

Handheld intelligence for contemporary free trade

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Abstract

Free trade operates in a world that is undergoing metamorphic change, technologically, environmentally, and culturally. Accordingly, business epistemology must evolve to manage large-scale complexity in a strategic framework. eGanges, a new genre expert system shell for various domains including law and management, is an intelligent management tool that has an epistemological design for navigation and processing of large scale, complex information systems. Yet its interface design, with interactive visualization, is friendly to ordinary understanding and suits Personal Digital Assistants (PDAs); business applications of eGanges may be constructed or consulted at any time or place, in any context, as required.

Keywords: Business epistemology, logic, deduction, induction, abduction, business expert systems, change management

I. Introduction

Contemporary business is now immersed in a world that is undergoing metamorphic change; free trade has to be managed in this context. Ongoing problems that must be managed at both macro and micro levels, are large-scale and complex. Production and trade must be geared to the impact of massive, complex, new markets. Environmental sustainability is confronting the business world with highly disturbing risks that are also massive and complex. Likewise, technologies are exploding established human boundaries to unforeseeable, complex lengths. Somehow all three of these forces of change are intricately entwined also on a massive scale, in complex ways. Simple ideals, beliefs and aspirations that were thought to be the instruments of change in the twentieth century (Whitehead, 1933), have been surpassed by forces of change that have dense logic. Business ontologies and epistemologies have to be adjusted accordingly. eGanges is a software aid for dealing with these management problems but, like the new forces of change, it requires a paradigm shift in thinking comparable to the paradigm shifts in the sciences that were identified by Kuhn (1962, 1970).

II. Business epistemology

Business epistemology is a matter of understanding the logic of information that is relevant to informed decision-making, strategic thinking, and planning (cf. Davey, 1981). There are three types of logic: the necessary logic of deduction, the ontological logic of induction and the variable support of abduction. In eGanges, these are clearly partitioned in a user-friendly way. Relevant information is either a deductive premise, an inductive premise or an abductive premise; it is applied accordingly.

The eGanges shell was originally designed for the legal domain; the design of its epistemology, derived from computational legal epistemology (Gray, 2005), makes it a new generation expert system shell. In the construction of particular applications of the shell, premises are located according to whether they are to be used deductively, inductively or abductively. Generally, in the legal domain, rules of law are deductive premises that can be used as extended deductive systems; the facts of precedent cases are inductive premises that detail the instances of an antecedent in a rule of law; and reasons for a rule of law are abductive premises. By analogy, generalizations may be

made about business schema. For instance, business rules, strategic pathways or procedures may constitute deductive premises; they may be particularized by inductive instances and supported in some way or not, by abductive reasons.

In eGanges, there is a River visualization for deductive premises, a spectrum gloss for inductive premises, and various forms of other glosses for abductive premises. The deductive River paradigm, is the same as the Ishikawa fishbone (Ishikawa, 1985) that was developed and used extensively in Japan following World War II, for quality control of manufacturing. Ishikawa's generic fishbone diagram, shown in **Figure 1**, was in turn similar to a Samurai military formation that advances from left to right. It was used by Ishikawa as a paradigm to represent causation in manufacturing processes; a picture says a thousand words. The eGanges River, a form of logic flowchart, may also be used to represent causation, no matter how complex or extensive that causation is; if a map gets too complicated, appropriate parts of it can be nested in a series of submaps as required. Nesting of tributary structures can represent large-scale complex causation, procedures, policies, rules, or strategies. eGanges Rivers flow from top, down to their Final result, as indicated by the arrows in Figures 3-10.

In his book on developing business expert systems through the determination and automation of business rule systems, Morgan (2002, pp.123-4) illustrates an Ishikawa fishbone by using the paradigm to represent a business system for determining a loan application. Gray (1988) first proposed the River paradigm for the automation of legal reasoning but it was not until the publication of Morgan's book that the similarity of the fishbone and River paradigms were recognized [1]. Legal reasoning and business reasoning has the same logic form. Non-monotonic DIAlectic, the variable mix of deductive, inductive and abductive arguments, takes on new meaning as business logic.

The earliest epistemological ideograph is the Tree of Porphyry (c.300 AD) shown in Figure 2, as a representation of Aristotle's categories of substance. Many other forms of epistemological ideographs have been developed including, in the legal domain, the legal argument graphics of Fraunce (1588), the evidence evaluation flowchart of Wigmore (1931, 1937), and the game trees of Baird, Gertner and Picker (1994). *Ad hoc*

or pragmatic flowcharts, decision trees, and Venn diagrams are commonly used in business management as epistemological aids. The flowcharts of eGanges are called Rivers as a metaphor of a tributary structure; deductive premises that are linked for extended deduction take this form. The computerization in eGanges facilitates the drawing, storage, navigation and processing of the River ideographs of deductive logic.

III. Scope of applications

The subtleties of epistemology that are employed in the design of eGanges require business applications that have mined and streamlined knowledge for informed decision-making. eGanges can map extensive and complex streamlining of rules, policies, procedures, causation and strategies. The knowledge maps may be navigated or applied in a particular consultation. *Inter alia*, specific business applications of the software may be designed for the training or guidance of employees, the strategic negotiation of agreements, resolution or avoidance of conflict, quality control of operations, transactions and policies, and compliance planning.

Applications that are common to many nations, such as a legal application of the United Nations Convention on Contracts for the International Sale of Goods, known as the Vienna Convention, may assist the negotiation of free trade contracts; where the law varies, comparative applications such as different environmental law or spam controls of several nations involved in relation to a free trade transaction, may also expedite negotiations. Understanding of complex logic, complex choice and complex transactions in a user-friendly, transparent way is facilitated by appropriate management applications.

