

# **PDA business logic for informed decisionmaking: IAS 24**

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## **Abstract**

Systematization can expand management capabilities; it provides the controls over choice, chance and change that allow effective focus on, and attainment of, strategic targets, goals and objectives in an evolving environment. Increasingly complex adaptations and modifications are required to maintain systems; precise, electronic aids are commonly employed, including Personal Digital Assistants (PDAs). eGanges is a new generation complex logic system to aid decision-making that is designed for PDAs; it is a user-friendly shell with a computational epistemology that distinguishes expert deduction, induction and abduction, in an interactive knowledge visualisation of rules, procedures, policies, strategies and causation. Decision-making alternatives created by logical disjunctions, can be clearly seen no matter how extensive or complex. An Accounting application of eGanges explains the logic streamlining of IAS (International Accounting Standard) 24 which is concerned with disclosure of Related Parties, and demonstrates the significance of logic in the decision-making of the compliance system.

## **Fields of Research: Accounting and Management**

### **1. Introduction**

A decision is required when there is more than one way of proceeding. If the alternatives are known and evaluated, an informed decision may be made. The quality control of informed decision-making is partly concerned with establishing the alternatives from available information. In order to determine the alternatives, logical disjunction, the 'or' in information, must be specified. The various ways in which disjunction occurs in information, contributes to the complexity of informed decisions made on the basis of that information. eGanges is a complex logic system shell with an epistemology that suits informed decision-making in business. An international accounting application of eGanges shows disjunctions that must be considered in complying with International Accounting Standard (IAS) 24.

### **2. Literature review**

Ishikawa (1985) posed a quality control ideograph called a fishbone which has been widely used in industry. It was originally posed for quality control of manufacturing processes in Japan after World War 11. The fishbone is a representation of causation and is shown in **Figure 1**; it is similar to a Samurai military formation that advances from left to right. However, it can capture disjunction for the purposes of informed decision-making. This was demonstrated by Morgan (2002, pp.123-4), in his work on developing business expert systems through the determination and automation of business rules. Morgan illustrates an Ishikawa fishbone by using the paradigm to represent a business decision-making scheme for determining a loan application.

Gray (1988), who worked with Morgan in 1989 on the first ESPRIT legal project, first proposed a River paradigm for the automation of legal reasoning, but it was not until after the publication of

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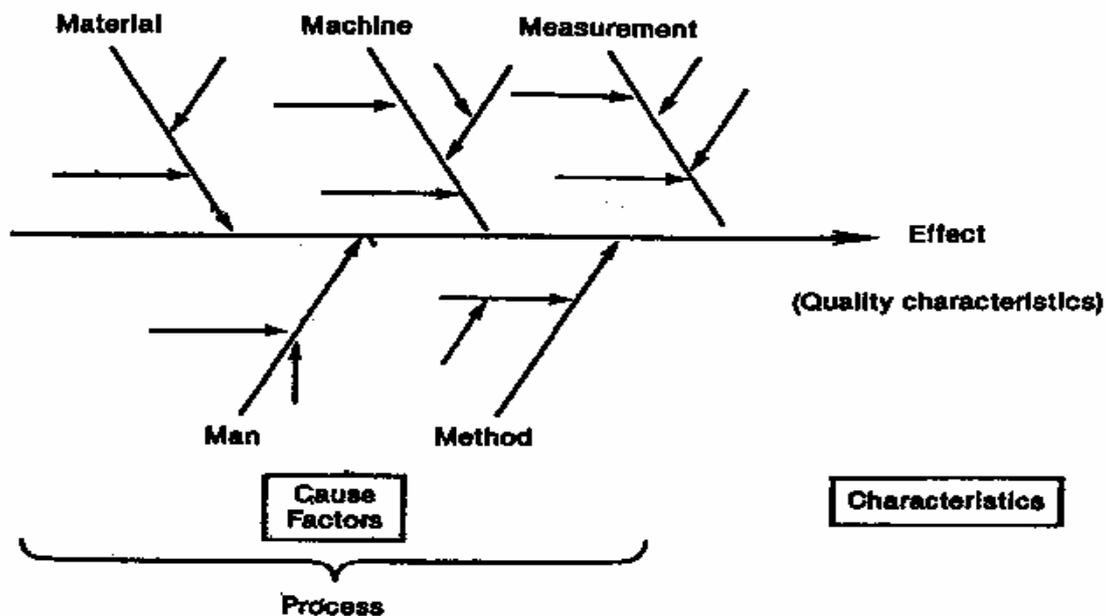


