Evading economic reality
Real property access takings and the slippery slope of legal language

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Abstract
Purpose – The purpose of this paper is to also analyze what causes judicial decisions about access impairment in American eminent domain and police power cases to be based on subjective interpretations instead of objective factual evidence about the spatio-material conditions of access.
Design/methodology/approach – Following a review of commentary on decision making and language in legal contexts, contemporary rhetorical analysis combined with discourse analysis are employed to illuminate inconsistencies of legal terminologies with respect to access.
Findings – The analysis finds that legal terminology of access takings sustains cognitive indeterminacies and prevents the use of standard quantitative approaches to measurement.
Research limitations/implications – The implications of this research are that access conditions need to be considered in the context of transaction costs based on an underlying ontology of access phenomena.
Practical implications – This paper calls for changing legal policy so that objective measures of access can be used to evaluate impairment.
Originality/value – This is the first paper to analyze underlying problems in access takings and sets the stage for a more objective and scientific approach to a long unresolved problem involving property takings.

Keywords Economics, Real property law, Language, United States of America
Paper type Research paper

1. Introduction
Without access to and from a public thoroughfare, most parcels of private real property lose most of their functional utility and their economic value. Access conditions impose what are called transaction costs. In real estate, as in many other areas involving economic analysis, transaction costs are seen in the context of property rights and institutional impacts on exchanges of property. This is true even in the context of physical movement research domains such as transport economics, wherein transaction costs are seen as search, negotiation and contract costs (Rietveld and Vickerman, 2006). Since the concept of transaction costs came into the currency of economic analysis several decades ago, it has expanded from property and institutional contexts to include spatial contexts. However, these spatial contexts have been geographic, at macro (metropolitan, regional and national) levels. No previous analysis using the concept of transaction costs has been applied to the micro level of the spatial environment where streets interface with real estate parcels.

In the USA, access can be taken, completely or partially, through the police power or eminent domain subject to the limits of the Fifth Amendment of the Bill of Rights. Legislatures tell courts that real property should have “reasonable” access: to receive government compensation, access must be substantially impaired, not inconvenienced. It is only when access is judged to be substantially impaired that economic analysis can proceed. Thus there is no way to link changes in impairment to changes in spatial
transaction costs. Consequently, while there are several thousand access takings annually, there is wide variability in the courts in determining what constitutes substantial impairment of access and considerable dissatisfaction with court decisions. While the extensive inconsistencies in the way access litigation is resolved are evidence of heuristic and bias types of judgment errors, underlying these judgment errors are ambiguities in the meanings of terms such as impairment, substantial and even access itself.

This paper examines the language of access impairment to see why access issues can be so confusing and why they are resolved so unsatisfactorily. Classic rhetorical analysis in its contemporary form (Burke, 1965) and discourse analysis are employed to illuminate the orientations and limitations of legal language with respect to access. Discourse is language as social practice determined by social structures (Fairclough, 1989). Discourse analysis is a synthesis of modes of analysis that emerged mostly from linguistics and post-structuralism. In a more elaborated form than employed here, discourse analysis involves a recursive uncovering of statements to illuminate and critically assess the social structure from which they emerge. This analysis shows how language factors become the underpinnings for the great variability in legal judgments. The paper concludes by proposing that, because they are fundamentally non-discursive conditions, access conditions cannot be effectively analyzed through legal language and discourse. It then briefly examines alternatives proposed in behavioral law and economics research to relying on traditional economic assumptions and suggests that non-discursive character of access means that it must be represented using non-discursive approaches.

2. The problem: what constitutes reasonable access?
While it is a common sense notion that a parcel of real property needs access to be useful, and that some forms of access are better than others, the myriad legal disputes about property access takings that reach appeals courts in almost every state court system of the USA indicate there is no clear agreement nor understanding of what constitutes “reasonable” access. The following commentary, found in the annotations to Section 15 of the Bill of Rights of the Colorado Constitution, identifies the core issues. (The commentary cites a number of legal cases not reproduced here.)

