A Modest Proposal: A Testable Differentiation between Third- and Fourth-Order Information Complexity

KATHRYN CASON, ALISON BRAUSE, AND MATTHEW DAUDE LAURENTS

ABSTRACT

In Human Capability, Jaques and Cason (1994) described the importance of the Third and Fourth Orders of Information Complexity used by adults working to create and manage our commercial endeavors, govern our countries, and provide services such as healthcare and education to our populations. Today our knowledge of these two Orders is still in descriptive terms, therefore less subject to testing than meets the necessary scientific rigor. In order to pursue a better understanding of how to more effectively educate and employ this capability in the adult population it is necessary to have clarity about the boundaries of these apparently discontinuous innate human “processes.” The authors here set out important aspects of their continued inquiry.

Key words: capability, Elliott Jaques, orders of information complexity

Requisite Organization (RO) is a science-based theory of management and behavior. As such, it involves two central tasks: (1) the application of results of scientific research to building a theory of management and other trust-inducing social systems and (2) the establishment of genuine scientific methods and standards for such research. These tasks are united in a set of methodological problems, since the application of the theory constitutes a test of the adequacy and explanatory power of that theory. A key methodological issue in both tasks is therefore the role of concepts. In this essay, we examine a particular problem in the practice of assessing orders of information complexity, as described in Human Capability (Jaques and Cason, 1994), to bring to light a number of methodological issues concerning concept formation.
INTRODUCTION

There are three concepts – rarely distinguished prior to Jaques' work – on which the theory of RO is based: work, task, and role. The distinction comes to light in Jaques' oft-quoted “riddle” concerning the usages of the term work: “That was tough work doing the work they gave me to do at work today” (Jaques, 2002: 18)

Discussion of these usages leads to an understanding of work in the basic (technical) sense as “the labor or the toil, in order to achieve the output connected with the assignment we have been given” (Jaques, 2002: 19). This allows Jaques to recast the original sentence as “That was tough work, carrying out the assignments I was given in my employment role today” (Jaques, 2002: 19f). Yet this definition of work does not serve to differentiate it from the notion of work as energy expended. His fundamental insight into the nature of work was that “what I do that is experienced as the ‘real work’ is not to use physical effort to move something, but to ‘use my head’ in the sense of using judgment and making choices and decisions to deal with difficulties that arise on the way to achieving the goal set by the assignment” (Jaques, 2002: 20). Thus the “exercise of judgment, choice, and decision” is central to the concept of work.

Jaques’ clarification of these concepts was intimately connected with his identification of strata, or a hierarchy of managerial layers. Findings from empirical studies such as the time-span of discretion instrument and felt fair pay (Jaques, 1951; Richardson, 1971) support the existence of these strata. However, the explanation for such strata eluded Jaques for 25 years until he and Cason conducted a seminal study indicating that these strata reflected the ways in which human beings process information and the kinds of information that people are able to use to work (Jaques and Cason, 1994). The result of these investigations is a theory of human capability, one component of which is the differentiation of orders of complexity of information.

Jaques and Cason found that it is possible to train analysts to discriminate a hierarchy of orders of information complexity with a high degree of inter-rater reliability, if certain conditions were met. However, as they have acknowledged, the orders of information complexity are currently descriptive in nature and thus do not yet meet the criteria for scientific concepts. For this reason, trained analysts may be able to differentiate levels of information complexity reliably yet without being able to articulate specific operational criteria by which the distinctions have been made.

This unsatisfactory state of affairs has led to charges such as this by those outside the discipline:

In the end the study looks a lot like social science at its silliest. For one thing, Dennis Kucinich and Carol Moseley Braun both score better than Abraham Lincoln. For another,

---

1 Viz., the analysts’ Current Potential Capability (CPC) must be at Stratum IV with a Mode of at least Stratum V.
Moreover, in as much as science is a system of interrelated concepts, the lack of conceptual clarity has methodological implications for the discipline as a whole. As Jaques pointed out, “Undefined concepts end up in slovenly language underpinning slovenly thought. The first and most fundamental step in the construction of any science is to develop a univocally defined taxonomy” (Jaques, 2002: 13).

AN ASSESSMENT PROBLEM

One implication of the application of the theory of orders of information complexity to managerial hierarchies is that employees must minimally be able to use information at the third order of complexity to work in a managerial hierarchy without additional assistance. Employees unable to use information at this order may be employed in managerial systems, but they often have aids or other support. Executives at Stratum V or above must use information at the fourth order in their work. Individuals capable of using information at higher orders tend to leave the managerial hierarchy to continue their work. Thus, in the application of this theory to management hierarchies, a key assessment problem is the distinction between the third and fourth orders. Moreover, experience has shown that this distinction poses difficulties for those learning to identify the order of complexity of information deployed in work.

