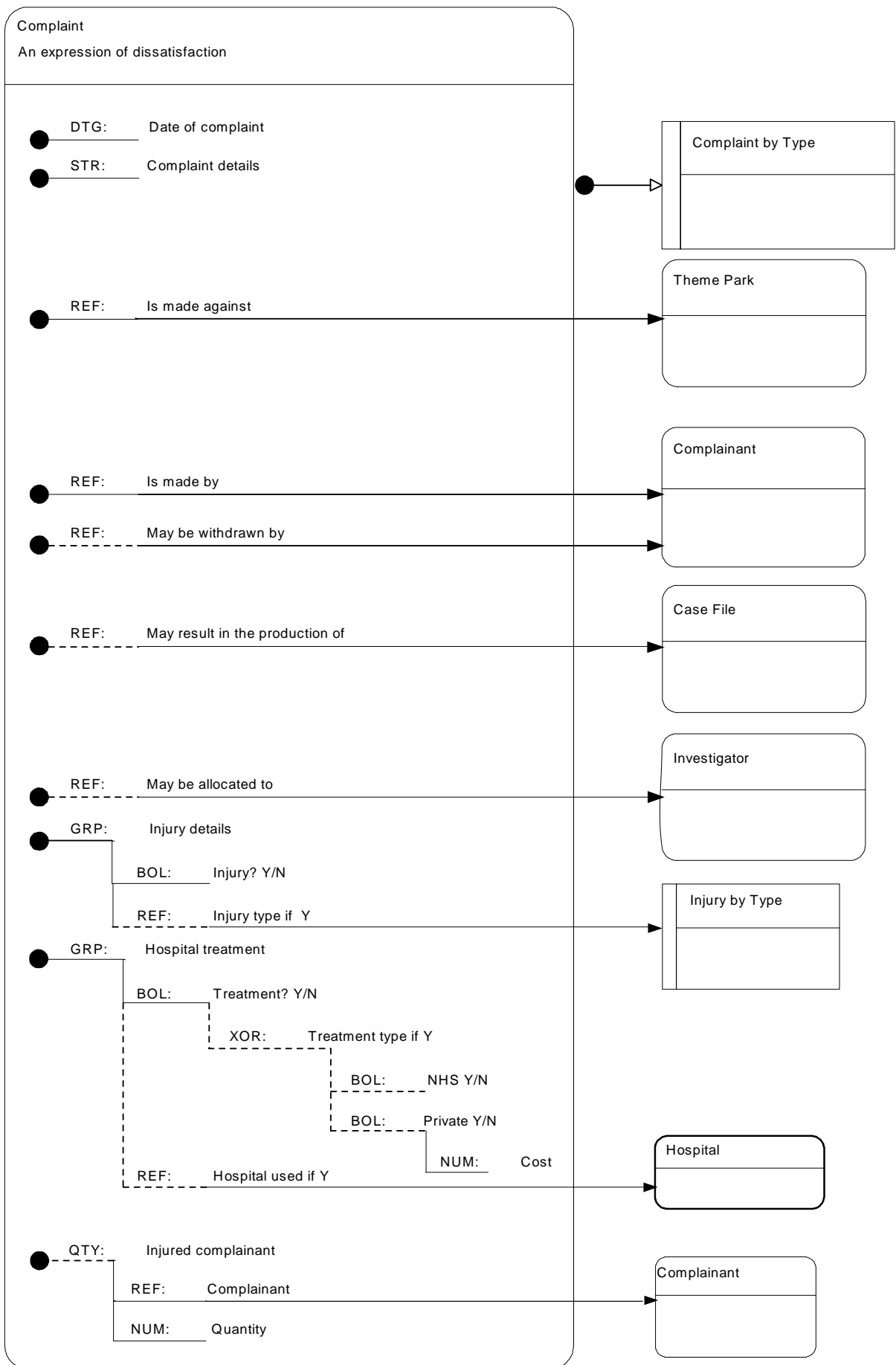


Figure 5.5. Complaint entity model Step 5 - quantity characteristics

11. Figure 5.5 shows the completed **model** of 'Complaint'. It should be noted that each 'real world' thing is modelled separately. This is done for two main reasons. Firstly it makes validation of a **model** easier for SME's in that they only have to look at the **model(s)** relevant to their area of expertise. Secondly, it is a very good discipline to get into and ensures that one **model** is complete before the next one is started.

12. Getting the understanding correct is essential before using CBML to document that understanding in a precise and unambiguous way.

13. The other **models** can now be built based on the information contained in Annex C.

14. Another good discipline to get into is to work down from the top of the **model** and create a **model** for each **referred** thing. As can be seen in Figure 5.5, the first **referred** thing is 'Complaint by Type'.

COMPLAINT BY TYPE

15. The results of the analysis that are shown in Annex C indicate that there is a fixed list of types of Complaint used by TPOS. The values associated with this list are reproduced in Table 5.2.

Table 5.2. Complaint types

Complaint Type		
Fun Fair Ride Complaint	Water Associated Complaint	Static Equipment Associated Complaint
Transport Associated Complaint	Animal Associated Complaint	H & S General Complaint

16. The **model** of complaint categorised by type is as shown in Figure 5.6.

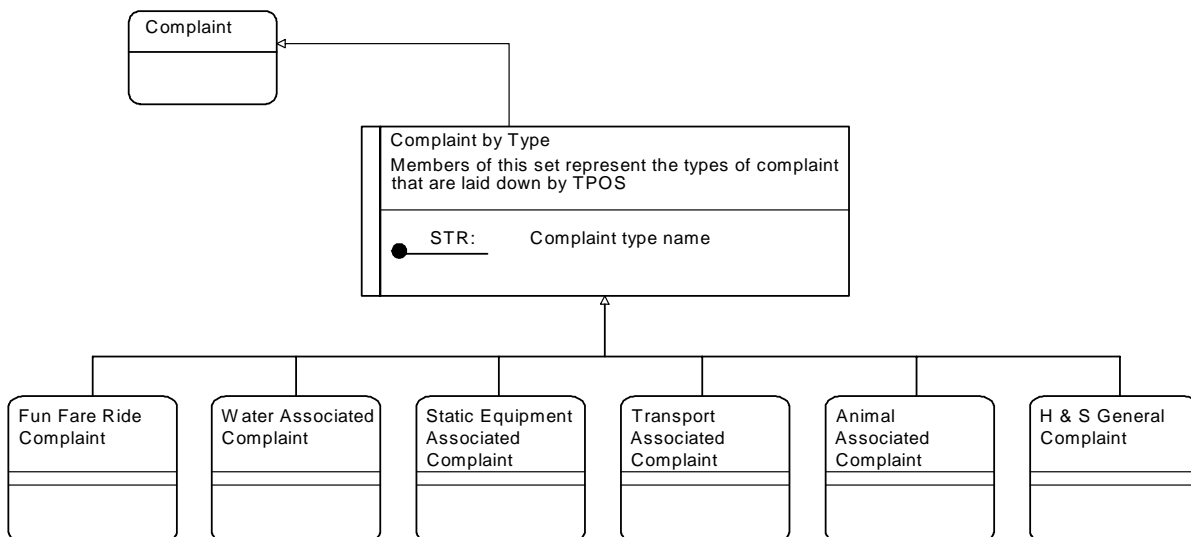


Figure 5.6. Categorisation of complaint by complaint type

17. In the **model** shown in Figure 5.6, the **entity class** 'Complaint' is the **scope** or **owner** of the **categorising set** and the **members** of the **set** can be seen. There is an **intrinsic characteristic** defined in the **set** that has the meaning 'All members of the **set** must have a value for Complaint type name that may not change'. This is reflected in the fact that each **category** within the **set** has a name. The **members** of the **set** have not been defined further. However, if there were a requirement to define each individual **category** then this would be the time to define them.

18. Applying the 'rule' described in paragraph 14 to Figure 5.5 means that the next **model** to be created is that for 'Theme Park'. The information that is needed to describe 'Theme Park' is shown in Annex C and reproduced in Table 5.3.

Table 5.3. Theme Park characteristics

Characteristic Name	Sample Entry	Data type	Comments
Theme Park Name(M) (F) (S)		STR	
Address (M) (F) (S)		STR	
Town/City (M) (F) (S)		STR	
Postcode (M) (F) (S)		NUM	
Tel Number (O) (F) (S)		STR	

19. The completed **model** for 'Theme Park' is shown in Figure 5.7.

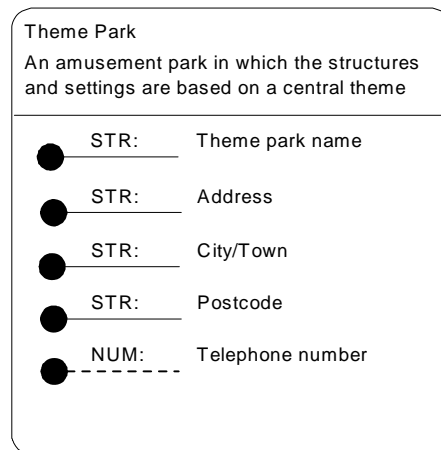


Figure 5.7 Theme park entity class model

20. Following the 'rule' set earlier, the next **model** to be created is that for 'Complainant'. This **model** was actually used earlier – see Figure 4.4 - when describing the types of **characteristics** that are used in CBML and is shown again for ease of reference in Figure 5.8.

