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### The Battle of the Precedents

**Citation for published version:**

Schafer, B & Voyatzis, P 2013, The Battle of the Precedents: Reforming Legal Education in Mexico Using Computer-Assisted Visualisation. in Z Bankowski, P Maharg & M Del Mar (eds), The Arts and the Legal Academy : Beyond Text in Legal Education. Emerging Legal Education, Ashgate Publishing, pp. 149-68.

**Link:**

[Link to publication record in Edinburgh Research Explorer](#)

**Document Version:**

Peer reviewed version

**Published In:**

The Arts and the Legal Academy

**Publisher Rights Statement:**

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## Chapter 9

### The Battle of the Precedents: Reforming Legal Education in Mexico Using Computer-Assisted Visualization

*Panagia Voyatzis and Burkhard Schafer*

#### **Introduction**

This chapter will explore problems that have been created for legal practitioners in the Mexican (civilian) legal system by the increased use of precedent-based reasoning and will indicate how a combination of innovative visualization techniques with Artificial Intelligence (AI) could create teaching tools to address them. It will argue that these problems can be predominantly attributed to the operative image of the law and legal reasoning that the Mexican legal profession holds, one that seems to be ill-suited for understanding and successfully engaging with precedent-based reasoning. The first part of the chapter presents the problems as felt by legal practitioners, the images of law that the latter seem to hold, and the inadequacy of these images for engaging with precedent-based reasoning. The second part will describe the use of visualization tools that could offer legal practitioners a more suitable image of reasoning to guide them when using legal precedents. We first give a critical overview of AI-assisted argumentation diagramming in law and then propose an extension that draws from visualization in military history.

#### **Better a Slave to Principles than a Slave to Men**

During the last decade, the role and working practice of the Mexican federal judiciary has changed dramatically. The judiciary is in the process of becoming a more confident and active precedent-giver and also precedent-user, moving away from its historical self-understanding as part of a civilian jurisdiction and orienting itself more towards the USA as the predominant economic power in the region. Integration in NAFTA and constitutional reform under the last government all played a role in a process that changes not just the use of precedents, but pushes the judicial system in its entirety towards an adversarial, common law approach that emphasizes adversarial, oral procedure in more types of proceedings than was previously

possible. As a result, more federal precedents are issued, published and made available to all legal professionals. As a consequence, precedents are also being increasingly cited in the daily practice of the lower courts.<sup>1</sup> However, this fundamental change in ‘legal style’ has not been problem-free for the legal community. In 2006 the Supreme Court of Justice published the results of a comprehensive, three-year-long study of the perceived problems that judges, officials and legal practitioners in Mexico face with the administration of justice. The research conclusions and the working papers show that legal practitioners experience disorientation when dealing with precedents: they expressed doubts about the role of precedents in daily practice<sup>2</sup> and, specifically, they complained that often they did not know what to do with so many precedents, which are perceived as either repetitive or contradicting each other. What was intended to increase legal certainty is perceived as having the opposite effect, creating confusion and a perceived loss in legal certainty.<sup>3</sup> The research participants suggested that there should be clear rules for giving weight to conflicting precedents and to determine their validity, that courts should issue fewer precedents, that contradictions should be avoided by institutional incentives and that institutional efforts should be put into practice to unify precedents.<sup>4</sup> In short, what was asked for can be understood as no less than a ‘codification of precedent-based reasoning’ – defying in a sense the very reason for moving away from the traditionally used codes towards an increased use of precedents in the first place. What creates certainty in the view of these practitioners are codified abstract rules, which make precedents a ‘legal irritant’ (Teubner 1998), something that needs to be tamed. Psychologically, we can understand this reaction as a form of cognitive inertia or cognitive dissonance: faced with massive changes across all aspects of the legal profession (and indeed wider society and politics) in a short period of time, practitioners in Mexico cling to their learned reasoning and behaviour

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<sup>1</sup> Suprema Corte de Justicia de la Nación. Dirección General de la Coordinación de Compilación y Sistematización de Tesis, *Libro Blanco de la Reforma Judicial: Una agenda para la justicia en México* (Mexico City: Suprema Corte de Justicia de la Nación, 2006) 166.

<sup>2</sup> *Ibid*, 166–8.

<sup>3</sup> Suprema Corte de Justicia de la Nación, *Estudio sobre la reforma judicial integral. Diagnóstico ciudadano y conclusiones de los foros. Problemario: Problema 19* (Mexico City: Suprema Corte de Justicia de la Nación).

<sup>4</sup> Suprema Corte de Justicia de la Nación, *Libro Blanco de la Reforma Judicial*, 166–9.

pattern especially strongly where it comes to the core of their self-understanding and what it means to think legally. In 2007 a public enquiry raised by the Senate of the Mexican Republic regarding the functioning and future reform agenda for the judiciary raised similar concerns and questions about precedents.<sup>5</sup>

Legal professionals claim that they are dealing with more legal information than they can handle, which makes them ask for less, more unified and non-contradictory information. To put this desire into its proper context, though, we need to see beyond their *perceived* problems and solutions; we need to understand more about the objective load of information, the way this information usually ‘behaves’, and also the practitioners’ knowledge in context. First, it is quite illuminating to find that the amount of information available to legal practitioners<sup>6</sup> does not seem to be excessive compared to that available in other legal systems – in fact, quite the opposite. Second, it is necessary to remember that precedents are models of decisions with variable degrees of authority, persuasiveness and ‘on point-ness’, and as such cannot be used in an all-or-nothing way; they usually help practitioners in building functional maps of the law and in making inferences. However, it is precisely this type of understanding, acquired when learning how to reason with legal rules, that dominates the legal-cognitive problem-solving apparatus of the Mexican legal profession.