Figure 1: Ishikawa (1985, p.63) Fishbone: Cause and Effect Diagram

Morgan's book that the similarity of the fishbone and the River ideograph became apparent. (Gray, 2005a; 2005b) The eGanges shell was designed by Gray in 2002, as part of her doctoral work at the University of Western Sydney. This shell facilitates the construction and processing of large scale nested Rivers for informed decision-making. eGanges has been applied to mobile learning (Gray and Gray, 2005) and some fields of business (Gray, Gray, and Treanor, 2006), as well as the legal domain, but it has not been considered in terms of the logic and the prior analytics required for informed decision-making. This paper considers the role of disjunction in decision-making and the prior analytics required for the production of an eGanges application of IAS (International Accounting Standards) 24.

### 3. IAS 24

Corporate governance is required to conform to subordinate legislation in the form of accounting standards that apply to the practice of accounting. The International Accounting Standards Board has provided IAS 24 to set the requirements for reporting on related parties; web summaries published by the Board set out the details of the text of IAS 24 as follows:

Web Summaries

IAS 24: Related Party Disclosures

Introduction

IAS 24 *Related Party Disclosures* was issued in December 2003 and is applicable for annual periods beginning on or after 1 January 2005.

IAS 24 prescribes the disclosures necessary to draw attention to the possibility that the financial position and profit or loss of an entity may have been affected by the existence of related parties and by transactions and outstanding balances with such parties.

## Summary of IAS 24

A party is related to an entity if it:

- directly or indirectly, controls, is controlled by, or is under common control with, the entity;
- has significant influence over the entity;
- has joint control over the entity;
- is a close member of the family of any individual who controls, or has significant influence or joint control over, the entity;
- is an associate of the entity;
- is a joint venture in which the entity is a venturer;
- is a member of the key management personnel of the entity or its parent;
- is a close member of the family of any of the aforementioned key management personnel;
- is an entity that is controlled, jointly controlled or significantly influenced by, or for which significant voting power in such entity resides with, any of the key management personnel or their close family members;
- is a post-employment benefit plan for the benefit of employees of the entity, or of any of its related parties.

IAS 24 requires the following related party disclosures:

- Nature of relationships between parents and subsidiaries, even if there were no transactions between those related parties;
- The name of the entity's parent and, if different, the ultimate controlling party;
- Compensation of key management personnel;
- If there have been transactions between related parties, the nature of the relationship and information about the transactions and outstanding balances with related parties. Such disclosures are made separately for each of the following categories: the parent; entities with joint control or significant influence over the entity; subsidiaries; associates; joint ventures in which the entity is a venturer; key management personnel; and other related parties.

Before an IAS 24 application of eGanges can be constructed, it is first necessary to determine the logical structure of this wording by a process of prior analytics. The semantics or meaning of the wording must be specified as logical units in relation to each other, according to the requirements of the shell. This includes the determination of disjunctions.

## **4. Types of disjunction**

There are two types of disjunction in the logic of strategic decision-making:

1. Consistent disjunction: alternate ways of establishing the strategic goal  
and
2. Contradictory disjunction: alternate ways of failing to establish the strategic goal

The eGanges shell shows by its interactive visualisation of a River ideograph, the alternate ways of establishing a strategic goal. However, eGanges will also show a failure when it occurs, by showing a failure of a node on the River.

## **5. Complex logic system**

A complex logic system contains two or more of the three forms of logic: deduction, induction and abduction. It provides for both types of disjunction, as it occurs in premises that are used

deductively, inductively or abductively. The eGanges River is a deductive structure. In addition to the River, eGanges has various gloss facilities for premises that are used inductively or abductively in relation to the deductive structure. It is assumed that all the streams of a River are correct or true Major deductive premises but they can be upgraded if changes are required. Where written information, such as IAS 24, is the subject of an eGanges application, the semantic system of the premises in the writing, which is determined by prior analytics, provides the tributary connections for extended deductive reasoning. The tributary structure of the River may be nested if it extends too far for one page.

