The Role of Intermediate Factors in Explaining Precedential Constraint

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Abstract

Formal accounts of precedential constraint have attracted much attention in AI and Law over the past decade. A recent development in this area has been the proposal to give a finer grained account using the intermediate factors taken from factor hierarchies of the sort found in CATO. Canavotto and Horty show, however, that cases constrained in the hierarchical setting are unconstrained when using only base level factors, and vice versa. We argue that the intermediate factors should play no part in constraining outcomes, but they are invaluable in explaining the reasoning applicable to the case.

Keywords

Precedential Constraint, Factor Hierarchy, IRAC, Explanation.

1. Introduction

Modelling reasoning with precedent cases has been a central topic of AI and Law since its very beginnings [1]. The key element of legal reasoning with precedents is the principle of *stare decisis* ("stand by what has been decided"). This principle is designed to ensure that like cases are treated alike, and makes decisions in precedent cases binding on courts in future decisions[1].

Most current thinking on the topic has its roots [2] in the HYPO system of Edwina Rissland and Kevin Ashley [3], which addreesed the domain of US Trade Secret Misappropriation. Particularly influential has been an immediate successor to HYPO, CATO[2], [4] developed by Ashley with his PhD student, Vincent Aleven.

CATO represents cases as sets of *factors*, stereotypical patterns of fact representing a *reason* to decide for a particular party to the dispute. The factors present in cases are termed *base level factors*. The factors are in turn reasons for the presence or absence of *intermediate factors*, also sometimes called *abstract* factors. These factors are organised into a set of hierarchies, one for each *issue*. Issues are the various points that the plaintiff must establish in order to win a claim.

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[1]Whether the courts are obliged to to follow the decisions varies from jurisdiction to jurisdiction. Inferior courts are generally obliged to follow the decisions of superior courts (*vertical stare decisis*), but whether decisions of courts of equal status (*horizontal stare decisis*) must be followed varies. In the US, federal appeal courts obey horizontal *stare decisis*, whereas the appeal courts of New York state do not. Courts may be able to show good reason not to follow a precedent: this usually involves *distinguishing* the case by showing a significant difference with the precedent. Of course, superior courts are not bound by the decisions of inferior courts. Even if not bound by a precedent, however, the court may find the precedent *persuasive* and follow it, thus conferring its own status on the decision.

[2]Teaching law students how to make good distinctions was the guiding purpose of CATO system.

CATO was concerned only to generate arguments, not commit to an outcome. Issue Based Prediction (IBP) [5], was designed to predict case outcomes, and so the issues were organised into an and/or tree, tying the separate hierarchies of CATO into a single structure with the outcome as root. Factor based reasoning is used to resolve the issues, standard logical reasoning to deduce the outcome from the and/or tree of issues. The Value Judgement and Argumentation Prediction (VJAP) of [6], used the same hierarchy but extended IBP by using value judgements to justify preferences between factors. Factors are by far the most common way to represent cases when modelling reasoning with precedents. As well CATO, IBP and VJAP, all of which, like HYPO, addressed US Trade Secrets Misappropriation, factors are used in [7], [8], [9], [10] and many others.

The principle of *stare decisis* means that the set of precedents can constrain the decision in a new case. So the question arise for a new case: is the case constrained by the precedents, so that the decision is straightforward, or is the new case sufficiently different that the judges must choose the decision which they believe is justified on the facts of the new case (thus setting a new precedent). To answer this question, in [11] John Horty introduced a formal account of precedential constraint for reasoning with legal cases described as sets of factors. Horty's original conference paper was expanded into a journal paper [12], and some improvements were suggested in [13]. A key element of Horty's approach is that it used the *reason* model of precedential constraint [14], as opposed to the *results* model [15]. Given a case $C = P \cup D$ where P are the pro-plaintiff factors and D are the pro-defendant factors the results model, as used in [7] and [16], states that the set P is preferred to the set D if the plaintiff wins and that D is preferred to P if the defendant wins. The reason model recognises that a subset of its factors may be enough for the winning side to be preferred to the complete set of opposing factors, and so the preference is, if the plaintiff won, the reason R is preferred to D where $R \subset P$, and, if the defendant won, R is preferred to P where $R \subset D$. The advantage of the reason model is that it constrains more cases than the results model. Later developments include modelling both factors and dimensions ([17], [18]), but here we will consider only factors[3].