A system of precedents provides a more or less wide range of past decisions with varying degrees of authority. Their weight can be evaluated according to a set of complex considerations, both formal and substantive – precedents of lower courts are normally trumped by precedents of higher courts, older decisions by newer decisions, tangential decisions by on-point decisions, etc. Aspects that determine the weight also include whether the case was decided by a slim majority or an unanimous decisions, and whether the specific part that is cited is core of the ratio or a mere obiter (Atiyah and Summers 1987: 115–16). Precedents are also sensitive to their relations with other precedents, i.e. precedents often form clusters to make strong ‘fronts’ that can be subjected to ‘attacks’ in different strengths from contradictory precedents. In the (civilian) German

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<sup>5</sup> Senado de la República, *Consulta Pública de la Reforma del Estado en México. Foro local sobre la reforma del Poder Judicial*. Monterrey, Nuevo León, 28 June 2007.

<sup>6</sup> In the Mexican legal system, only ‘extracts’ of resolutions selected by the Supreme Court of Justice or Collegiate Tribunals are published as precedents; that is, not all resolutions are available as precedents that do not represent overwhelming amounts of legal information.

legal system, this is known as ‘ständige Rechtsprechung’ or ‘consolidated jurisprudence’ – the recognition that sometimes a consensus emerges across a variety of cases over an extended period of time. This gives the position a considerably higher weight than a single precedent and can even trump precedents from a notionally higher-ranking court.

This information is used to build stories about the legal system and to make sense about the ‘location’ of particular legal claims and their likely outcomes. Thus, precedents can be understood as past decisions providing context-sensitive models that point with variable force towards a certain direction, guiding future decisions. As such, precedents do not have all-or-nothing validity, but are better understood as having *degrees of authority, soundness or force*, and, as MacCormick and Summers point out, ‘this is a truth already understood in some quarters within common law systems, but the partial convergence of civil law systems ... requires us to face up to it frontally’ (1997: 544).

Here we argue that the perceived information overload that legal practitioners report in the Mexican context is partly the result of their image of the law and the corresponding cognitive toolbox they have at their disposal. The image of the law circulating within this legal system is that of classical legal positivism (Cáceres 2002; Cáceres and Rodríguez 2008), i.e. one that depicts the law as a system of rules from which practitioners should identify those which *apply* to the particular case. The rules are valid or invalid and therefore are applicable or inapplicable, binding or not binding: in this model, there is no place for degree of force. As Duxbury argued: ‘precedents, unlike statutes, do not bind judges in an all-or-nothing fashion, that the binding force of a precedent is best explained not in terms of its validity (this being a non-scalar concept) but in terms of its authority (of which there can be degrees)’ (2008: 23). For example, if we look at the most authoritative introductory book for legal studies in Mexico, we find that only seven pages are given to the issue of precedents, the so-called *jurisprudencia*; in there the author explains the statutory law that creates the official system of precedents and comments on when precedents are binding and when they are not – for example, ‘when there is normative contradiction it is not possible that the incompatible precedents are both valid’ or ‘determining if two contradictory precepts have or have not binding force is not a problem for logic but something that only positive law can solve’ (García Maynez 2000: 68–75). Maynez’s language is that of (all-or-nothing) *bindingness, validity and applicability*, and in this account there is no room for evaluations of

normative *soundness* that function as a matter of degree (on the inadequacy of classical positivism in understanding precedents, see Duxbury 2008: 58).

Legal practitioners in Mexico seem to have deeply internalized an image of the law incompatible with the way in which legal precedents work in a legal system. They seem to be expecting to find unique answers and clear signs of validity as they were taught to, while precedents seem to require a different idea of what ought to be done. The operative idea of law in this context is unsuitable for precedent-based reasoning. In order to enable lawyers to function appropriately in the new system, more than just acquiring additional information is necessary; rather, a more radical ‘Gestaltswitch’ that changes deeply ingrained cognitive assumptions is required.

This points us to an often overlooked topic in both comparative law and jurisprudence. In comparative law, the work of Pierre Legrand heralded a ‘cognitive turn’ that identified legal families and legal systems by the unique ‘legal mentality’ of its members (Legrand 1996). In legal theory too, certain cognitive attitudes shared by a group feature prominently in a wide variety of theoretical accounts of the notion of ‘legal system’, from the system theoretical account of Guenther Teubner to the ‘interpretive community’ of Ronald Dworkin. However, while the emphasis on shared cognitive practices is an important insight, there is little analysis or reflection on how these shared practices emerge. Rather, the legal systems under consideration are typically mature systems that have evolved over centuries and in the process have accumulated a rich stock of ‘problem-solving methodologies’ (Legrand and Machado 1998). Dworkin’s ‘Hercules’ too operates in a ‘data-rich environment’. What sets him apart from mere mortal lawyers is that he has full knowledge of all cases and precedents, and on this basis can calculate the optimal ‘fit’ for the decision at hand. The problem that his metaphor addresses is therefore one of an apparent oversupply of precedents that seem to permit a ‘pick and choose approach’ where every decision can be supported – just as is stated by the Mexican judiciary. However, in Dworkin’s analysis, this is the result of limitations of the human mind and its memory – full knowledge reduces the scope of permissible interpretations. In this analysis, the Mexican judiciary is not confronted with too many precedents, as they believe, but just enough to permit conflicting interpretations, and yet not enough to *see* patterns emerging. It is here that we encounter a direct link to the theme of this book – the ability to see patterns in a wealth of data is a visual ability that is not easily reducible

to simple rules that can be communicated textually. In the same way in which an experienced chess player will 'see' that a group of pieces is weak or strong, an experienced lawyer will have developed a 'feel' that a certain group of cases, taken together, form such a strong pattern that they allow us to blank out contradictory information as mere noise.