Processing of a nested River requires the user input of the Minor deductive premises. This is achieved by the eGanges communication system that also carries out the extended deductive reasoning by processing the input.

It is important to distinguish the three forms of logic in informed decision-making. As each form brings different logical weight to the process. Deduction, induction and abduction, may be used systematically or strategically to optimize profit in business. Deduction carries the certainty of logical necessity; induction brings the instances of existence or definition to the elements of deduction; and abduction lends strong or weak support for the elements of deduction.

## **6. Computational epistemology of eGanges**

eGanges has a complex logic system that is a computational epistemology; part of this epistemology provides for the interactive visualisation of extended deductive premises that are formalised as a system of rules, procedures, policies, strategies and/or causation. Through the interactive visualisation, input is collected from a user as the Minor deductive premises which triggers transparent sorting and feedback that automates extended deduction processing. Extended deductive logic provides and determines the flow of the complex logic system. The sorting and feedback required to simulate extended deduction is governed by meta-rules of logical argument or processing heuristics. The epistemological design of eGanges has two parts: the static and the dynamic.

### ***Static***

The static part of eGanges consists of:

- (1) maps of a system of extended deductive premises that have the structure of a tributary system like a river;
- (2) spectra of inductive instances that detail the components of the deductive premises; and
- (3) strata of abductive premises that provide further information that is pertinent to the components of the deductive premises.

### ***Dynamic***

The dynamic part of eGanges has three ways of processing the deductive maps:

- (1) free navigation of the maps which may be nested as far as the expertise requires;
- (2) interrogation of the user to elicit the Minor premises of the user's situation for the purpose of automated extended deduction;
- (3) decision-making according to the extended deduction permitted by the Major premises of the maps and the user's Minor premises.

This epistemology is illustrated by the IAS 24 example. Because IAS is a system of rules, it requires an epistemology that is suitable to the legal domain. Accounting may in other respects have a different epistemology, as examined by Davey (1981).

## 7. Prior analytics of IAS 24

It can be observed from the wording of IAS 24 that there is a list of entities that are Related parties and a list of Required disclosures required in regard to these entities. The list of disclosures adds two entities to the list of Related parties, namely parents and subsidiaries. It may be that one or two of the entities described in the list of Related parties encompasses parents and subsidiaries. However, there are wider disclosures required for parents and subsidiaries, so that they should be added to the list of Related parties for the logic structure.

Apart from parents and subsidiaries, the Related parties referred to in the list of Required disclosures all appear in the list of Related parties. By the addition of parents and subsidiaries to the list of Related parties, there are no Related parties not provided for in the list of Required disclosures. Thus the list of Required disclosures may be used to construct the logic structure required for an eGanges application.

The purpose of IAS 24 is also stated as an overriding guide to the scope of disclosure requirements. This can be included in an eGanges application as an abductive gloss on the logic structure of the Required disclosures.

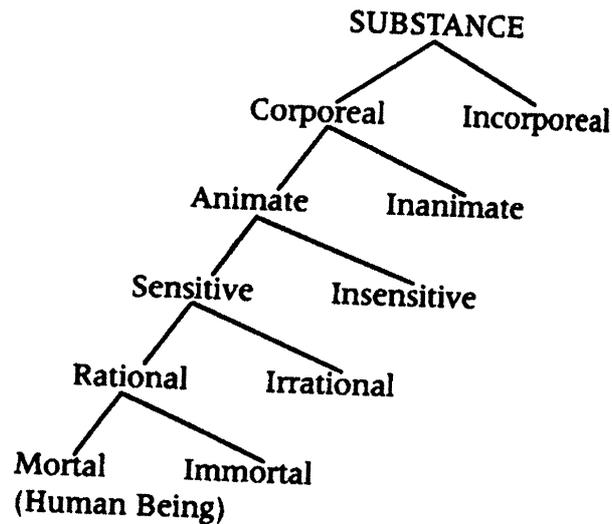
## 8. IAS 24 River

The logic structure required by eGanges is a tributary structure called a River. This is constructed in the Rivers window of the eGanges interface. When eGanges is in Build mode, a construction menu is available that facilitates the production of the required River. A River can be thought of as a strategic extract from a decision tree. It has one Final result, and all the tributaries that lead to this must be satisfied unless there is a disjunction that offers a choice of streams, in which case, only one stream must be satisfied. The direction of flow is indicated by an inference arrow on each stream. If a decision-maker feels lost in the forest of information trees, the River may be found by prior analytics. The tributary structure may then be explored to see and satisfy the alternate conditions required to reach the strategic goal.