Whatever permanently prevents the e adjacent owner’s free use of the streets for ingress or egress to or from his lot, and whatever interference with the street permanently diminishes the value of his premises, is as much a damage to his private property as though some direct physical injury were inflicted thereon. ...Right of access to and from a general street system must be substantially impaired, not merely inconvenienced, by modification of the system. ... The fact that a municipality may under its police power interfere to a certain extent with access to and from premises does not mean necessarily that such interference constitutes a “taking” for which under amendments 5 and 14, US Constitution, and under Section 25 of art. II, Colo. Const., and this section there must be compensation. Rather, to constitute such a taking there must be an unreasonable or substantial deprivation of access. ... Mere inconvenience and mere circuitry of route necessary for access or egress occasioned by a public improvement are not compensable items of damage (State of Colorado (a), Constitution of Colorado, Article II – Bill of Rights, Section 15. “Taking property for public use – compensation, how ascertained”, available at: http://647b8f78c178.1243758112.cgov-dos.state.co.us/LNP/DOC=0-4-18).

A typical concern is Montague’s (1999): “... the question that continues to puzzle even the best legal minds is just how substantial is substantial enough to warrant damages recovery in an impairment of access case”. Knowing the difference between access that
is “substantially impaired” and that which is “merely inconvenienced” requires knowing when access is deficient, sufficient or perhaps even excessive. This means it must be measured.

Access between a street and a parcel of real estate comes in two dimensions, what Montague (2000) calls on–off and to–from. On–off is ingress or egress onto or off of a parcel. But the scope of access control in state codes and constitutions is actually much broader and includes not just this interface but the overall network of streets. The “general street system” and the “system of vehicular access to or from any public highway” can include just about every street. At this level, the language is that access must be substantially impaired, not merely inconvenienced, by modification”. To mere inconvenience as a condition that does not warrant consideration of damages is added mere circuitry of route. What is not clear are the differences between convenience, inconvenience and mere inconvenience or the differences between circuitry of route and mere circuitry of route. What is also not acknowledged is that what are called modifications may very likely be major transformations, especially when successive modifications involving mere inconvenience and circuitry of route have accumulated over the years.

The problem in dealing with access rights compensation is that courts rely on what is called “reasonable” access but have no consistent or systematic way of defining what “reasonable” access means. For example, in one of the rare systematic studies of access takings, Westerfield et al. (1995) reviewed access litigation and studies involving land values. Among their findings are the following:

In most access litigation, acceptance of the view that only “reasonable” access need be provided is common. This allows states to liberally use their police powers as a means of controlling access, avoiding the need for eminent domain proceedings. Several factors come into play in determining whether reasonable access is provided to a property owner after a taking has occurred. Often, it is the combination of these several deciding factors which determines whether access or loss thereof, is compensable. Cases from different states, and even within a state, will often contradict one another even though they would seem to have similar deciding factors involved.

Westerfield et al. (1995) conclude their review with the opinion “that the definition of reasonable access is a purely subjective one. Inconsistencies in the analysis of reasonable access litigation indicate that no uniformity exists, and the individual judge may determine what he/she believes to be ‘reasonable.’” The importance of this conclusion, made by researchers in the Center for Transportation Research, University of Texas at Austin, must not be underestimated. Much of the research focused on surface transportation and related issues in the USA occurs at the two Texas public universities, the University of Texas and Texas A & M University.

3. Causes of the problem
3.1 Information structure
One explanation for the persistent pattern of inconsistencies is that the conditions involving access are such that information about them cannot be presented effectively. Montague (1999) points out “…the determination of whether there has been a substantial impairment of access caused by a public road project is a question of law”. This means a question of substantial impairment is decided by a judge, not a jury. For example, a property owner’s complaint about loss of access must pass through three decision gates before reaching the stage where economic damages can be determined. Information is necessary to pass through each decision gate. Because
testing for substantial impairment occurs as described in Figure 1, it is impossible to make an analysis based on economic information.

In addition, information in court cases can be incomplete in the sense that each case is treated on its own rather than in comparison with other cases on the same topic. “Judgments of cases and problems in isolation – and isolation is typical of the legal system – may produce global or systematic irrationality...simply because cases are examined in isolation (Sunstein, 1999, 121). As Montague says, “…every case turns on its own facts”. Therefore comparing and contrasting one situation with another is difficult.

3.2 Heuristics and biases
The lack of complete and determinate information leads to using approaches which in turn can lead to judgment mistakes. The study of errors in human judgment has received considerable attention in what is called the “heuristics and biases” literature, a domain related to behavioral economics. Behavior in this context is not the same as that in the behaviorist agenda of a generation ago in that it considers contexts not acknowledged in that stimulus response defined agenda: cognition, culture, emotion, ethics and morality and others (Altman, 2005). Research in this domain, which had its inception with Simon’s (1977) work resulting in the concept of bounded rationality and is more recently manifest in Kahneman and Tversky’s (1979) prospect theory, has led to reassessing the assumption long dominant in economic thought that humans are consistently, fully and effectively rational.