In spite of the inter-rater reliability, this state of affairs indicates that criteria that would differentiate the third and fourth orders of information complexity are not sufficiently precise. In The Life and Behavior of Living Organisms, Jaques (2002) devotes considerable attention to differentiating the orders. He characterizes third-order as categories of intangible entities:

It is exemplified by information about types of activities, or categories of things, or classes of foods. Examples would be information about investment, a category that contains second order intangibles like money or rent, which in their turn contain first order tangibles like a coin; or production methods, a category that contains second order intangibles like tools or drawing instruments, which in their turn contain first order tangibles like a hammer or a pencil. (Jaques, 2002: 34f)

Fourth-order complexity of information is characterized as categories of categories of intangible entities:

It is the world of abstract concepts that are really abstract in the sense that to understand them you must be able to break them down into the categories of entities they encompass, and then to pick out the particular category intended so that you can choose the one relevant at the moment, so that in turn you can break out that category into its contained entities so that you can focus on the particular use of the concept in the immediate
communication in relation to some specific intangible or even tangible entities and situations. (Jaques, 2002: 35)

Jaques follows this with an example of someone deploying fourth-order information, concluding:

Thus he not only makes a statement about values, as a conceptual category, but then also lays out a number of specific third order complexity value categories within the concept, with specific second order complexity entities selected from within each specific category. That is what fourth order complexity is like. (Jaques, 2002: 35, italics added)

The last statement is telling, since Jaques appears to be acknowledging a concern that his descriptive and denotative definition of these orders falls somewhat short of the sort of operational definition characteristic of scientific concepts.

The purpose of the inquiry that follows is to move closer to scientific concepts of specific orders of complexity of information by investigating the nature of the problem and proposing a testable hypothesis. This analysis requires that we look at the larger context within which the specific problematic issues of differentiating the third and fourth orders of information arise (Table 1).

**ANALYSIS OF THE PROBLEM: CONCEPT FORMATION**

As seen above, the fourth order of information complexity involves the deployment of “abstract concepts.” It is clear that abstract concepts do a certain sort of “work” in argument-making, and this sort of work is what sets the fourth order from the third. However, the nature of concept is not explicitly articulated, and there is no explicit exploration of what it means to “deploy” a concept. An understanding of the context and process of concept formation is thus crucial to differentiating clearly between the third and fourth orders of information complexity. What is needed is a concept of concept.

<table>
<thead>
<tr>
<th>Orders of information complexity</th>
<th>Definition</th>
<th>Users</th>
<th>Approximate time–horizon range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sixth Order</td>
<td>Universals</td>
<td>Genius</td>
<td>Centuries to millennia</td>
</tr>
<tr>
<td>Fifth Order</td>
<td>General principles</td>
<td>Extraordinary mortals</td>
<td>Decades to centuries</td>
</tr>
<tr>
<td>Fourth Order</td>
<td>Categories of categories</td>
<td>Exceptional mortals</td>
<td>Years to decades</td>
</tr>
<tr>
<td>Third Order</td>
<td>Categories of intangible entities</td>
<td>Ordinary mortals</td>
<td>Days to months to years</td>
</tr>
<tr>
<td>Second Order</td>
<td>Intangible entities</td>
<td>Children</td>
<td>Hours to days</td>
</tr>
<tr>
<td>First Order</td>
<td>Here-and-now tangible entities</td>
<td>Infants and prelinguistic organisms</td>
<td>Seconds to hours</td>
</tr>
</tbody>
</table>
A good starting point in clarifying the nature of concept formation is Bridgman's detailed investigation of the nature of genuine scientific concepts. Essentially, he argues that concepts play the dual role of serving in explanatory frameworks and providing for experience. Thus in genuine science there can be “no a priori principles which determine or limit the possibilities of new experience. Experience is determined only by experience” (Bridgman, 1927: 3). Bridgman’s point is that concepts arise in and operate on experience. Consequently, we must conceive of concepts as operational rather than descriptive or pictorial. As Bridgman (1927: 5) states, “the concept is synonymous with the corresponding set of operations.” Bridgman’s formulation means that a concept is constituted by a particular set of transactions within experience. Hence the meaning of a concept is the work it can do in generating or transforming experience.

