

10.5281/zenodo.11245042: Response to the Editor's comment:

Dear author(s),

Thank you very much for this resubmission of "Embracing causal complexity." I sent the paper back out to the same three reviewers who have all now completed their appraisal of your revised paper (see their reviews in full below).

We are all in agreement that your writing is much more clear and streamlined in this version of the paper, and that the paper has improved significantly in terms of how its claimed contributions are presented.

Response. Thank you for your support for our paper. We are extremely grateful to have the opportunity to revise and resubmit the paper. Your original comments are reproduced in italics and our responses follow each comment.

However, there are still some issues that remain to be solved before we can recommend this paper. R2 draws attention to some significant issues with the implicit ontology of the paper at present, noting that your "generic framework for evaluating any organization" appears to treat organizations in a positivist manner, as things simply out there in the world rather than (also) products of our theoretical framing.

Response. Please see the detailed response to R2 comment below.

Using the example of your treatment of the relationship between technology and the organization, R2 highlights the specificity of the perspective adopted by your analysis framework, and the necessity - when claiming a complexity-sensitive account - to acknowledge multiple possible perspectives.

Response. Please see the detailed response to R2 comment below which highlights the plasticity of this Aristotelian analytical framework which can be applied at any level of analysis.

R3 echoes this point, noting that "the choice of categories seems arbitrary to me, i.e. why should a given cause, such as a consultant or a certain technology, be categorised as one type of cause or another?" For my own thoughts on these issues, please see my comments 1 and 2 below.

Response. The assessment of what constitutes a cause when analyzing a specific object is inherently subjective and varies according to the individual making the judgment. Aristotle offers a theoretical and ontological framework that identifies different types of causes and provides a means to categorize them. This framework emphasizes that any phenomenon can be examined through the lens of these different causes. Aristotle's classification of causes—including primary (formal, material, efficient, and final), secondary, accidents, and instruments—can be viewed as "arbitrary" just as easily as one might categorize all causes solely as efficient, or as any typology in management.

Ultimately, Aristotle provides an analytical framework that allows individuals to analyze any phenomenon. However, it is crucial to recognize that the user of this framework may be prone to errors and misjudgments. As Aristotle himself notes, especially in his discussions on the final cause that drives volition (as explored in his *Ethics*), individuals are always motivated to act by a final cause perceived as "good." For instance, a thief might justify stealing by believing that

it is a good act because it will help feed his family. Here, "feeding his family" serves as a final cause.

However, it is important to clarify that this is not always the final cause, nor is it the sole motivation for the act of theft. In this specific context, "feeding his family" may be perceived as a good, but Aristotle would argue that this is a mistaken judgment and does not align with the concept of "The Good," which for him represents the "common good." Therefore, while the thief's belief that he is acting for a good reason drives his actions, it reflects an erroneous assessment of what constitutes the final cause. In summary, Aristotle asserts that all actions are invariably guided by a final cause that represents some notion of "the good." This pull of a final cause may indeed be an apparent or superficial good.

The categorization of technology, for instance, as a secondary material cause is contingent upon the analyst's judgment. The same principle applies to any characterization; an analyst might mistakenly label a company as bureaucratic when it is not.

Moreover, we do not claim that technology is the sole secondary material cause. The classification of technology varies based on the specific object under consideration. It can function as a final cause that drives an engineer's work, serve as an instrument to achieve a particular goal (such as the development of a new product), or assume various roles depending on the context.

In the front-end of the paper, particularly, we still miss a clear articulation of the value-add of the proposed approach in contrast to the alternative approaches mentioned. R3 suggests that you haven't yet sufficiently explained why we need the approach that you advocate, and makes some suggestions regarding how you can position your approach in relation to the mentioned alternatives so as to clarify this value-add. On the same point, R1 highlights some specific examples of vague and abstract language that makes it difficult for the reader to understand what your paper is offering, and reiterates their recommendation that you use an illustrative example to demonstrate the power of your analytical framework over and above existing approaches. For more on this, please see my comment 3 below.

Response. We recognize the importance of distinguishing our framework from the alternative approaches and have enhanced our exposition in the front end of the paper accordingly.

To address R3's concern, we have explicitly outlined the unique advantages of our approach, highlighting how it accommodates the complexity of causal relationships in a way that existing frameworks may not. We clarify how our Aristotelian ontological framework not only categorizes causes but also allows for a more nuanced understanding of organizational dynamics, providing deeper insights into causal complexity that can be applied to any organizational phenomena.

In response to R1's feedback, we have rewritten large parts of our manuscript in using a more concrete language and in defining specific terms. We have also incorporated some illustrative examples to demonstrate the practical applications of our framework.

Throughout the paper there are still problems in terms of the clarity of your conceptual framework and lacking or insufficient definitions. R1 notes that you need to adopt the perspective of the reader here to recognize that, for instance, a clear definition of the "Newtonian paradigm" is necessary to apprehend your overall theoretical project. Similarly,

R3 draws attention to some definitions that are too dense or even tautological, lists concepts that still need to be defined on first mention, and recommends other concepts that “could be avoided in favour of a plain explanation (e.g., non-additive, eidos, non-univocal, non-proportional).

Response. In response to R1’s comment, we have provided a more comprehensive definition of the Newtonian paradigm, allowing readers to better grasp its relevance in contrast to our proposed framework and the causal complexity perspective.

Additionally, following the suggestions of R3, we have rewritten large parts of our manuscript to simplify our language and ensure that each concept is defined upon its first mention.