IV. Sample applications.

4.1 Training and guidance of employees

In the eGanges application, Julian's Bakery job, a bakery retail assistant's job was mapped as vocational procedure for training and on-the-job advice; the Initial map of the application is shown in Figure 3, in the Rivers window of the eGanges interface. The mainstream of the River lists the tasks to be completed in order to reach the Final result of completing the shift, namely: Shop opening, Shift trading and Shift closing.

Each task is detailed by secondary streams and sometimes details on a secondary stream are further particularized by tertiary streams, and so on. Sometimes there are choices, such as Figure 4 which is a submap of 'Shop opening complete' and contains a fan of two alternative ways of getting the door unlocked. A node that is patterned like a soccer ball indicates a submap; it is called a soccerball node.

Usually, a shop assistant would be instructed ad hoc in the job by the shop manager, as the day progresses. Over a period of time as the shop assistant performs according to instruction, questions might be asked to clarify tasks, depending on the shop assistant's perception of the work environment politics. If the shop assistant had an insight to improve the instruction, the performance of the job or the enterprise, the benefit of this insight might not emerge, depending on the workplace relations that had been established at the time of the insight. Adopted roles might be set and followed without question. The paradigm shift away from this practice to eGanges, would see training in advance through the eGanges application, with opportunities for the trainee to resort to the application for clarification during the job, and to input questions or comments through the Notes window for the manager to see.

Small administrative jobs can also be mapped. In 2006, finance law students were given a task of a Reserve Bank employee of writing a letter of advice to a group of people in a country town where the banks had left the town without financial services; the townspeople sought advice on alternative arrangements they might make between themselves. Provisions of payment systems legislation had to be referred to in the letter. The order in which relevant matters were to be set out and detailed was mapped as a small eGanges application to illustrate the answer to the assessment task. An employee might map a small task by reference to relevant applications; the small task map might then be used to carry out the task; it can also act as a quality control record to ensure that the task is properly carried out, or give authority for the task to be carried out in that way. Rather than working in the context of fuzzy reality and unspecified experience, there would be explicit understanding of large-scale complexity. There would be the communication required for exact quality control and precise understanding of jobs. As science and technology permeate work, this may be crucial to the workplace and the use

of work tools. eGanges may permit more effective training that gives greater flexibility and benefit to management; it may be possible to increase the number of skilled and semi-skilled workers from the population of unskilled workers.

An educational designer at CSU, in 2006, mapped her job for administrative purposes using eGanges. Job maps can be used as a basis for definition of contractual duties of an employee; parallel maps can also map employee contractual rights or employer duties to determine the necessary correspondence for viable contractual performance. Provisions for occupational health and safety might then be more thoroughly monitored.

Job maps can indicate the complexity of a job and the points at which alternative ways of carrying out the job are available. It is possible for eGanges applications to run on mobile phones that have Java and sufficient memory, so that they can be made available for performance of jobs at various or moving locations, like a telephone; eGanges (about 250 kB) and its applications are memory lean. A manager could build an application while waiting at an airport or station and email it to an employee.

4.2 Strategic negotiation of agreements

In the negotiation of free trade contracts, a map of the Vienna Convention can be used to ensure that strategic choices are made and the requirements for a valid contract are met. Figure 5 is the initial map that shows the soccer ball node, Concluded contract, for further exploration. Bespoke negotiation applications could be developed to incorporate or limit the information required for a specific business or specific transaction(s).

4.3 Avoidance or resolution of conflict

eGanges maps may also assist the prevention or resolution of conflict. This is illustrated in Figures 6 and 7 which show, respectively the case for opposing parties in a spam prosecution under the Australian Spam Act 2003. Figure 6 is a draft defense map that was constructed with a view to advising clients when it was OK to send a message, so that there would be no breach of the Act. Figure 7 is the prosecution map. The maps are not mirror images of each other; they have common nodes, such as the node, electronic message. However, when the two maps are compared, the differences become apparent;

they may have contradictory nodes or there may be contradictory nodes within one map, such as Australian link and No Australian link. Deductive maps may provide for contradictories as mutually exclusive alternatives or as opposing cases.

Prevention and settlement of conflicts work toward the compromise or removal of differences. eGanges applications that represent the requirements of parties in conflict, allow precise identification of the points of conflict and the points of agreement as the foci for further consideration. Upon the precise particularization of differences and contradictories, it might be possible to devise further alternatives to refine points of conflict as mutually acceptable solutions.

Figure 6 is the initial map of a well developed application that many levels of submapping. Figure 8 shows the chaos of logic structures when all the soccerball nodes are undone. This indicates how difficult it is to prevent or resolve conflict when negotiation occurs in the fuzzy reality of spaghetti logic.

4.4 Quality control of operations

Control of operations might require management of definitions or something on a larger scale. An eGanges demonstration applet that maps the deductive definitional rules of financial market in the Australian Corporations Act can be viewed online at:

www.grayske.com/FinLawTrial.index

This applet can be consulted by a user who does not have a copy of the eGanges shell installed on the computer used but does have Java software available. The applet was used in 2006 in online teaching of Finance Law students at Charles Sturt University. Not only do students learn the definition, they also learn how to think about the definition. The applet contains spectra and abductive glosses that provide an elaboration of points on the River.