According to Jolls (n.d.) most behavioral law and economics research has focused on three main judgment errors:

1. optimism bias (individuals believe that their own probability of facing a bad outcome is lower than it actually is);
2. self-serving bias (which affects fairness); and
3. hindsight bias (decision makers attach excessively high probabilities to events simply because they happened).

Judgment errors also derive from what is called framing. Framing is about the context or boundaries of choices with respect to presented information. Figure 2 shows two horizontal lines of identical length framed differently by two 45 degree lines with the obvious result that the lower of the two appears longer.

Many researchers studying reasoning, fallacies and biases now accept a dual systems account (called Systems 1 and 2) of thinking (Carruthers, 2008). Most judgment errors are seen by many to be instances of fallacies from using what is called
system 1. As Carruthers explains, system 1 is a collection of multiple fast and unconscious systems operating in parallel according to principles that are universal to the human species. These principles aren’t easily altered and are mostly heuristic. System 2, the more rational, is, in contrast, slow, serial and conscious. It operates according to more principles that vary (within a culture and between individuals), and can involve the application of valid norms of reasoning. System 2 principles are malleable, influenced by verbal instruction and often involve normative beliefs (about how one should reason).

3.3 Ambiguities in Language
Verbal instruction in natural language is virtually at the core of legal thinking and takes both spoken and eventually written form (Levi and Walker, 1990, p. 10). Legal English has long been a source of humor, invective and other forms of commentary about law and lawyers. Mellinkoff’s (2004) treatise was extensive in its analysis and pointed in its recommendations: “The most effective way of shortening law language is for judges and lawyers to stop writing” (Martin, 2000). Solan and Darley (2001) say it is one of the peculiarities of law “to take an ordinary concept and to give it a definition that applies just to those lucky enough to draw jury duty”. Recent work has used linguistics to examine the broader implications of legal language (Levi and Walker, 1990; Schane, 2006; Solan, 1993; Tiersma, 2005). Within the context of legal language itself, there are fundamental terminological problems that induce ambiguity. Some of these terms involve what Solan (1993) calls categorical indeterminacy, that is, when it is unclear whether a particular thing or event in question fits into a particular category of things or events.

4. The language of access
While many aspects of the legalese Mellinkoff criticized may have disappeared (Tiersma, 2005), there remain a sufficient number in the language of access to impede consistency in judgment. Terms such as impairment, substantial and even access itself are used in conflicting, vague and confusing ways.

4.1 Impairment
Important distinctions can be made between the term “impairment” and related terms like “damage” or “injury”. In legal commentary, access damage is likened to the infliction of a direct physical injury and the OED definition says impairment is “an injurious lessening or weakening” (OED, 1971, p. 1381). Impairment need not arise from exogenous human action or be the result of an injury. In the case of access, it can result from poor initial planning. In any case, impairment implies something that is both recognizable – in comparison with a previous condition, other otherwise similar conditions or a standard – and longer term, possibly chronic or permanent. Many things can be impaired; what makes a difference is whether the impairment is of a kind or degree that makes it substantially impaired.

4.2 Substantial
In its original usage, “substantial” derived directly from “substance” and denoted that which had separate, material existence. In contemporary usage, “substantial” conventionally connotes that which is large in size or quantity (though not necessarily a material thing). Yet, as many legal opinions show, both senses of “substantial” operate...
in access law. Thus, deciphering the meaning of “substantial” in the context of access can be problematic.

Merriam-Webster’s Dictionary of Law (Merriam-Webster, 1996) identifies seven different contexts for the use of “substantial:” substantial capacity test; substantial compliance; substantial evidence; substantial justice; substantial performance; substantial right; substantial factor. A substantial factor is an important or significant factor that is not necessarily the only factor leading to a plaintiff’s injury but is sufficient to have caused the injury by itself. For example, in Jeter et al. v. Owens-Corning Fiberglas (Philadelphia 1997, pp. 2300-2304), the majority opinion says:

The “substantial factor” test for determining proximate cause was incorporated into the Restatement (Second) of Torts, Section 431 (1965), which in turn has been adopted in Pennsylvania. In Ford, the Pennsylvania Supreme Court cited with approval the comments to Section 431 of the Restatement which defined “substantial factor” as “conduct [that] has such an effect in producing the harm as to lead reasonable men to regard it as a cause, using that word in the popular sense. . .”Restatement, supra, at Section 431, comment a. See Ford, supra, at 595. 379 A.2d at 114. Nowhere in that definition is there a quantification of causation such as was implied by the trial court when it instructed the jury that the defendants action must have been “considerable” or “significantly large”.