A decision trees requires a selection of one path only, but there are many alternate pathways to the strategic goal that are obfuscated by the branches to goal failure. Even in the earliest taxonomy tree of Porphyry (c.300 AD), contradictory pathways were shown; **Figure 2** is Porphyry's tree which represents Aristotle's ontology of substance. In a River, the alternate pathways to the strategic goal are streamlined and pathways to goal failure are not shown.

**Figure 3** shows the Initial map of the IAS 24 River in the Rivers window of the eGanges interface. This Figure is a diagram of the eGanges interface and not the real interface which uses colour coding to facilitate understanding of the logic structures and their processing. A real eGanges applet can be operated at: [www.grayske.com/FinLawTrial/index.html](http://www.grayske.com/FinLawTrial/index.html)

The strategic outcome or Final result of the IAS 24 River is Compliant disclosure. Goals along the mainstream to this strategic outcome are the four disclosure requirements, each of which is particularised upstream by secondary streams, tertiary streams, quaternary stream, quinary streams, and so on. Nodes that are marked, called soccerball nodes, such as Transactions with related parties,



**Figure 2: Tree of Porphyry (c. 300 AD)**

indicate a nested sub-map. Figure 4 is the sub-map of Transactions with related parties. It can be seen in Figure 4 that there are many more sub-maps that further particularise the requirements for disclosure. The hierarchy of details may be created by nesting as deeply as required. The River may be navigated freely to see the full extent of the task of informed decision-making that is required to achieve the outcome of Compliant disclosure.

From the disjunctions in Figures 3 and 4, that appear as fan structures, it can be seen that the prior analytics which determine consistent disjunctions, has revealed the full extent of the obligations to disclose; there is a requirement to investigate what needs to be disclosed as well as to make disclosures. If an investigation reveals nothing to disclose, then no disclosure will achieve the outcome of Compliant disclosure.

## **9. Communication system of eGanges**

The interactive visualisation of the River allows the user to provide input through the communication system of the Questions and Notes windows and the five alternative answer buttons, each of which is labelled according to its effect on reaching the Final result of Compliant disclosure. All of the nodes on every tributary in the River structure must be established to achieve the strategic outcome of Compliant disclosure, unless there are alternative ways of establishing a node by a fan of tributaries upstream.

The communication system allows either questions or commands to be inserted in the Questions window. Potential answers may be adjusted to suit the natural language of the text used in the Questions window. For instance answers to a command might be Not done, Done and Uncertain. The reason that three Positive answers that are all consistent with the Final result, are allowed, is to provide for information in the nature of neutral nodes, that may be significant, but does not affect the outcome. However, normally, the neutral facility is not applicable, and the alternative Negative, Positive and Uncertain answers represent the contradictory disjunctions.

eGanges Interface © Pamela N. Gray, 2002  
 C:\Program Files\Ganges\gan\_files\ganfiles\ias24.gan

Reverse

Negative Case

Positive Case

Uncertainties

Current Result page 1 / 15

Options

Build	Consult
Update	Help
Undo	Redo
Save	Search
Back	Forward
Report	Print
Clear	Close