In constructing the applet, it was necessary to identify the implied choice points in order to determine the deductive links that would give effect to the compressed disjunction in

the definition. Choice can be made apparent through its logic structures, although natural language descriptions compress the alternatives of complex disjunction so that they are not clearly seen.

Figure 9 is a first model map of how metamorphic change might be managed. The areas of change such as technology, and environmental, social and economic sustainability, must be managed in association with the areas that are being changed. This is a logic of becoming; homeostasis is maintained in synergy with heterostasis. The node 'Base' might include the first model map itself, giving effect to a fractal nature in the system that has been seen to ensure its perpetuation (Bolzano, c.1848, 1950, Bronowski, 1977, Cocks, 2003). The Quality control of management itself can be effected through appropriate eGanges applications.

4.5 Compliance planning

The requirements of law may be included as part of a business application, or an application may be wholly legal and available for business consultations. A simple environmental law application that maps an offence created by the Australian Environment Protection and Biodiversity Conservation Act s.? is shown in Figure 10. It has no sub-maps. The offence protects certain endangered species from harmful human behaviour including business activities of this nature. Where there is a list of extinct in the wild species on a government website, an abductive link could be made available at this node directly to the website.

V. Paradigm shift

The paradigm shift introduced by eGanges has various aspects. Firstly, business ontologies must be derived and precisely formulated in the DIAlectic schema of eGanges. This amounts to a shift from fuzzy reality to logic reality. Once the precise units of business ontology are formulated as a River, they are available for the extended deductive processing of the eGanges epistemology. This amounts to a dynamic logic reality; on a consultation, there can be a quick sorting of user input into the adversarial windows of a Positive case that achieves the Final result of the River, the Negative case that fails to achieve this result, or the Uncertainties about either case. The user inputs

are the Minor deductive premises in relation to the River of Major deductive premises, so that an interim or final result of the input is always readily available. Where input at a deep level of submapping has implications for nodes in maps prior to it, the DIAlectic processing of eGanges automates these indirect inferences.

With eGanges business epistemology, the non-monotonic reasoning that variably mixes deductive, inductive and abductive premises so that the net result of the logic is confusing, is replaced by choices about the logic to be used to give clarity to the basis of the net result. The precise DIAlectic of eGanges distinguishes bases as necessary, ontological, and supported or not by relevant considerations.

The shift from *ad hoc*, pragmatic, non-monotonic flowcharts of business to the synthetic logic flowcharts of Rivers in a holistic DIAlectic amounts to a significant change in business intelligence that may affect competitive practices. The confusing nature of non-monotonic discourse is replaced by logic communication that permits the clear understanding and agreement about the detail of large-scale complex negotiations and operations, that may be designed to ensure optimum business in times of metamorphic change. Corresponding adjustments may be required in the biases of business team priorities.

VI. Practical Use

The epistemological system of eGanges includes an interrogation or command facility for the exchange of information between the eGanges application and the user. For each node in the River, a question may be asked or a command may be given in the Questions window, and responses may be made by selection from the available answer buttons. For instance, for a question, answers might be ‘yes’, ‘no’ or ‘uncertain’; for commands, answers might be ‘done’, ‘not done’ or ‘uncertain’. The substantive content of this communication system is determined by the application builder, in the course of constructing the application. Answers are input that establish or do not establish the node. Changes to answers can be readily made in consultation of an application as information changes and improvements are determined.

It is easy to learn and use eGanges, both in the construction and in the consultation of an application. However, like a book, an application is only as good as the author. The builder of an application must have sufficient expertise to sort deductive, inductive and abductive information, and order the information for the interactive visualization of the River, so that its deductive processing is substantively correct. An application may be detailed as far as the information goes, with DIAlectic precision.

The interactive visualization of eGanges also requires minimal language use. Short questions and node labels in the nested River flowcharts that represent rules, policies, procedures, strategies or causal systems, are readily translated to various foreign languages. Nodes can be linked to pictures or videos for abductive explanations, using illustration or action. The graphics convey the choices and the points of agreement or disagreement. Communication of logic and the selection of a pathway is kept clear in complicated negotiations; the intelligence of eGanges applications is a ready aid to support free trade negotiations and decision-making where there are foreign language difficulties

In a user-friendly way eGanges gives access to the necessary logic of deduction, the ontological logic of induction, and the variable support of abduction. The design is suited to PDAs because it is not necessary to input text, and sms language may be used for optional input. By clicks on any node, any inductive or abductive gloss option, an answer, an item of feedback in an adversarial window, or the current result button, an application may be consulted; River maps may be navigated, inductive and deductive glosses for any River node may be consulted, and the user's situation may be processed anywhere and any time, for fast solutions or careful consideration.

The answer buttons are labeled to indicate, transparently, the way they will be sorted into the adversarial windows. It is possible to have nodes that may be answered in three different ways any of which result in a Positive case point; these nodes are called neutral nodes as they allow for points in extended deduction that are relevant but not significant in determining the Final result. Neutrals may be used by an application builder to manage adversarial sorting and current result. There also may be other

management conventions or protocol requiring a variation of the eGanges algorithm for producing the Current result; eGanges feedback may be interpreted accordingly. For instance, one node in particular in the adversarial windows' lists may be identified as a key or deciding factor; or a percentage of nodes, such as 60% of Positive nodes may be sufficient to establish the positive Final result.