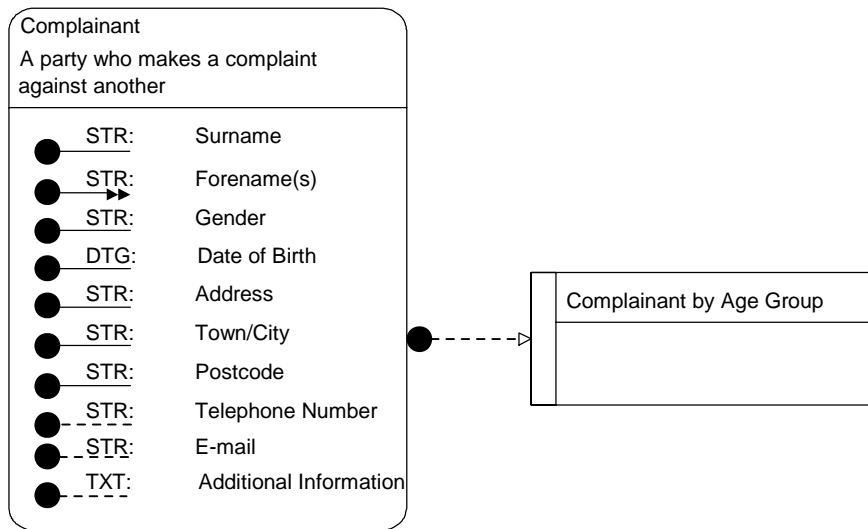


Figure 5.8 Categorisation of complainant as a complainant by Age Group

21. In accordance with the 'rule', the next **model** to be created is that for 'Complainant by Age Group' .

22. This **model** was actually used earlier – see Figure 4.6 - when discussing **categorising sets** and **categories** and is shown again for ease of reference in Figure 5.9.

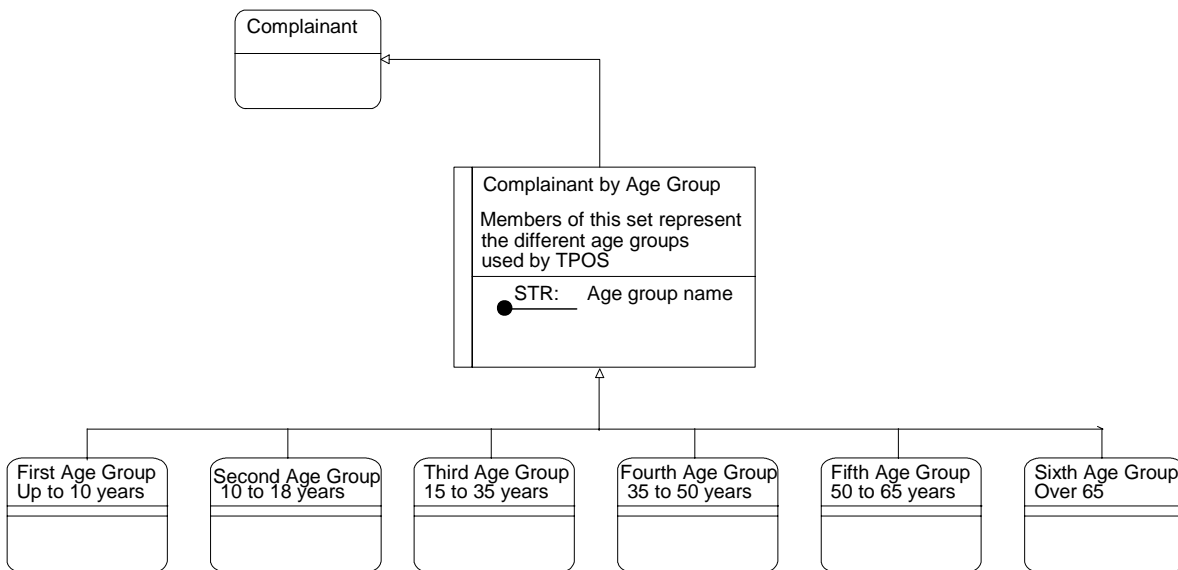


Figure 5.9. Model of complainant by Age Group

23. It is worthwhile noting at this point how specific the naming is.

### THE CASE FILE MODEL

24. The next **model** to be created is that for 'Case File'. The information that is needed to describe a Case File is shown in Annex C and reproduced in Table 5.4.

Table 5.4. Case File characteristics

Characteristic Name	Sample Entry	Information Type	Comments
Case Number (M) (F) (S)	127/04	STR	
Complainant Surname (M) (S) (F)		STR	
Date Case Opened (M) (S) (F)		DTG	
Date Draft Report Confirmed (M) (S) (F)		DTG	
Final Decision Issue Date (O) (ML) (F)		DTG	
Final Decision Response Date (C) (S) (F)		DTG	
Implementation Date (M) (S) (F)		DTG	
Case Closed Date (M) (S) (F)		DTG	
Investigator's name (M) (M) (F)		STR	

25. The 'Case File' **entity class** is described by the following **characteristics**.

CASE FILE INTRINSIC CHARACTERISTICS

- a. Case Number (M) (S) (F)
- b. Date Case Opened (M) (S) (F)
- c. Date Draft Report Confirmed (M) (S) (F)
- d. Final Decision Issue Date (O) (ML) (F)
- e. Implementation Date (M) (S) (F)
- f. Case Closed Date (M) (S) (F)

CASE FILE REFERENTIAL CHARACTERISTICS

- a. Reference to 'Complainant' who is the originator of the 'Complaint'.
- b. Reference to 'Investigator' who is the person who opens a 'Case File'

26. As was the case when building the 'Complaint' **model**, the 'Case File' **model** will be built by adding the **characteristics** in steps. The first step is to add the **intrinsic characteristics** as shown in Figure 5.10.

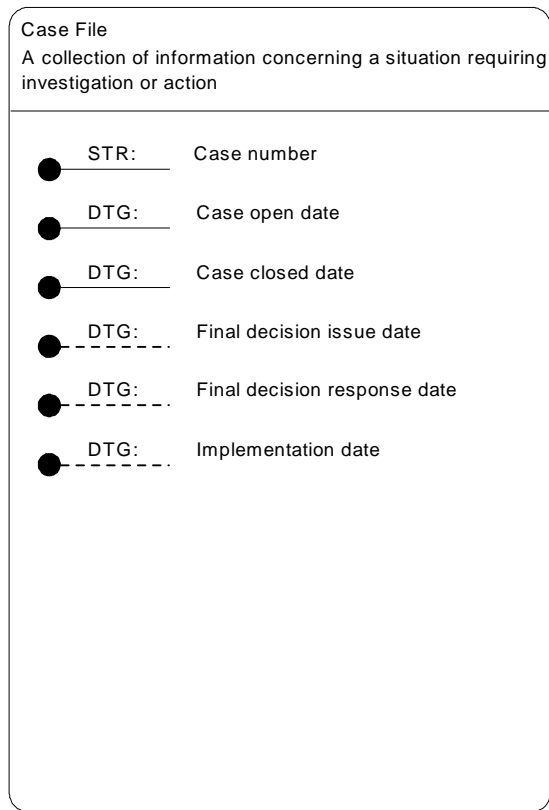


Figure 5.10. Case File entity model Step 1 - intrinsic characteristics

27. The second, and in this case the last, step is to add the **referential characteristics** as shown in Figure 5.11.

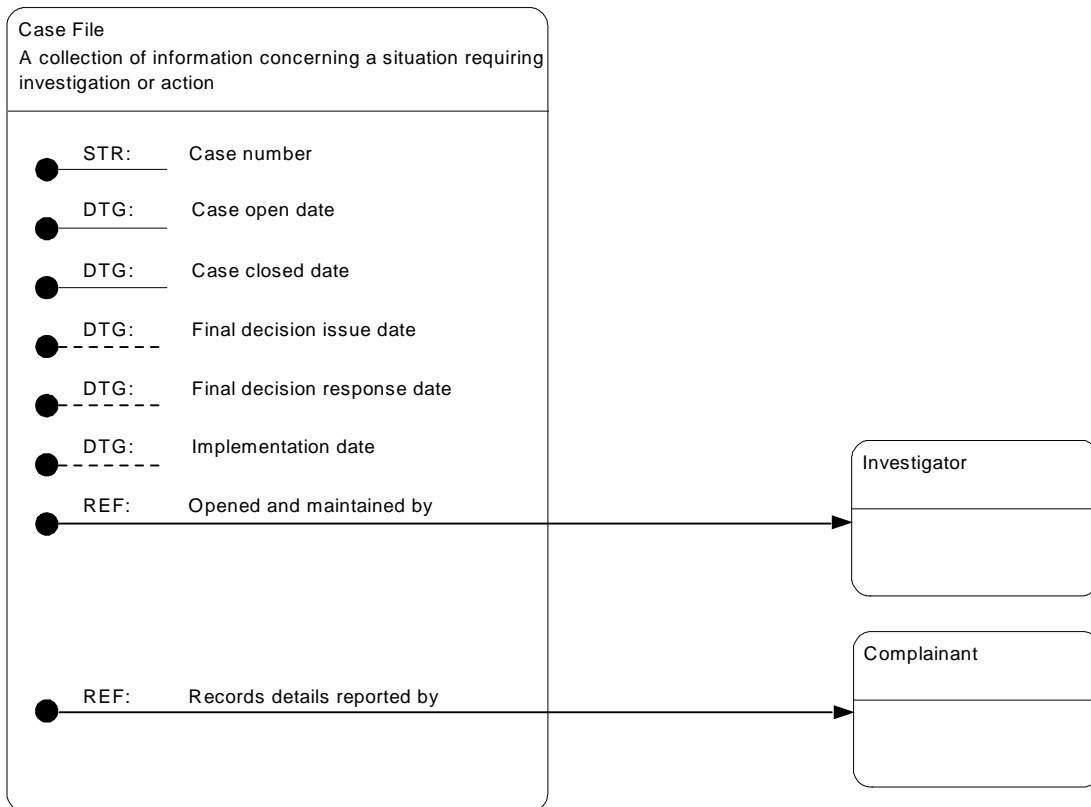


Figure 5.11. Case File entity model Step 2 - referential characteristics

28. Although not identified during the initial investigation – see Annex C, it can be seen from Figure 5.11 that there is an **entity class** called ‘Investigator’. To be thorough and complete, a **model** needs to be created.