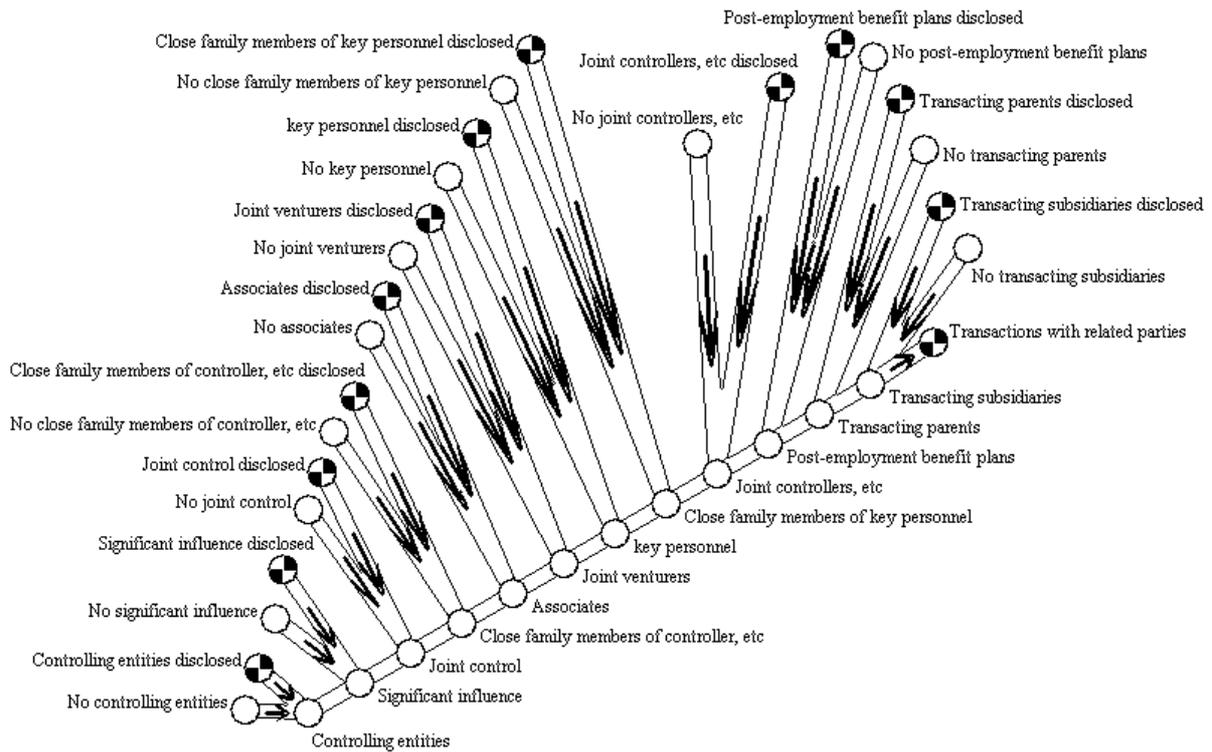
Questions

Answers - select one

No	Negative
Yes	Positive
Uncertain	Positive
Uncertain	Positive
Uncertain	Uncertain

Note

Figure 3: Initial map: IAS (International Accounting Standard) 24 in eGanges interface  
 © Pamela N. Gray, Xenogene Gray, 2006