There are three main types of factor hierarchy in the literature. In CATO [4], there is a *separate* hierarchy for *each* issue. Each *hierarchy* has one or more layers of *intermediate* factors, and a bottom layer of *base level* factors. In IBP [5] and VBJP [6], the root is the *outcome*, followed by one or more layers *of issues*, followed by a layer of *base level* factors. Here there are no *intermediate* factors. In the ANGELIC methodology [20] we have a combination where the root is the *outcome*, followed by one or more layers *of issues*, followed by one or more layers of *intermediate* factors, followed by a layer of *base level* factors. Horty's model of precedential constraint in [12], however, does not use a hierarchy: it moves straight from *outcome* to *base level* factors, giving a one step explanation, $baselevel factors \rightarrow outcome$.

In [10] it was argued that ignoring issues resulted in some cases which should be constrained being unconstrained, since the cases could be distinguished using factors belonging to a different issue, and so not relevant to the main point of the case. Instead the method should be applied at the issue level rather than the outcome level, and use the hierarchy of IBP. This enables reasoning with portions of precedents as recommended by Branting [21]. The use of issues gives rise to a two step explanation: $baselevel factors \rightarrow issues \rightarrow outcome$.

[3]Our view is that dimensions should be used at the factor ascription stage, not the constraint stage [19].

At ICAIL 2023 two papers, [22] and [23], attempted to go further, by reintroducing intermediate factors. Neither placed any particular stress on issues: it appears that the root may be an issue or an outcome in [22], but always an outcome in [23]. In this paper we will discuss mainly [22], which contained some interesting results regarding the constraints imposed by hierarchies with intermediate factors (*H-constrained)* and *flat* hierarchies, those with only base level factors (*F-constrained*). In [22] it was demonstrated that there were significant differences between using a single step argument from factors to outcome and the hierarchical approach: cases H-constrained might not be F-constrained without the intermediate factors, and cases F-constrained might not be H-constrained. This gives rise to two types of problem case (A and D cases are constrained or unconstrained with either hierarchy and so unproblematic):

B: Cases F-constrained but not H-constrained
C: Cases not F-constrained but H-constrained.

These results are clearly undesirable, unless one of the two constraints always gives the correct outcome. We argue that the F-constraint is the correct notion. We will consider type B cases and type C cases in turn.

2. Type B cases: F-constrained but not H-constrained.

Our example type-B case will use the example from [22], shown in Figure 1. In this domain there are six factors. There are three pro-plaintiff factors, $F1_p$, $F2_p$ and $F4_p$, and three defendant factors, $F3_d$, $F5_d$ and $F6_d$[4]. In the type B example we have:

- A precedent case with pro plaintiff factors $F1_p$ and $F4_p$ and pro defendant factor $F5_d$.
- A current case with pro plaintiff factor $F1_p$ and pro defendant factor $F5_d$.

Given the account of hierarchical constraint in [22], the current case is apparently F-constrained because the reason for deciding for the plaintiff is $F1_p$, the reason for deciding for the defendant is $F5_d$, and the decision for π in c_3 gives the preference $F1_p \succ F5_d$. Thus, when flattened in accordance with [22], we have the preference $F1_p \succ F5_d$ relative to the concern π/δ, so that the current case is F-constrained. However, in the hierarchical setting, when $F4_p$ is absent, as in the current case, R_d is present, and since R_d was absent from the precedent, there is no preference for Q_p over R_d, and so the current case is not H-constrained.

My view, however, is that the case should *not* be F-constrained. If we apply the reason model as set out in [12] directly to the flatted hierarchy we have three possible reasons;

- (a) $F1_p$ and $F4_p \succ F5_d$: (b) $F1_p \succ F5_d$: (c) $F4_p \succ F5_d$

But now suppose we use the layered hierarchy to explain the reasoning which led to a decision for the plaintiff in c_3. We can see that it is $F4_p$ that is preferred to, and so neutralises, $F5_d$. $F4_p$, however, does not provide a reason to find for the plaintiff, and so $F1_p$ is required for the decision, and so $F4_p \succ F5_d$ cannot be the reason. There is, however, no comparison in c_3 between $F1_p$ and $F5_d$ and so it would be unsafe to give $F1_p \succ F5_d$ as the reason, because

[4]For extra clarity I subscript factors with the party favoured.