THE INVESTIGATOR MODEL

29. From the information needed to describe ‘Case File’ it can be seen that the ‘Investigator’s Name’ is required. From the scenario given in Section 3 it can be seen that if there are sufficient grounds for the complaint then the investigator will open a case file and may create a draft report. The information therefore required to describe an ‘Investigator’ is as shown below.

INVESTIGATOR INTRINSIC CHARACTERISTICS

- a. Name (M) (S) (F)

INVESTIGATOR REFERENTIAL CHARACTERISTICS

- a. Reference to ‘Draft Report’ as the ‘Investigator may be the initiator of one.
30. The finished **model** of the ‘Investigator’ **entity class** is as shown in Figure 5-12.

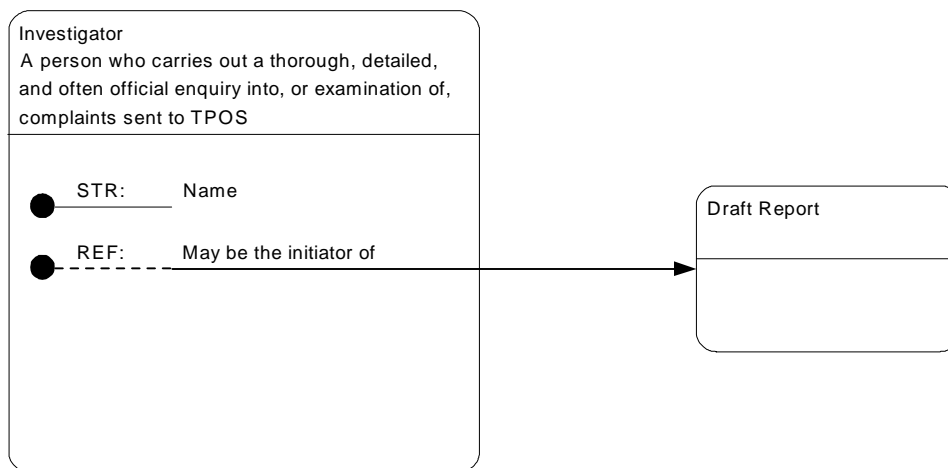


Figure 5-12 Model of ‘Investigator’ entity class

31. The discussion of ‘Investigator’ introduced the ‘Draft Report’ which is another **entity class** for which a **model** is required.

THE DRAFT REPORT MODEL

32. From the scenario given in Section 3, the following facts concerning the ‘Draft Report’ can be established:

- a. It is given a ‘confirmed date’.
- b. It is sent to the ‘Theme Park’ who must respond in 5 days.
- c. It is sent to the ‘Complainant’ who must respond within 7 days.
- d. It is updated as necessary, based on the responses, before a ‘Final Report’ is created.

33. The information therefore required to describe a ‘Draft Report’ is as shown below.

DRAFT REPORT INTRINSIC CHARACTERISTICS

- a. Draft Report confirmed date (M) (S) (F)

DRAFT REPORT REFERENTIAL CHARACTERISTICS

- a. Reference to 'Final Report' as the 'Draft Report' is the basis from which a 'Final Report' is created.
- b. Reference to 'Theme Park' as the 'Draft Report' is sent to and responded to by the 'Theme Park'.
- c. Reference to 'Complainant' as the 'Draft Report' is sent to and responded to by the 'Complainant'.

34. The completed **model** for the 'Draft Report' **entity class** is as shown in Figure 5-13.

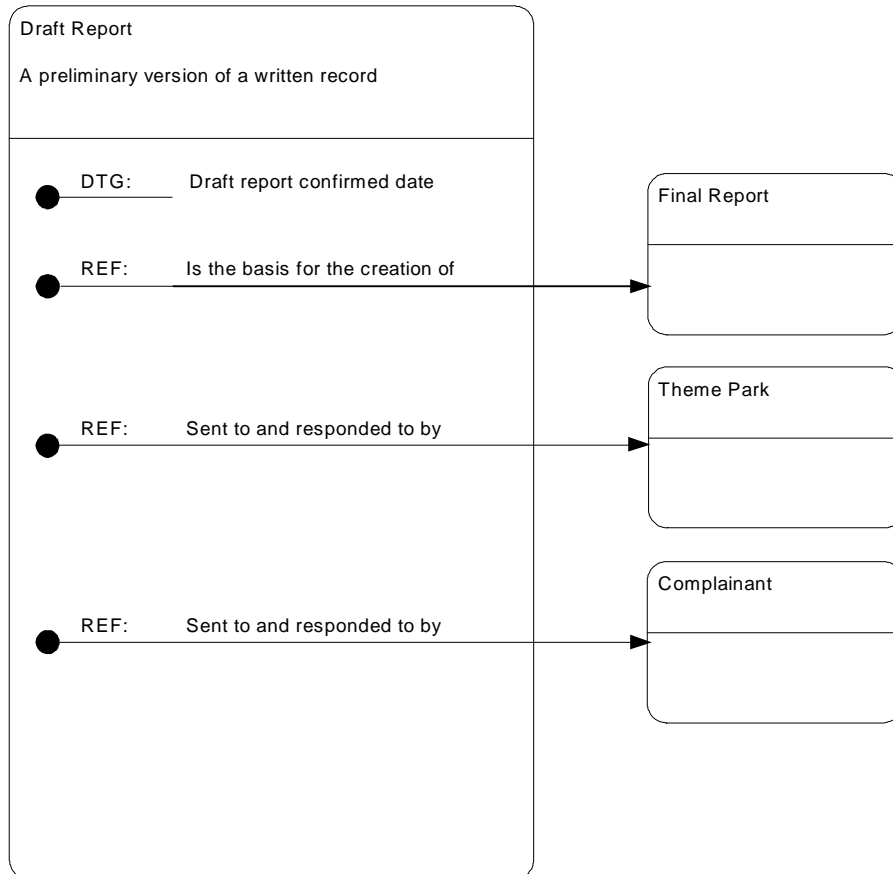


Figure 5-13 Model of 'Draft Report' entity class

35. A **model** now needs to be created for the **categorising set** 'Injury by Type'.

THE INJURY BY TYPE MODEL

36. It has been stated by the user that there is a fixed list of types of Injury used by the TPOS. The values associated with this list are as shown in Table 5.5.

Table 5.5. Injury types

Injury Type					
Facial Injury	Back Injury	Head Injury	Leg Injury	Arm Injury	Mouth Injury

37. The completed **model** for the **categorising set** 'Injury by Type' is as shown in Figure 5.14.

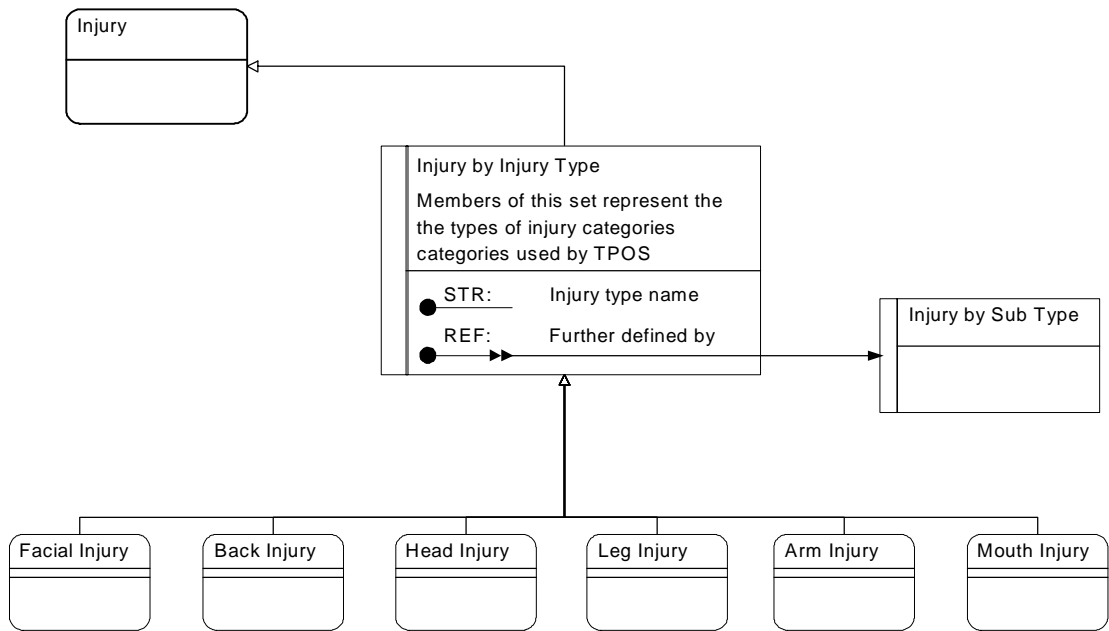


Figure 5.14. Model of the 'Injury by Type' category set

38. As can be seen from Figure 5.14, each 'Injury by Type' must be further defined by one or more **members** of the **categorising set** 'Injury by Sub-type'. Therefore a **model** is required for the **categorising set** 'Injury by Sub-type'.

THE INJURY BY SUB-TYPE MODEL

39. It has been stated by the user that there is a fixed list of types of Injury Sub-types used by TPOS. The values associated with this list are shown Annex C and repeated in Table 5.6.

