A Means-End Classification
of Argumentation Schemes

Fabrizio Macagno

1 Introduction

Argumentation schemes have been developed in argumentation theory as stereo-typical patterns of inference, abstract structures representing the material (semantic) relation and logical relation between the premises and a conclusion in an argument with a corresponding set of critical questions indicating their defeasibility conditions (Walton et al. 2008). They can be regarded as the modern interpretation and reconsideration of the ancient maxims of inference (Walton et al. 2008; Walton and Macagno 2006). Many authors in the last 50 years have proposed different sets and classifications of schemes (see Hastings 1963; Perelman and Olbrechts-Tyteca 1969; Kienpointner 1992a, b; Walton 1996; Grennan 1997; Walton et al. 2008; van Eemeren and Grootendorst 2004). These approaches raise crucial problems concerning the criteria used for distinguishing and classifying the schemes, and defining the structure of an argumentation scheme. These apparently purely philosophical questions are becoming increasingly important for practical purposes, in particular the application of the schemes to the field of education (Macagno and Konstantinidou 2013; Nussbaum 2011; Duschl 2008; Kim et al. 2012; Rapanta et al. 2013) and Artificial Intelligence (Mochales and Moens 2009, 2011).

The purpose of this paper is to address the problem of classifying the schemes, starting from the analysis of their nature and structure. The different components of the natural patterns of arguments will be distinguished, and in particular the quasi-logical and the semantic levels. These distinctions will be used to show the shortcomings of the existing classifications, and to propose a new model based on the pragmatic purpose of an argument, which is regarded as a move (speech act) in a dialogue.

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2   Existing Classifications

In the modern and contemporary theories on argumentation (or argument) schemes, several types of classification have been advanced (Walton et al. 2008, Chap. 8). The crucial problem that these theories tried to address is to manage and organize a potentially high number of patterns, so that they can be easily selected and used both for production and analytical purposes.

Perelman and Olbrechts-Tyteca conceived their system of *topoi* into two broad categories, defined based on the two purposes that they considered to be the basic ones, finding associations and dissociations between concepts (Perelman and Olbrechts-Tyteca 1969, p. 190). According to the New Rhetoric, arguments from association are divided in three main classes: Quasi-logical Arguments, Relations Establishing the Structure of Reality, and Arguments based on the Structure of Reality, while dissociation constitutes a distinct class. This classification can be represented as follows (Fig. 1):

This classification is based on several criteria, namely the conceptual-ontological structure (association-dissociation; the reference to the structure of reality), the logical structure (quasi-logical vs. non-logical arguments), and the type of relations

Quasi-Logical Arguments
▪ Contradiction and Incompatibility
▪ Identity and Definition
▪ Analyticity, Analysis and Tautology
▪ The Rule of Justice
▪ Arguments of Reciprocity
▪ Arguments of Transitivity
▪ Inclusion of the Part in the Whole
▪ Division of the Whole into its Parts
▪ Arguments by Comparison
▪ Argumentation by Sacrifice
▪ Probabilities

The Relations Establishing the Structure of Reality	
Establishment through Particular Case	Reasoning by Analogy
▪ Example ▪ Illustration ▪ Model and Anti-model	▪ Analogy ▪ Metaphor

Arguments based on the Structure of Reality			
Sequential Relations	The Relations of Coexistence	Double Hierarchy Argument	Differences of Degree and Order
▪ Causal Link ▪ Pragmatic Argument ▪ Ends and Means ▪ Argument of Waste ▪ Argument of Direction ▪ Unlimited Development	▪ Analogy ▪ The person and His Acts ▪ Argument from Authority ▪ The Speech as an Act of the Speaker ▪ The Group and its Members ▪ Act and Essence ▪ Symbolic Relation		

Fig. 1 Classification of the arguments in the New Rhetoric

between concepts (sequential vs. coexistence). However, the interrelation between all these criteria is not specified, and there is not a unique rationale linking all such different arguments.

A different approach is provided by Toulmin, Rieke and Janik in *An introduction to reasoning* (1984). The classification advanced here is based on the basic functions of the warrants on which the arguments are grounded. Their attempt was to analyse the patterns of reasoning without taking into account their purpose, or their field of use. In this fashion, nine general classes of arguments were distinguished, subdivided into subclasses (Toulmin et al. 1984, p. 199) (Fig. 2):

Also in this case, different criteria are used for the classification. Some schemes represent different types of reasoning (generalization, sign, analogy); others are characterized by logical rules of inference (dilemma, opposites), while others refer to the content of the argument (authority, classification, cause, degree). The relationship between the various criteria is not given.