The eGanges interface has been described by Professor Daniele Bourcier of the Sorbonne's Centre for Studies and Research in Administrative Science (CERSA), as a Mondrian design; it makes three dimensional logic forms accessible to ordinary human cognition, as well as offering the flexibility of River shaping as mnemonic, aesthetic, and pleasing art forms. The software has regard for the balance of functions of both sides of the brain. Applications of eGanges are set in chips not stone; they are flexible for quick and easy change.

VII. Conclusion

It can be seen that eGanges Rivers are ideographs that can convey and manage complex large-scale information about requirements and choice in order to reach a specified objective, goal or target. It offers the River as a logic guide through the dense information forest in which contemporary business must be conducted, where it is easy to get lost in the trees. In international transactions, with the globalization of business, even further information arises from international factors. The flow of the River, indicated by the inference arrows, ensures that the direction of reasoning is always toward the end result. Information can be managed with scientific precision for massive, intricate change through a stable and reliable epistemology. eGanges offers formalized DIAlectic for business negotiations, meetings, transactions, operations, policies, planning, training etc.

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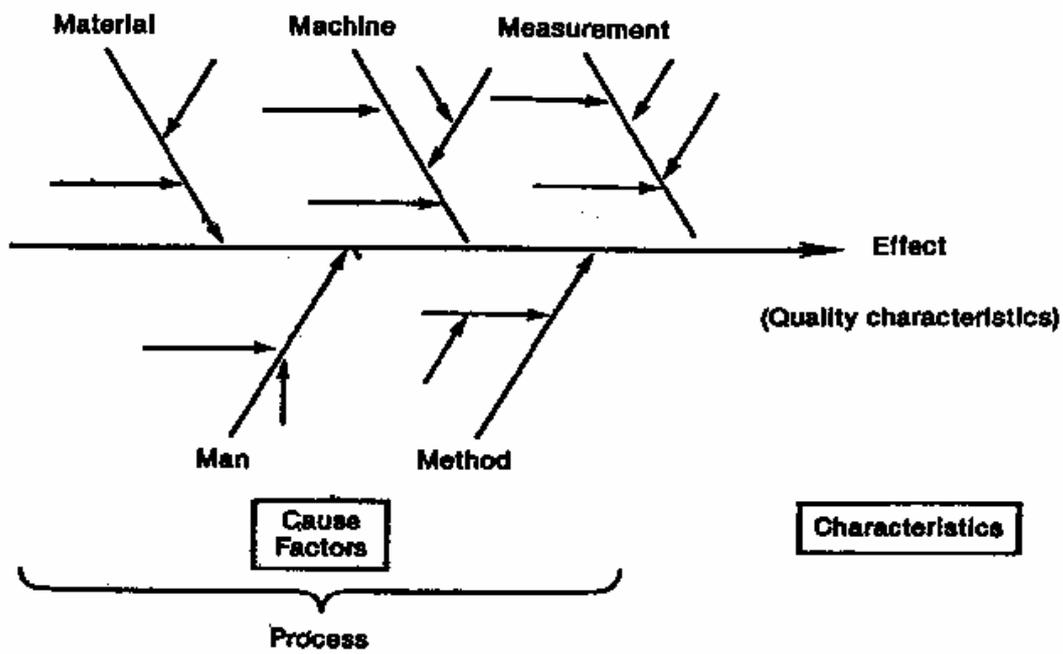


Figure 1: Ishikawa (1985, p.63) Fishbone: Cause and Effect Diagram

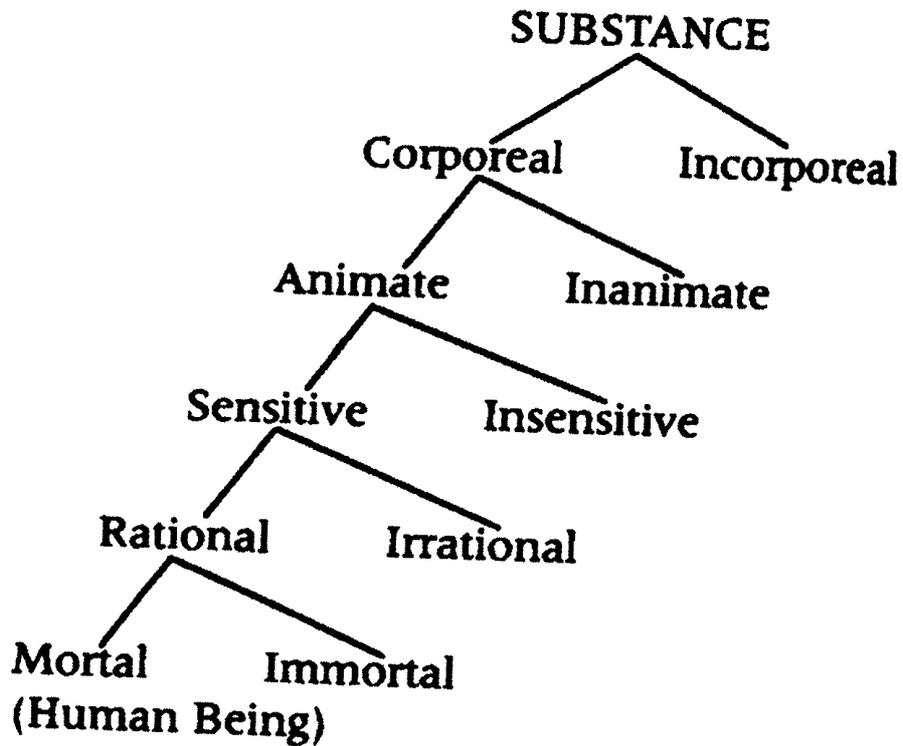


Figure 2: Tree of Porphyry (c. 300 AD)

eGanges Interface © Pamela N. Gray, 2002
 C:\Documents and Settings\Pamela\My Documents\ieGanges\ieGanges\ieGanges\Revers