I would therefore like to invite you to revise your paper again in light of these comments (major revision). We all very much appreciated your letter addressing the last round of reviews point-by-point, and so would ask that you do the same for this revision.

In what follows, I offer my own perspective on the issues to be addressed, as a complement to the reviewer comments copied below.

I hope this feedback is helpful to you, and - given the great potential your paper holds - that you will agree to undertake this further revision.

Very best regards,

Genevieve Shanahan

Ambiguity regarding the object of analysis to which the Aristotelian framework is designed to apply

I like the restructuring, where you now keep the cashing-out of the Aristotelian framework in specifically organizational terms for section 3. This restructuring now reveals an ambiguity in your account of the final cause in the organizational example. I think this ambiguity is actually rooted in quite a fundamental ambiguity in your characterization of the object of analysis throughout the paper: to what are we applying the Aristotelian analytical framework? A specific object (e.g., an organization), a specific action, or a specific process?

Response. Indeed, the Aristotelian framework possesses a certain plasticity, allowing it to be applied to various entities, whether a specific object, action, or process. In our paper, we chose to apply it broadly to the analysis of an organization at a macro level. This choice was somewhat arbitrary, but it was driven by our intent to provide an illustration that would resonate across different theoretical backgrounds. By adopting this broad perspective, we aimed to ensure accessibility for a wide range of readers. However, we recognize that this breadth may have led to more generalized examples, as opposed to more detailed and specific ones. We thus could either focus narrowly and risk losing readers in the intricacies or maintain a broader approach, potentially at the expense of specificity.

Here’s what I see in your account of the final cause in the organizational example:

On page 13 you first talk about the organization’s environment (stable or changing) as something like the context of the organization at the outset of the analysis - this could cohere

with the object/action/process-focused perspective, but strikes me as really corresponding more to an accident in your account (“every organization is further shaped by its specific context”)

Response. Regarding the final cause, we view the environment or context as fulfilling as final cause, as it acts as a "force" that shapes and directs the organization. The environment can be either stable or dynamic. You correctly note that the changing or stable nature of the environment could be seen as an accidental property of the environment itself. This would be the case if you analyze the environment. However, if you consider and examine an organization, we argue that for all organizations the environment is a final cause; and that for this particular organization, its specific environment can be either stable or changing, which constitutes its specific external condition. For example, OpenAI operates in a highly dynamic environment, which drives its rapid development of AI technologies, while Home Depot operates in a comparatively stable environment. Nonetheless, every organization is influenced by its environment, which shapes its direction and actions.

Then on page 14 you slide into talking about the particular environment to which the organization tends - that is, what the agents of the organization hope the organization’s context will be (at the end of a particular period, corresponding to the action/process-focused perspective? Or in the future more generally conceived, corresponding to the object-focused perspective?). This is very different to the above characterization, and also highlights the core ambiguity I’m worried about.

Response. The use of the term "tends" may have introduced some confusion by implying a process-oriented perspective, rather than the intended object-focused view. In this context, we meant to emphasize that a specific organization is influenced by its environment at a given point in time, aligning with the object-focused perspective you mentioned.

However, this does not exclude the presence of a process perspective within the Aristotelian framework. First, as previously noted, the interactions among causes introduce a dynamic dimension, or movement through time. For instance, efficient causes—such as agents within the organization—may devise strategies to achieve a goal, potentially reshaping the environment. Conversely, the environment itself may evolve through accidents or external changes.

Second, Aristotle's view of an organization encompasses both an object and a process simultaneously (see Zara & Delacour, 2023). There are two perspective that represent the two sides of the same coin: an organization is a substance (quiddity) and is in entelechy which represents the organization as a process, a dynamic progression. There is no substance without movement or movement without substance. Stability and movement are considered by Aristotle equally as two ways to look at, deal and examine, the same object or situation.

Further confusing matters, in the sub-section on Step 2, you characterize final causes as the goal of the organization. I certainly understand that this will often involve modifying the organization’s environment, but is this necessarily always the case? Is there something in the Aristotelian account that excludes the possibility of self-directed goals?

Response. We characterize final causes as the goal of an organization because, according to Aristotle, the final cause is understood as an aim, an end, or a purpose. The environment can indeed influence the organization, guiding it toward specific actions and objectives.

However, this does not imply that efficient causes, such as agents within the organization, cannot set their own goals, which may differ from or conflict with the environment. These internally driven goals also function as final causes, shaping and directing the agents' actions. For instance, agents may decide to initiate a reorganization (a self-directed goal), which in turn prompts a series of specific actions. This reorganization might aim to line up with the environment, or it could pursue entirely different objectives, such as cost reduction or the implementation of new technologies. Agents retain the autonomy to choose which goals or ends to pursue, whether shaped by external forces or their own strategic judgments. In all cases, their actions are driven by a final cause.

It is important to note that the focus in these examples differs: in the first paragraph, the focus is the organization, while in the second, it is the actions of the agents. Although this distinction might seem confusing or ambiguous, it is however essential. It highlights the plasticity of the Aristotelian framework, which accommodates both perspectives without excluding any possibility. The strength of the framework lies in its capacity to provide a structured approach to understand complex phenomena.

Thus, both perspectives—whether focused on the organization globally or on the actions of individual agents—are valid. And indeed, they are both essential to make sense of complex phenomena. The framework does not claim to offer an "absolute truth" but rather serves as a tool to help scholars interpret, understand, and make sense of various organizational realities.