The classification provided by Kienpointner in *Alltagslogik* is extremely complex and fine-grained. He analyses the scheme based on two distinct criteria, one based on the type of inference, the other on the epistemic nature of the premises and pragmatic function of the conclusion. On this view, every scheme must have either a descriptive or a normative conclusion, must be pro or contra a certain thesis, and must be real (namely based upon the truth or likeliness of the premises), or fictive (grounded upon the mere possibility) (Kienpointner 1992a; 1992b, p. 241). In this sense, all the schemes can have descriptive or normative, pro or contra, real or fictive variants. The classification provided in *Alltagslogik* groups 21 schemes in three abstract classes characterized by the typology of the inferential rule: argument schemes using a rule; argument schemes establishing a rule by means of induction; and argument schemes both using and establishing a rule. The first general class is subdivided in its turn in four content-based categories: classification, comparison, opposition, and causal schemes. The classification appears as follows (Kienpointner 1992a; 1992b, p. 246) (Fig. 3):
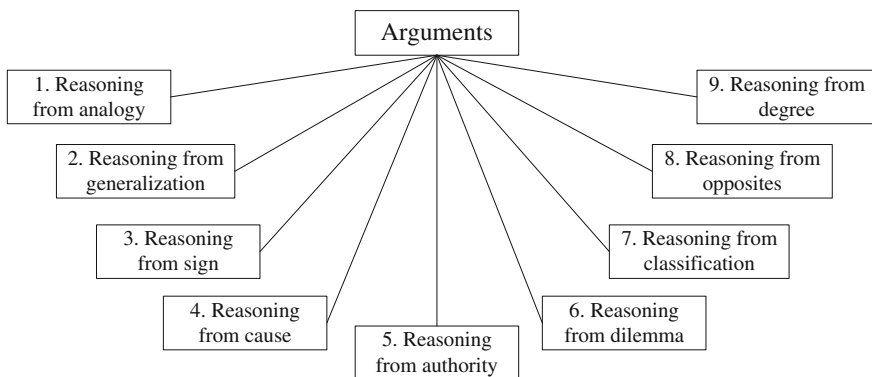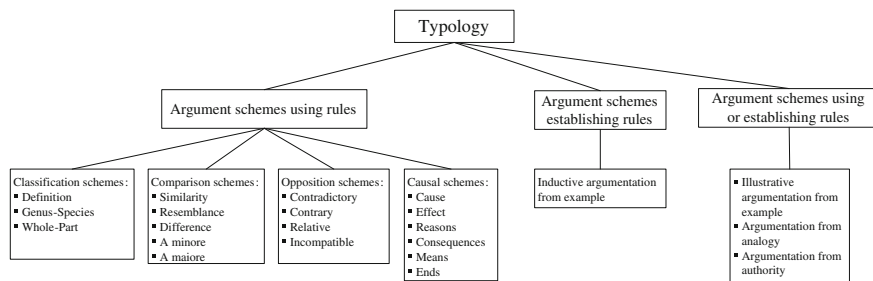

Fig. 2 Classification of the arguments in Toulmin

Fig. 3 Classification of the arguments in Kienpointner

Based on the aforementioned dichotomic criteria, all the argument schemes may in turn have descriptive or normative variants, different logical forms (*Modus Ponens*, *Modus Tollens*, Disjunctive Syllogism, etc.), and different word-world relation (fictive—real).

This type of classification is also based on a twofold criterion, the logical structure of the scheme (whether proceeding from a rule or establishing it inductively) and the content. However, as shown below, these two dimensions cannot be considered as matching. Moreover, reducing most of the schemes to quasi-deductively valid inferences risks overlooking the actual type of reasoning underlying an argumentation scheme (Lumer 2011, p. 3). Moreover, the pragmatic dimension taken into account as a variant of the schemes does not account for the specific type of reasoning (rule or value based) that underlies a normative conclusion.

The pragma-dialectical system of classification of schemes consists of three basic schemes (van Eemeren and Grootendorst 1992, pp. 94–102): the symptomatic argumentation, the argumentation based on similarities, and the instrumental argumentation. The first one represents types of argumentation in which the speaker tries to convince his interlocutor "by pointing out that something is symptomatic of something else," in the sense that what is stated in the argument is a sign or symptom of what is stated in the standpoint. The second scheme is grounded on a relation of analogy between what is stated in the argument and what is stated in the standpoint. Finally, in the third type of scheme the argument and the conclusion are linked by a very broad relation of causality. All the arguments are classified under these categories (van Eemeren and Grootendorst 1992, p. 97). For instance, arguments based on inherent qualities or a characteristic part of an entity or from authority are regarded as belonging to the symptomatic argumentation; arguments pointing out the consequences of an action or based on the means-end relationship are considered as subclasses of causal arguments (Garssen 2001, p. 91). Also in this case, the system of classification is grounded on a twofold criterion. While the causal argumentation is characterized by a material relation, the analogical argumentation represents rather a type of reasoning independent from the specific content of the premises and conclusion. The symptomatic argumentation is a combination of these two criteria, as a sign or a symptom presupposes an abductive pattern and a material causal relation.

The last system of classification that we can take into account is provided by Lumer (2011). He distinguishes the argumentation schemes by setting out three general classes, each including subclasses:

1. Deductive argument schemes

    a. Elementary deductive argument schemes;
    b. Analytical arguments;
    c. Definitoric arguments;
    d. Subsuming legal arguments;

2. Probabilistic argument schemes

    a. Pure probabilistic argument schemes (statistics, signs);
    b. Impure probabilistic argument schemes (best explanation);

3. Practical argument schemes

    a. Pure practical argument for pure evaluations;
    b. Impure practical argument schemes (for justification of actions; justification of instruments);
    c. Arguments for evaluations based on adequacy conditions;
    d. Arguments for welfare-ethical value judgements;
    e. Practical arguments for theoretical theses.

Also this system consists of a mix of two distinct criteria, the logical and the pragmatic one. While the first two classes are characterized by the type of reasoning on which they are based, the last one is rather a type of argument with a specific pragmatic purpose, recommending a course of action. Moreover, the subclasses are defined considering both logic-based and content-based criteria, where together to distinctions grounded on the logical form (analytic schemes; probabilistic schemes) some subclasses are based on the nature of the premises (definitoric; subsuming).

All these types of classification show how a sole criterion is not sufficient for providing a clear and comprehensive classification of schemes. In order to understand what criteria can be used and what abstract categories can be considered as the most basic ones, it is necessary to analyze the structure of the schemes. Once the common components of these heterogenic combinations of premises and conclusions are brought to light, it can be possible to find criteria for organizing them for specific purposes.

3 Types of Reasoning and Semantic-Ontological Connections

The relationship between the premises and the conclusion of an argument can be reconstructed based on generic principles. What guarantees the inferential passage is a specific major premise that includes the predicates occurring in the minor

premise and the conclusion. In order to reconstruct and motivate the inferential structure, we need to distinguish the specific principle of inference from two other different levels: (1) the general rules of inference, i.e. the generic, semantic-ontological connections between the predicates of the argument, which establish the *acceptability* of an argument; and (2) the logical rules governing the formal disposition of the terms or propositions in an argument, i.e. the rules of commitment establishing the *acceptance* of an argument. These levels of abstraction will be referred to as "specific *topoi*," "generic *topoi*," and "rules of commitment" (or logical rules).