This helps to explain why deploying concepts in (genuine) arguments may serve as diagnostic signs for the purpose of differentiating orders of information complexity. Their operational nature allows us to conceive of concepts as a means of organizing information in experience. This implies that the moment at which differentiation in the orders of information complexity becomes visible is the moment of genuine work. For this reason, practitioners of this sort of assessment must see the subject fully engaged in the work of making a genuine argument in favor of or against a particular course of action or problem statement.

Although this approach clarifies a number of problematic aspects of concept formation, it raises a central question: What is this notion of “experience” that concepts arise from and return to in their generative and transformative functions? A careful analysis of the generic context of work sheds light on what is distinctive about the orders of complexity.

The Spanish philosopher José Ortega y Gasset provides the crucial insight into this problem. Ortega argues that the starting point for all reflection and inquiry is “my life:” my life is the ground and horizon of my knowledge (Ortega y Gasset, 1960, Chapter 10). What is “known” is what has entered my life, and my knowledge extends only to those things that have, in some way, become part of my life. My life is, as it were, the “arena” within which I encounter things, engage in transactions with them, and capture and articulate those transactions in ideas. Of course, as Ortega y Gasset points out, each person must conceive of this “arena” in the first person singular: my life is not your life, though our lives may “overlap”. As a first approach, this immediate “transaction” with the things that enter my life is experience.

The notion of experience as the ground and horizon of concept formation is captured in the ordinary English sense of “experience” – particularly when used in job applications. When someone applies for a job as a manager, for instance, we are concerned to know about his or her management experience. By this we mean not merely having “drifted through,” “gone through the motions” of managing for a period of months or years – giving orders to subordinates, for instance
– or quoting (as opposed to using) a book or a theory. Rather, we are concerned about the process and “residual effects” of active engagement in managing. This is why we rarely confuse someone having acted in the role of a manager on stage or in a film with her having acted in the role of a manager in a corporation. This makes clear that the key feature of experience, for our purposes, is a certain sort of engagement that goes deeper than appearance.

This notion of engagement is characterized by Dewey as a key aspect of inquiry, which he defines as “the controlled or directed transformation of an indeterminate situation into one that is so determinate in its constituent distinctions and relations as to convert the elements of the original situation into a unified whole” (Dewey, 1938: 108). There is a parallel between Dewey’s conception of inquiry as transformation and Jaques’ conception of work. This parallel is crucial to elucidating key features of concept formation and deployment as types of work. Let us begin to draw out this parallel by exploring what Dewey calls the “pattern of inquiry.”

Although a full account of the nature of inquiry would require considerably more space, a brief exploration of the pattern of inquiry is germane to the argument. Inquiry as a process of directed transformation requires specific elements. First, there must be a situation of puzzlement that invokes the sort of engagement characteristic of an agent in inquiry. Dewey stresses that this puzzlement is not to be construed as a merely “subjective” or “psychological” feature of the agent; if this were the case, there would be no connection between the operations constitutive of concepts and “the world of things.” On the contrary, the puzzlement that characterizes the problematic situation is a feature of the agent’s active engagement in the situation. As such, it is an indication that transformation toward some goal may be possible.

The most general motivation to engage in the process of inquiry is to intervene in the processes at work in the situation in such a way as to guide the situation toward resolution of “the problem.” To move toward resolution, the agent in the situation must first determine what the problem is so as to frame a “goal” for transformation. The problem is generated by the agent’s transactions in the situation, and thus serves to constitute an “end-in-view” in the process of transformation. The goal having been envisioned, the agent then uses the resources available in the situation to control the processes of transformation.

Thus the initial phase in the process of inquiry is the “formulation of the problem.” This term, however, is not descriptive of a merely mental or psychological process. If the engagement is genuine, the formulation of the problem involves something like a “dialogue” between the agent and the elements of the situation. Daude Laurents (1994, Chapter 7) has characterized this phase of inquiry as “mapping”: the “territory” of the situation is given, but not all elements are relevant to the process of transformation. As Ortega y Gasset points out, situations have foregrounds and backgrounds: we “count on” the background, though we cannot encompass it entirely in deliberation.
The initial phase of inquiry thus involves a selection process in which the agent determines a set of elements available in the situation that will constitute “the problem.” Obviously, this does not imply that the problem is properly constituted on the first attempt: the history of science is replete with examples of progressive attempts to “state” a particular problem. A problem is “properly” defined when it motivates transformation toward resolution, and this is Daude Laurents’ point in characterizing the initial phase as “mapping.” A map of some territory provides assistance in navigating that territory – much as Jaques’ notion of “taxonomy” as a set of basic concepts that “guide” scientific inquiry. The work of Isaac and O’Connor (1978) on multimodal distributions of capability implies that, in nascent sciences, such initial taxonomies are often in descriptive terms rather than genuine concepts. Their example is Piaget, whose stages of cognitive development are, in their view, essentially descriptive. If they are correct in their appraisal, then Piaget’s work might be seen as mapping in Daude Laurents’ sense.