Under the law of Pennsylvania, a cause can be found to be substantial so long as it is significant or recognizable; it need not be quantified as considerable or large. These latter terms imply a percentage threshold that a plaintiff must surmount before a jury will be permitted to rule in his favor; however, our courts have never required such an approach. In fact, defendants have been found to have been negligent, and their negligence to be a substantial factor in the plaintiff’s harm, even though their negligence was relatively minor vis-a-vis other defendants or the plaintiff.

And when considering causes, it is “not the least bit obvious that substantial factor defines causation other than stipulatively” (Solan and Darley, 2001). In other words that it does not define causation empirically.

Substantial appears in other contexts. A substantial capacity test determines whether a defendant (as a result of mental disease or defect) lacked the capacity to appreciate the wrongfulness of his or her conduct or to conform the conduct to the requirements of the law. Substantial compliance (with a statute or contract) satisfies its purpose or objective even though its formal requirements are not complied with. Substantial evidence is that which a reasonable person would find sufficient to support a conclusion. Substantial justice is justice of a sufficient degree especially to satisfy a standard of fairness. Substantial performance is that which departs in but minor respects from what was promised in a contract or agreement. A substantial right merits enforcement or protection by the law: a right related to a matter of substance as distinguished from a matter of form.

In these contexts, “substantial” connotes five ways of conceptualizing, and therefore considering, whether a condition is substantial:

(1) if it is a large part of a whole;
(2) if it is larger or more important in comparison with other factors;
(3) if, of several factors, it is one sufficient to be a cause of something;
(4) if it is one that satisfies a purpose rather than a formal requirement; and
(5) if it is related to material rather than formal matters.
Yet, how these are interrelated to each other is not clear. The language of law suggests that at least one factor of these five would need to be present for a substantial condition to be present. In practice, the presence of one factor would likely be taken as an indicator rather than as conclusive evidence and weighed against the direction the other factors indicated. But with the minimal evidence at hand now, there is no way to know if this would be true.

4.3 Substantial impairment in non-access contexts
In a legal context, the concept of substantial impairment has been applied to human physical disability, building structural conditions, consumer goods, human mental functioning and governmental actions affecting contracts.

4.3.1 Human physical disabilities. The measure of “substantial” impairment in the context of American disability act (ADA) disabilities is considerably less subjective. The Court found that phrases such as “substantial impairment” and “major life activities” should be interpreted to create a demanding standard for qualifying as disabled.

When addressing the major life activity of performing manual tasks, the central inquiry must be whether the (person) is unable to perform the variety of tasks central to most people’s daily lives, not whether the (person) is unable to perform the tasks associated with her specific job (Toyota Motor Mfg. vs Williams).

4.3.2 Building structure. For many courts, substantial impairment of the structural integrity of a building constitutes a collapse. In Rankin vs Generali, (986 S.W.2d 237) the Tennessee Court of Appeals needed to decide what constituted a collapse of a building within coverage of a property insurance policy. In looking to other jurisdictions, it found a minority of jurisdictions regarded “collapse” as an unambiguous term to be defined in its ordinary usage: “a falling in, loss of shape or reduction to flattened form or rubble”. (The insuring company’s decision was based on this). However, the majority view was that a collapse did not require complete destruction or falling in of a building. Rather, the “clear, modern trend” was to hold that “collapse coverage provisions...which define collapse as not including crackling and settling “provide coverage if there is substantial impairment of the structural integrity of the building or any part of a building” (American Concept Ins. Co. v. Jones, 935 F. Supp. 1220, 1226 (D. Utah 1996)).

4.3.3 Consumer protection. In the context of consumer protection, lemon laws (which apply mostly to automobiles) refer to the substantial impairment of the use, safety or value of a vehicle. For example, an opinion rendered by the Court of Appeals of Tennessee at Knoxville says

Finally, we address the issue of whether the non-conformity substantially impaired the value of the vehicle. It is important to note that the language of the statute, “a buyer may revoke his acceptance if the non-conformity substantially impairs the value to him”, involves subjectivity. The uniform commercial code (UCC) does not define “substantial” impairment, probably because of the privilege of subjectivity, which may vary from person to person. Even so, any subjective decision of a buyer is subject to some scrutiny, reasonably exercised; ... but the language “value to him” may not be lightly regarded;... (Faye L. O’Bryant v. Reeder Chevrolet Co., Inc., d/b/a Chevrolet-Geo Co., Tennessee No. 3A019810-CV-00325).