3.1   Specific **Topoi**

In the *Topics*, Aristotle pointed out a crucial difference between the *topoi* (or rather generic topics) and the *idia* (the specific topics) (Rubinelli 2009, pp. 59–70). According to Aristotle, the specific *topoi* represent propositions that relate to specific disciplines, such as ethics, law, or medicine, which are used to draw specific conclusions. For instance, in the third book of the *Topics* some specific principles of inference concerning the classification of "what is better" are set out (*Topics,* 116a 13–18). Specific topics can be used both as an instrument for invention, namely for generating and finding the premises of an argument, and as premises warranting the conclusion (De Pater 1965, p. 134; Stump 1989, p. 29). For instance, a specific *topos* concerning one of the possible ways of classifying an action as "better" than another can be directly used to support the conclusion. We can analyze the following case:

> Saving the money for buying a house is more desirable than spending it on expensive cars, because a house is more lasting than a car.

The reasoning can be represented as follows:

Minor premise	A house is more lasting than a car
Major premise	That which is more lasting or secure is more desirable than that which is less so
Conclusion	A house is more desirable than a car

The specific *topos* indicating one of the possible "operational" definitions of "to be better" directly warrants the conclusion. In specific domains of knowledge, specific *topoi* can be listed as instruments of invention, pre-packaged arguments that be used for supporting prototypical viewpoints. For example, ancient and modern treatises on legal topics (or rather on the specific commonly accepted principles of reasoning) indicate hundreds of topics that can be used by lawyers in certain circumstances, such as the following ones:

> When a man and a woman refer to each other with the name of "spouse," marriage is not proven, but is presumable. (Everardus, *Loci Argumentorum legales*, 54, 13th paragraph). Where a person does an act, he is presumed in so doing to have intended that the natural and legal consequences of his act shall result. (Lawson 1885, p. 262)

These propositions are used in law to support specific conclusions, i.e. *prima facie* cases that can be rebutted when additional information comes in. Such arguments, however, have the purpose of shifting the burden of production, leaving it up to the other party to provide contrary evidence.

Specific *topoi* provide relations between specific concepts ("acts"), which are abstracted from their individual occurrences (this specific act). These specific rules of inference are the subject matter of a further process of abstraction, leading from concepts to categories of concepts or meta-concepts, the generic *topoi*.

3.2 Generic **Topoi**—*Semantic-Ontological Relations*

Generic topics can be considered as the result of abstractions from the specific ones, or more correctly, from a large number of specific topics. They provide classes of both necessary and defeasible inferences. In the first class fall some maxims setting out definitional properties of meta-semantic concepts, i.e. concepts representing semantic relations between concepts, such as definition, genus, and property. For example the *locus* from definition, which establishes the convertibility between definition and *definiendum*, represents also the essential logical characteristic that a predicate needs to have in order be considered as a "discourse signifying what a thing is." Other *loci*, such as the ones based on analogy or the more and the less, are only defeasible, as they represent only commonly accepted relationships.

In the *Topics*, Aristotle focuses most of his analysis on the topics governing the meta-semantic relations between concepts, i.e. genus, property, definition, and accident. Cicero reduced the Aristotelian list of *topoi* to 20 *loci* or maxims, grouping them in generic categories (differences) and dividing them in two broad classes, the intrinsic and the extrinsic topics. While the first ones proceed directly from the subject matter at issue (for instance, its semantic properties), the external topics support the conclusion through contextual elements (for instance, the source of the speech act expressing the claim). In between are the topics that concern the relationship between a predicate and the other predicates of a linguistic system (for instance, its relations with its contraries or alternatives). We can represent Cicero's topics as follows (Fig. 4):

This classification was the model that was taken into account by several dialectical theories, of which the most important, due to its influence on the further medieval accounts, is the one developed by Boethius in *De Topicis Differentiis*.

Intrinsic		Extrinsic
Directly from the subject matter	**From things somehow related to the subject matter**	
1. *definitio* • By material parts (whole-part definition) • By essential parts (genus-species definition) 2. *notatio* (etymological relation)	1. *Coniugata* (inflectional relations) 2. *Genus* (genus-species relation) 3. *Forma* (species-genus relation) 4. *Similitudo* (similarity relation) 5. *Differentia* (difference relation) 6. *Contraria* (4 types of opposite relation) 7. *Adiuncta* (relation of concomitance) 8. *Antecedentia* 9. *Consequentia* 10. *Repugnantia* (incompatibles) 11. *Efficentia* (cause-effect relation) 12. *Effecta* (effect-cause relation) 13. *Ex comparatione maiorum, minorum, parium* (comparison)	Authority

Fig. 4 Cicero's classification of *generic topics*

3.3 Rules of Commitment—Logical Form

The Latin and medieval dialectical tradition analyzed in depth a type of *loci* that are not based on any semantic, metaphysical, or ontological relationship between concepts. These *loci* are not aimed at increasing the *acceptability* of a conclusion based on the *acceptability* of the content of its premises. Rather, they represent relations of *acceptance* (or commitment) between propositions. For instance, the acceptance of (or commitment to) the consequent of a conditional proposition follows from the acceptance of—or commitment to—the conditional and the antecedent thereof (Cicero, *Topica*, 53, 1–25). These "formal" topics were analyzed in particular in the dialectical theories of the 12th and 13th century. Such theories conceived the categorical syllogisms as proceeding from topics from the whole to the part, called "*dici de omni*" and "*dici de nullo*." These topics were grounded not on the semantic-ontological content of the propositions, but only on the meaning of the quantifiers (Green-Pedersen 1984, p. 256).