The problem is of course where these skills and cognitive practices come from. In Dworkin's theory, the legal system is already mature, its interpretive communities well established and benefiting from an abundance of data points. In Legrand's approach, the common lawyer and the civilian lawyer are equally already 'fully formed' and already so ingrained in the cognitive paradigm of their respective systems that they may well be 'uneducatable' in principle and unable to ever develop a true understanding of what it means to be a lawyer in the opposite system (Legrand and Machado 1998). As a consequence, their theories are not designed to analyse and understand legal systems in radical transition, to the point that Legrand at least seems to deny that such a transition is possible in principle.

The missing element, in our view, is the role of legal education. Common (civilian) lawyers are not born, they are made. Studying legal education and the way in which it imparts certain cognitive traits on its 'raw material' should therefore be, in our view, integral to both the jurisprudential question pertaining to the nature of legal knowledge and the comparative legal question regarding the most basic differences and commonalities between legal systems. From this it follows that in order to understand and to support the transition of a legal system such as Mexico from a statute-based civilian system to a precedent-based system, we need to look at the reform of legal education much more urgently than at reforms of the legal framework (for example, a statute on the use of precedents, as requested by the Mexican practitioners). It is of course here that we encounter some systemic difficulties – educators who developed their own skill sets and cognitive schemata under one system are charged with imparting radically different modes of thinking to their students. At the same time, practitioners are often outside the reach of intensive educational measures and in turn tend to hire people who display skills similar to their own. This tendency to reaffirm cognitive schemata is of course at the heart of the system theoretical account of Luhman and Teubner, their emphasis on the tendency of systems to replicate themselves and their underlying conceptual orderings (see e.g. Teubner 1989). To break this circle, we therefore need tools that: a) enable training of cognitive schemata outside the



established training pathways; and b) directly address the development of cognitive skills and do not just import additional factual information. Legal AI systems meet these criteria (see e.g. Conati and van Lehn 2000; van Joolingen 1999). ‘Always on’, Internet-enabled and unsupervised, they in theory enable learners to learn at their own pace and in their own time, outside entrenched structures of supervision and control, and without the need to physically travel to the place of education (which should make them attractive for practitioners). At their best, they build on sound cognitive science principles and are therefore particularly suitable for the type of cognitive change discussed above (see e.g. Anderson et al. 1995; Schank 1990). One of the results of this ‘designed for cognition’ approach is that in recent years, particular focus has been devoted to computer-assisted visualization in legal education. In Japan, a country that faced a similar transition to the one discussed briefly for Mexico, using computer-assisted legal education was for these very reasons a prime enabler to bring about a dramatic change in legal education (see Tanaka et al. 2005; Yoshino and Sakurai 2005).

In the next section, we briefly describe one particularly influential approach in legal AI that exhibits many of the features we have identified as desirable, Kevin Ashley’s Legal ARgument Graph Observer (LARGO) programme (Ashley 2009). However, our analysis will show that while it is a good starting point, the specific method of visualization, which remains within the concept of arguments as directed graphs that is popular in AI, is not optimal for our purpose. We then briefly outline a radical departure from traditional argumentation visualization techniques: the battle of the precedents. Drawing our inspiration from familiar battle and campaign maps, we argue that the semantic richness of this type of visualization, and its ability to present dynamic interaction between forces of different strength, makes it particularly suitable for our purposes. Our everyday language reflects this approach: we talk about being overwhelmed by a precedent, being compelled by its force; we feel its strength and are torn between different precedents. These metaphors hint at a visual and almost haptic way to reason with precedents that we would ideally like to represent more directly than common approaches allow.

### **The LARGO System**

While it is not uncommon to promote legal expert systems for use in legal education, few of the existing approaches have been designed with an educational purpose in mind. Rather, they tend to start their lifecycle

as decision support tools which then are assigned a secondary function as teaching or training aids. Kevin Ashley's LARGO system deviates from this pattern (Ashley 2009). For this reason, and for a number of desirable design features that will be discussed below, we take this approach here as an example of the state of the art in AI-supported argumentation visualization in law. Ultimately, this system is based on his influential HYPO expert system (Ashley 1990). However, its next incarnation, CATO, is already a dedicated teaching aid, not just a re-use of an expert system for a secondary market (Alevan 2002). As a result, it takes insights from pedagogical theory right to the heart of the development of the system. Again, unlike many other AI and law systems promoted as teaching tools, both CATO and LARGO have been subject to some empirical evaluation of their efficiency – and the fact that the picture remains ambivalent is in itself an important finding (Alevan and Ashley 1997; Ashley, Desai and Levine 2002).