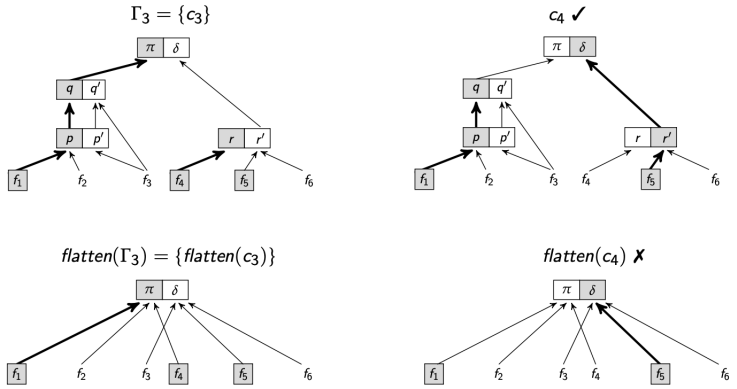

Figure 1: Example Type B case [22]. π is a decision for plaintiff, δ a decision for the defendant. Lower case letters are intermediate factor names: without a prime they favour the plaintiff, with a prime they favour the defendant. Highlighted nodes are accepted. Arrows indicate reasons for the parent node: bold arrows are the effective reasons.

that would ignore the importance of $F4_p$ in counteracting $F5_d$. This would leave as $F1_p$ and $F4_p \succ F5_d$ the most plausible reason, given the knowledge represented in the hierarchy.

Now, however, c_4 is not constrained by this reason, since $F4_p$ is missing, so that the preference does not apply to c_4. If, however, c_4 is in fact decided in favour of the plaintiff, we will have our comparison between $F1_p$ and $F5_d$, and then we can revise our reason to $F1_p \succ F5_d$. The precedent justifying this reason would be c_4, however, not the original precedent, c_3.

So, although the hierarchy helps us explain the decision, it is the flattened hierarchy that should be used to constrain future cases.

3. Type C cases: H-constrained but not F-constrained.

The same domain is used as for the type B case. The example is illustrated in Figure 2.

- The precedent contains $F1_p$, $F4_p$, $F3_d$ and $F5_d$ and was found for plaintiff.
- The current case contains $F2_p$ and $F6_d$.

Since there are no factors in common, the precedent does not F-constrain the current case. However, in the layered case, both cases contain Q_p and R_d and the decision for π turned on the preference $Q_p \succ R_d$ expressed in c_1, and so the case is H-constrained.

Our view is that the case should not be constrained. The problem causing different behaviour is that factors should only be grouped under the same intermediate factor if they are of the *same strength*[5], if preferences are going to be expressed between the intermediate factors. The preference may well depend on the strength of the reasons why the intermediate factors

[5]Factors with different strengths are recognised in both CATO [4] (which distinguishes weak and strong factors) and IBP [5], which has ordinary and "knock out" factors. This is needed since not all downplaying arguments succeed. These qualitative strengths should not be confused with the quantitative strengths represented by dimensions a factors with magnitude [17]. Strengths of factors is also ignored in [23]: "what matters is that both [fact situations] G and F satisfy the [intermediate] pro-π factor F101, and not why it is satisfied."

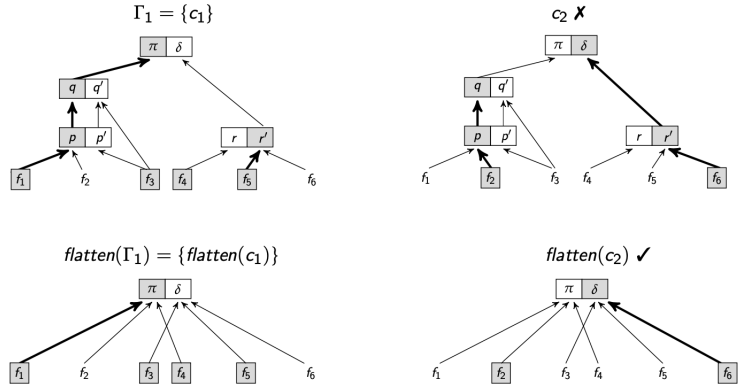

Figure 2: Example Type C cases [22]. Notation is as for Figure 1

are present. If factors of differing strengths are grouped under the same intermediate factor problems arise, as discussed in [24] (Section 4.1), since a weak factor may be treated as if it were a strong factor, and so be used to distinguish the case even though the difference is not significant.