Options

Build	Consult
Update	Help
Undo	Redo
Save	Search
Back	Forward

Questions

Note

Answers - select one

No	Negative
Yes	Positive
Uncertain	Positive
Uncertain	Uncertain

Negative Case

Positive Case

Uncertainties

Current Result page 1 / 5

Figure 3: Initial map: Julian's Bakery job in eGanges interface
 © Pamela N. Gray, Xenogene Gray and Lyn M. Treanor, 2006

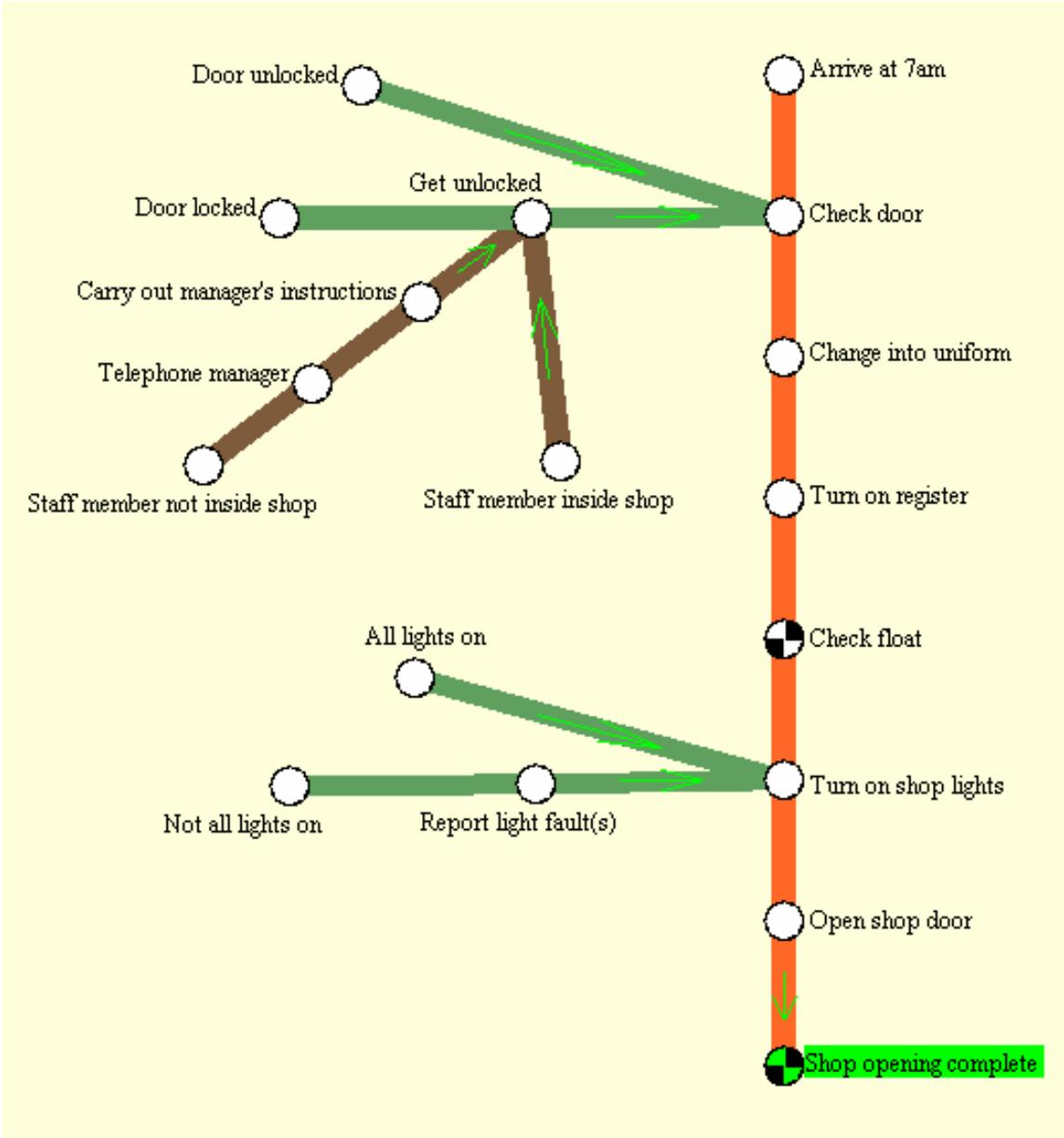