I think clarification on this point could help resolve some further issues regarding clarity in the paper: Clarification on this point could assuage my concern regarding the Aristotelian framework's subjective perspective, where causes seem to be defined in terms of a particular agent's intentions.

Response. Aristotle's ontology does not fit neatly into contemporary categories of subjectivism or objectivism (see Zara & Delacour, 2023). These perspectives were not part of the philosophical landscape in his time. However, if we are to draw a modern comparison, his approach aligns most closely with critical realism, though there are key differences. Aristotle recognizes the existence of objective realities while also acknowledging the role of agents' intentions and actions in shaping outcomes, creating a nuanced perspective that transcends strict subjectivist or objectivist perspectives.

I understand that you see this as a can of worms better left unopened, but I think this question is actually crucial to understand the ontology of causes and causality proposed. I am still quite sure that, as mentioned in my previous response, it is crucial from the perspective of causal complexity that this paper explicitly recognize that the proposed analysis of causes and causality can (and often should) be applied to the various objects/actions/processes that are involved, overlapping and interacting, in any given empirical case.

Response. This is correct. The framework can indeed be applied to any object. While Aristotle's ontology can accommodate the subjective dimension of agents, including their volition, free will, and the judgments they make about particular objects, this does not negate its objective aspect. Both the subjective and objective perspectives coexist in his framework, allowing for a more comprehensive analysis of complex phenomena.

You can of course specify that the project of this paper focuses on unpacking the causal complexity within any given object/action/process, but this project must be understood as a

complement to other work on causal complexity that emphasizes the multitude of overlapping objects/actions/processes - and corresponding intentions - at play in any given empirical case. Indeed this would cohere with your overall thesis that the Aristotelian ontological framework can be used to bring together multiple valuable approaches to causal complexity.

Response. You're right. The Aristotelian framework we develop indeed integrates different valuable approaches, whether these involve differing theoretical perspectives or multiple views of organizations—as objects, processes, or actions enacted by agents. All of these perspectives are valid because, for Aristotle, an organization embodies all of these aspects simultaneously. This reflects the framework's distinctive ontology, which allows for the coexistence of multiple, complementary viewpoints. We develop this point in our revised version.

Similarly, the definitional difference between per se and secondary causes seems to indicate that these are relational ontological categories - that is, these classifications are all relative to a given final cause: "the per se causes are essential because they are primary, or to avoid tautology, because they are the principles of the secondary causes" (p. 17)

Response. Not exactly. Per se causes are not relative to the final cause. The key distinction between the per se and secondary causes, as outlined in the paper, is that per se causes are always necessary to produce an effect. In contrast, secondary causes may or may not be necessary and exert their influence and causality in a different manner.

I believe more explanation is also needed regarding 'reciprocal and total' causality, as it's hard to see immediately how misaligned per se causes can cause anything at all. Again, I think this difficulty is connected to the ideas of 'alignment' and 'misalignment' being defined in terms of subjective intention, whereas the 'reciprocal and total' nature of the causality is intention-agnostic.

Response. We have rewritten this section to enhance clarity. The concept of total and reciprocal causality emphasizes that each cause in the pair contributes to and depends on the causality of the other. Their effectiveness is interdependent, and this relationship is indeed neutral with regard to intentions.

I also find it hard to understand the difference between secondary causes and instruments in the subsection on Step 2 - might the mapping of the Aristotelian ontology onto the organizational example be more clear if the paper were to specify exactly what it defines as the object of study in this case? e.g. by specifying what the level of analysis is, and what final cause is under examination, the reader can understand why we are not interpreting technology as an instrument or employees as efficient causes of their own projects.

Response. The perceived ambiguity likely arises from two factors. First, the plasticity of the Aristotelian framework allows it to be applied to various objects, processes, or actions, meaning that one element (e.g., technology, environment) may function as a cause in one context and as something else in another, depending on the object under consideration and the level of analysis. Second, the framework can appear ambiguous because it transcends traditional dichotomies such as subjectivist vs. objectivist, essentialist vs. existentialist, and positivist vs. phenomenological perspectives. Rooted in Aristotle's specific ontology, the framework allows us to navigate and reconcile these perspectives.

For Aristotle, agents are free because they are pulled by a final cause. This means that while agents define self-directed goals, these goals are shaped by an overarching final cause. While this may seem contradictory from the perspective of subjectivist or objectivist, it is central to Aristotle's ontology and the dynamic nature of causes within it.

Some problems inherent to the Aristotelian ontology?

Some ontological distinctions appear straightforwardly misguided - if these are indeed accurate representations of Aristotle's ontology, it is nevertheless hard to see the value in applying fundamentally deficient elements of this framework. For instance, the conclusion that divergent secondary causes will cancel each other out does not seem sufficiently justified - surely a very strong secondary cause can outweigh the effects of a very weak secondary cause? ("On the other hand, if the secondary causes are divergent from each other, they will not affect or modify the per se cause. Clearly, if top and middle management do not agree, their influence on the CEO will be less tangible." (p. 17). Similarly, the claim that accidents' "interrelation with the per se causes they may affect is less strong than interrelations between secondary and per se causes" on the grounds that "accidents may or may not occur" seems to conflate two distinct senses of causal strength - a moderator may not be guaranteed to obtain, but its effects may be highly significant when it does. It appears as though the implicit definition of "causal strength" here is something like that in the statistical approach, a form of simplification I would have thought to be diametrically opposed to the causal complexity you are advocating.