LARGO focuses on one specific aspect of case-based reasoning, testing the applicability of a precedent to a given scenario by means of hypotheticals. A quick example, based on the case of *California v. Carney*,<sup>7</sup> can help illustrate this approach: the rule to be interpreted requires a warrant for the search of a person's dwellings. The case at hand involves a Dodge Mini Motor Home. Are motor homes dwellings for the purposes of the law? The prosecution proposes a test: if the place that is searched has wheels and is self-propelling, then no warrant is required, as it is a car. The justification for this is based on principles, which in turn are derived from a history of precedents. One principle is that rules should be clear-cut and nothing seems easier than counting wheels. The defence offers an alternative test: if the place that is searched is used as a home and has the features commonly associated with one (such as a bed), then a warrant is required, as it is a home. Again, principles derived from precedents support this view, here the principle that privacy needs protecting. At the oral presentation, the judge then queries both tests using hypotheticals. For example, he asks of the prosecution: assume a case (the hypothetical) where the motor home has wheels and a motor, but is on a permanent parking lot, has gas pipes and electricity wires permanently attached to it, and cannot move without causing damage. Would you still want to apply your test and treat it as a car? At this point, the prosecution can either stick to its guns and argue that this case also should be decided under its proposed test

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<sup>7</sup> *California v. Carney*, 471 U.S. 386 (1985).

(and hence be deemed a car) or it can refine the test by excluding, for example, situations where the car is permanently attached to an unmovable structure and in a way becomes part of it.

This type of reasoning can be found frequently in SCOTUS hearings. In addition, it also plays a major role in US teaching practice, linked to the ‘Socratic model of education’ (Stuckey 2007). Ashley argues that it is a suitable tool to explain and motivate rule choice and contextual and policy analyses. Citing from the *Best Practices for Legal Education*, he supports the view that open hypotheticals are particularly suitable ‘to demonstrate complexity and indeterminacy of legal analysis’ (Stuckey 2007: 214).

For our purposes, reasoning with hypotheticals meets several desirable features of a computer-assisted training system for Mexican lawyers coming to terms with the shift towards common law reasoning. As Stuckey argued, focusing on reasoning with hypotheticals takes the idea of complexity and indeterminacy of precedents to the heart of the enterprise to teach precedent-based reasoning skills. As we noted above, one of the misunderstandings of the Mexican judiciary is the notion that precedents ought to unequivocally support one line of reasoning over the other. Consequently, case-based reasoning systems in the HYPO-CATO-LARGO tradition allow the incorporation and formal representation of wider social and political values in the reasoning process that challenge this assumption (for technical details, see Bench-Capon and Sartor 2003). This too has been identified in the studies cited above as a desideratum for Mexico. The systems are rooted in the tradition of adversarial, oral argument – another feature Mexico is increasingly moving towards. Despite all this, hypothetical reasoning is not restricted to common law systems. MacCormick observed that ‘use of hypothetical cases in academic work ... is a major technique used in the United Kingdom and in the United States, and also in most civil law countries’ (MacCormick and Summers 1997: 529). This creates sufficient degrees of familiarity that are conducive to learning. As possible uses, he notes the following:

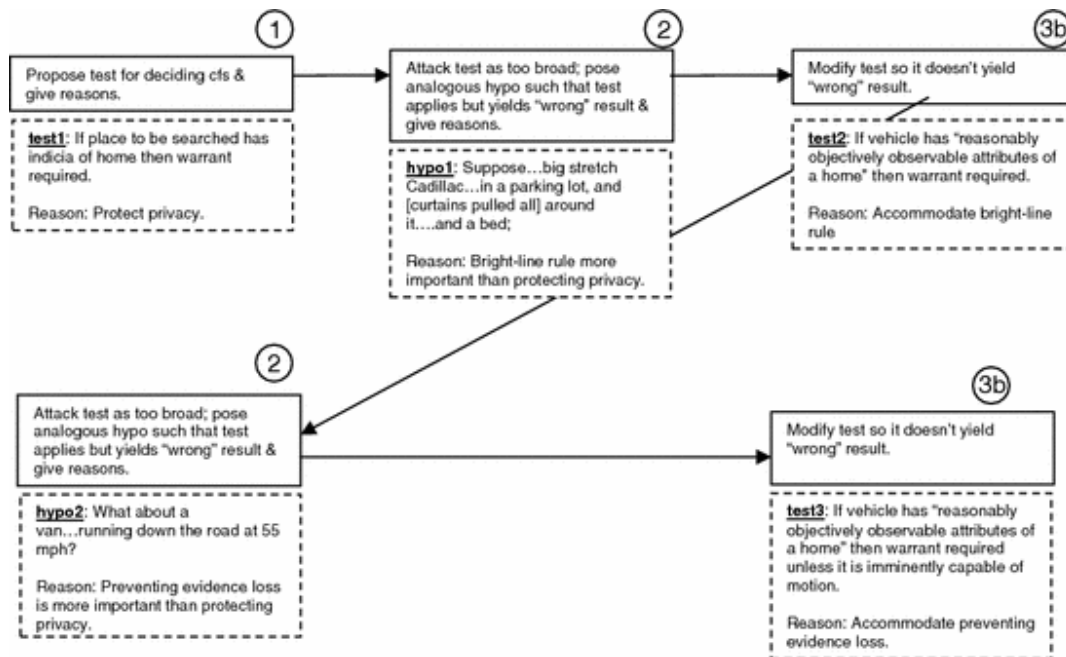
1. the construction of clear cases to which a code section, statute or doctrine must apply if it is to have any rational application’;
2. ‘the construction of *reductio ad absurdum* arguments demonstrating the unsoundness of proposed applications of code sections, statutes or doctrinal formulations’;
3. ‘the elaboration of coherent patterns of applications of authoritative language and demonstrations of how proposed or possible applications would not be coherent’;

4. 'the formulation of paradigm cases so as to display a policy rationale in its clearest application';
5. 'the articulation of distinctions between paradigm cases and borderline cases';
6. 'the creation of conceptual bridges between cases along a continuum';
7. 'use [of] a well-designed hypothetical case to help justify extending a rule';
8. use of a 'hypothetical case ... to help justify rejecting the application of a rule in a precedent to the case ... about to be decided'.