This distinction between semantic-ontological and formal (logical) topics suggests an analysis of the different rules of inference in which the semantic-ontological topics are combined with the logical rules. Formal topics can be thought of as representing the highest level of abstraction, which groups together more generic principles different and somehow similar argument structures (Searle 2001, p. 19). For example, the ancient topics from antecedents or "*dici de omni*" formalize the deductive pattern of *modus ponens* normally used in dialectics. However, many acceptable and reasonable arguments, such as reasoning from example or sign, follow formal patterns different from the deductive ones (see also

Blair 2007; Godden 2005). In addition to the deductive rules, also the inductive ones need to be accounted for, and the type of reasoning called "abduction" (Pierce 1992, pp. 140–141), "retroduction" (see Greenland 1998, p. 545; Poole 1988) or reasoning from best explanation (Josephson and Josephson 1996, p. 15).

The prototypical relationship between the types of argument and the logical level of abstraction can be summarized in the table below, where three most important types of reasoning (or categories of arguments of the highest level) are distinguished (Fig. 5):

This classification suggests the possibility of analyzing arguments from a multi-logical perspective, in which the logical form can be described using distinct *types of reasoning*, which in turn can include various *logical rules of inference* (*MP*, *MT*…). However, in the Latin and medieval tradition, the formal rules of inference are treated as maxims and not as distinct levels of abstraction. For this reason, the two levels of the general, semantic topics and of the logical rules were not distinguished, and the possible interconnections between them were not taken into account.

The modern theories of argument schemes or argumentation schemes inherited this model, proposing classifications essentially mirroring the ancient approach. The rules of commitment are treated at the same level as the semantic-ontological topics, and not as distinct levels of abstraction. This approach can be extremely helpful for quickly identifying common characteristics in the arguments that are frequently used, but it leads to classificatory problems. A possible solution is to acknowledge the discrepancy between logical form and semantic content as a divergence in kind, and try to show how these two levels can be interconnected. The starting point is the model that, by merging the two levels, best mirrors the multi-logical approach to natural arguments: the model of argumentation schemes (Walton et al. 2008).

Type of reasoning (abstraction - form)	Deductive axioms	Induction	Abduction
Type of argument	Argument from definition, genus...	Argument from example	Argument from (improper) signs
	Argument from cause to effect	...	Practical reasoning
	Argument from consequences	...	Argument from best explanation
	Argument from commitment	...	...

Fig. 5 Types of argument and types of reasoning

4   Argumentation Schemes as Imperfect Bridges

Argumentation schemes are stereotypical patterns of inference, combining semantic-ontological relations with types of reasoning and logical axioms and representing the abstract structure of the most common types of natural arguments. The argumentation schemes provided in (Walton et al. 2008) describe tentatively the patterns of the most typical arguments. However, the two levels of abstraction are not distinguished. For this reason, under the label of "argumentation schemes" fall indistinctly patterns of reasoning such as the abductive, analogical, or inductive ones, and types of argument such as the ones from classification or cause to effect.

In order to design a system for classifying the schemes, it is useful to understand the limits thereof, and investigate how the two distinct levels of abstraction are merged. For example the argument from cause to effect will be taken into account (Walton et al. 2008, p. 168):

Argument from cause to effect

Major premise	Generally, if A occurs, then B will (might) occur
Minor premise	In this case, A occurs (might occur)
Conclusion	Therefore in this case, B will (might) occur

This argumentation scheme is based on a defeasible *modus ponens*, which is combined with a semantic causal relation between two events. The semantic-ontological level is merged with the logical one, and this combination represents only one of the possible types of inferences that can be drawn from the same semantic-ontological connection. The actual relationship between the two levels of abstraction is much more complex. For example, we consider the classic Aristotelian causal link between "having fever" and "breathing fast," and see how this cause-effect relation can be used to draw a conclusion on the basis of different logical rules:

1. He had fever. (**Fever** causes breathing fast). Therefore, he (must have) breathed fast.
2. He did not breathe fast. (Fever causes **breathing fast**). Therefore, he had no fever.
3. He is breathing fast. (Fever causes **breathing fast**). Therefore, he might have fever.
4. He has no fever. (**Fever** causes breathing fast). Therefore, he may be not breathing fast.
5. You may have fever. When I had fever, **I** was breathing fast, and you are breathing fast.

These cases illustrate how different logical rules can be followed to draw a conclusion from the same semantic connection, in this case a causal relation. Cases (1) and (2) represent instantiations of defeasible axioms, i.e. the defeasible *modus*

ponens (in 1), and the defeasible *modus tollens* (in 2). Cases 3 and 4 proceed from abductive reasoning. In (3) the conclusion is drawn by affirming the consequent, while in (4) the denial of the antecedent can be rephrased by contraposition as "not breathing fast is caused by having no fever," leading to a conclusion drawn abductively (Walton et al. 2008: 173). Finally, in (5) the conclusion is based on an inductive generalization, based on a single case. The prototypical nature of the relationship between semantic relations and logical rules (types of reasoning and axioms) hides, in this sense, the lack of correspondence between these two levels. For this reason, a classification system of the argumentation schemes based on these criteria would be inaccurate. Different criteria are needed, accounting for this twofold nature of the schemes.

5   A Means-End Classification

Argumentation schemes can be conceived as the combination of semantic (or topical) relations with logical rules of inference. A classification based on the semantic links can provide an instrument for bringing to light the material relations between premises and conclusion. However, the same semantic relation can be combined with various logical rules, and lead to various types of conclusion. For example, causal relations are the ground of the argument from cause to effect, but also of arguments from sign and practical reasoning. A classification based only on the semantic content would blur these fundamental differences. For this reason, it is necessary to find an overarching classificatory principle.

Argumentation schemes can be thought of as instruments for reconstructing and building arguments (intended as discourse moves), i.e. analytical or invention tools. For this reason, in order to provide a classificatory system to retrieve and detect the needed scheme it can be useful to start from the intended purpose of an argumentation scheme. From an analytical point of view, the analysis of an argument in a discourse, a text, or dialogue presupposes a previous understanding of the communicative goal (and, therefore, the "pragmatic" meaning) of the argument and the components thereof. For example, an argument can be aimed at classifying a state of affairs, supporting the existence of a state of affairs, or influencing a decision-making process.