Response. Thank you for raising this point. We acknowledge that there may have been some ambiguity in our explanation, and we appreciate the opportunity to clarify. Our intent in discussing 'causal strength' was to emphasize the varying ways in which causes exert influence, which aligns with the notion of causal complexity as explored in the literature, such as in Fiss's work. The Aristotelian framework allows us to explore why certain causes have more or less causal power, depending on the context and interrelations among causes.

We do not believe that our approach directly mirrors a statistical interpretation of causality, though we understand how that impression might have arisen. Rather, we aim to offer a conceptual framework that addresses the intricacies of causal interrelations, acknowledging the complex and sometimes unpredictable nature of these relationships. We apologize if this distinction was not sufficiently clear, and we have worked to refine this aspect of the paper to better communicate our intent.

Distinction between the Aristotelian and other approaches to causal complexity still unclear

While section 2 - "Embracing Causal Complexity" - is now much more streamlined and clearer, there are still some aspects of your account of the state of play regarding scholarship on causes and causality that are somewhat unclear:

In configurational theory, is the distinction between core and peripheral elements quantitative or qualitative? That is, is it just a matter of relatively stronger or weaker relationship with the end result? Or has it something to do with the distinction between necessary and sufficient conditions? (p. 5)

Response. The distinction between core and peripheral elements in configurational theory is primarily qualitative rather than strictly quantitative. While it may appear that core elements

are simply those with a stronger relationship to the outcome, their role is more deeply tied to the structure of the configuration.

Not clear yet to the reader what the salience of the difference between configurations and factors is, so this statement is a little unclear: "While this approach provides many insights, it focuses on configurations to depict causal complexity, rather than on factors." (p. 5) - it's important to make sure the reader clearly understands this difference as the Aristotelian conceptualization of causality you present does itself seem to rely precisely on configurations of causes. So, the distinction to highlight is perhaps not configurations vs. factors but configurations of variables versus configurations of causes, or something like this.

Response. We have rewritten this section to enhance clarity and better distinguish the terms used by different approaches, as they do not adopt the same terms and contrary to the configurationist scholars, the Aristotelian framework we develop does not intend to identify configurations of causes but rather highlight how the different types of cause can interact and produce different effects. This is not a configuration *per se* as we decompose the process and the different types of causalities at play.

What do the concepts of total vs partial get us that is different and better than the more familiar necessary vs sufficient? Statements like the following seem to suggest that "total causes" can be understood straightforwardly as necessary causes: "both per se causes in each pair are total causes of the effect. This means that there is no effect in the absence of one or the other." (p. 20).

Response. It is not only that the different *per se* causes are necessary—without them, there is indeed no effect. However, our argument goes further to emphasize the notion of *total and reciprocal causality*, which means that each cause contributes to and is influenced by the causal power of the other causes, as discussed throughout the paper. This reciprocity underlines how causes can be aligned or misaligned, which is a central point in our analysis.

The discussion of causal complexity and its divergence from the Newtonian paradigm is still a bit too abstract overall. For instance, it's not clear to me what I should understand feedback loops, discontinuities and non-proportionality to mean in this context - e.g. I would have thought Newtonian physics can account for feedback loops, for instance, so maybe it's a case of needing to better-specify what you mean by the Newtonian paradigm?

1. *"Concerning causality, it is argued that it should not be viewed in Newtonian terms; but that feedback loops, discontinuities and non-proportionality should be favored instead (Bunge, 2009)." (p. 6)*
2. *The summary on page 8 at the end of section 2.2 - "Aristotle's conceptualization of causes" - defines your position in relation to schools of thought represented by Hocutt (1974) and Scott (2011) but we haven't yet encountered these references (in fact, they're not listed in the bibliography, so maybe they were a late addition not yet fully integrated into the text?).*

Response. We have revised this section to enhance its clarity. Additionally, we have provided a more detailed explanation of the Newtonian paradigm and clarified the various terms used, such as "feedback loops" and "non-proportionality." This should help readers better understand these concepts and their relevance to our discussion. We have also added these references in our bibliography.

Indeed, the characterization of the two perspectives in terms of their divergent readings of the word “because” risks appearing to introduce a new idea rather than merely summarizing and rephrasing what has been explained thus far. In particular, I struggle to understand what is meant by the following statements:

- *“we believe that the four per se causes are not just 'because'.” - I think without some context of what ‘because’ means to Hocutt (1974) specifically this part is not really legible.*
- *“causes are not univocal, i.e., they do not have only one meaning (Scott, 2011). Causes do not always mean the same thing; they are asserted with different meanings” - Here there is a potential ambiguity regarding whether you mean that the total set of causes contains subsets of different cause types OR that any given cause (or maybe quotidian “because” statement?) is itself plurivocal.*

Response. What we intend to convey is that, for Aristotle, causes are not simply defined in terms of "because," which would confine them to an explanatory realm, as noted by Hocutt. Instead, as Stein (2011) aligns with Aristotle's perspective, causes carry different meanings and effects and are ontological categories. This distinction is crucial; for instance, a material cause differs significantly from a formal cause. In addition, the concept of "being" is also not univocal in Aristotle's philosophy; the being of a human differs fundamentally from the being of a table. We have revised this section to reflect these nuances more clearly.