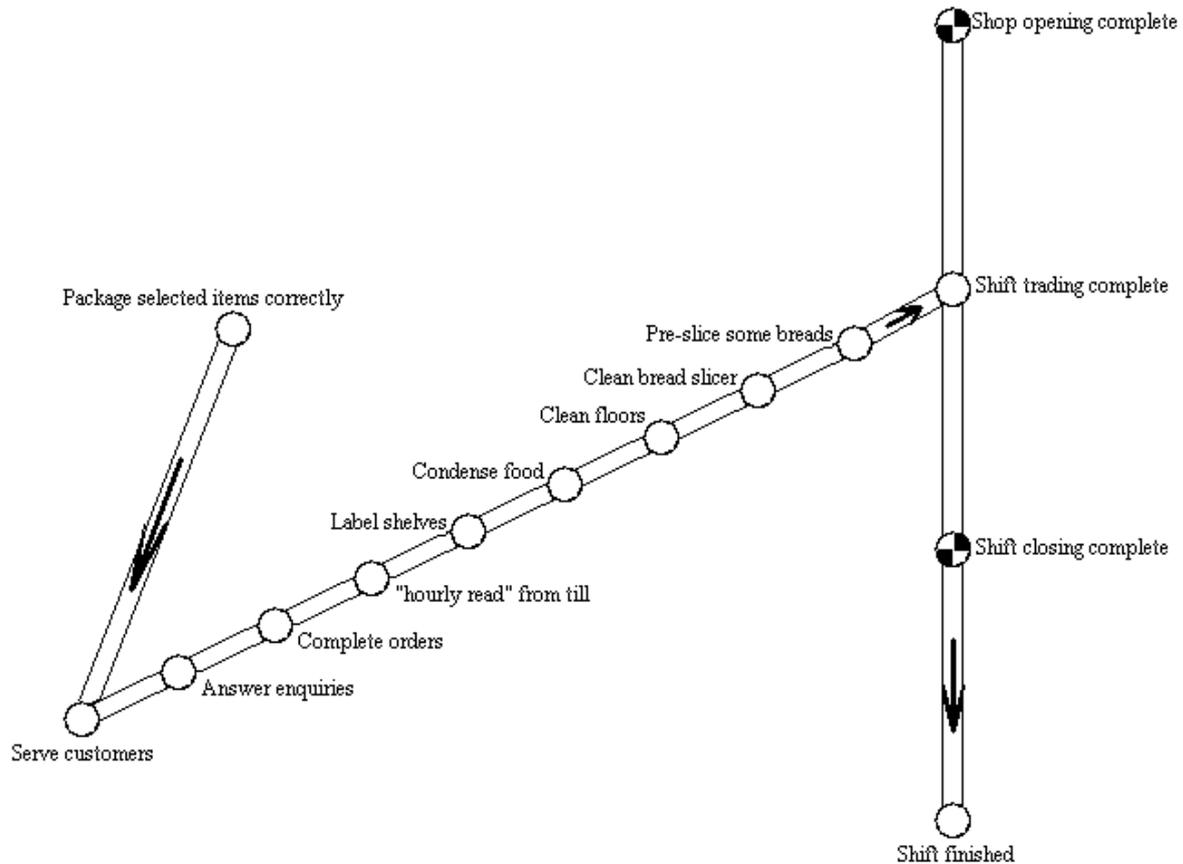
**Figure 4: Submap of Transactions with related parties,  
IAS (International Accounting Standard) 24  
© Pamela N. Gray, Xenogene Gray, 2006**

As input answers are received, they are sorted into the Adversarial windows as indicated by the labels on the potential answers that match the labels on the adversarial windows. The cumulative results at any stage of a consultation of an application can be obtained by clicking on the Current result button that will show the Current result in the window below the button. Once a Negative Minor premise appears in the Negative Case window, the Final result of the River cannot be achieved. A Negative Minor premise will not appear in the Negative Case window until all the fan alternatives of a Positive disjunction fail. Eganges manages disjunction in its automated extended deduction.

## 10. Other business applications

The knowledge of lawyers and business experts that take the form of rules, policies, procedures, strategies and/or causation is information that can be used in informed decision-making to optimize profit. Prior analytics of this information require the determination of the choices that are implicit in the information. Streamlining of alternatives as the decision-making pathways requires a determination of the disjunctions in the premises of the knowledge.

**Figures 5-7** are the initial maps of three other eGanges business applications. **Figure 5** indicates how eGanges might map the job of a bakery assistant for training, on the job reference and quality control. **Figure 6** provides for a large scale mapping of the United Nations Convention on Contracts