This not only implies that substantial is used in its contemporary usage, i.e. great or large, but also points out the subjective nature of “substantial” in this context.
4.3.4 Contracts. A similar set of conditions applies in analyzing contract impairment, the meaning of which has not changed significantly since the early 16th century. For example, Article I, Section 10, of the US Constitution contains a prohibition on any of the states passing a “law impairing the obligation of contracts...”. This means that a government cannot legislatively alter the terms of an existing contract involving a private party because it would lessen the terms of the obligation. For example, in the following dissent, Justice Davis points out what constitutes “substantial” depends on the nature of parties to the contract. The more powerful the party, the greater the scrutiny applied to the analysis of the contract.

Under contract impairment analysis ‘substantial’ has two dichotomous meanings. The initial determination is not, as the majority opinion conveniently assumes, a mere application of the substantial impairment test. The initial inquiry is a determination of whose contract is impaired by the legislation. This inquiry dictates the proper meaning to be applied to “substantial”. Therefore, as correctly argued by the respondent and the amicus in this case, the threshold for establishing a “substantial” impairment when evaluating a government contract is lower than the threshold for establishing a “substantial” impairment when evaluating contractual relationships between private parties. (West Virginia Regional Jail and Correctional Facility Authority vs West Virginia Investment Management Board, West Virginia Supreme Court, No. 25134).

4.4 Impairment of function or impairment of use
As it is used in a variety of contexts, the notion of impairment contains two alternate concepts, impairment of function and impairment of use. There is a difference in the way access might be involved in the functioning of a property compared to the way it might be involved in the use of a property. For example, impairment of function is a common term in the evaluation of neurological and physiologic impact on human motor and mental activity. Deterioration, injury or incomplete development of a physical element in a physiological or neurological system decreases the performance of some human activity that would otherwise be normal. Impairment of function, as applied in a broader sense, follows this same causal relationship: that something problematic in the underlying elements or structure of the object or system negatively impacts its ability to perform at an otherwise expected or normal level.

Impairment of function thus involves a change in the constitution, assembly or arrangement of the object or system itself (irrespective of its usefulness to a subject), whereas impairment of use involves a change in the relationship or interface between the object itself and the subject which uses the object. An impairment of function (substantial or not) may result in and be affirmed by the need for increased effort, for alternatives or for development of ameliorative or corrective measures, to use the object.

A variety of things can have their use impaired without a preceding impairment of function. If a person had a drinking glass and it broke, its function would quite certainly be impaired, “substantially” and probably completely. So would its use. Conversely, if that glass were completely intact, and was in a locked cabinet, its use would be impaired, but not its function. Or, suppose the outside surface of the glass was so greasy that it would slip out of someone’s grip. This would be an impairment of use, not function. The size and configuration of a small, two-seater sports car may impair its use by a very tall, large person such as an national football league (NFL) offensive lineman. Or consider a typical sedan built for use on roads in the UK. For an American, the positioning and arrangement of driving controls presents an impairment of use. In neither instance,
however, is function impaired. In consumer protection, the idea of impairment involves the consumer's use, not the object's function.

Impairment of use is not the same as impairment of function. Nor is it necessarily contingent on impairment of function. Nevertheless, it is not likely that something can be used if its function is substantially impaired. Impairment in the context of human disabilities directly relates to the physical functioning of the person in the everyday material world. A hand without a neurological capability cannot be used for writing. A substantial impairment of the structural integrity of a building is an impairment of function: the function of the structural system is to hold the building together. A similar example of impairment of use caused by impairment of function comes from a definition used in space and military procurement: "piece part: A single piece not normally subject to disassembly without destruction or impairment of use, such as resistors, transistors, relays and gears" (Jones, 1987). If the impairment can be corrected or mitigated or if it affects a part of but not all of the range of human activities, it is not substantial. Impairment of a property's access can affect or damage its usefulness, its functionality or both.