This teleological classification needs to be combined with a practical one, as the generic purposes of a move need to be achieved by means of an inferential passage. In this sense, the classificatory system needs to account for the possible means to achieve the pragmatic purpose of an argument. Not all the semantic (material) relations that are at the basis of the schemes can support all the possible conclusions or purposes of an argument. Definitional schemes are aimed at supporting the classification of a state of affairs, and are unlikely to lead to the prediction or retrodiction of an event. Similarly, a pattern of reasoning based on the evaluation of the consequences of an action or an event can be used to establish the desirability of a course of action bringing it about, but cannot reasonably lead to the truth or falsity

(or acceptability) of a proposition. For this reason, the analysis of the pragmatic meaning (i.e. the purpose) of an argument provides a criterion for restricting the paradigm of the possible means to achieve it. The crucial problem is to find categories of argument purposes that can establish criteria for distinguishing among classes of semantic relations, which in turn can be specified further according to the means to achieve such goals.

The first distinction to be made is based on the nature of the subject matter, which can be a course of action or a state of affairs. In the first case, the goal is to support the desirability or non-desirability of an action, while in the second one the schemes are aimed at providing grounds for the acceptability of a judgment on a state of affairs. The ancient dialectical accounts (see Cicero, *Topica* and Boethius, *De Topicis Differentiis*) distinguished between two types of argumentative "means" to bear out a conclusion, i.e. the "internal" and the "external" arguments. The first ones are based on the characteristics of the subject matter (such as arguments from definition or cause), while the others derive their force from the source of the statement, i.e. from the authority of who advances the judgment or the proposal (arguments from authority). This first distinction can be represented as follows (Fig. 6):

The acceptability of a conclusion can be supported externally in two ways. If the argument is aimed at establishing the desirability of a course of action, the authority can correspond to the role of the source needed for recommending or imposing a choice ("You should do it because he told you that!"). Otherwise, the popular practice can be a reason for pursuing a course of action ("We should buy a bigger car. Everyone drives big cars here!"). When external arguments are used to support also a judgment on a state of affairs, the relevant quality of the source is not the
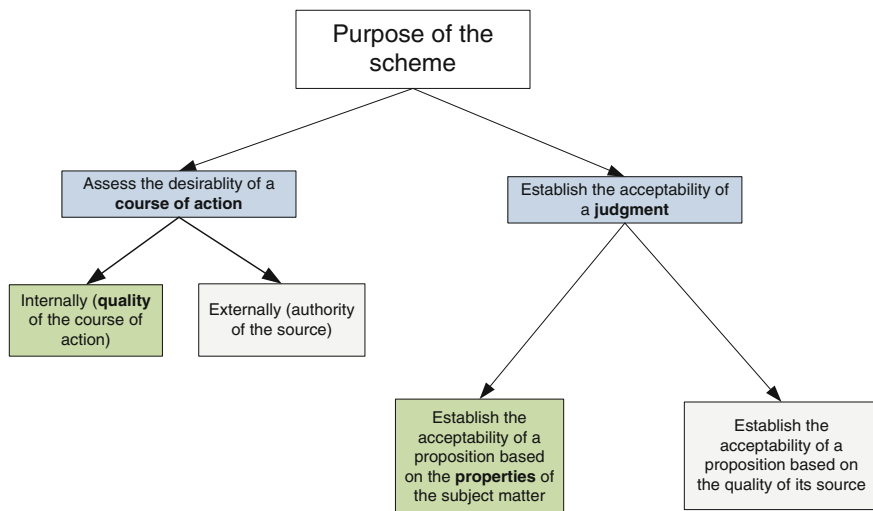

Fig. 6 Basic purposes of an argument

speaker's authority (which is connected with the consequences of not complying with the orders/conforming to common behavior) but rather with his superior knowledge. The quality of the source can be also used negatively to show that a source is not reliable (it is not a good source), and that consequently the conclusion itself should be considered as doubtful (*ad hominem* arguments). The external arguments can be represented as follows (Fig. 7):

Internal arguments need to be divided into the two categories of arguments aimed at assessing the desirability of a course of action, and the ones supporting the acceptability of a judgment. Courses of action can be classified as desirable or not depending on the quality of their consequences (the course of action is a condition of a resulting positive or negative state of affairs) or their function in bringing about a desired goal (an action is productive of a desired state of affairs) (Fig. 8):

The arguments used to provide grounds for a judgment on a state of affairs can be divided according to the nature of the predicate that is to be attributed. The most basic differentiation can be traced between the predicates that attribute the existence of a state of affairs (the occurrence of an event or the existence of an entity in the present, the past, or the future), and the ones representing factual or evaluative properties. The arguments supporting a prediction or a retrodiction are aimed at establishing whether or not an event has occurred or will occur, or whether an entity was or will be present (existent). The arguments proceeding from casual relations (in particular from material and efficient causes) bear out this type of conclusion. The other type of predicates can be divided in two categories: factual judgments and value judgments. The first type of predicates can be attributed by means of
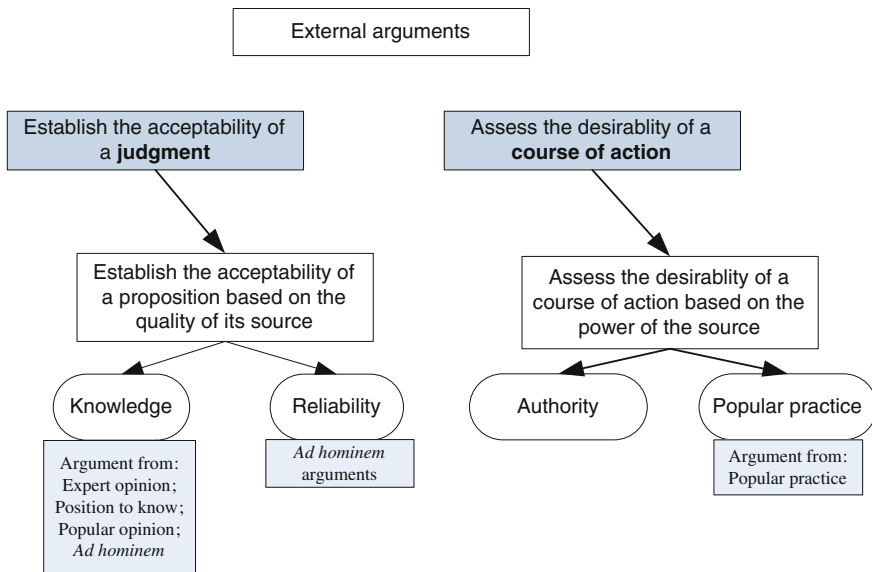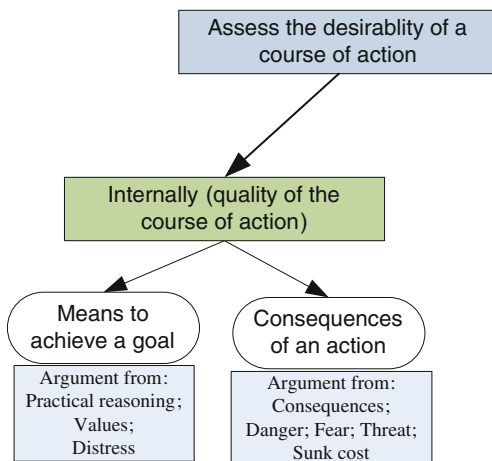