Table 5.6. Injury sub-types

Injury Sub-Type					
Burn	Break	Bruise	Sprain	Cut	Fracture

40. The completed **model** for the **categorising set** 'Injury by Sub-type' is as shown in Figure 5.15.

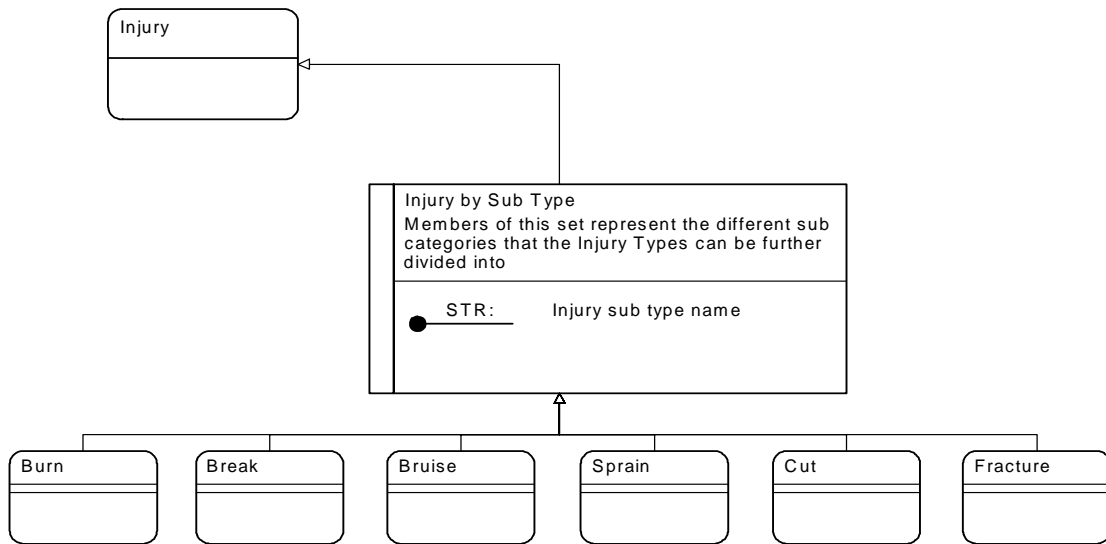


Figure 5.15. Model of the 'Injury by Sub-Type category set

41. A **model** now needs to be created for the **entity class** 'Hospital'.

THE HOSPITAL MODEL

42. The information that describes 'Hospital' can be found in the overall information used to initially describe 'Complaint' – see Annex C - and is as shown in Table 5.7.

Table 5.7. Hospital characteristics

Characteristic Name	Sample Entry	Data type	Comments
Hospital Name (M) (S) (F)	St Mary's	STR	
Address (M) (F) (S)	Dacombe Road	STR	
Town/City (M) (F) (S)	Swindon	STR	
Postcode (M) (F) (S)	SN5 7XQ	STR	
Tel Number (O) (F) (S)	01793-521380	NUM	

43. The completed **model** for the **entity class** 'Hospital' is as shown in Figure 5.16.

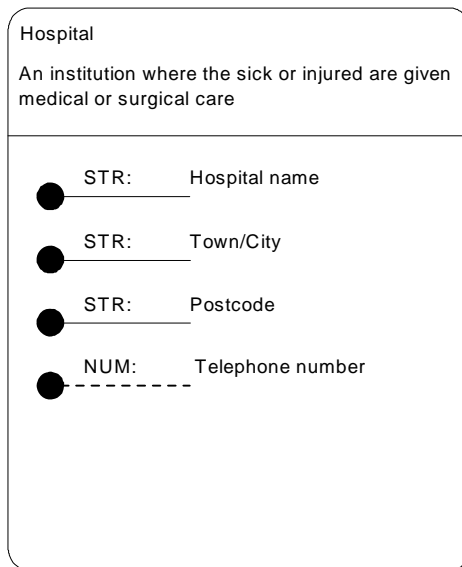


Figure 5.16. Model of the 'Hospital' entity class

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## **ANNEX A      ANALYSIS**

1.      The initial task in the modelling of a business area is the analysis. Too often analysts make assumptions as to the meaning of aspects of a business area that leads to inaccurate representation of the business information needs. It is essential, that from the outset the emphasis must be on understanding. Do not attempt to start by drawing models based on incomplete or inaccurate information. Gain understanding before anything else.
2.      What are we trying to gain understanding of? We are trying to gain understanding of 'real world objects'. What are 'real world objects'? A real world object is something that is important to a business area such as 'Employee', 'Organisation', 'Equipment', 'Systems Analyst' etc. These things that the business needs to have information about in order to conduct its business. Real world objects cannot be modelled correctly unless they are properly understood. This understanding must be in the context in which it used.
3.      How do we gain understanding of the real world objects in a relevant context? The first and most common way is by carrying out interviews with the relevant domain experts. Existing system documentation can also be a useful source of information and the existing systems themselves, be they either computer or paper based. Remember, all systems, irrespective of them being either computer or paper based, can distort the business information, because they create data that has nothing to do with the business per se. Audit trails are put into place for management reasons. Filing systems are put into place for orderliness and allowing ease of access to the information they contain.
4.      Analysis is not easy therefore perseverance is essential. Struggle to understand the real information that is required to support the business rather than that which is associated with the processing of the information. Don't make assumptions. Keep asking questions, even if it is the same one put differently, until the required level of understanding is reached.
5.      Achieving understanding has always been a requirement of data analysis, however, it has often been interpreted as being a soft, or logical, way of defining data structures within an implementation. This is not the way it should be viewed. CBML is a way of defining the information the business needs, therefore understanding is vital if the business information needs are to be correctly modelled.
6.      What are the possible pitfalls that you may stumble across during your analysis? A cynical attitude could be that you should never believe a word anybody tells you. Naturally this cannot be always true, however, different people will have a different understanding of the same thing(s).
7.      Beware of information contained in data models or object models. Both types of model are associated with implementation and not with the real business world. They therefore contain technical issues that can be very misleading to the analyst. Use them for reference but do not follow slavishly or you will get it wrong. If you do then you will end up by modelling, possibly a physical database structure, in another notation and not modelling the business information needs. These types of models are most certainly inputs to the analysis process, but should only be used to gain understanding. These models may also contain information regarding:
  - a.      The source of the information.
  - b.      The authority associated with the information.
  - c.      Ownership of the data.
  - d.      The date it was entered, last modified, archive date.
8.      Be careful. This might not automatically be part of CBML. Is it information essential for the conduct of business? Keep asking this question.
9.      Identify information that is actually the same, although it may feign a difference due to history, projection or competing values. Understand this repeating information and why it exists. This repeating information has a specific meaning in CBML, which has already been explained in paras 61 and 62 in the main body of the document.

10. When the analysis is being carried out ensure that the understanding is written in terms that avoid distortions. Once this understanding has been achieved it must not be lost. Use a format suitable to you. This recording of understanding is particularly important when interpreting implementation models, current systems and operational documentation. Often, when revisiting these items at a later date, your interpretation may be different.

## **ANNEX B      BUSINESS MODELLING AIDE MEMOIRE**

1. Read all the material available to you and ensure that you have a full understanding of the business area that has to be modelled.
2. Identify those things about which information needs to be held. These will become **entity classes**.
3. Is the name of the **entity class** meaningful to the business?
4. Is the description accurate, meaningful and precise?
5. Identify the various ways that things are classified by the business. These will become **members of entity categorising sets**.
6. What are they for specialisation/**categorisation** of?
7. Has the owning **entity class** been identified?
8. Is the name of the **entity categorising set** a true reflection of what the **members** represent?
9. Does the description truly describe the **members** of the **set**?
10. Identify the **characteristics** that may be held for each type of thing. What kind of **characteristics** are they?
11. **Intrinsic characteristics?** Are they part of the definition of the:
  - a. **Entity class** itself?
  - b. **Instances** of the **entity class**?
  - c. What type of **intrinsic characteristic** is it?
    - (1) **Character** STR?
    - (2) **Numeric** NUM?
    - (3) **Time** DTG?
    - (4) **Complex** CPX?
    - (5) Either or all **OR**?
    - (6) Exclusive or **XOR**?
    - (7) **Quantity** QTY?
    - (8) What is it a quantity of?
  - d. Are they **Optional** or **Mandatory**?
  - e. Are they **Fixed** or **Variable**?
  - f. Can they have several values?
12. **Referential Characteristics?** Are they part of the definition of the:
  - a. **Entity class** itself?
  - b. **Instances** of the **entity class**?

- c. Are they **Optional** or **Mandatory**?
  - d. Are they **Fixed** or **Variable**?
  - e. Are they **Single** or **Multiple**?
  - f. Can they have several values?
  - g. Are the names truly meaningful?
13. **Categorisations**? Are they part of the definition of the:
- a. **Entity class** itself?
  - b. **Instances** of the **entity class**?
  - c. Are they **Optional** or **Mandatory**?
  - d. Are they **Fixed** or **Variable**?
  - e. Are they **Single** or **Multiple**?
  - f. Can they have several values?

## ANNEX C INFORMATION REQUIREMENTS FOR TPOS

1. After carrying out the analysis process, it has been identified that the following information about the following real world things is required to support the TPOS business:

2. NOTE. Within the following Tables the **usage rules** that apply to each **characteristic** are indicated by the abbreviations shown below.