Of these, points 3, 7 and 8 are core skills that need to be taught by any approach to instruct students in reasoning with precedents. However, points 4, 5 and 6 are of particular interest in our case, as they focus on the essentially contested nature of reasoning with precedents, the role of policy rationales and also the absence of clear-cut, hard and fast rules and cut-off points (the 'continuum of cases'). The ability to address all these points is an important design feature in LARGO. But possibly even more important is another intrinsic feature of reasoning with hypotheticals: it increases by its very nature the number of cases, or rather case scenarios, under consideration. As we argued above, it is partly the scarcity of precedents that can cause problems in a legal system in transition, and the way in which artificial hypotheticals are generated can be seen as a partial answer to this problem. Furthermore, successful hypotheticals are for pedagogical and rhetorical reasons designed to be easier to decide than the often 'muddy' real-life cases. Their purpose is to facilitate 'line-drawing' in normative reasoning by establishing positive and negative paradigm cases, that is, cases where it is intuitively clear that a rule should or should not apply (Harris, Pritchard and Rabins 2004: 64ff.).

At the core of LARGO is the 'process model of hypothetical argument' (PMHA) that expresses in a formal structure typical expert schemes of reasoning with hypotheticals.

A graphical representation of this basis structure, annotated with the *Carney* case discussed above, is here:



**Figure 9.1 A typical HYPO reasoning diagram (from Ashley 2009: 329)**

Students are then asked to use this model to create their own diagrammatic representations of the examples of hypothetical reasoning from the oral argument. Ashley argues that by making a conceptual phenomenon visible, it can become the subject of reflection. Diagrammatic visualization of conceptual models serves as ‘scaffolds’ that make explicit important features of good (and bad) performance, allowing the teacher to guide the students towards mastering complex knowledge by small steps (Ashley 2009: 339). LARGO can represent the facts of the case, proposed tests and hypotheticals as basic entities. These are connected by five kinds of relations among them: modifying a test, distinguishing a hypothetical, analogizing a hypothetical, a hypothetical leading to test or modification and a generic relation. Thanks to a ‘graph grammar’, LARGO can, through a set of predefined rules, parse the student-generated diagram, compare it to standard solutions and, on the basis of this comparison, provide feedback.

As mentioned above, LARGO (and equally so the related CATO) has been subject to some empirical evaluation. An initial small group study in 2006 showed statistically significant benefits for the group of students using LARGO in comparison to the control sample. However, a repeat with a larger sample the following year was not able to replicate this result (Pinkwart et al. 2009). In this respect, LARGO fares similarly to other approaches to computer-assisted diagrammatic reasoning software for legal education. Bart

Verheij's more traditional approach, which uses Toulmin diagrams to express the support and attack relation between arguments, resulted in similarly weak evidence for an actual improvement in the learner's performance (Verheij 2007). Finally, our own experience using Wigmore charts for evidence teaching was equally inconclusive. We have given elsewhere a comprehensive analysis of these results and how they converge with research in cognitive science more generally (Schafer 2007). A summary must suffice here: there is strong evidence to suggest that visualization *can* have a strongly beneficial effect for solving analytical tasks (see Larkin and Simon 1987; Stenning 2002). But this does not mean that a diagram is *always* worth 10,000 words. Rather, as Cox argued, it depends on at least three factors (Cox 1999):

1. the properties of the representation;
2. the demands of the task;
3. user-dependent factors, such as prior knowledge and cognitive style.

The worth of a diagram – to quote Cox again – ‘depends upon what kind of diagram it is, which words it represents, who produced and/or uses it, and the nature of the task’ (1999: 343).

At least for our purposes, there seems therefore to be an incongruity between the properties of the representation, what the user is supposed to do with them and how both align with his or her cognitive style.

If we return for the moment to the survey of the Mexican judiciary, their main problem was threefold:

1. to accept that ‘bindingness’ of precedents can come in degrees and that some are ‘more binding’ than others;
2. to accept that this requires balancing and weighting precedents;
3. to understand that despite the above two points, the outcome of this balancing process is not arbitrary.

In our subsequent analysis, we argued that for legal systems, ‘phylogeny recapitulates ontogeny’ so to speak. The process by which individual students in their legal education acquire certain cognitive skills is also a model for the way in which entire legal systems develop and possibly change their ‘legal mentality’. The Mexican legal system, *qua* system, struggles according to this analysis with problems that are structurally similar to that of a student acquiring legal reasoning skills and vice versa. If this is the case, then the task that the learner faces is to find a way to reason with and about the various strength or ‘bindingness’ of precedents,

to find ways to come to acceptable equilibria between conflicting precedents, and to avoid the danger, identified in the reactions of the Mexican jurists, of reducing this weighting process to a simple ‘counting algorithm’.