Outstanding structural issues

While I do appreciate your restructuring of the article overall, it is less clear that section 3.3 gives us anything that was not or could not have been already said in section 2.3. That is, we get some minor clarifications of Aristotle’s account of causality, but these appear sporadically amidst a reiteration of what was said before, and there is not a clear extension through your own proposed operationalization for the organizational context. Perhaps too much space given over the Discussion explaining the 3 contributions (which appear to overlap to some degree), whereas I believe this space could be better used to actually do some of the described theoretical expansion.

Response. We understand our point. Given the specificity of the terms used in our framework, we believe it is essential to first introduce and explain the various types of causes and causalities. This foundational overview will then allow us to apply these concepts in a more illustrative and operational manner.

We believe that this structured approach will better guide the reader through our arguments. In addition, we have revised sections of our discussion to strengthen our contributions, based on your suggestions. These enhancements aim to clarify our position and better articulate the value of our approach.

Some ideas mentioned in this section I'd like to see expanded in this paper:

“This is interesting for organization studies in revealing how a cause can also sow the seeds of its own perdition.” (p. 19) - While you claim on page 28 that, to your knowledge, this has only been addressed once in the literature to date, the lack of explanation of what you mean makes it very difficult to evaluate this claim.

Response. We have developed this point in the discussion section.

“The influence of accidents and secondary causes will depend on the causality of the per se cause, they affect. The more causality the per se causes have, the more difficult it is to influence them. This brings us to the interrelations between the per se causes.” (p. 20) - sounds interesting, but not sure what you mean.

Response. We develop this point further in the discussion. When taking the statue example, the sculptor, specifically Phidias, as the efficient cause exerts more causality as his assistant. The same applies for a CEO vs a simple employee.

“Over time, therefore, an increasing amount of change therefore accumulates without necessarily being enacted. However, as it accumulates, it may reach a tipping point where a small additional accident leads to significant effects (e.g., the threshold effect developed by Granovetter, 1978).” (p. 23) - what does it mean, in an Aristotelian framework, for change to accumulate without being enacted?

Response. Exactly the same as we mention above, i.e. that change can accumulate and after a threshold can after that become in effect. For example, change driven by different causes such as new norms might not be sufficient to change the structure but they can accumulate. New causes such as accidents can also tend to shape the structure, but not sufficiently to do so, but they can accumulate with prior causes and then change the structure. We develop this point in the discussion

Minor comments:

*Your restructuring of the article does make your unique contribution much more clear. As a minor point, you might want to retitle section 3 (“**Aristotle’s** analytical framework”) to something like “Proposed Aristotelian analytical framework” to clarify that this is **your** analytical framework inspired by Aristotle’s approach and conceptual tools, as indicated on page 7 (“we briefly describe Aristotle’s conceptualization of causes and causalities, before developing our analytical framework”)*

Response. We have changed the title as suggested.

Your reference to ANT perspectives in the course of 3.3.3 is not well-integrated and appears misplaced, structurally. I would expect this to be addressed in the discussion/conclusion where the value of the Aristotelian approach over and above existing approaches is addressed

Response. We have addressed this perspective in the discussion section.

Unclear phrasing

- 1. “While many scholars recognize the benefits of causal complexity, they struggle to apply it effectively” (p. 1) - should rather be something like “the benefits of theoretical models that take account of causal complexity”*
- 2. “our analytical framework enables to examine any organization and social phenomena, extending our understanding of causal complexity.” (p. 1) - should rather be something like “enables us to better understand/predict/explain...”*

3. *“This means that they can converge/diverge towards the same effect and thus partially affect their end result, or they can affect the different per se causes by diverging or converging in their effect.” - I just find this paragraph difficult to follow*
4. *“Here, we introduce an additional factor that perpetuates this aspect. This expands our explanations of this phenomenon.” (p. 28) - unclear what each “this” refers to*

Response. we have thoroughly revised and rewritten these sentences as a significant portion of the article to enhance both clarity and scholarly readability. Our goal was to improve the overall flow and precision of the language, ensuring that the content is more accessible and engaging for academic readers.

We would like to sincerely thank you for your numerous and constructive comments, which help us considerably to strengthen our manuscript. We also hope that you will find this revised version of the paper much improved and of interest for publication in PCI Organization Studies.

The Authors

Response to the comments of Reviewer 1

Dear authors,

Thank you for engaging with and incorporating feedback. Furthermore, I would like to express my gratitude for your willingness to provide comprehensive responses. The revised manuscript reads better and provides a more accurate and detailed account of the capture and operationalization of causal complexity. I'm appreciative of the effort you have invested in revising the manuscript. I also appreciate your work on the tables (Fig1 is particularly insightful).

I will limit my comments here to those issues that I feel still require attention.

Response. We sincerely thank you for your interest in our manuscript and for all of your constructive comments. We address them point by point below and hope this will meet your expectations.

***Clarity.** I still think the manuscript will benefit from a clear focus. For example, the start of your abstract “While many scholars recognize the benefits of causal complexity, they struggle to apply it effectively.” Or the launch of your introduction “Numerous scholars have highlighted that considering causality as complex rather than relying on the Newtonian, linear or correlational paradigm, brings in various advantages such as dealing with contradictions, understanding the richness of phenomena, exploring dynamics and developing theory, for example [...]” are (very) vague. I recommend that you remove all of these wordings from your text. Given that your text is primarily a theoretical essay, despite the admirable efforts you have made to illustrate it, such standard formulations make it challenging for the reader to engage with your text.*

Response. We have revised both our introduction and abstract to enhance clarity and conciseness, ensuring they provide a more effective guide for the reader. These revisions aim to streamline the key concepts and arguments, making it easier to follow our framework and its contributions from the outset.