C = Conditional

O = **Optional**

M = **Mandatory**

F = **Fixed**

V = **Variable**

S = **Single**

ML = **Multiple**

### COMPLAINANT CHARACTERISTICS

Characteristic Name	Sample Entry	Data type	Comments
Surname (M) (F) (S)	Smith	STR	
Forename(s) (M) (ML)(F)	Mary Jane	STR	
Gender (M) (F) (S)	Female	STR	Male; Female
DOB (M) (F) (S)	12/07/64	DTG	
Age Group (O) (F) (S)		STR	(DDL)
Address (M) (F) (S)	21, Brown Street	STR	
Town/City (M) (F) (S)	Salisbury	STR	
Postcode (M) (F) (S)	SP2 0DY	STR	
Tel Contact (O) (F) (S)	01722 - 479614	NUM	
Email (O) (F) (S)	marys@hotmail.com	STR	
Additional Information (O) (F) (S)	N/A	STR	

### AGE GROUP DETAILS

Age Group					
First Age Group -Up to 10 yrs	Second Age Group -10 to 18 yrs	Third Age Group - 18 to 35 yrs	Fourth Age Group - 35 to 50 yrs	Fifth Age Group - 50 to 60 yrs	Sixth Age Group - Over 65 yrs

COMPLAINT CHARACTERISTICS

Characteristic Name	Sample Entry	Data type	Comments
Complaint Type (M) (F) (S)			(DDL)
Date of Complaint (M) (S) (F)		DTG	
Complaint Details (M) (S) (F)		STR	
Injury Incurred? (M) (S) (F)	Y/N	BOL	
Injured Person's Name (C) (S) (F)	Smith		Mandatory if injury was incurred.
Forename(s) (M) (ML) (F)	John	STR	
Gender (M) (F) (S)	Male	STR	Male; Female
DOB (M) (F) (S)	12/07/94	DTG	
Injury Type (O) (ML) (F)			(DDL)
Injury Sub-Type (C) (S) (F)			(DDL) Mandatory if Injury Type is specified
Number of Persons Injured (M) (F) (S)		QTY	
Hospital Treatment Required (M) (S) (F)	Y/N	BOL	
Treatment Type		XOR & 2 x BOL + NUM	Either NHS or Private, if Private then what was the cost
Hospital Name (O) (S) (F)	St Mary's	STR	
Hospital's Address (M) (F) (S)	Dacombe Road	STR	
Hospital's Town/City (M) (F) (S)	Swindon	STR	
Hospital's Postcode (M) (F) (S)	SN5 7XQ	STR	
Hospital's Tel Number (O) (F) (S)	01793-521380	NUM	
Theme Park Name (M) (S) (F)		STR	
Investigators Name (O) (S) (F)	Michael Jackson	STR	
Investigators Telephone Extension	5519	NUM	

COMPLAINT TYPE

Complaint Type		
Fun Fair RideComplaint	Water Associated Complaint	Static Equipment Associated Complaint
Transport Associated Complaint	Animal Associated Complaint	H & S General Complaint

INJURY TYPE

Injury Type					
Facial Injury	Back Injury	Head Injury	Leg Injury	Arm Injury	Mouth Injury

INJURY SUB-TYPE

Injury Sub-Type					
Burn	Break	Bruise	Sprain	Cut	Fracture

CASE FILE CHARACTERISTICS

Characteristic Name	Sample Entry	Data type	Comments
Case Number (M) (F) (S)	127/04	STR	
Complainant Surname (M) (S) (F)		STR	
Date Case Opened (M) (S) (F)		DTG	
Date Draft Report Confirmed (M) (S) (F)		DTG	
Final Decision Issue Date (O) (ML) (F)		DTG	
Final Decision Response Date (C) (S) (F)		DTG	
Implementation Date (M) (S) (F)		DTG	
Case Closed Date (M) (S) (F)		DTG	
Investigator's name (M) (M) (F)		STR	

THEME PARK CHARACTERISTICS

<b>Characteristic Name</b>	<b>Sample Entry</b>	<b>Data type</b>	<b>Comments</b>
Theme Park Name (M) (F) (S)		STR	
Address (M) (F) (S)		STR	
Town/City (M) (F) (S)		STR	
Postcode (M) (F) (S)		NUM	
Tel Number (O) (F) (S)		STR	

## ANNEX D GLOSSARY

<b>apex</b>	The <b>class</b> , not a <b>category</b> , that is the <b>scope</b> of the <b>categorising set</b> that is at the top of a <b>categorisation structure</b> .
<b>array</b>	Multiple repetitions of the same <b>characteristic</b> or <b>fragment</b> definition treated as a single <b>characteristic</b> or <b>fragment</b> .
<b>boolean</b>	BOL – A <b>data type</b> that can have a value of true or false only.
<b>bound</b>	Asserts that the <b>instance</b> of the <b>referred class</b> is <b>bound</b> to the <b>instance</b> of the <b>native class</b> for life.
<b>categorisation</b>	Defines how a <b>class</b> may be categorised. When a <b>categorisation</b> is in place the <b>class</b> or <b>category</b> takes on the <b>characteristics</b> of the relevant <b>category</b> .
<b>categorisation structure</b>	A hierarchy of <b>categorising sets</b> , <b>dividing sets</b> and <b>categories</b> . The top <b>categorising set</b> has a <b>scope</b> that is a <b>class</b> . This <b>class</b> is the <b>apex</b> .
<b>categorising classification</b>	A classification of an <b>entity class</b> , <b>substance class</b> , <b>entity category</b> or <b>substance category</b> that is maintained during the life of the <b>entity class</b> or <b>substance class</b> being categorised in accordance with rules defined in a <b>CBML model</b> .
<b>categorising set</b>	An inclusive term for <b>entity categorising set</b> and <b>substance categorising set</b> .
<b>category</b>	An inclusive term for <b>entity category</b> and <b>substance category</b> .
<b>category descriptor</b>	The definition of a type of information that is used to describe a <b>category</b> within a specific <b>categorising set</b> .
<b>category dividing set</b>	An inclusive term for <b>entity category dividing set</b> and <b>substance category dividing set</b> .
<b>CBML models</b>	A <b>model</b> of information defined in CBML.
<b>character</b>	STR – A <b>data type</b> whose value is a sequence of characters.
<b>characteristic</b>	The definition of an <b>intrinsic</b> type of information.
<b>characteristic group</b>	A group of <b>characteristics</b> that are treated collectively while each <b>characteristic</b> in the <b>characteristic group</b> remains a discrete <b>characteristic</b> .
<b>characteristic type</b>	An <b>characteristic</b> is either a <b>class characteristic</b> , that is it applies to the <b>class</b> , or an <b>instance characteristic</b> , that is it applies to an <b>instance</b> of a <b>class</b> .
<b>class</b>	An inclusive term for <b>entity class</b> and <b>substance class</b> .
<b>class characteristic</b>	A <b>characteristic</b> that is applicable to a <b>class</b> not its <b>instances</b> .

<b>class specialising scheme</b>	An inclusive term for <b>entity class specialising scheme</b> and <b>substance class specialising scheme</b> .
<b>classification</b>	The generic term for all ways in which a type definition may be applied to a <i>subject</i> .
<b>classification structure</b>	A hierarchy of <b>class schemes</b> and <b>classes</b> . The top of the hierarchy is a <b>class</b> that has a <b>usage rule</b> of <b>root</b> .
<b>common fragment group</b>	A <b>fragment</b> is used to define a number of quantities all refer to the same <b>class</b> or <b>category</b> .
<b>common reference quantity</b>	A group of <b>quantity complex characteristics</b> that are all quantities of the same thing.
<b>complex characteristic</b>	A <b>characteristic</b> that consists of more than one <b>fragment</b> .
<b>composition</b>	The internal structure of a <b>simple fragment</b> consisting of three parts: <b>data type</b> ; <b>composition qualifying detail</b> and <b>composition constraint on value</b> .
<b>composition constraint on value</b>	A constraint on the values that are valid for a <b>characteristic</b> that could be for example: minimum, maximum or a range of values, or a catalogue of permitted values.
<b>composition qualifying detail</b>	Further details of the form of a valid value for the <b>characteristic</b> that could be for example: the character alphabet or the language used for a <b>data type</b> of <b>character</b> , an applicable <b>unit of measure</b> for a <b>data type</b> of <b>numeric</b> , or an applicable unit time, the applicable calendar, a time datum, a time period of applicability for a <b>data type</b> of <b>time</b> .
<b>compound fragment</b>	A sub-part of a <b>characteristic</b> that consists of a combination of other <b>compound fragments</b> and/or <b>simple fragments</b> .
<b>context</b>	The purpose of the <b>model</b> and defined by the domain that it applies to and the <b>scope</b> of the <b>model</b> .
<b>context at a level</b>	A combination of <b>context</b> and <b>level</b> .
<b>contingent</b>	A <b>characteristic</b> defined for a <b>category</b> whose applicability to a <b>class</b> is contingent upon the <b>class</b> being categorised to the <b>category</b> the <b>characteristic</b> is defined for.
<b>data type</b>	The basic form of a value to be assigned to a <b>fragment</b> , there are five <b>data types</b> : <b>character</b> , <b>numeric</b> , <b>boolean</b> , <b>time</b> and <b>referential</b> .
<b>dividing set</b>	An inclusive term for <b>entity category dividing set</b> and <b>substance category dividing set</b> .
<b>element</b>	An inclusive term for a <b>class</b> , <b>category</b> , <b>scheme</b> , <b>set</b> , <b>categorisation</b> or <b>characteristic</b> .
<b>element description</b>	A textual description or explanatory information for a CBML <b>element</b> .
<b>element name</b>	A name for a CBML <b>element</b> .