Figure 4: Julian’s Bakery job eGanges submap of Shop opening complete

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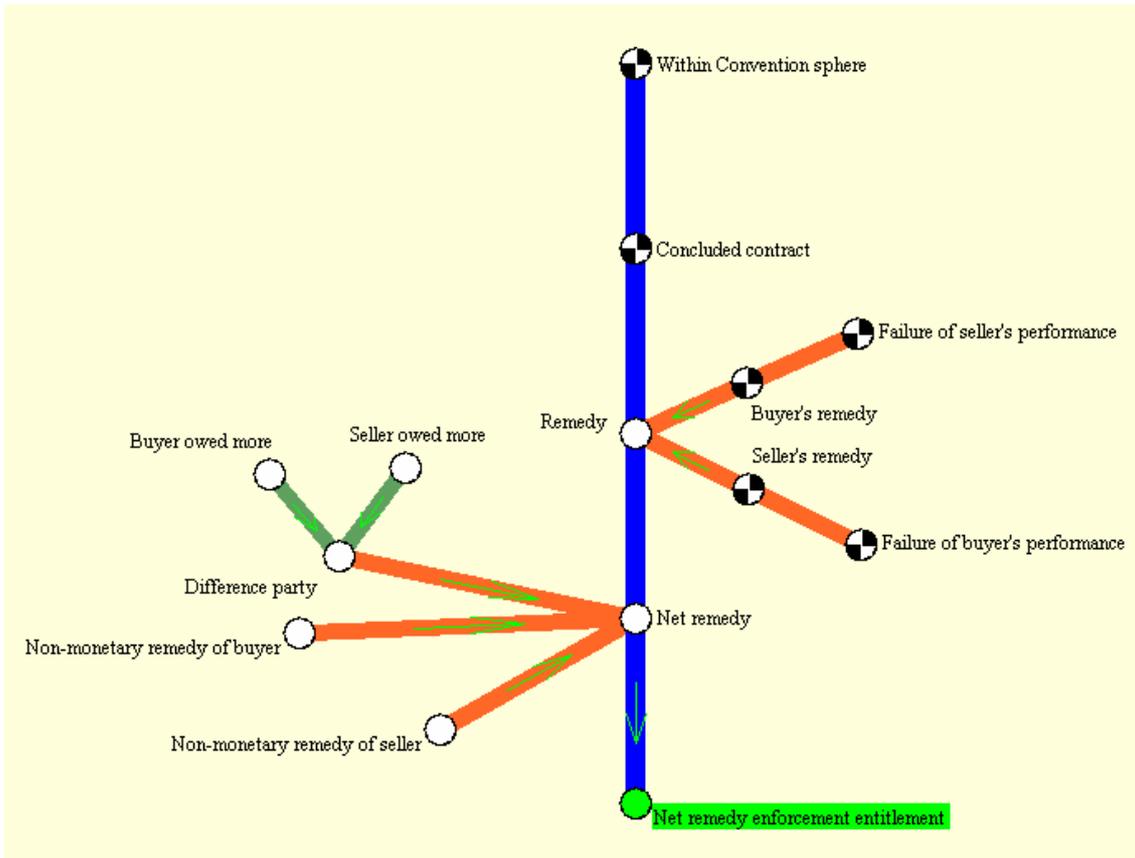


Figure 5: eGanges Initial map: Vienna Convention

© Pamela N. Gray, 2003

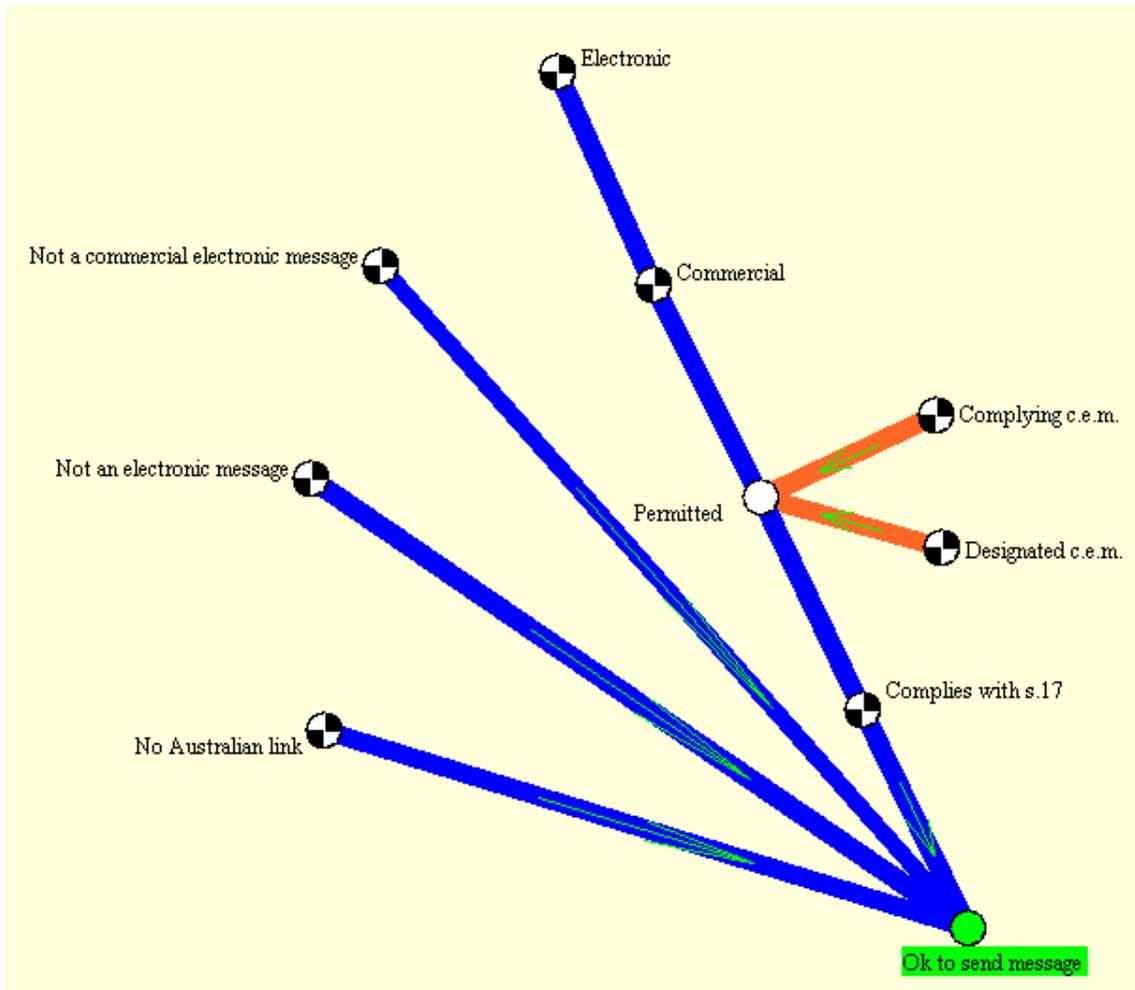


Figure 6: eGanges Initial map for compliance – Australian Spam Act 2003
 © Philip Argy, Pamela N. Gray and Xenogene Gray, 2006