***Definitions.** There is still room for improvement in terms of concept definitions. For example, it is important to define the Newtonian paradigm in the introduction for an unfamiliar readership. This effort at definition, which may be tedious for you who are experts in the subject, will help readers to fully grasp the project. This brings me directly to my third point.*

Response. As suggested, we have added a definition of the Newtonian paradigm in the introduction.

***The “real deal” of your article.** Thanks to your in-depth answers, I fully understand your project. It seems to me that there is an opportunity to enhance the clarity and efficiency of the wording employed in the responses, in order to more effectively convey the core objective of the article. In this regard, the introduction still lacks a bit of 'punch' to enable your readers i) to be drawn into the text and ii) to grasp the essence of your innovative approach. In light of my previous comments regarding the introduction, I would like to extend them to encompass the discussion that begins first paragraph, page 24 of the PDF. In this context, it would be beneficial to provide a detailed delineation of what your analytical framework can do (and what it cannot). For example, I found your response to my discussion on gender bias thought-provoking, and it seems to me that this exchange could find a place in your conclusion. Such an addition could offer the scientific community a valuable point of reflection.*

Response. We have rewritten the introduction to better position our paper and its potential interest from a theoretical point of view.

In the conclusion section, we have developed the issue of how Aristotle can or cannot bring answers to contemporary questions and issues.

***A “Hook”.** I apologize for returning to this comment, already made in the previous revision. It seems that including a hook from an example at the outset of the introduction could prove beneficial. As previously stated, the article remains theoretical. However, the incorporation of illustrative examples has facilitated a more comprehensive understanding of the proposals, as a result of the thorough revisions undertaken. Could I suggest that you consider further clarification of the introduction to your manuscript? It is not yet evident what your guiding principle is. One solution could be to provide an example of a situation where your analytical framework sheds new light on the subject. For example, the situations involving CEOs could be an avenue to explore.*

Response. We appreciate your suggestion regarding the inclusion of a hook in the introduction through an illustrative example, and we understand the potential value it could add. However, we have chosen not to include a specific example, as doing so might limit the scope of the paper and prove too restrictive, especially given the challenge of identifying an example that fully captures the complexity we aim to address. Instead, we have revised the introduction to better clarify our positioning, provide more examples and enhance the hook, making it more engaging while maintaining the broad applicability of our analytical framework.

I wish you success in revising your paper.

Very best regards,

Response. We thank you for your constructive feedback and have revised our manuscript to better position it, and enhance its clarity. We hope that this revised version meets your expectations.

The Authors

Response to the comments of Reviewer 3

Thank you for the opportunity to review the paper. I understand the concerns about the expansion of "causes" as conceptual and operational tools for the researcher in the field of organization studies. I think this is a legitimate problem that deserves the contribution of your paper around the Aristotelian metaphysics of causality. My advice goes into what I think you do not see while immersed in the problems of a paper development. The idea of complex causality is still under development, for example under the label of Qualitative Comparative Analysis (QCA), which seems to invigorate the configurational perspective (<https://doi.org/10.1177/0149206316679252>). So bringing Aristotle into the picture seems attractive, because it could further elevate the analysis of complex causality.

Response. We sincerely thank you for your interest in our manuscript and for all of your constructive comments. We address them point by point below and hope this will meet your expectations.

My first point is about the way you think in the 'first step' of your model, linking "material cause" and "organizational structure"; "formal cause" and norms, values and beliefs, and so on... And the final statement about the per se causes: "As such, any organization could be understood through its structure (material cause), norms (formal cause), agents (efficient cause), and environment (final cause). This gives us a generic framework for evaluating any organization." My attention is immediately drawn to the conception of organization that you imply in the arguments, once you imagine an organization within a positivist framework, as a thing that is already there. So my concern is with another possibility once we are dealing with Aristotelian causes. Because for me it would be more accurate to think of the organization as the final cause.

Response. You are absolutely correct in suggesting that an organization can be viewed as an "object" in Aristotelian terms. In fact, it could be considered a "substance," and our chosen framework in this illustration reflects precisely that. However, this may give the impression that Aristotle's ontology is strictly positivist—although this term was not in use during his time. It is essential to avoid imposing such an ahistorical interpretation on his philosophy.

Aristotle's ontology transcends dichotomies; it is neither strictly positivist nor subjectivist, neither essentialist nor existentialist. Engaging his ideas in a dialogue with contemporary philosophical categories is therefore challenging. The closest, albeit careful, parallel might be drawn with critical realism, although significant differences remain.

In practical terms, Aristotle's framework integrates both perspectives. An organization can be viewed as an "object," but this does not preclude it from being understood as a "process." In Aristotelian ontology, *quiddity* (viewing the organization as a substance,) and *entelechy* (viewing the organization as an act, in exercise) represent two complementary aspects of the same reality. These two perspectives of intelligibility are essential, they represent the two sides

of the same coin, which can be examined through Aristotle's four *per se* causes in their respective pairs (see Zara & Delacour, 2023).