<b>element types</b>	An inclusive term for all the different types of CBML <b>elements</b> , these are: <b>entity class</b> , <b>substance class</b> , <b>entity category</b> , <b>substance category</b> , <b>entity class specialising scheme</b> , <b>substance class specialising scheme</b> , <b>entity categorising set</b> , <b>substance categorising set</b> or <b>characteristic</b> , <b>entity category dividing set</b> , <b>substance category dividing set</b> , <b>categorisation</b> , <b>simple characteristic</b> , <b>complex characteristic</b> or <b>characteristic group</b> .
<b>entity categorising set</b>	A group of <b>entity categories</b> that share a common <b>scope</b> , delineating criteria, and are mutually exclusive.
<b>entity category</b>	A holder for <b>class</b> and <b>instance</b> contingent <b>characteristics</b> and possibly <b>categorisation</b> used to further describe an entity when the entity is classified through <b>categorisation</b> as belonging to the <b>entity category</b> based on rules defined in a <b>CBML model</b> .
<b>entity category dividing set</b>	A group of <b>entity categories</b> that are sub- <b>categories</b> of the same <b>entity category</b> as <b>owner</b> of the <b>entity category dividing set</b> .
<b>entity class</b>	Something that exists in the <b>real-world</b> as an individual object, either tangible or intangible, such as “person”, “vehicle”, “invoice”.
<b>entity class specialisation structure</b>	A hierarchical structure of <b>entity classes</b> and <b>entity class specialising schemes</b> , the top of the structure is always an <b>entity class</b> defined as the <b>root</b> .
<b>entity class specialising scheme</b>	A definition of the criteria to delineate the <b>entity class</b> , or possibly the <b>entity category</b> , that is the <b>owner</b> of the <b>entity class specialising scheme</b> into <b>sub-classes</b> of the <b>entity class</b> that are themselves <b>entity classes</b> and <b>members</b> of the <b>entity class specialising scheme</b> .
<b>extant data</b>	Data that exists in the implemented information systems.
<b>fixed</b>	Applies to <b>characteristics</b> and <b>categorisations</b> to indicate that once a value has been assigned to a <b>characteristic</b> or a <b>categorisation</b> has been defined it cannot be changed.
<b>fragment</b>	An inclusive term for <b>simple fragment</b> and <b>compound fragment</b> ; part of a <b>characteristic</b> that requires other <b>fragments</b> to form a <b>characteristic</b> .
<b>generic complex</b>	A <b>complex characteristic</b> whose <b>fragments</b> have not been explicitly defined.
<b>group</b>	GRP – A <b>group</b> consisting of more than one <b>characteristic</b> .

<b>holder</b>	This is a place where <b>characteristics</b> may be defined that is:
	<ul style="list-style-type: none"> <li><b>Entity class</b></li> <li><b>Entity class specialising scheme</b></li> <li><b>Substance class specialising scheme</b></li> <li><b>Category</b></li> <li><b>Categorisation structure</b></li> <li><b>Category dividing set</b></li> </ul>
<b>information element</b>	A single piece of information defined by a <b>characteristic</b> that has a value, or set of values, ascribed to it when used to describe an actual thing in the real world.
<b>information fragment</b>	A single value defined by a <b>fragment</b> that is a component of an <b>information element</b> .
<b>instance</b>	An individual thing in the <b>real-world</b> defined by an entity.
<b>instance characteristic</b>	A <b>characteristic</b> that is applicable to an <b>instance</b> of an <b>entity class</b> ; in <b>real-world</b> terms it as applicable to a <b>real-world</b> object.
<b>intrinsic</b>	Applied to <b>characteristic</b> and <b>categorisation</b> when the <b>characteristic</b> or <b>categorisation</b> is not dependent on contingency to be applicable to a <b>holder</b> .
<b>intrinsic characteristic</b>	An applicable <b>characteristic</b> independent of any contingency.
<b>level</b>	There are 5 levels, or type of <b>model</b> , within the CBML environment.
<b>level A</b>	A <b>model</b> of the physical representation of an implemented data store.
<b>level B</b>	A <b>model</b> of the logical or physical structure of an implemented data store after the removal of multiple use of columns or attributes.
<b>level C</b>	A <b>CBML model</b> within a defined <b>context</b> using the terminology of the <b>context</b> and the information structure as perceived by the <b>context</b> .
<b>level D</b>	A <b>CBML model</b> within a defined <b>context</b> using, where possible, the terminology of the <b>context</b> but an information structure that is compatible with the enterprise information structure.
<b>level E</b>	A single information <b>model</b> of the whole enterprise.
<b>loose</b>	Asserts that the <b>instance</b> of the <b>referred class</b> is not <b>bound</b> to the <b>instance</b> of the <b>native class</b> for any time span.

<b>mandatory</b>	Applies to <b>characteristics</b> and <b>categorisations</b> to indicate that a value for a <b>characteristic</b> or a <b>categorisation</b> is required.
<b>measurable property</b>	A feature of an entity or substance that may be measured such as: dimension, area, volume, speed, mass, etc.
<b>members</b>	The <b>classes</b> or <b>categories</b> that are mutually exclusive <b>sub-classes</b> or <b>sub-categories</b> of the <b>owner</b> of that are defined by the <b>scheme</b> or <b>set</b> .
<b>model</b>	The combination of CBML <b>elements</b> defined for a <b>context at a level</b> .
<b>model level</b>	The <b>level</b> at which a <b>model</b> is defined.
<b>multiple</b>	Applies to <b>characteristics</b> and <b>categorisations</b> to indicate that there may be more than one concurrent value for a <b>characteristic</b> or a <b>categorisation</b> . This is different to the presence of competing values through <b>plurality</b> .
<b>native</b>	Within a <b>model</b> the <b>holder</b> that is being described.
<b>non-root</b>	Not the top <b>entity class</b> or <b>substance class</b> in a specialisation hierarchy and hence the <b>entity class</b> or <b>substance class</b> is a <b>member</b> of a <b>scheme</b> . Whether an <b>entity class</b> or a <b>substance class</b> is or is not a <b>root</b> is a <b>usage rule</b> .
<b>numeric</b>	NUM – A <b>data type</b> whose value is a real number in the range of minus infinity to plus infinity including zero but excluding plus and minus infinity.
<b>optional</b>	Applies to <b>characteristics</b> and <b>categorisations</b> to indicate that a value for a <b>characteristic</b> or a <b>categorisation</b> may not be required.
<b>OR</b>	A set of CBML <b>characteristics</b> and/or <b>categorisations</b> and/or <b>characteristic groups</b> and/or <b>fragments</b> that are alternatives. These alternatives <b>are not</b> mutually exclusive.
<b>overall status</b>	A value ascribed to an <b>element</b> to define the current state of the <b>element</b> definition within the approvals process.
<b>owner</b>	The <b>class</b> or <b>category</b> that a <b>scheme</b> or <b>set</b> is describing.
<b>plurality</b>	An inclusive term for <b>source plurality</b> and <b>time plurality</b> .
<b>quantity complex characteristic</b>	A <b>complex characteristic</b> to represent a quantity requiring not only a numeric value but also “to what” the value applies.
<b>real-world</b>	The world external to an information <b>model</b> .
<b>real-world entity</b>	An entity that is an identifiable thing, physical or otherwise, that may be encountered in the real world.
<b>real-world substance</b>	Something that is tangible and exists in the real world for which there cannot be <b>instances</b> .

<b>referential</b>	REF – A <b>data type</b> that is a pointer to a <b>class, scheme, category</b> or <b>set</b> .
<b>referred</b>	The <b>class, scheme, category</b> or <b>set</b> that is referred to either by a <b>referential</b> , the <b>class</b> or <b>category</b> referred to as <b>owner</b> of a <b>scheme</b> or <b>set</b> , or the <b>scheme</b> or <b>set</b> referred to by the <b>members</b> of a <b>scheme</b> or <b>set</b> .
<b>repeating characteristic group</b>	A <b>characteristic group</b> that has a <b>multiple usage rule</b> .
<b>root</b>	The top <b>entity class</b> or <b>substance class</b> in a specialisation hierarchy and hence the <b>entity class</b> or <b>substance class</b> is not a <b>member</b> of a <b>scheme</b> . Whether an <b>entity class</b> or a <b>substance class</b> is or is not a <b>root</b> is a <b>usage rule</b> .
<b>scheme</b>	An inclusive term for <b>entity class specialising scheme</b> and <b>substance class specialising scheme</b> .
<b>scope</b>	The <b>class</b> or <b>category</b> that is being categorised.
<b>set</b>	An inclusive term for <b>entity categorising set, substance categorising set, entity category dividing set</b> and <b>substance category dividing set</b> .
<b>simple characteristic</b>	The simplest part of a <b>characteristic</b> that represents a single item of data with a defined <b>composition</b> .
<b>simple fragment</b>	A <b>fragment</b> that represents a single piece of data.
<b>single</b>	Applies to <b>characteristics</b> and <b>categorisations</b> to indicate that there is only one concurrent value for a <b>characteristic</b> or a <b>categorisation</b> . This does not prevent the presence of competing values through <b>plurality</b> .
<b>source plurality</b>	Applies to <b>characteristics</b> and <b>categorisations</b> . For a <b>characteristic</b> it asserts that the value for a <b>simple characteristic</b> or set of values for a <b>complex characteristic</b> , may vary dependent upon the source of the information that defined value or set of values. For a <b>categorisation</b> it asserts that the <b>member</b> or <b>members</b> of the <b>categorising set</b> to which a <b>class</b> or <b>instance</b> is categorised may vary dependent upon the source of the information that defined the <b>member</b> or <b>members</b> .
<b>specialisation structure</b>	An inclusive term for <b>entity class specialisation structure</b> or a <b>substance class specialisation structure</b> .
<b>specialising classification</b>	A generic term for the <b>specialisation structure</b> .
<b>specialising scheme</b>	An inclusive term for <b>entity class specialising scheme</b> or a <b>substance class specialising scheme</b> .
<b>status by authority</b>	An indicator of whether the definition of a CBML <b>element</b> is approved by a particular authority. There may be a number of authorities that need to approve a definition during the approval process.