Does LARGO address these issues? Argumentative strength is not expressed in this system, or indeed in any of the other computer-assisted diagram systems for law, which typically only represent the logical *function* of an argument (for example, to support or attack another argument) but rarely their relative weight. Case-based reasoning systems like CATO are capable of reasoning about relative strength to some degree in the background – for instance, it is able to compare the ‘on-pointedness’ of two cases along a range of predefined parameters. But not only is this element not expressed in the diagrammatic representation, this mode of reasoning reduces the weighting process to an ultimately rule-based calculation. This is a necessary feature of computer-based systems that aim to either solve a case or, as in LARGO, give students automated feedback to their answers. In order to be able to parse the information, ultimately some form of rule-like presentation is inevitable. Thus, not only does the system fail to address the aspect of reasoning that the learner is most likely to struggle with, it also uses exactly the (problematic) stop-gap solution that an insecure learner might crave, reducing the intuitive process of ‘seeing’ patterns in the precedents and ‘feeling’ their strength to simple, yes/no rules that promise certainty but ultimately miss their target.

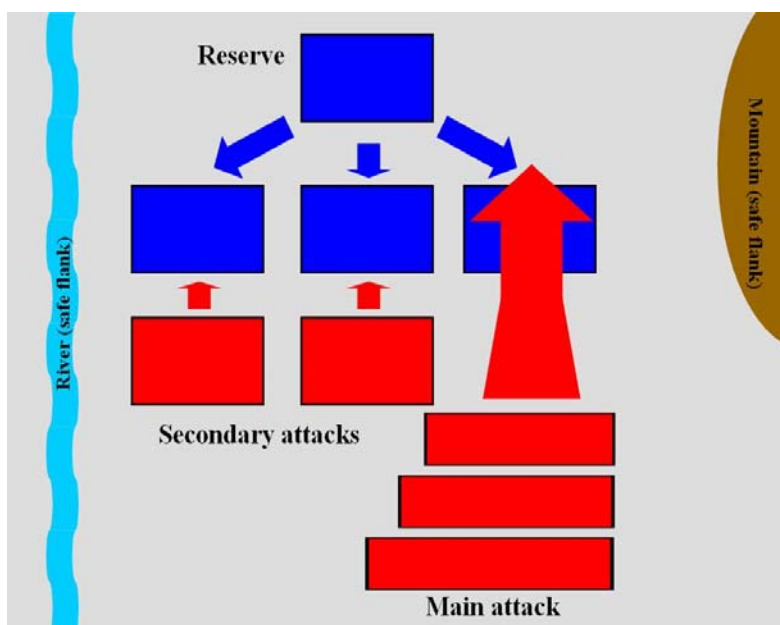
This is but an expression of a broader dilemma: the more we expect the computer programme to do, the more intelligent we want it to be and the more prescriptive it is also going to be in its choice of diagrammatic representation. Mind maps allow the user almost unrestricted freedom in terms of how to arrange the information, LARGO imposes considerably more constraints in order to become ‘understandable’ by the computer, and CATO or Verheij’s ArguMed impose more restrictions still in order to enable the computer not just to suggest feedback but also to identify and correct mistakes. From research in the pedagogical and cognitive implications of using diagrams, we know by contrast that the more the user can claim ‘ownership’ of his or her diagrams and construct them according to his or her liking, the greater the effect (Cox 1999).

On this basis, we will now propose an alternative to the way in which case-based reasoning is presented in LARGO. A visualization appropriate at least for our intended audience should: a) explicitly

represent argumentative strength; b) represent those features of the context of an argument that influence the weighting process; c) permit ‘clustering’ of precedents that form coherent positions and cannot be reduced to acyclical directed graphs that express support relations between individual cases; and d) give the user sufficient flexibility to adjust the representation to his or her cognitive style.

History, and more specifically military history, has for a long time used visualizations that match all the above criteria in the form of the ubiquitous battle maps. These visualizations typically develop a semantic that is sufficiently constraint to allow a degree of standardized interpretation.

A typical example is as follows.



**Figure 9.2 Explanation of ‘attack in oblique order’, from the Art of Battle website<sup>8</sup>**

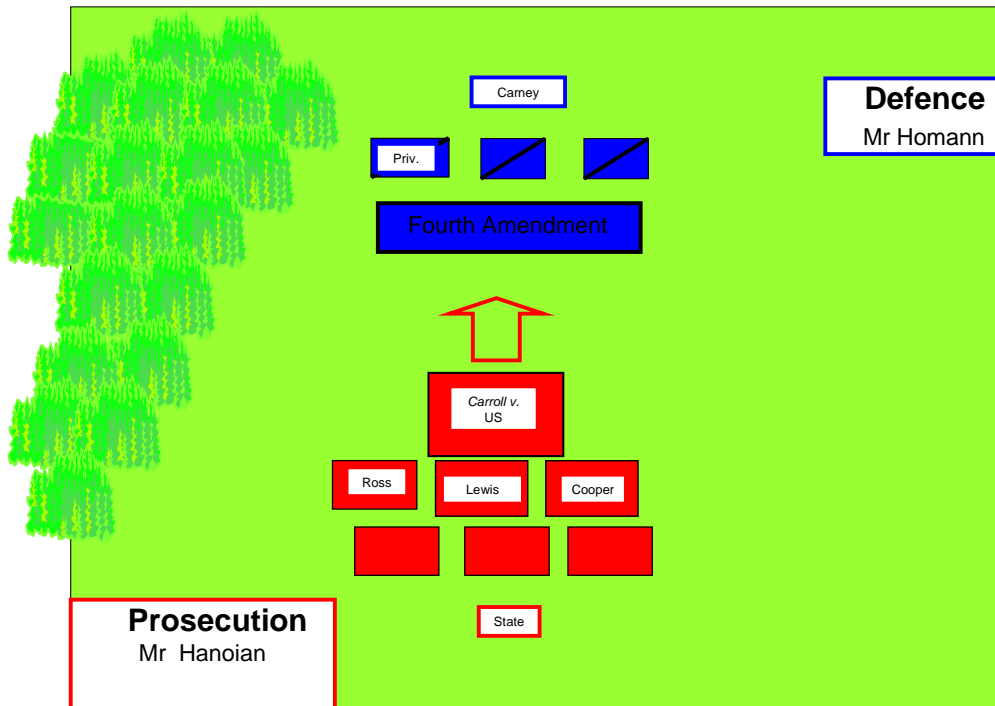
The different size of boxes and arrows is used to describe different strengths of a unit and different strengths of an attack respectively. This does not merely help to depict a historical battle – it is also used in the training of officers, playing a causal, explanatory role why one general defeated the other. The skill that the officer takes from this is the ability to see, immediately and without the need for complex calculations,