Mapping and the initial formulation of the problem to be addressed leads to “controlled or directed transformation.” Dewey identifies two basic types of resources for transformation in the situation of inquiry: material means and conceptual means. Material means are those resources that are experientially given in the situation and that serve as the “what” on which operations are carried out in the process of transformation. Conceptual means are the operations themselves, often represented by rules, ideas, or concepts.

There are two significant consequences of this theory of inquiry for the concept of work and for the differentiation of orders of information complexity.

First, material and conceptual means are constituted by their functions in inquiry. This implies that no specific entity is inherently a material means for inquiry, and that no particular concept is inherently a conceptual means. However, Dewey’s term “conceptual means” must not be confused with the term “concept.” Concepts may serve as conceptual means in a particular inquiry, but concepts are not inherently conceptual means for inquiry. The term “conceptual means” is intended to mark a particular sort of function in inquiry, characterized by operations on the material of inquiry.

Consider the problem of determining the length of the diagonal of a square. The properties of the particular square, given experientially, constitute the material means. For instance, the square is 10 meters by 10 meters. In this case, it is a particular knowledge or concept of geometry that serves as the conceptual means, namely the Pythagorean Theorem. The Pythagorean Theorem is not an inert fact about triangles; on the contrary, it functions as a set of operations that allow the problematic situation – the problem of the length of the diagonal – to be transformed into a determinate situation, in which this length is known.

Thus the distinction between material and conceptual means is not absolute but fluid, shifting in accord with the function of a particular element in inquiry. This implies that, depending on the nature of the inquiry at hand, a concept or
group of concepts may serve as the material for inquiry, the process of transformation being guided by other higher-order concepts. (A rather abstract example is a proof in mathematics or propositional calculus, or the sort of analysis of concepts required in theory-building). Thus the function of an element in inquiry is what defines it as material or conceptual means.

Second, since conceptual means are operations, they are marked by their “portability” from one situation to another, while material means are rooted in specific situations in ways that make material means unsuitable for “transfer” to another situation as material means. A concrete example may clarify this distinction. A specific situation $S_1$ is characterized by a problem, let us say, a broken piece of furniture. (Although not the point in hand, this illustrates that a genuine problematic situation calls for the formulation of a particular problem, in this case, characterized by questions about the “best” way to rejoin the pieces so that the furniture is restored to usefulness.) Speaking simplistically, the material means in this case include the pieces of furniture that will be rejoined. The operations involved in actually assembling the pieces and overcoming obstacles to the “resolution” of this problem are the conceptual means. The pieces of furniture are specific to $S_1$. If these material means reappear in another problematic situation as material means, they will not have the same function as they did in $S_1$; material means are not portable across situations in ways that preserve function. On the other hand, the operations by which the situation was transformed are “portable” in the sense that it may have the same function across various situations.

A clearer, though more abstract, example is given in the evolution of particular logical “tools,” say, a logical form such as the law of the excluded middle. Tools like these are found to be effective in their transformative function in particular situations, but because their functions are constituted operationally, they are “abstractable” from specific situations in such a way as to become portable across situations.

We are now in a position to return to Bridgman’s characterization of concepts. Concept formation is driven by “data,” because concepts evolve as sets of operations that serve in a transformative function in inquiry. Sets of operations that are found to function reliably in the process of “resolving” problematic situations are retained and applied in other situations. Thus, as sets of operations, concepts are testable in the sense that their effectiveness as instruments of transformation can be assessed in use. In the process of transferring, applying, and testing concepts, opportunities arise for refining them as instruments of transformation, in ways analogous to the process of refinement that leads from

\[ \text{For the purpose of this line of thought, we assume that science involves inquiry in the sense proposed by Dewey. For a fuller discussion of this point, see Dewey, 1938, Part IV, “The Logic of Scientific Method”.} \]
sharp-edged stones to scalpels to lasers as instruments of “cutting” in medical practice. Refinement of instruments does not take place in a vacuum: the context for refinement is the problematic situation, in which instruments are put to use and assessed for their effectiveness.