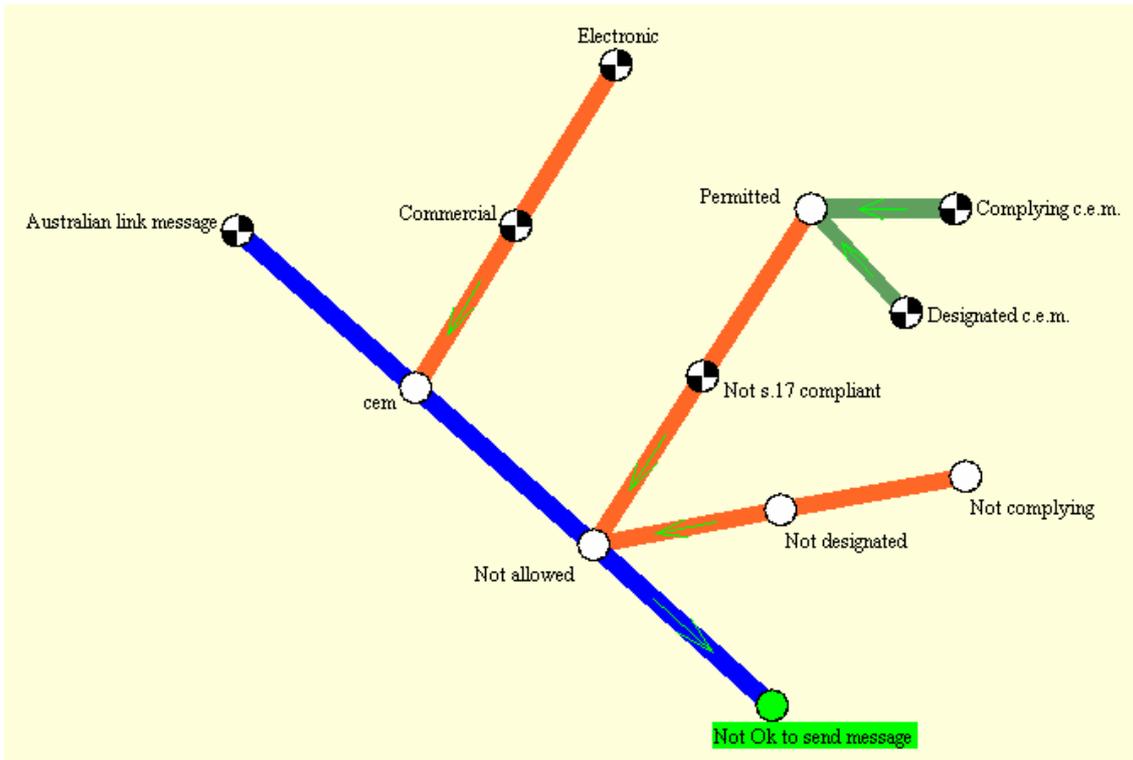


Figure 7: eGanges Initial map for prosecution – Australian Spam Act 2003

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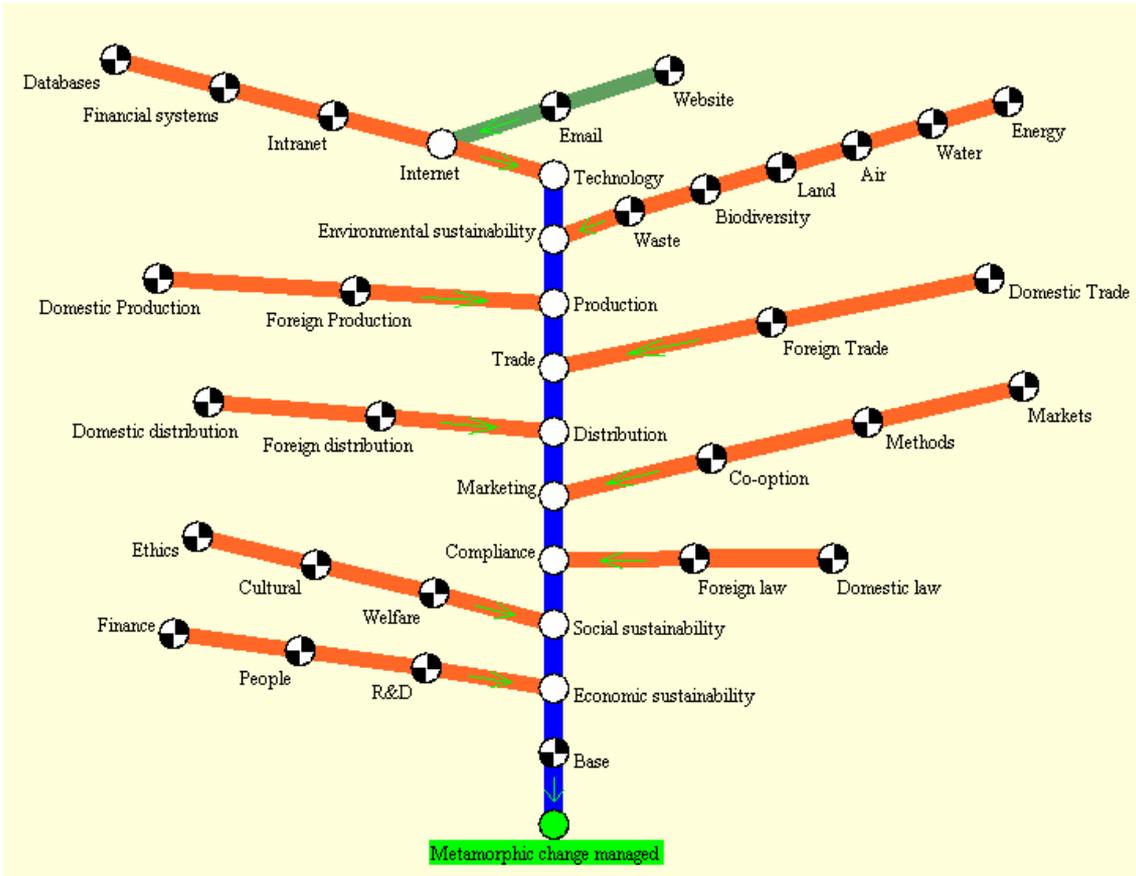