<sup>8</sup> <http://www.theartofbattle.com/tactics-tutorial> [accessed 24 July 2012]. We are very grateful for the comments and support by the site’s owner, Jonathan Webb. Our representation of Carney is loosely based on battles from his website; it is left to the reader to identify which one is the historical inspiration.



how a combination of forces and environment creates winnable and indefensible positions and strategies. It is this causal, explanatory element aided by visualization that we are most interested in here. In a legal setting, we can now think of precedents as individual units. The difference in size would correspond to the ‘objective’ strength of a precedent (for example, the Supreme Court versus the Court of First Instance), whereas the size of the arrow expresses the strength of the use of the precedent in a given context – an on-point precedent will be stronger than a tangential one, for instance. In the example, we can see also how a learner would immediately identify the cluster on the right-hand side – a form of ‘cohesiveness’ that creates a centre of gravity and that goes beyond a simple ‘support relation’, so that all units support each other. Clusters of precedents are used in the same way in legal argumentation. They work not because there is an explicit linear support relation in the sense, for example, of Toulmin’s warrant or support between them, but because their joint effect gives additional strength to the argument that is proposed.

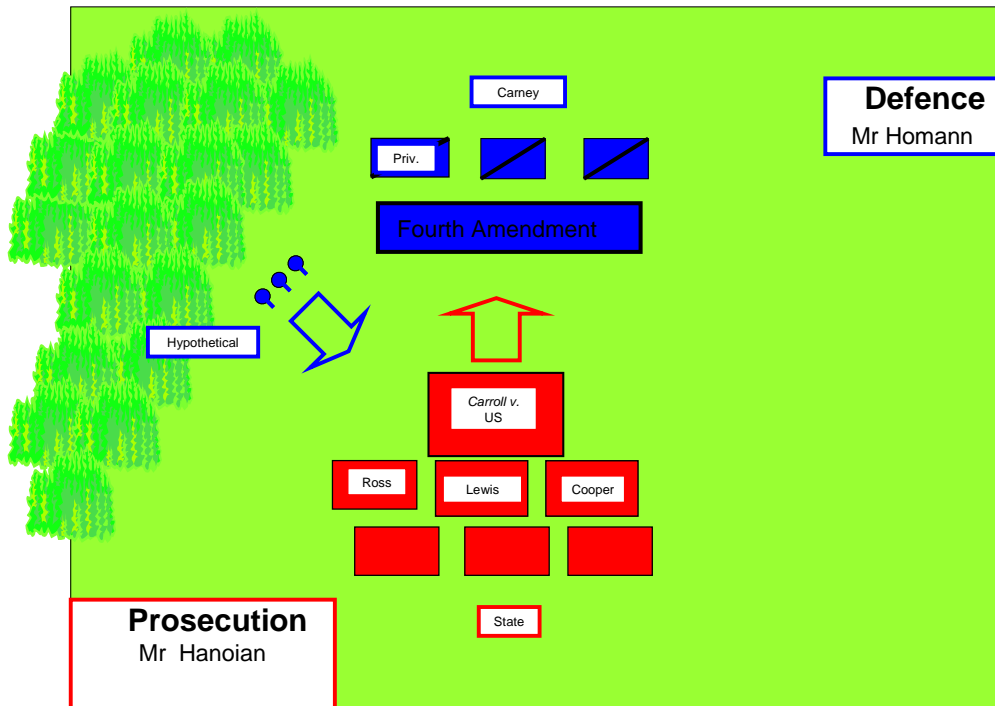
In battles fought between coalitions, visual markers can be used to distinguish internal subdivisions within a side – and the learner will begin to ‘see’ and understand them as a possible source of weakness, despite their possible utility. In the same way, persuasive but non-binding precedents from other jurisdictions can be marked up as ‘auxiliary troops’ within a coalition. Procedural moves at the initial stage of a hearing finally correspond to typical skirmishing attacks that do little but prepare the ground for the real issue, even if they sometimes can strike lucky.