Fig. 7 External arguments

reasoning from classification, grounded on descriptive (definitional) features and supporting the attribution of a categorization to an entity or an event (Bob is a man; Tom is a cat). Value judgments are classifications that are not based on definitions of categorical concepts (to be a cat) but on values, or rather hierarchies of values. Such judgments proceed from criteria for classifying what is commonly considered to be "good" or "bad." Also the reasoning underlying the attribution of evaluative predicates, such as "to be a criminal," can be considered as belonging (also) to this group of arguments. These latter patterns are grounded on signs of an internal disposition of character, which in its turn is evaluated. The distinctions discussed above are summarized in Fig. 9 below.

This system of classification of argumentation schemes is based on the interplay between two criteria, the (pragmatic) purpose of an argument and the means to achieve it. This dichotomic model can be used both for analytical and production purposes. In the first case, the speaker's intention is reconstructed by examining the generic purpose of his move, and then the possible choices that he made to support it, based on the linguistic elements of the text (Macagno and Zavatta 2014; Macagno and Walton 2014a, Chap. 5; Macagno and Damele 2013). Depending on the desired level of preciseness, the analysis can be narrowed down until detecting the specific scheme, i.e. the precise combination of the semantic principle and the logical rule supporting the conclusion. In this fashion, the analyst can decide where to stop his reconstruction. This analytical model can be of help also for educational purposes, as it can be adapted to various teaching needs and levels (detecting arguments in a text; reconstructing implicit premises, etc.). For production purposes, the nature of the viewpoint to be argued for opens up specific alternative strategies to support it, which in turn can be determined by the characteristics of the conclusion.

This model relies on the analyst's or the speaker's reconstruction (or awareness) of the purpose of a move, which can be partially identified by taking into
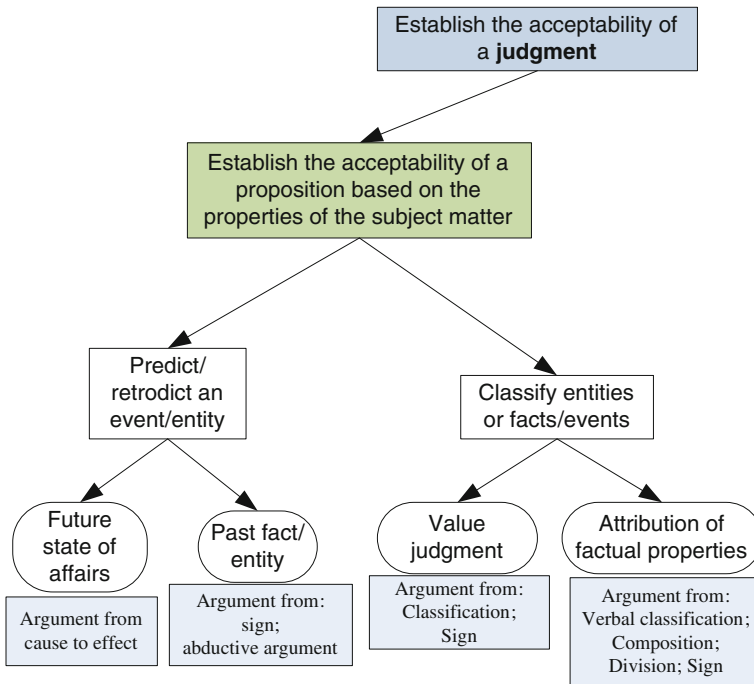
Fig. 9 Establishing the acceptability of a judgment on a state of affairs

consideration the nature of the subject matter (whether it is a decision or a judgment). The purpose then opens up possible choices according to the generic goal of the communicative act. The speaker's intention can be further specified by detecting the most generic strategy chosen to provide a basis for the acceptability of the conclusion. In this case, in order to reconstruct the move or provide an argument, the analyst or the speaker can choose whether to use some properties of the subject matter or to appeal to an external source. In the first case, the means used to achieve the goal are determined by the nature of the subject matter. In particular, the crucial distinction is between the classification and the prediction or retrodiction of an entity or state of affairs. This choice leads to a further specification of the nature of the viewpoint that the speaker intends to support with his argument (is the event a future or a past one? is the classification a value judgment or does it consist in the attribution of factual properties?), and then to the specific means that can be used to achieve this precise purpose (argument from values, from definition, etc.). In case of decision-making, the argumentation schemes are classified according to the same interrelation between goals and generic strategies. The internal arguments can be divided between reasoning from consequence and reasoning from means to goal.