To directly address your question: using an Aristotelian approach, an organization can be understood through multiple lenses, depending on the focus, angle, or level of analysis adopted. For instance, it can be analyzed according to the part (material cause) or to the whole (formal cause). Alternatively, one could focus on the actions of a group of agents, their collective efforts, where the organization itself becomes a final cause, much like how the city, in Aristotle's terms, is the final cause that unites people towards a common purpose. The object of analysis—whether an organization, a substance, an event, or a process—determines the specific cause under consideration.

This plurality and diversity underscore the plasticity of the Aristotelian framework, which allows for a range of analytical perspectives. For example, an organization can act as a material cause when analyzing a financial portfolio, or as an accidental cause when considering an environmental disaster or another event. The framework allows to accommodate this diversity without losing coherence.

You probably try to simulate the rationality of practitioners, but then you run the risk of being more managerial than Aristotelian. In closing this session, you offer the example of bureaucracy "... characterized not only by a specific material cause (functional, hierarchical, etc.), but also by its formal cause, a set of norms, values, and beliefs, with a particular type of decisions made by its agents (efficient cause), and the particular environment (final cause) to which it tends." But bureaucracy is not an object, it is an ideal type that informs real objects.

Response. Indeed, bureaucracy is not an object, but an ideal type, an organization can be labeled as a bureaucracy or bureaucratic if it displays certain characteristics. Our framework enables us to explore those characteristics, as different causes which shape the organization and examine their interrelations. Clearly, this type of organization informs, shapes, affects people, even though this organization has been constructed by these same people acting as efficient causes.

I wonder if you could try another way to show how the first step of the model might be useful for operationalizing the four causes, for example, the historical emergence of a particular corporation, cooperative etc.

Response. Indeed, the framework could certainly be applied in the way you suggest. However, for the readability of the paper, we had to choose a specific focus and level of analysis to maintain consistency and clarity. Without this focus, we risked overwhelming the reader, especially given the complexity of Aristotle's framework. Introducing multiple levels of analysis and varying perspectives in a short paper would have further complicated an already intricate discussion. In the discussion section, we have better emphasized that the framework can be used to examine to any object, process, actions, decisions; which we refer to as the plasticity of the framework.

My second point is a misunderstanding of the intertwining of technology and structure when you say "Technology could be seen as a secondary material cause that contributes to the material cause - the structure." I wonder if you are focusing too much on the perspective of the organization, and if you are looking for causes, you have to do it differently, you have to ask yourself if the materiality of technology is not the material or formal cause for the development of a variety of organizations.

Response. This is also correct, technology seen as a secondary cause can lead to the development of different organizations. This reveals the plasticity of the Aristotelian framework as we discuss further in this revised version.

And the better decision will not be possible to anticipate, because you are not dealing with identical objects. And perhaps this is a difficult problem in translating Aristotelian metaphysics into organizational studies, because you probably imply organizations as beings that share attributes with each other. But the complexity is lost if you go that way, because you will not be able to distinguish the singularities that define the essence of an organization. In a word, you are likely to find organizations that have been shaped by technology, and others that have been less influenced by it.

Response. Yes, exactly some organizations will be more or less shaped by technology, some will not. This or that particular organization can be heavily influenced by technology, as OpenAI for example, some organizations will be less influenced, and some will be low-tech or no-tech, such as an artisan organization producing handmade vases. But even in the latter case, it is still an organization.

Our intention was not to analyze a specific organization but to use the Aristotelian framework as a reading and analysis grid for organizations in general. As such, we have made our intentions clearer at the beginning of this section.

Finally, I would like to make a comment about what you synthesize in Figure 4. The analysis is too deterministic, and I don't think Aristotle himself would agree with such an approach, because an organization is a human construct rather than a natural entity.

Response. For Aristotle an organization is both a human construct and an “entity” (despite not a natural one). Leaving out one perspective aside would not fit into his ontology. There is a deterministic aspect in Aristotle but it is only one aspect as he also maintains a subjectivistic approach.

We believe that this is his strength, the most interesting element to use Aristotle, especially in connection with complexity theories. The deterministic approach is fundamental and unique in the Newtonian perspective. Complexity theory rethink this determinism with chaos, with non-linear, non-proportional interrelations, with configurations, with discontinuities, etc. It still considers a kind of determinism, although it cannot lead to predictability. Aristotle not only encompasses these latter aspects but also integrates subjectivist approaches, giving to the efficient causes – agents – free will, power, judgement, etc. We added these aspects in the discussion section.

In this sense, I understand that the Aristotelian approach to politics and the state would be more fruitful for the development of your paper and the discussion of complex causality.

Response. We could have done that, and this is a very interesting topic to explore. However, as mentioned, we had to stick to one focus, one level of analysis, as to remain consistent throughout the paper. Thanks to your suggestion we opened up those avenues for future research in the discussion section.

Once again, thank you for the opportunity to read your paper.

Response. We thank you for your constructive feedback. We hope that this revised version meets your expectations.

The Authors

Response to the comments of Reviewer 2

Thank you for the revised version of your manuscript. I can see that you have streamlined a lot of the text and made it much clearer to the reader. Well done for the hard work you have put into it!

To be honest, I am still not fully convinced of the value of your arguments as presented in the current text, but I accept that there is a legitimate scholarship for them, and that the current state of the manuscript could see the light of day. So I'll reiterate my previous points here, but I'll focus on what I personally consider to be minor issues (because they don't require rewriting), so that you can decide how to address them.

Response.