<b>sub-category</b>	A <b>category</b> that belongs exclusively to a higher order <b>category</b> but has one or more additional <b>characteristics</b> at least one of which will have a constant value.
<b>sub-class</b>	A <b>class</b> that belongs exclusively to a higher order <b>class</b> but has one or more additional <b>characteristics</b> and/or <b>categorisations</b> at least one of which will have a constant value.
<b>substance categorising set</b>	A group of <b>substance categories</b> that share a common <b>scope</b> and are mutually exclusive.
<b>substance category</b>	A <b>category</b> that defines <b>class characteristics</b> that may be applicable to a <b>substance class</b> based on rules defined in a <b>CBML model</b> .
<b>substance category dividing set</b>	A group of <b>substance categories</b> that are sub- <b>categories</b> of the same <b>substance category</b> as <b>owner</b> of the <b>substance category dividing set</b> .
<b>substance class</b>	Something that is tangible and exists in the <b>real-world</b> but never as an individual object for example “petrol”, “water”, “carbon dioxide” etc.
<b>substance class categorisation structure</b>	A hierarchical structure of <b>substance categories</b> and <b>substance categorising sets</b> that always has an <b>entity class</b> at the top.
<b>substance class specialisation structure</b>	A hierarchical structure of <b>substance classes</b> and <b>substance class specialising schemes</b> , the top of which is always a <b>substance class</b> defined as the <b>root</b> .
<b>substance class specialising scheme</b>	A definition of the criteria to delineate the <b>substance class</b> that is the <b>owner</b> of the <b>substance class specialising scheme</b> into <b>sub-classes</b> of the <b>substance class</b> that are themselves <b>substance classes</b> and <b>members</b> of the <b>substance class specialising scheme</b> .
<b>sub-type</b>	A <b>class</b> or <b>category</b> that defines explicit divisions of another <b>class</b> or <b>category</b> .
<b>time</b>	DTG – A <b>data type</b> whose value is a position or period in the continuum of time.
<b>time plurality</b>	Applies to <b>characteristics</b> and <b>categorisations</b> . For a <b>characteristic</b> it asserts that as the value for a <b>simple characteristic</b> or set of values for a <b>complex characteristic</b> , change with time these different values or sets of values may compete for relevance. For a <b>categorisation</b> it asserts that the <b>member</b> or <b>members</b> of the <b>categorising set</b> to which a <b>class</b> or <b>instance</b> is categorised change with time these different <b>member</b> or <b>members</b> of the <b>categorising set</b> may compete for relevance.
<b>unique</b>	Having the quality of <b>uniqueness</b> .
<b>uniqueness</b>	The value for a <b>simple characteristic</b> or set of values for a <b>complex characteristic</b> is <b>unique</b> within a defined <b>uniqueness scope</b> .

<b>uniqueness scope</b>	The <b>scope</b> within which <b>uniqueness</b> applies, for example within all <b>instances</b> of a <b>class</b> , within a single value of another <b>characteristic</b> .
<b>unit of measure</b>	An amount or quantity adopted as a standard of measurement for amounts or quantities of the same kind.
<b>unit of measure group</b>	A set of <b>units of measure</b> for the defined <b>measurable property</b> such as metric or imperial.
<b>usage rule</b>	Rules that apply to some CBML <b>elements</b> within a <b>context at a level</b> the same <b>element</b> potentially having different <b>usage rules</b> in a different <b>context at a level</b> . The applicable <b>usage rules</b> for <b>characteristics</b> and <b>categorisations</b> are: <b>optional/mandatory, optional/mandatory, fixed/variable, time plurality, source plurality</b> . The applicable <b>usage rule</b> for <b>classes</b> is <b>root</b> or not <b>root</b> . The applicable <b>usage rule</b> for <b>characteristics</b> in a <b>characteristic group</b> is <b>optional/mandatory</b> .
<b>variable</b>	Applies to <b>characteristics</b> and <b>categorisations</b> to indicate that once a value has been assigned to a <b>characteristic</b> or a <b>categorisation</b> it may be changed with time.
<b>Whole Life Existence Binding</b>	Is when one <b>instance</b> (or set of <b>instances</b> ) can only exist while the <b>instance</b> to which it is <b>bound</b> exists.
<b>XOR</b>	A set of CBML <b>characteristics</b> and/or <b>categorisations</b> and/or <b>characteristic groups</b> and/or <b>fragments</b> that are alternatives. These alternatives <b>are</b> mutually exclusive.

## ANNEX E MODELLING LEVELS

### MODEL LEVELS

1. In CBML there are three **levels** at which a **model** can be created; namely, **level C**, **level D** and **level E**. Levels A and B are not used in CBML notation and therefore will not be covered.

### LEVEL C

2. **Level C** is a true representation of how the business sees its information. **Level C models** are what are being used throughout this tutorial. Business terms are used, and the full rigour of CBML is not used.

### LEVEL D

3. **Level D** is still a true representation of the business. However, the full rigour of CBML is brought into force. For example, Figure E.1 shows how 'Complainant' appears at **level C**.

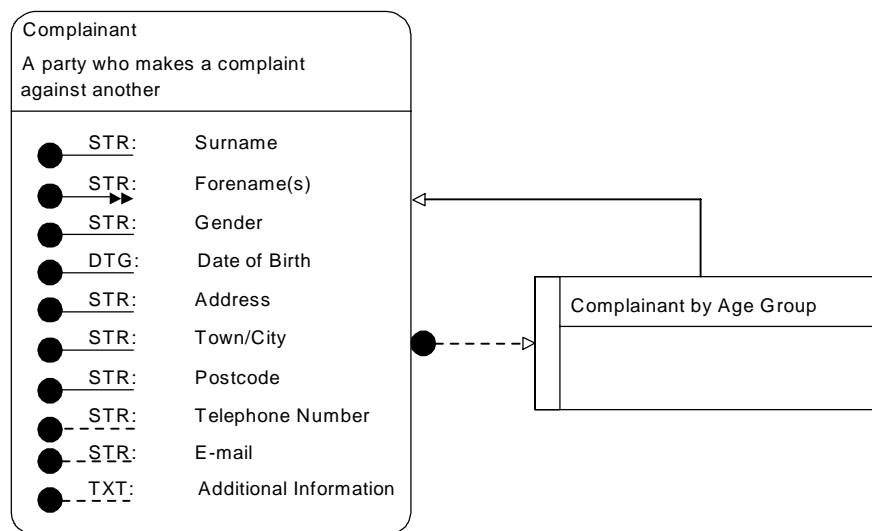


Figure E.1 Level C representation of the complainant entity class

4. Within 'Complainant' there is a requirement to specify the 'Gender' of the 'Complainant'. The values associated with this requirement are 'Male' and 'Female'. When applying the rigour of CBML the **model** would be as shown in Figure E.2. Note that, as previously occurred for the **intrinsic characteristic** 'Age Group', the **intrinsic characteristic** 'Gender' is no longer shown in the 'Complainant' **entity** graphic and now links the **entity** to the **categorising set** 'Complaint by Gender'.

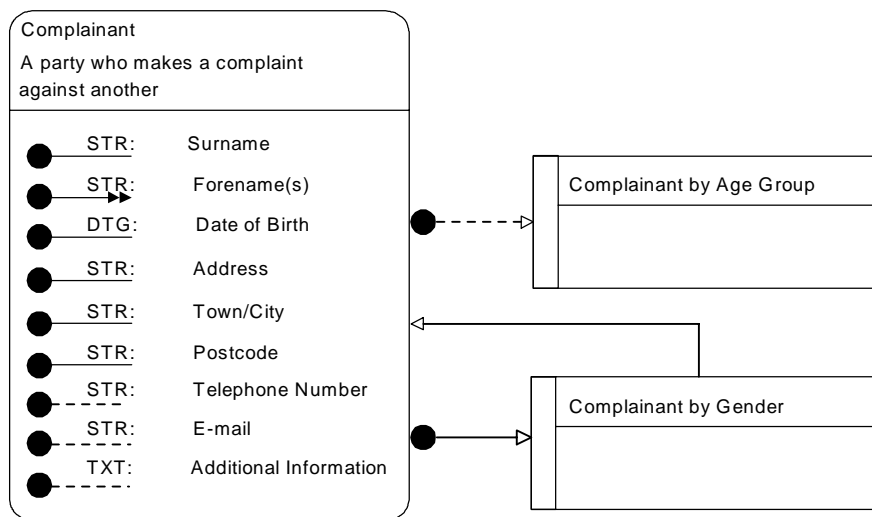


Figure E.2 Level D representation of the complainant entity class

5. None of the business meaning has been lost, and this **model** now states that 'Each instance of Complainant must be categorised as one and only one member of Complainant by Gender that may not change'. This is exactly what was stated in the **level C model**.

#### LEVEL E

6. **Level E** is the enterprise **level** where all **level D models** are brought together to represent the overall view that the enterprise has of its information. Up to this point, the **models** created have been based on the fact that the TPOS deals with 'Complainants' and 'Investigators'. However, there could be, for example, a Human Resources (HR) department within the TPOS that deals with 'Employees'. Complainants, 'Investigators' and 'Employees' are all different views of people. To reconcile these views within TPOS people can be classified as 'Person' and the **level E model** would be as shown in Figure E.3.

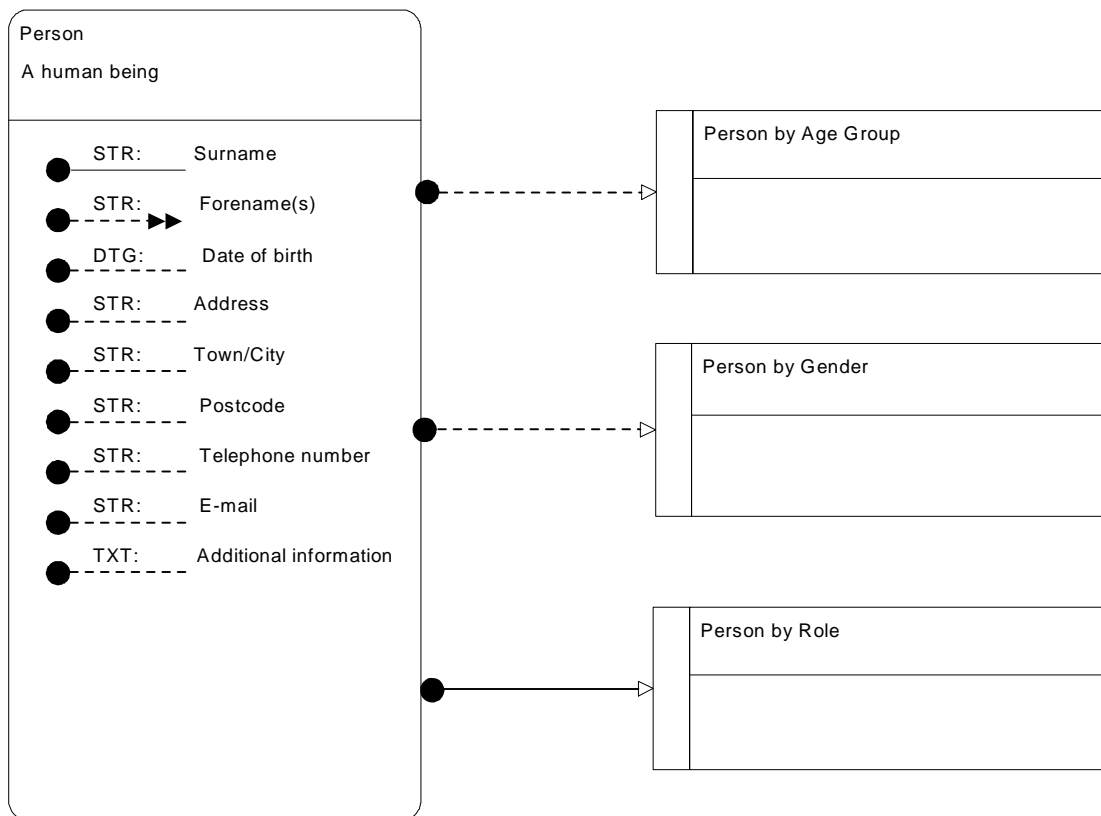


Figure E.3. Level E model of 'Person'