An alternative to the internal, more complex arguments, is provided by external arguments, where the choice of backing the conclusion by means of the opinion of a knowledgeable and reliable source can be further made more specific by

distinguishing between the kinds of sources (experts or the majority of people) and the nature of the support (knowledge or reliability).

The semantic relation characterizing a scheme can be "shaped" according to different types of reasoning, namely logical forms. For instance, the desirability of a course of action can be assessed internally by taking into consideration the means to achieve a goal. However, this pattern of reasoning can be stronger or weaker depending on whether there is only one or several alternatives. The paradigm of the possible means will determine whether the reasoning is abductive or deductive, resulting in a conclusion more or less defeasible. The same principle applies to the other semantic relations, such as the ones proceeding from cause or classification, which can be shaped logically according to inductive (or analogical), deductive, or abductive types of reasoning.

6   Conclusion

The classification of argumentation schemes is a problem from which their development and application depends. Given their number and complexity, their use becomes problematic without a system guiding their selection. In order to organize the schemes in a useful and accessible way, it is crucial to understand their nature and their components. Argumentation schemes are the result of a combination of two levels of abstraction: semantic (or topical) relations, and logical forms. Semantic relations provide a criterion of classifying the arguments based on the content of their major premise, and represent what makes a conclusion more *acceptable* than the premises. The logical forms (the types of reasoning and rules of inference) instantiate the rules of *acceptance*, namely how a premise supports a conclusion based on the relation between the antecedent and consequent, or between the quantification of the predicates in the premises and the conclusion. The possible combinations between them are extremely complex. Argumentation schemes are imperfect bridges between these two levels. They are the most frequent and common combinations that characterize the fundamental arguments used in everyday argumentation. They are incomplete abstractions, simplified and proto-typical patterns that cannot be organized according to the aforesaid semantic and logical levels.

In order to classify the schemes, it is necessary to find a criterion of classification transcending both levels of abstraction, and leading to a dichotomic system, which can be used proceeding both from the affirmation of a disjunct, and from exclusion of the alternative. The classificatory system proposed in this paper is not based on what an argument is, but rather on how it is understood and interpreted, i.e. on its communicative purpose. In this fashion, a classification system can mirror the actual practices of reconstructing and using arguments. The pragmatic purpose of an argument is connected with the means to achieve it, which are determined by the ontological structure of its conclusion and premises. On this view, it is possible to suggest a course of action, to predict an event, or to classify an entity, depending on

the nature of the predicate(s) attributed in the premises that support or can be used to support the conclusion. The system of classification becomes a tree of dichotomic choices aimed at reconstructing or achieving a communicative goal.

This proposal presupposes a strict interaction between the pragmatic and the reasoning dimension of discourse. An argument is regarded as a speech act, whose meaning depends on how it can be reasonably interpreted in a specific context by a specific interlocutor (Macagno and Zavatta 2014; Macagno and Douglas 2015; Macagno and Walton 2014b). For this reason, pragmatically ambiguous messages reveal different argumentative structures, and correspond to distinct or more or less complete arguments. For example, we consider the following communication between a lawyer of a Mafia boss and a judge, which is aimed at different goals depending on the actual interlocutor or the potential audience:[1]

> In your interest, my client complains about the fact that you are too strict. You should be more careful.

This speech act is clearly aimed at different purposes, and depending on the background information shared with the interlocutor, the message can be interpreted differently. This reported classification of the judge as "too strict" can be considered apparently (by a bystander or general audience) as a friendly advice, leading to an implicit invitation to comply with the softer, commonly attitude of judges in general (popular practice). The only problem is that it is told indirectly by an accused party to a judge in charge of judging him, and that the classification is not neutral, but strongly negatively evaluated by the speaker (my client "complains"). By adding the tacit information concerning the common practices used by the mafia, the purpose of the speech act becomes a threat (namely an argument from negative consequences that are brought about by the speaker unless some conditions are complied with), based on a value judgment on the judge's behavior. On the one hand, this speech act is intended to communicate a neutral piece of information, a classification that cannot be regarded as threatening by a third party (the police). On the other hand, the lawyer conveys a clear message and a clear instruction to the judge on how to behave, by threatening him. The background information concerning the conveyance of threats by mafia leads the hearer to adding further tacit premises and reconstructing the actual purpose of the "classification" or "advice." In this sense, the pragmatic dimension of communication, namely the relevance of a speech act in a specific context, becomes the starting point for analyzing its argumentative structure.

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[1]"Un avvertimento indiretto una volta mi fu recapitato tramite un avvocato, nel corso di uno dei miei primi procedimenti di mafia a Palermo. Mi riferì, «nel mio interesse» (così disse …), che il suo cliente mafioso si lamentava di me perché io ero un po' troppo «rigido», e quindi era meglio che stessi «più attento». Anche in quel caso feci la mia segnalazione per iscritto al capufficio e alla Procura di Caltanissetta." (Ingroia 2010, p. 47).

References

Aristotle (1984). *Topics* (W. A. Pickard-Cambridge, Trans.). In J. Barnes (Ed.), *The works of Aristotle*. Princeton: Princeton University Press.

Blair, J. A. (2007). The "logic" informal logic. In H. V. Hansen, et al. (Eds.), *Dissensus and the search for common ground CD-ROM* (pp. 1–16). Windsor, ON: OSSA.

Boethius, S. (1978). *De Topicis Differentiis* (edited with a translation, introduction and commentary by E. Stump). Ithaca, NY: Cornell University Press.

Cicero, M. T. (2003). *Topica* (edited with a translation, introduction and commentary by T. Reinhardt). Oxford: Oxford University Press.

De Pater, W. (1965). *Les Topiques d'Aristote et la Dialectique Platonicienne*. Fribourg, Germany: Éditions de St. Paul.

Duschl, R. (2008). Science education in three-part harmony: Balancing conceptual, epistemic, and social learning goals. *Review of Research in Education, 32*, 268–291.