Figure 9: Gray-Treanor metamorphic change management model 1 (tv aerial)

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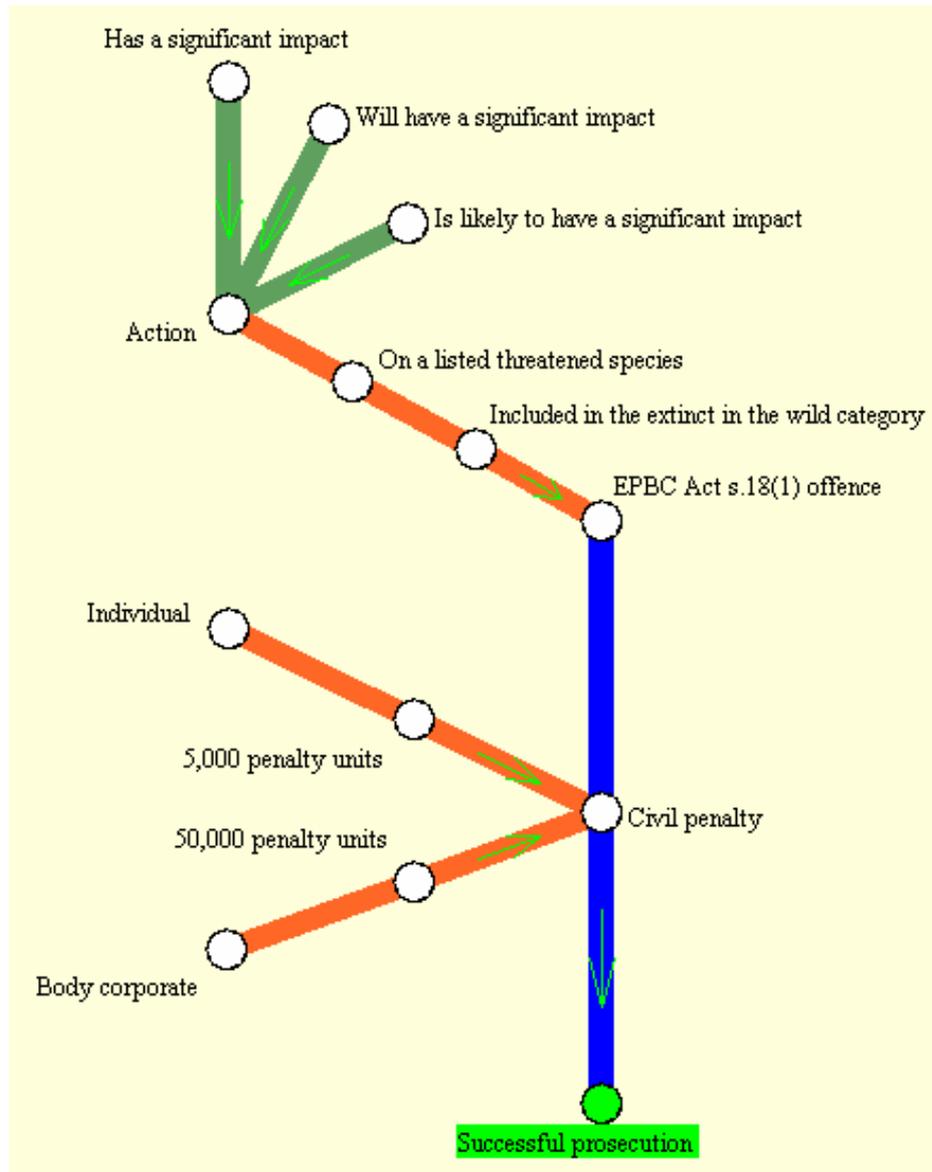


Figure 10: eGanges Successful prosecution map - Australian Environment Protection and Biodiversity Conservation Act 1999 (Cth) s.18(1)

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Endnote

[1] Morgan worked with Pamela N. Gray in 1989 in connection with the first ESPRIT legal project in Cambridge, England.