**Figure 5: Initial map: Julian's Bakery job**  
 © Pamela N. Gray, Xenogene Gray and Lyn M. Treanor, 2006

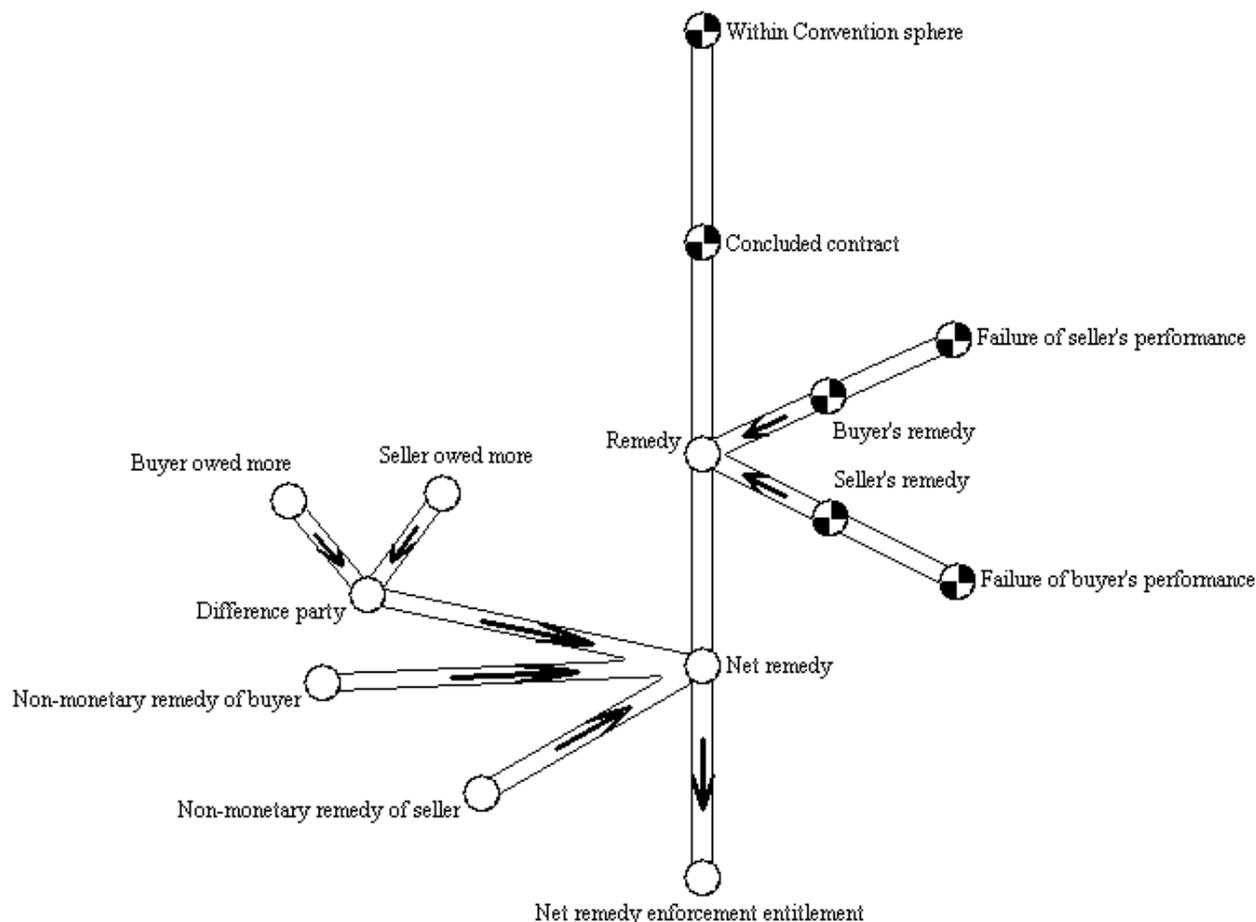
for the International Sale of Goods, known as the Vienna Convention. **Figure 7** illustrates how a large business might be comprehensively managed by an eGanges application.

Looking at the various shapes in the maps, it can be seen that logic provides the character of artificial intelligence artefacts. The maps could involve a cognitive art that creates mnemonic shapes and aesthetic preferences for users.

## 11. Mobile intelligence

eGanges is designed to suit PDAs. It is small program of about 200KB, which minimizes the size of its applications. With simple clicks, the user may navigate the knowledge, provide input for extended deductive processing, and obtain the pro tem or final result of that processing at any point.

The minimal use of language for labels, questions and answers, facilitates translation to other languages; the complex logic may be understood through the ideographs, so that common understanding transcends language like the international toilet icons at airports that everyone is