Everardus, N. (1607). *Loci Argumentorum legales*. Venetiis: apud Matthaeum Valentinum.

Garssen, B. (2001). Argumentation schemes. In F. van Eemeren (Ed.), *Crucial concepts in argumentation theory* (pp. 81–99). Amsterdam: Amsterdam University Press.

Godden, D. (2005). Deductivism as an interpretive strategy: A reply to Groarke's defense of reconstructive deductivism. *Argumentation and Advocacy, 41*(3), 168–183.

Greenland, S. (1998). Probability logic and probabilistic induction. *Epidemiology, 9*, 322–332.

Green-Pedersen, N. J. (1984). *The tradition of topics in the middle age*. Munich, Germany: Philosophia Verlag.

Grennan, W. (1997). *Informal logic*. Montreal, QC: McGill-Queen's University Press.

Hastings, A. (1963). *A reformulation of the modes of reasoning in argumentation*. Evanston, Illinois: Ph.D. dissertation, Northwestern University.

Ingroia, A. (2010). *Nel labirinto degli dèi*. Milano: Il Saggiatore.

Josephson, J., & Josephson, S. (1996). *Abductive inference. computation, philosophy, technology*. New York: Cambridge University Press.

Kienpointner, M. (1992a). *Alltagslogik: Struktur und Funktion von Argumentationsmustern*. Stuttgart, Germany: Fromman-Holzboog.

Kienpointner, M. (1992b). How to classify arguments. In F. H. van Eemeren, R. Grootendorst, J. A. Blair, & C. A. Willard (Eds.), *Argumentation illuminated* (pp. 178–188). Amsterdam: Amsterdam University Press.

Kim, M., Anthony, R., & Blades, D. (2012). Argumentation as a tool to understand complexity of knowledge integration. In *Proceedings of the 2nd International STEM in Education Conference—Beijing, China—24–27 November 2012* (pp. 154–160). Beijing: Beijing Normal University.

Lawson, J. (1885). *The law of presumptive evidence*. San Francisco: Bancroft & Co.

Lumer, C. (2011). Argument schemes—an epistemological approach. In F. Zenker (Ed.), *Argumentation: Cognition and Community. Proceedings of the 9th International Conference of the Ontario Society for the Study of Argumentation (OSSA), May 18–21, 2011* (pp. 1–32). Windsor, ON (CD ROM).

Macagno, F., & Damele, G. (2013). The dialogical force of implicit premises: Presumptions in enthymemes. *Informal Logic, 33*, 365–393.

Macagno, F., & Douglas, W. (2015). Classifying the patterns of natural arguments. *Philosophy & Rhetoric, 48*(1), 26–53.

Macagno, F., & Konstantinidou, A. (2013). What students' arguments can tell us: Using argumentation schemes in science education. *Argumentation, 27*, 225–243.

Macagno, F., & Walton, D. (2014a). *Emotive language in argumentation*. New York: Cambridge University Press.

Macagno, F., & Walton, D. (2014b). Argumentation schemes and topical relations. In G. Gobber & A. Rocci (Eds.), *Language, reason and education* (pp. 185–216). Bern: Peter Lang.

Macagno, F., & Zavatta, B. (2014). Reconstructing metaphorical meaning. *Argumentation, 28*, 453–488.

Mochales, R., & Moens, M. F. (2009). Argumentation mining: The detection, classification and structuring of arguments in text. In *Proceedings of the Twelfth International Conference on Artificial Intelligence and Law (ICAIL), June 8–12. Universitat Autonoma de Barcelona, Barcelona* (pp. 98–107). New York: ACM.

Mochales, R., & Moens, M. F. (2011). Argumentation mining. *Artificial Intelligence and Law, 19*, 1–22.

Nussbaum, M. (2011). Argumentation, dialogue theory and probability modeling: An alternative framework for argumentation research in education. *Educational Psychology, 46*, 84–106.

Peirce, C. S. (1992). *Reasoning and the logic of things: The Cambridge conferences lectures of 1898*. Edited by K.L. Ketner. Cambridge, MA: Harvard University Press.

Perelman, C. & Olbrechts-Tyteca, L. (1969). *The new rhetoric: A treatise on argumentation* (J. Wilkinson & P. Weaver Trans.). Notre Dame, IN: University of Notre Dame Press.

Poole, C. (1988). Induction does not exist in epidemiology, either. In K. J. Rothman (Ed.), *Causal inference* (pp. 153–161). Chestnut Hill, MA: E.R.I.

Rapanta, C., Garcia-Mila, M., & Gilabert, S. (2013). What is meant by argumentative competence? An integrative review of methods of analysis and assessment in education. *Review of Educational Research, 83*, 483–520.

Rubinelli, S. (2009). *Ars Topica. The classical technique of constructing arguments*. Dordrecht: Springer.

Searle, J. (2001). *Rationality in action*. Cambridge, MA: MIT Press.

Stump, E. (1989). *Dialectic and its place in the development of medieval logic*. Ithaca: Cornell University Press.

Toulmin, S., Rieke, R., & Janik, A. (1984). *An introduction to reasoning*. New York: Macmillan.

van Eemeren, F., & Grootendorst, R. (1992). *Argumentation, communication and fallacies*. Hillsdale, NJ: Erlbaum.

van Eemeren, F., & Grootendorst, R. (2004). *A systematic theory of argumentation: The pragma dialectical approach*. Cambridge: Cambridge University Press.

Walton, D. (1996). *Argumentation schemes for presumptive reasoning*. Mahwah: Lawrence Erlbaum Publishers.

Walton, D., & Macagno, F. (2006). Argumentative reasoning patterns. In *Proceedings of 6th CMNA (Computational Models of Natural Argument) Workshop, ECAI (European Conference on Artificial Intelligence), Riva del Garda, Italy, August 28–September 1* (pp. 48–51). Trento: University of Trento Italy.

Walton, D., Reed, C., & Macagno, F. (2008). *Argumentation schemes*. New York: Cambridge University Press.