4.5 Access

Underlying the problem of the ambiguity of terms such as "substantial" and "reasonable" as they are used in courts and legislatures is an equally fundamental one. The concept of "access" itself is vague and poorly understood and little rigorous thought has been given to it. Both within and across the primary disciplines that address it, real estate and traffic engineering, there is no common definition of access. It is only in the context of building design, particularly for handicapped persons, that indifferent thinking about access begins to be replaced.

The Dictionary of Real Estate Appraisal defines access as the "path by which a property is approached through a neighborhood; the means of physical entrance into or upon a property" (American Institute of Real Estate Appraisers, 1989, p. 3). Montague (2000, p. 16-3), distinguishes between "access to and from" referring to a path of approach and "access on and off" referring to means of physical entrance. Access, both as a concept and as an operant, is a fundamental issue in analyzing real estate value. For example: "An appraiser analyzes all forms of access to and from the property and the neighborhood. ...Residential sites, for instance, are influenced by their access to workplaces, schools, shopping areas, recreational facilities and places of worship". (Appraisal Institute, 1992, p. 214) Access is also mentioned in the context of location which is typically defined as "time-distance relationships or linkages, between a property or neighborhood and all other possible origins and destinations of people going to or coming from the property or neighborhood (Appraisal Institute, 1992, p. 186). Access is often linked with a building's or site's visibility. For example, in Simons's (1992) study of site attributes, access and visibility accounted for about five percent of the first-year sales of a sub shop franchise. In developing their visibility index, Ordway et al. (1988) showed that poorly visible strip shopping centers had much higher vacancy levels.

The approach from traffic engineering is no less ambiguous. One state access management handbook defines access as "The ability to enter or leave a public street from or at an adjacent driveway or another public street (Center for Transportation Research and Education, 2000). Another says "Mobility is the efficient movement of people and goods. Access is getting those people and goods to specific properties" (Florida Department of Transportation, n.d.). A third calls access a "means of ingress
or egress between a primary highway and abutting property or an intersecting local public road or street" (Iowa Office of Traffic and Safety, n.d.).

Not only is there is no common definition of access across definitions, there’s no common definition within one. No wonder it’s hard to measure: in neither real estate nor traffic engineering is there a clear definition of access. As a result, the same physical evidence on impairment of access can be read in fundamentally different ways making it confusing and unpredictable. But there are other problems that bear on real estate analysis.

4.6 Access or accessibility
Access is frequently confused and conflated with accessibility in the discourse of traffic engineering, real estate, urban design and planning, geography and related disciplines. Haynes et al. (1999) say that accessibility has been modeled as a measure in terms of entropy, topology, gravity, distance, cumulative-opportunity measure and temporal/spatial components. They note that “accessibility is a slippery notion” and refer to Pierie (1979) who sees accessibility as “maximum contact with minimum activity”, an efficiency based concept. In real estate economics for example, although “access” (and not accessibility) is used in the title of an article addressing hedonic price modeling (Des Rosier et al., 2000), the issue being addressed is accessibility, not access as it is understood in access takings. In this article, as in many articles addressing geographic patterns and economic value, access and accessibility are often used interchangeably with each regarded as an attribute, not a spatio-material reality. Access is not simply another category between real estate and public streets; it is a use of the land and has spatial properties like any other land use.

Accessibility is not a measure of access, nor of the amount or degree of access. Accessibility is a measure of the effort of movement from one place or location to another. The surface movement system accommodates automobiles, large and small trucks, bicycles, pedestrians and wheelchair users each of which can require a different form of access. What is accessible for a pedestrian may not be for a wheelchair user (Barrier Free Environments, Inc., 1994). The difference between access and accessibility is the difference between a term referring to an object of analysis; access, and a term referring to a performance criterion or standard: accessibility. Accessibility is a function of form of access and means of movement. Formally: $A=f(\alpha, \mu)$ with $A =$ accessibility; $\alpha =$ a measure of access; and $\mu =$ a measure of movement.

5. Language and categories
5.1 Categories
Within the context of legal language itself, there are fundamental terminological problems that induce ambiguity. The terms, substantial, impairment, function and use are examples what Solan (1993) calls categorical indeterminacy, that is, when it is unclear whether a particular thing or event in question fits into a particular category of things or events. For example, it is not clear whether the word “substantial” refers to a measure or to something of substance. And while the terms “function” and “use” refer to different contexts of a thing’s performance, it appears that they are used interchangeably. While the relationship between things and the words describing them is rarely isomorphic, the notion of categorical indeterminacy, with its particular relevance to legal language, suggests that categories can supersede reality as a way of attempting to frame access problems. This also affects the logic of decision making. But, beyond categorical indeterminacy, there is an epistemological indeterminacy
involving not a categorical term nor even the referent of the term but the existence of concepts anchored in phenomena that the categorical terms in use do not, and probably cannot, accommodate.