Consider the example hierarchy in Figure 3. This is taken from the US Trade Secrets domain and uses base level factors from CATO [4]. It shows a fragment from the hierarchy for the issue *InfoValuable*. The intermediate factors differ from CATO, but choice of intermediate factors is always with the analyst, to best suit the task, so we have chosen intermediate factors to best illustrate the problem.

We will use two cases, *Mason v. Jack Daniel Distillery* and *MBL (USA) Corp. v. Diekman* . The factors in *Mason* relevant to *InfoValuable* were F6p, *SecurityMeasures* and F16d, *InfoReverseEngineerable*. The relevant factors in *MBL* were *SecurityMeasures* and F20d, *InfoKnownToCompetitors*. *Mason* was found for the plaintiff and *MBL* for the defendant.

Suppose the first case to appear was *Mason*. Both IF1 and IF2 are present, and since the case was found for the plaintiff, we must, using H-constraint, accept that IF1 $\succ$ IF2. Now if *MBL* comes before the court, it would appear to be H-constrained. But *MBL* was found for the defendant, showing that the preference IF1 $\succ$ IF2 does not hold. How can this be? What the judges have to decide is not the absolute question of whether protection is preferred to availability in all cases, but whether the protection is *sufficient* in *the case under consideration*. This requires them to examine the reason why the intermediate factors hold, namely the base level factors. In *Mason* it is reasonable to think that the measures taken by Mason were sufficient to outweigh the mere possibility of reverse engineering, given the time trouble and expense that that might take. So we do have the preference $F6_p \succ F16_d$. But in *MBL*, the defendant has the stronger reason, that the information is already known to competitors. Thus the security measures taken by MLB seem to have been a case of bolting the stable door after the horse has gone, and it is quite reasonable to have the preference $F20_d \succ F6_p$. Thus the H-constraint does not hold: instead both *Mason* and *MBL* give rise to F-constraints, for different sides.

Turning now to the example from [22], shown in Figure 2, it might well be that $F1_p$ establishes Q_p with sufficient strength to defeat R_d, when R_d is established by $F5_d$, but that $F2_p$ does not

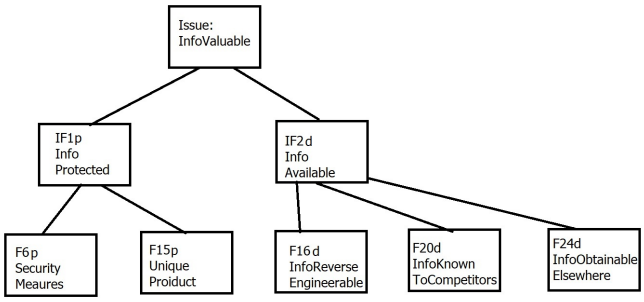

Figure 3: Fragment of the factor hierarchy for the issue *InfoValuable*.

when R_d is established by $F6_d$. If it turned out that the current case in Figure 2 was decided for the plaintiff, that might be held to justify the hierarchy used there. But this requires the decision from the court, effectively establishing that $F2_p$ is stronger than $F6_d$, so that the current case itself becomes the precedent. The decision could equally have been made for the defendant, establishing that $F6_p$ was stronger than $F2_p$. Without the decision the assumption of equal strength of the reasons for the intermediate factors cannot be made, and so the H-constraint should be considered valid only if the F-constraint also holds with appropriate precedents. In all cases where the decision legitimates the hierarchy, the legitimating case can be used to justify a preference between base level factors.

To apply H-constraints conceals that a judgement is being made as to whether the plaintiff intermediate factor is *sufficient* to outweigh the defendant intermediate factor, and this judgement is a, perhaps *the*, crucial step in the decision.

4. Explanation

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We have so far argued that F-constraint is the correct notion when determining the outcome of a case. Does this mean that we can ignore intermediate factors and return to the two step explanations of [5] and [10]? Let us consider why intermediate factors were introduced in CATO [4]. The purpose of CATO was to teach law students to distinguish cases and to defend against distinctions. One way of defending against a distinction is to *downplay* it, by finding a different factor which could be used to substitute for or cancel the distinguishing factor. Thus where *Mason* is the precedent and *MBL* the defence can distinguish *Mason*:

Def : In *MBL*, the information was known to competitors. This was not so in *Mason*.
Plain : In *Mason*, the information was also obtainable, through reverse engineering, and the security measures taken by Mason were sufficient to counter this availability.
Judge : That the information is known to competitors is far stronger than the mere possibility of reverse engineering. I find for the defendant.