7. It should be noted that the only **intrinsic characteristic** that has remained **mandatory** is 'Surname' as this is the only one that is required for both 'Complainant' and 'Investigator' and by the HR department for 'Employee'. A new **categorising set**, 'Person by Role', has been defined, and the **members** of this are 'Complainant', 'Investigator' and 'Employee' as far as the TPOS is concerned.

8. Any other business domain within the TPOS that deals with 'People' can now use this **model** as the foundation of their information **model** to support their particular business. They can take those **information elements** that they require to support their domain and create a **level C model**. They can then make any extensions that they need. For example, a department may deal with 'Parliamentary Questions' and need to keep a record of the name of the MP that asked the question and the Constituency the MP represents. Their **level C model** for MP would be as shown in Figure E.4.

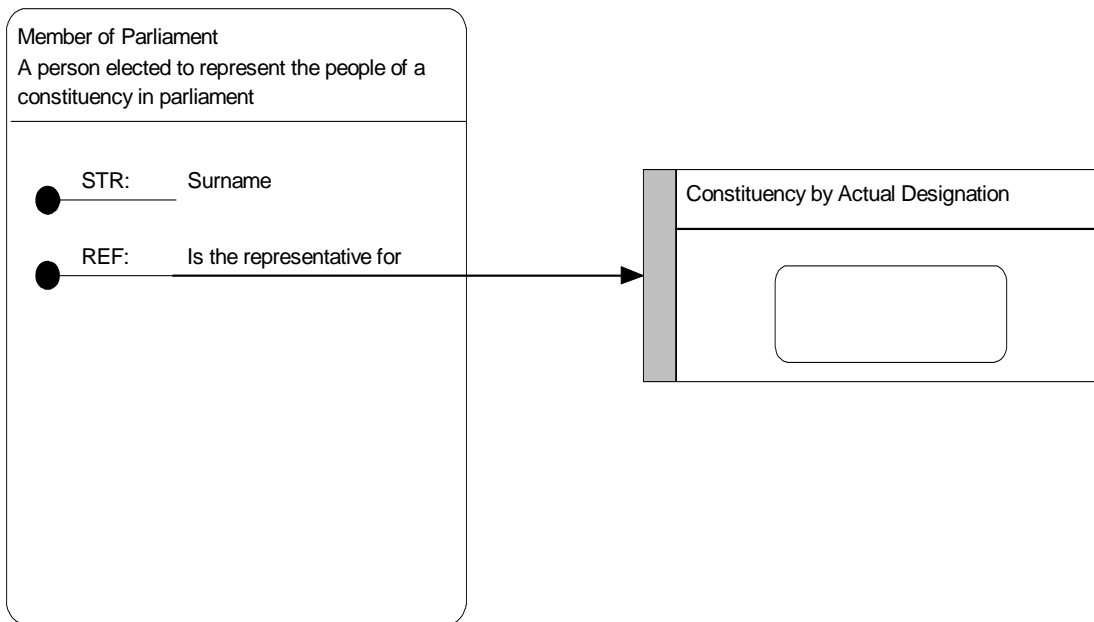


Figure E.4. Level C model of Member of Parliament

9. This **model** would be the same at **level D**. It could then be reconciled at **level E** and the **model** would now be as shown in Figure E.5.

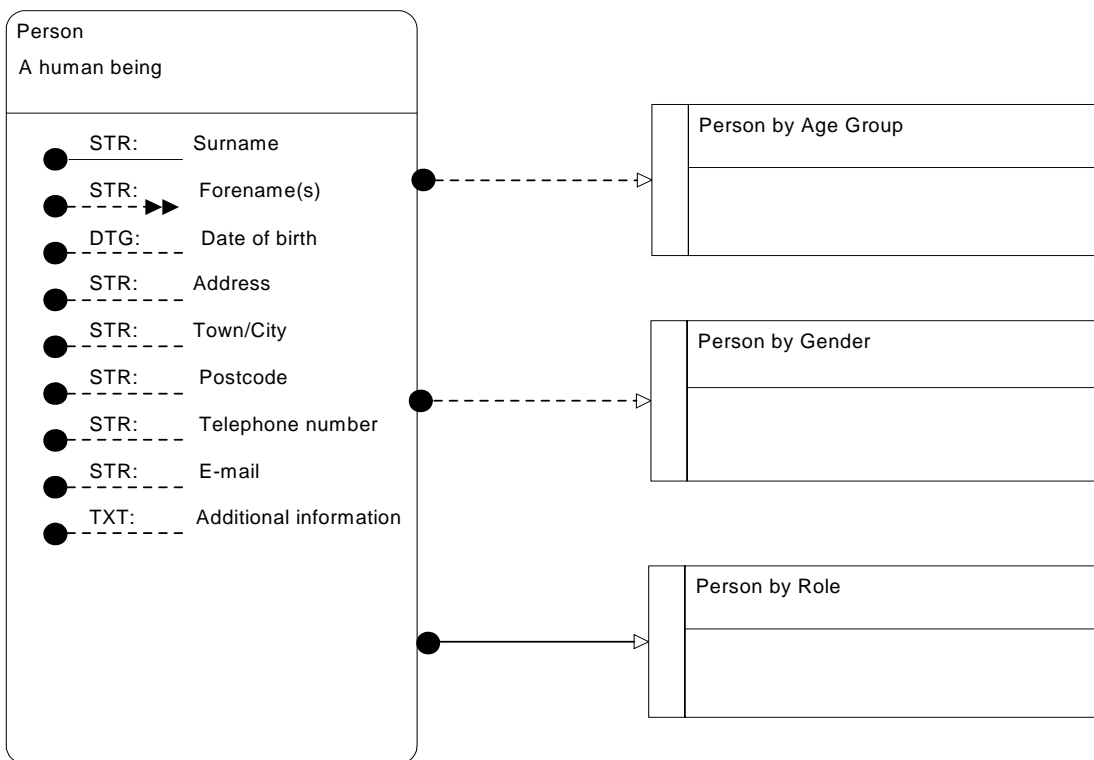


Figure E.5. Model of Person at Level E

10. The **members** of the **categorising set** 'Person by Role' are extended to include 'Member of Parliament', and the **referential characteristic** would be from the **category** 'Member of Parliament' to 'Constituency by Actual Designation' as shown in Figure E.6.

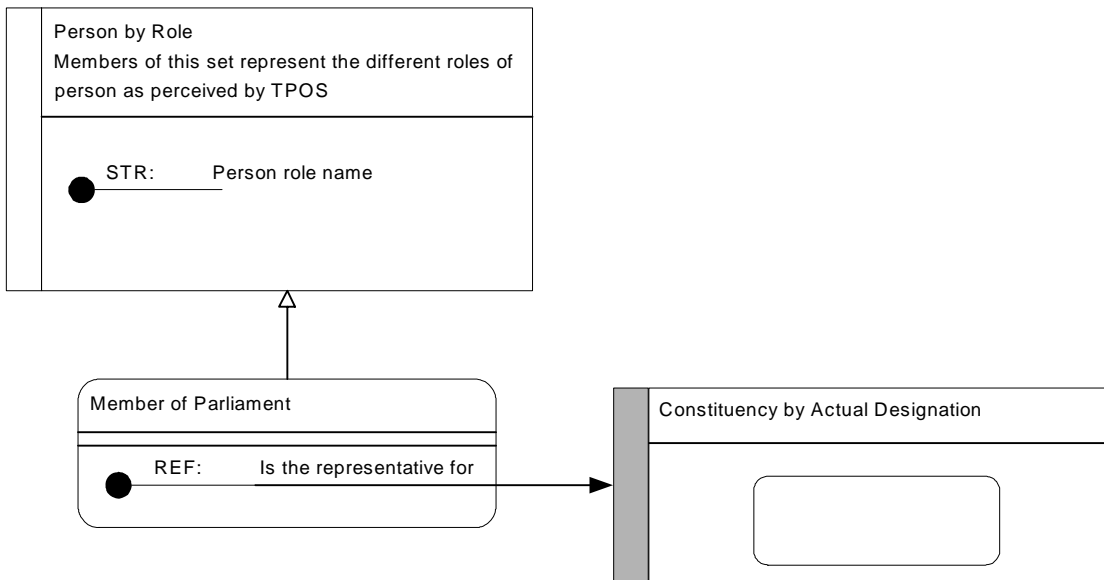


Figure E.6. Member of Parliament as a member of Person by Role