First, regarding my previous comment 1 (narrow contextualisation and problematisation of the paper), I think you haven't explained well the theoretical starting point of your work yet: how to deal with complexity and why other theories that address it would still rely on the Newtonian paradigm. However, you can try to work around this by acknowledging theories like sensemaking (which operates at the individual level) and systems thinking, which is actually also a perspective of causal complexity, and you need to spell out the difference (see, for example, <https://www.tandfonline.com/doi/abs/10.1057/jors.2008.176>).

Response. In this revised version, we have rewritten our introduction to better anchor and position our paper. In parallel, we have rewritten some parts of our literature review to better discuss the advantages but also shortcomings of existing research on causal complexity. Our starting point is the causal complexity perspective, which has been acknowledged to bring interesting insights and respond to the pitfalls of the Newtonian paradigm. It does not mean that there are no other streams of research that deal with complexity, nor that other theories have not responded to some aspects of the Newtonian paradigm.

*Regarding my second point (concepts not clearly and accurately explained), although the text has improved considerably, it is still too dense. The explanations are still very tautological, e.g. see page 25, second paragraph) As a workaround, I suggest that you simply look for terms that are not yet defined at the time of the first mention (e.g. *per se* causes on p6) and consider whether you need to keep all the terms you use, or whether the mention of some of them could be avoided in favour of a plain explanation (e.g. *non-additive, eidos, non-univocal, non-proportional*).*

Response. We have rewritten large parts of our paper to improve its clarity, readability and have taken care to provide definitions for each specific term.

Finally, the third point (The promised contribution is not delivered) has also improved considerably. However, I think this still remains the biggest shortcoming of the text. I can see the value of your illustration of the application of causal complexity to organisations, but the

choice of categories seems arbitrary to me, i.e. why should a given cause, such as a consultant or a certain technology, be categorised as one type of cause or another?

Response. Aristotle provides a theoretical/ontological framework that highlights the fact that there are different causes, a way of categorizing them, and emphasizes that everything can be analyzed according to these different causes. Aristotle's categorization of causes as primary (formal, material, efficient and final), secondary, accidental, instrumental, etc. could be considered as "arbitrary" as considering all causes as efficient (as the Newtonian paradigm does), or as any typology in management.

That's all Aristotle gives us, he gives us a certain analytical framework. His framework can thus be a tool, an instrument. It is a particular individual who will use that framework to analyze this or that particular thing. So, it means that the individual can be wrong and can make mistakes. Like any tool or instrument, we can use it with good judgement, wisely, fully, without mistakes or not. We can assess technology as a secondary material cause and be wrong. And to consider technology as a secondary material could be seen as arbitrary, as arbitrary as the analyst's judgement.

Nonetheless, the assessment can also be correct, and technology be rightfully considered as a secondary material cause. However, that does not mean that technology will always be a secondary material cause. It all depends on the object under consideration and the level of analysis. For example, it may be a final cause, or a formal cause, or an accident. A certain thing can be considered as a "this or that" cause depending on the level of analysis, depending on the object under consideration.

This Aristotelian analytical framework does not provide the ultimate criteria of truth. We cannot thus say that technology is only, solely and always a secondary material cause. The framework cannot be used as a checklist or a model with unchanging results. It is not a mechanical model that would always produce the same result (such as technology as a secondary material cause). It is an analytical grid, a way of structuring our thoughts, which enables us to grasp, understand, comprehend, make sense of, analyze and examine an object, an event, a process. It is an intellectual exercise that opens up new perspectives and aspects that were not apparent before. As such, it helps us to broaden our understanding of organizational phenomena.

It could be seen as a mind trick, but it differs from methods such as metaphors, what-if scenarios, etc. in that it is also an ontological framework, i.e., it is not just at the epistemological level. It shapes not only what we can know and what we do know, but also the way we think, the basic way we grasp a problem, analyze something, etc. This is why it is so complicated to write this paper, because it is a way of grasping reality that is completely different from how we are used to thinking.

So, one might still have doubts about the contribution of the text: even if the framework is neatly applied, how does it help us understand what is going on better than any other theory, and how does it differ from the other work on causal complexity you cite? A contribution in terms of novelty is not something required to be recommended in PCI. Therefore, again, trying to focus on minor changes that could be made, I suggest you simply revise how you frame your current contributions (ontologically ground causes and causality and concretely operationalize causal complexity) by rephrasing them in a more careful and less abstract way (e.g. what exactly do you mean by ontological grounding and how can an operationalization be concrete?)

I will also suggest you to revise the following excerpts:

1. *"the Newtonian paradigm remains central in organization studies (e.g., Tsoukas, 2017)." (p3) - It should be "According to Tsoukas (2017), the..." and not Tsoukas as an illustration of that (e.g.)*
2. *"scholars instead recognize the diversity of causes" (p4)*
3. *"highlighted Aristotle's radical departure from the Newtonian paradigm" (p6) - How can one departure from something that appeared 2000 years later?*
4. *"This perspective highlights organizations in act, i.e., in exercise." (p.13)*
5. *"There is therefore an interrelation between the two pairs of per se causes, which is different from the interrelation between secondary causes or accidents and per se causes." (p.20)*
6. *"We contribute to extend and diversify our existing methods" (p.24)*
7. *Figure 5 has grammar corrector marks*
8. *Make sure you inform the sources of your figures (if yours or adapted from elsewhere)*

Response. All these excerpts have been rewritten to improve their clarity.

I wish you all the best with your work!

Response. We thank you for your constructive feedback. We hope that this revised version meets your expectations.

The Authors