**Figure 9.3** *Carney v. US*

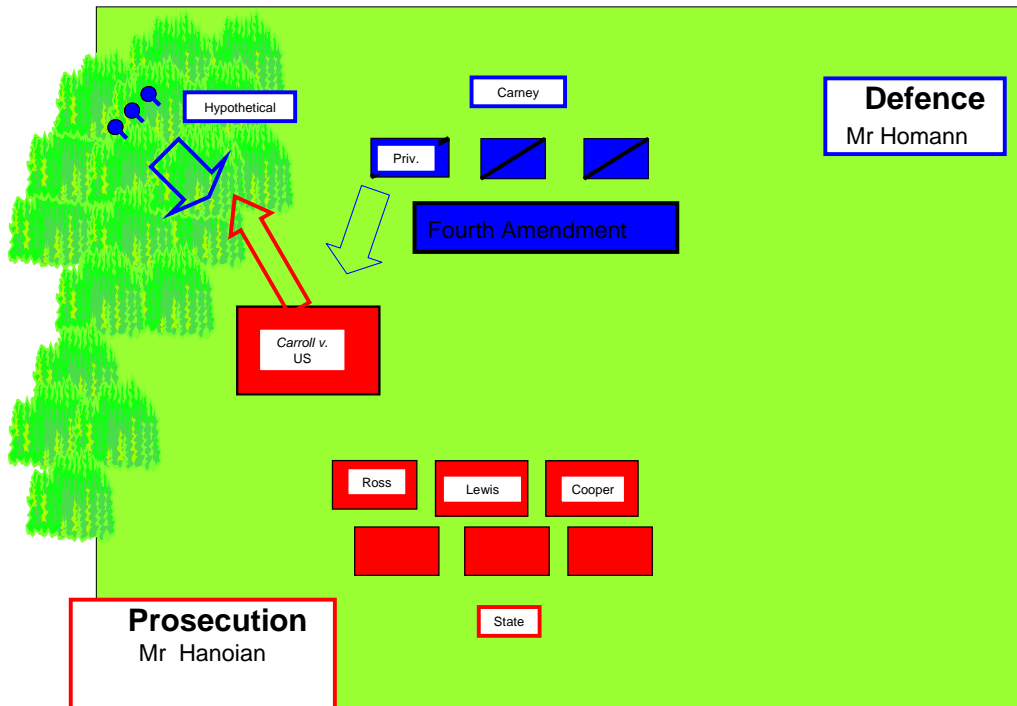
Figure 9.3 shows how we can begin to translate the LARGO diagrams into Battle maps. Carney is ‘hiding behind’ the Fourth Amendment, which secures a principal value – privacy (for obvious semiotic reasons, using a battle that involves a siege, with Carney the party under siege, would have also been a possibility, the Fourth Amendment creating legal walls that correspond to the physical wall of his car). The social value underpinning the Fourth Amendment is privacy – values are indicated by the boxes with a cross bar. The prosecution is using a lead case, *Carroll v. US*, which established the vehicle exception, to pierce the Fourth Amendment protection. However, its case is supported by a whole range of other precedents, all of them mentioned, but none of them later discussed in the decision – they merely help to form the ‘centre of gravity’ we talked about above. These cases include *US v. Ross* and *Cardwell v. Lewis*.

At this point, counsel for the defence launches a counter-attack in the form of a hypothetical: what would be the case if a motor home had a tent attached to it? Would the tent be protected, but the car not?



**Figure 9.4 A hypothetical attacking a precedent**

The aim of the attack by the hypothetical, visualized as round blobs on the left (hypotheticals are not precedents, so are a symbol other than boxes), is to ‘overextend’ the precedent and lure it into territory where it can be attacked by the blue forces. By conceding, for example, that under the proposed interpretation of *Carroll v. US*, the tent too would be unprotected, the precedent is isolated from its supporting, more conservative cases. This allows it to be attacked by the privacy principle that underpins Carney’s case. Here is how a successful development would have looked like: Carroll takes the bait, overextends itself and is finally defeated by the privacy policy rationale.



**Figure 9.5 A precedent getting isolated and destroyed (restrictively distinguished)**

Maps are potentially semantic-rich environments – depending on the graphic skills, the environment can also be used to represent relevant features. Very common are indicators of height, a natural choice given the importance of holding the high ground in battles. So important is this feature of military campaigns that it found its way into ethical discourse, and the spatial representation of maps would make it possible to graphically represent the idea of ‘holding the moral (or legal) high ground’, putting an additional (and instantaneously visible) burden on an attacker.

These representations of battles are common and predate computer animations by a considerable amount of time. What computers add in value though is their ability to incorporate them into animations. Particularly good examples can be found at the Art of Battle website<sup>9</sup> (which also provided the blueprint for the above illustrations), History Animated<sup>10</sup> or the Discovery Channel.<sup>11</sup> The added dynamic element will be,

<sup>9</sup> <http://www.theartofbattle.com/ancient-battles> [accessed 24 July 2012].

<sup>10</sup> <http://www.historyanimated.com/newhistoryanimated> [accessed 24 July 2012].

<sup>11</sup> <http://dsc.discovery.com/convergence/rome/battlemaps/battlemaps.html> [accessed 24 July 2012].

we hope, a particularly good teaching tool to aid the transition from the fixed, document-based procedure of the past to Mexico's embrace of oral, adversarial and dynamic hearings that coincided with the introduction of precedent-based reasoning. In addition, it may be possible to regiment the construction of maps sufficiently to make them at least in part readable by an 'intelligent' program like the one used in LARGO. Should this become feasible, automated features such as feedback generation, one of the strengths of LARGO, would become possible. As a next step, though, we hope to represent a number of interesting cases both as animated and static battle maps, using a variety of representation forms. Following this, we hope to test these on a student population, both as passive consumers and active creators of these maps. Should there indeed be a measurable benefit, the issue of balancing the demands of computer readability with the desirable freedom of the map users to develop representations that suit their personal cognitive style would have to be addressed. Jerome Frank, despairingly, characterized legal procedures as trial by combat. If this analysis is correct, and we think it is, then the techniques and methods that have been used to train new commanders should also be suitable to train new judges. Our approach hopes to make the first small contribution in this direction.

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