In CATO the difference in strength is not important, since its role is only to find arguments, not to determine outcomes. It is up to the user, acting as judge, to decide on which argument

wins. And the plaintiff's argument is a valid downplaying argument, albeit not a strong one. Had Mason contained the stronger $F24_p$, *InfoObtainableElsewhere*, instead of $F6_p$, the downplaying argument would probably have succeeded [6]. Thus the judgement between intermediate factors is an important part of the reason for the decision, and so should be reflected in the explanation. And this requires the intermediate factors.

A popular method for explaining legal cases, widely used in US Law Schools, is the Issue-Rule-Application-Conclusion (IRAC) method [25]. An IRAC "issue" is not limited to what are termed "issues" in the hierarchies, but rather refers to the main point under dispute which may equally be a conflict between intermediate factors such as we found in *Mason* and *MBL*. Note therefore that a flat hierarchy would be insufficient to identify such issues: the issue (in the IRAC sense) in *Mason* and *MBL* is not so much whether $F6_p$ outweighs $F16_d$ or $F20_d$, as whether the protection was sufficient to keep the value of the information given the extent of the availability. Thus the explanation offered by [10], that the security measures were preferred to the reverse engineerability is not really enough.

The IRAC issue in these cases is whether the protection was sufficient to keep the value of the information given the extent of the availability. The rule is that if the protection is considered sufficient given the availability, the information is valuable and not otherwise. The application concerns the relative strength of the reasons supporting the conflicting intermediate factors. The conclusion then follows from the rule. Thus the IRAC explanation in *Mason* is:

I : Was the protection sufficient given the availability of the information?
R : If the protection was sufficient, find the information valuable.
A : The security measures taken by Mason were sufficient to outweigh the bare possibility of the information being reverse engineered.
C The information was valuable.

And in *MBL*, with *Mason* as precedent:

I : Was the protection sufficient given the availability of the information?
R : If the protection was sufficient, find the information valuable (*Mason*).
A : The security measures taken by MBL were not sufficient to protect the information since it is known to competitors.
C : The information was not valuable.

This greatly improves the explanation, because it identifies the real issue, and explains why the base level factors are in conflict, and the import of their relative strengths.

4.1. Nested IRAC

In deeper hierarchies, we may need to apply explain several judgements and so need to nest the explanations. Consider the fragment of the factor hierarchy for US Trade Secrets shown in Figure 4. Here we have an additional layer of intermediate factors. Consider first *National Instrument Labs, Inc. v. Hycel* which contained only factors $F1_d$, *DisclosureInNegotiations*, and $F21_p$, *KnewInfoConfidential* relating to the issue of confidentiality. *National Instrument Labs* was found for the plaintiff, so $F21_p \succ F1_d$. The explanation would be:

[6] In IBP [5], the problem is resolved by making some factors "knock out" factors, resistant to downplaying.

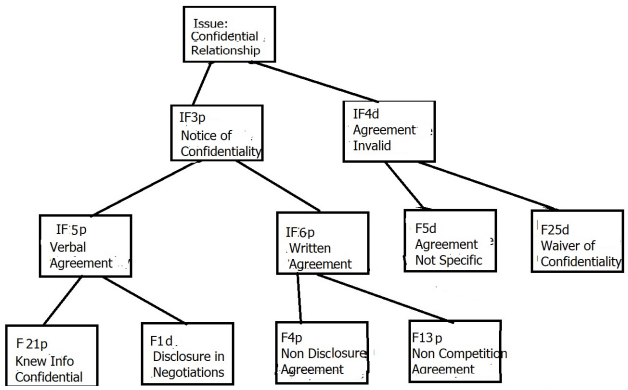

Figure 4: Fragment of the factor hierarchy for the issue *ConfidentialRelationship*.

I1 : Was there a confidential Relationship?

R1 : A confidential Relationship exists if there was notice of confidentiality, which is not invalid.

I2 : Was there notice of confidentiality?

R2 : There was notice of confidentiality if there is a verbal agreement or a written agreement.

I3 : Was there a verbal agreement?

R3 : There is a verbal agreement if the defendant knew the information to be confidential.

A3 : The defendant knew the information to be confidential.

C3 : There was a verbal agreement.

A2 : There was a verbal agreement.

C2 : There was notice of confidentiality.