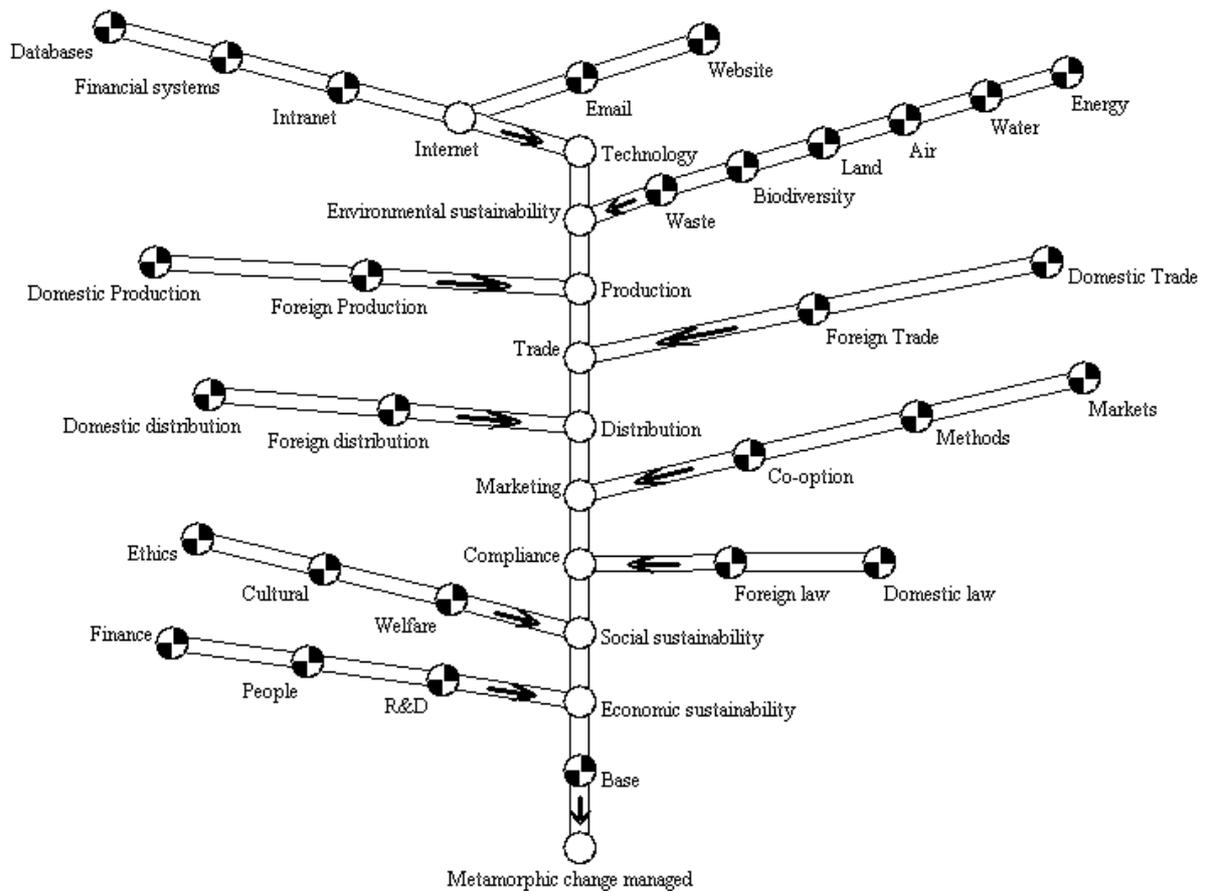


**Figure 6: Initial map: Vienna Convention**  
 © Pamela N. Gray, 2003

most grateful to see. eGanges suits multi-ethnic societies. In an increasingly complex social organisation, conflict prevention and peace applications might offer hope and solutions. Although the eGanges epistemology is complex, it is reduced by design to concrete complex logic that requires only the urban intelligence for understanding road and rail transport maps. Complex negotiation may be effected through ideographs for efficient and effective achievement of complex agreement and common understanding of choices and selection preferences.

## 12. Conclusion

The user-friendly complex logic system shell, eGanges, has an epistemology that provides for the various types of disjunction, so that applications of this shell can be designed as computer aids for decision-making. eGanges is also designed to suit Personal Digital Assistants (PDAs) so that the aid is mobile and pervasive. The eGanges application of IAS 24 confirms that the eGanges epistemology applies to the accounting domain and may assist corporate governance. The ostensible simplicity of eGanges and its widespread applicability permits an upgrade of human intelligence that is required for the new civilisation that is being created by science and technology.



**Figure 7: Gray-Treanor metamorphic change management model 1 (tv aerial)**  
 © Pamela N. Gray and Lyn M. Treanor, 2006

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