In his analysis of the development of cognitive processes, Olson (1980) explains that cognitive representations emerge from different perspectives, from the available information about the world and at the same time from the available activities that order and represent the world. Therefore, the process of classification into categories abstracts from concrete characteristics of objects. This aspect of reflective abstraction (Piaget and Inhelder, 1972) in operations of classification contributes in a most important way to elaborate the classifiers’ cognitive systems. By classifying something, we have not only represented an element and placed it in an ordered relationship to other phenomena, by ordering things we also try to gain the power of predicting future events. Terms like substantial, impairment, access and affiliated terms need to be understood not simply as phenomena under dispute, but as mental organizing tools, as categories.

Amsterdam and Bruner (2000) analyze several U.S. Supreme Court opinions to illuminate the powerful impact of categorical thinking and show that the categorical approach characteristic of law can be seriously flawed and lead to unjustifiable opinions. As they point out, once some phenomenon, thing or event is put in a category, features of the category will be attributed to it and the features that don’t fit in the category will not be noticed. This is the case with access. Categories, according to Amsterdam and Bruner (2000), are grounded in conceptions of what matters to ourselves and to those upon whom we depend – our reference groups, as sociologists call those with whom we feel interdependent in the conduct of life. In his review of Amsterdam and Bruner, Winter (2001) says categorization is pragmatic, functional and “profoundly normative” because a judge cannot approach any case without bringing an entire repertoire of cultural categories and their normative meanings to it and that this is necessary if a judge is to be persuasive in the context of mainstream values.

5.2 Measuring a category
Reasons for judicial inconsistency in access takings stem partly from the problem of judicial decision-making in the larger realm of regulatory takings in general. Miceli and Segerson (1996) say that one of the difficulties is that the law requires a binary (all-or-nothing; compensate or not) solution to what is essentially a continuous problem (how much to compensate), and that there is no obvious rule when the line from compensable to non-compensable actions has been crossed. Under-compensation would result in more governmental project costs being borne by real property owners; overcompensation would result in higher taxes or refraining from undertaking beneficial public projects.

As in most public–private disputes, economic analysis usually focuses on efficiency. Two classic economic issues are typically involved in regulatory takings:

(1) moral hazard, which arises from any entitlement divorcing the consequences of people’s actions from their decisions (it occurs in insurance claims when the insured party has a low incentive to avoid loss); and

(2) fiscal illusion, which leads to government excess which can be curbed by requiring compensation.

However, a significant part of regulatory takings disputes involve an issue addressed not satisfactorily in economic analysis: fairness. The dilemma of fairness involves
addressing what Fischel (1995, p. 145) calls demoralization costs, the disutilities accruing to losers and their sympathizers and related observers who think they may be treated the same (unfair) way later. Demoralization costs would be calculated as the present capitalized value of lost future production caused by demoralization. Fischel says the source of demoralization costs is majoritarian exploitation, which is almost identical with fiscal illusion, and which causes the benefit cost ratio to be biased upwards thereby inducing undertaking too many projects. Land use regulations and road construction have been paradigmatic instances of majoritarian exploitation.

Approaching access as a “right” forces a binary (all-or-nothing) solution. The notion of a bundle of rights, of which access is one in the context of property says rights either exist or don’t. The exercise of a right may depend on conditions but it is either exercised or not exercised. When it is considered simply as a right, the only way access can be measured is as a nominal variable and this only in subjective qualitative terms. Variables measured on nominal scale allow only qualitative classification or categorization. They can be measured only to determine whether what varies falls in distinctively different categories – i.e. male or female, single- or multi-family. They cannot be ranked or quantified. Variables measured on ordinal scale can be rank-ordered. Something can be more or less, than something else (very hot, hot, warm) but how much more or less cannot be determined using an ordinal scale. An interval scale allows a variable to be quantified and the differences to be compared. Measuring temperature in degrees uses an interval scale. A temperature of 40° is not only greater than 30°, but a temperature increase from 20 to 40° is twice that from 30 to 40°. A ratio scale is similar to an interval scale but adds an absolute zero point. This makes it possible to compare quantities as ratios. On the Kelvin temperature scale, a ratio scale, a temperature of 1000° is not only higher than 100°, it is ten times as high.