A1 : There was notice of confidentiality and no evidence that it was invalid.

C1 : There was a confidential relationship.

Now consider a case with factors F4p, *NonDisclosureAgreement*, and F5d, *AgreementNotSpecific*.

I1 : Was there a confidential Relationship?

R1 : A confidential Arrangement exists if there was notice of confidentiality, which is not invalid.

I2 : Was there notice of confidentiality?

R2 : There is an explicit agreement if there is a verbal agreement or a written agreement.

I3 : Was there a written agreement?

R3 : There is a written agreement if there is a non-disclosure or a non-competition agreement

A3 : The defendant signed a non-disclosure agreement.

C3 : There was a written agreement.

A2 : There was a written agreement.

C2 : There was notice of confidentiality.

I4 : Was the agreement valid?

R4 : An agreement is valid unless confidentiality has been waived, or the agreement was not specific.

A4 : The agreement was not specific.

C4 : The agreement was not valid.

A1 : There was notice of confidentiality but the agreement was not specific.

C1 : There was no confidential relationship.

Note that the *outcomes* depend solely on the preference $F21_p \succ F1d$ in the first case and $F5_d \succ F4p$ in the second. This does, however, show how the IRAC explanation uses intermediate factors to contextualise the preference and shows why it matters.

4.2. Improving the presentation

Currently the explanation is a bit stilted, and resembles the *how?* of early rule based programs such as MYCIN [26]. It could be greatly improved by representing the case not as a set of factors, but as a set of *factor-fact* pairs where fact is a textual description of the facts which led to the ascription of the factor. In the *National Instrument Labs* case we could associate $F1_d$ with "The plaintiff revealed the information during negotiations of 3rd September 1978", and $F21_p$ with "but the defendant concedes that the information was given under terms of strict confidentiality"[7]. Now the central part of the *National Instrument Labs* explanation can become:

I3 : Was there a verbal agreement?

R3 : There is a verbal agreement if the defendant knew the information to be confidential.

A3 : The plaintiff revealed the information during negotiations of 3rd September 1978, but the defendant concedes that the information was given under terms of strict confidentiality.

C3 : There was a verbal agreement.

Similarly in the second case, we can associate $F4_p$ with "The defendant signed a non-disclosure agreement on 6th August 1977" and associate $F5_d$ with "The agreement made no mention of future discoveries, and cannot be held to cover the information in question, which was not discovered until September 1980." Now the relevant parts of the explanation can become:

I3 : Was there a written agreement?

R3 : There is a written agreement if there is a non-disclosure or a non-competition agreement

A3 : The defendant signed a non-disclosure agreement on 6th August 1977.

C3 : There was a written agreement.

and

[7]The defendant in fact argued that the information was available on the grounds of reverse engineerability, and that it was known to competitors. Both these claims failed. The case was thus lost at the factor ascription stage, showing the need for a stage before applying precedential constraints over preferences.

I4 : Was the agreement valid?

R4 : An agreement is valid unless confidentiality has been waived, or the agreement was not specific.

A4 : The agreement made no mention of future discoveries, and cannot be held to cover the information in question, which was not discovered until September 1980.

C4 : The agreement was not valid.

We believe that this connection to the facts of the case greatly improves the naturalness of the explanation.

5. Concluding Remarks

Providing a formal account of precedential constraint is an active topic in Artificial Intelligence and Law. The original account was in terms of factors and outcomes only. In [10] it was argued that issues also required consideration, to avoid irrelevant distinctions. More recently it has been argued in [22] and [23] that a still finer grained notion, including layers of intermediate factors should be used. This, however, raises some problems. In was shown in [22] that H-constraints and F-constraints do not always align, and H-constrained cases may not be F-constrained and *vice versa*. In sections 2 and 3 we argued that the correct outcome was always given by the F-constraint, and explained why this is so. Therefore, for determining the outcome of the case, only base level factors should be considered.

The explanation resulting from F-constraint is, however, rather terse and assumes that the explainee will be aware of how and why the base level factors relate and their consequences. This information is what is contained in the intermediate factors. In consequence, better explanations can be given using the finer grained hierarchy. We illustrated this in Section 4 by showing how it can yield IRAC style explanations. These can be made more natural by associating the base level factors with the facts that led to their ascription.

Thus we believe that the intermediate factors play an important cognitive role in aiding understanding of the domain, but play no role in the logic of precedential constraint.

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