5.3 Property as a category

Property is a powerful and broadly used idea and one of the most challenging areas of law and political philosophy. It is thus understandable when Minogue (1980) says property is the concept by which we find order in “things” and that this works at both the social and the epistemological level. Yet at the same time that property can be a thing it is also a right. As Grey (1986, p. 69) has pointed out, while most people conceive of property as things owned by persons, the specialist (the lawyer or property theorist) eliminates any necessary connection between property rights and things. Real property is a class or category which can be further sub-classified into more categories: for example, type, size, location, ownership. Baechler (1980) says, “The expression “private property” is a pleonasm – a contradiction. Simultaneously, one cannot speak of “public property” without conceptual and logical contradiction”. Nevertheless, property rights depend on the category of property. Streets are property owned by governments which can exercise the power to exclude.

It is worth further noting that judicial opinions in access cases rarely use the term “real estate”. Instead, it’s “property”. Technically, real estate denotes owned land and buildings and other physical built features on it; real property refers to the benefits and rights inherent in owned real estate. But these terms are frequently conflated, even by those in the real estate discipline. Bell (1998) says that while common speech says a person owns a “property”, this is true only if all resources associated with this object are owned. For example, a hotel has a variety of characteristics that can generate different and de-coupled use and revenue rights – the alienable rights to use rooms; alienable rights to manage it, etc. “The [hotel] can be referred to only as property only if
all of its relevant characteristics are bundled together in a single right of alienation”. Thus the legal language of access impairment uses what Hunt (1998) would call a folk concept of property in addressing access.

6. Conclusion
The law on access results in confusing judgments for several reasons. One is that the terminology of access is a victim of indifferent thinking in the principal disciplines (real estate and traffic engineering) that address the technical issues of access. Another is that, by relying on a categorical approach, the analysis of access is subjective, intuitive and inexact, thus inducing patterns of boundedly rational behavior. This paper has sought to show that addressing the problems of access analysis is like opening a set of Chinese boxes: that categories are contained in language which operates inside heuristics within a larger constraint of information structures.

Jolls and Sunstein (2006) point out that when a particularly important aspect of bounded rationality is shown to exist, legal policy can be developed to address it. One alternative is attempting to reduce or to eliminate biases through what they call “debiasing through law”, an approach that avoids paternalism. Another more common one is “designing legal rules and institutions so that legal outcomes do not fall prey to problems of bounded rationality ( )”. What seems evident in the above discussion is that the source of inconsistencies in addressing access derives less from bias and more from framing effects inherent, not in the situation or context but, in natural language, a deeper cognitive factor inherent in human evolutionary psychology. Carruthers (2008) says language has evolved to play a quasi-executive function that influences attention and online goals. To the extent it is natural language itself, not simply framing or bias, what can be done to remediate the problem is more complex (McDermott et al., 2008).

The economic reality of access and its impairment is that of transaction costs. Transaction costs are frictions and frictions occur at interfaces. Williamson (2007) proposes that transactions involve crossing “a technologically separable interface”. A total access taking (that creates landlocked conditions) completely separates activity at movement interfaces and a partial one (that alters not only on–off but also to–from conditions) very likely increases the friction. But the terminology of access is unable to measure either the friction or its cost.

In conclusion, the question here is at what point does a quantitative change (an increase in friction) result in a qualitative change of in access. The problem in defining “substantial” is a phenomenon known as Hegel’s law of the transition of quantity into quality. Hegel used the example of the boiling or freezing of water which occurs as its temperature rises above 100°C or falls below 0°C. The quantitative change in its temperature leads to a qualitative change in its state or form: from liquid to gas and liquid to solid. Is this a substantial change – a change of substance or a formal change – a change of form? But change under many conditions is reversible. When a quantitative change occurs irreversibly, as in the case of impairment of a building’s structural integrity, the resulting qualitative change may be one of form, not of substance. This is a question that cannot be answered directly using categories from natural language. Changes of form, particularly physical form (which is non-discursive), need to be analyzed using non-discursive techniques or methods in much the same way that the structural integrity of a building is analyzed. Thus an ontology of access needs to be developed. A variety of methods developed in recent years employing combinations of planar geometry, topology and discrete geometry can be applied to the access problem in order to establish its ontological reality. But to explain
how this is done and how legal rules might accommodate it is beyond the scope of this paper.

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Further reading

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