This implies that there are “grades” of conceptual means. Let us take portability as the standard for “ranking” conceptual means: the more portable a conceptual means, the more abstracted it is from the situation of application. In that case, conceptual means may be arranged in a hierarchy based on degree of abstraction. Note that in this context “abstraction” cannot mean detachment from the things of experience. If that were the case, then concepts would produce information processing that is increasingly less effective at higher levels of abstraction. On the contrary, when increasing abstraction is connected to increasing portability across situations, concepts used in work are seen as increasingly effective in organizing larger areas of experience.

From this vantage, the history of formal logic illustrates this connection between portability and abstraction. Logical forms such as categorical syllogisms, in an early stage of development, are conceived (for instance, by Aristotle) as applying under relatively narrow conditions. For instance, Aristotle seems to have limited the use of certain sorts of propositional forms to what we would now consider classes of existing entities. A later development of this notion involves making such propositional forms hypothetical, thus freeing them from the condition of existential import. In so doing, such forms become more “portable,” since they are not bound by certain sorts of conditions related to a range of possible situations.

Thus there is, in conceptual means (a function in inquiry, characterized by operations on the material of inquiry), a hierarchy of levels of abstraction. All conceptual means are abstract in the sense that conceptual means involve operations, and operations are by nature abstract. However, lower degrees of abstraction involve limitations imposed by connection to specific conditions that prevail in actual situations. The higher the level of abstraction, the more portable the operations are across various situations. Since the effectiveness of such operations rests with their ability to organize and transform information at lower levels, operations at higher degrees of abstraction represent larger potential areas of application, which means that they are able to “subsume” larger territories of information. Thus, as one moves up the hierarchy of information complexity, one finds not only higher degrees of abstraction but a heightened ability to work with larger “chunks” of information.

\[\text{Dewey's approach to abstraction may suggest that abstraction is a continuum proceeding from lower to higher degrees. Cf. Dewey's discussion of abstraction in the “General Theory of Propositions,” in the Logic, 1938, chapter 15. Jaques and Cason’s research points to the notion of abstraction as a discontinuous change of state.}\]
A MODEST PROPOSAL

We have seen that the theory of Orders of Information Complexity involves what Jaques and Cason describe as a hierarchical taxonomy that captures the discontinuous “phase states” in the kinds of information individuals are capable of handling when engaged in work. Thus, as one moves up the hierarchy, one finds greater “territories” of information represented in operations. However, if the third and fourth orders are to be genuine taxonomic designations, there must be distinctive operations involved at each order.

Individuals who process information at the Third Order to solve problems chunk information into categories. A category is a group of entities that are bound together by a lexical definition of the sort appearing in dictionaries, “in which we try to show what kinds of things are included and which are excluded” (Jaques, 2002: 34).

Those who process information maximally at the third order deploy categories to survey and take account of second-order information or third-order categories that already exist. Categories are selected in virtue of their relevance to the problem at hand to move the problem toward resolution. The information thus surveyed is the territory of a particular course of work. Thus the territory is “mapped” by means of third-order information in the form of categories. In third-order information processing, a web of categories constitutes the map by which work is controlled and directed.

However, for those using information at the third order, the map is hypostatized and thus appears from that perspective as an “entity.” The map is in this way taken as the territory it represents, and the operations that actually permit the construction of such a map are implicit and therefore background to the vicissitudes of work in that context. The implication of this is that information at the third order of complexity is constrained in a characteristic way by the “given” in the work situation.

Individuals using information at the third order may deploy multiple maps, but at best, multiple maps are linked only by an element or elements that appear in different maps and thus make these maps “overlap.” Multiple maps may be

---

4 The term “processing” opens the door to confusion, inasmuch as Jaques uses this term in his concept of types of information processing, including declarative, cumulative, serial, and parallel. These types of processing involving processing something, and what is processed is information at some order of complexity or other. (See Jaques, 2002, p. 33). Thus the use of the term “processing” is consistent and is illustrated in phrases like “serial processing of information at the third order of complexity”. Although the present discussion concerns information complexity, our contention is that a fuller understanding of both processing types and orders of information complexity will yield in a more robust (and testable) theory.

5 See Jaques’ Life and Behavior (2002) for a discussion on second order information complexity.

6 Note that the term “work” is here used in the technical sense signifying the exercise of judgment and choice in the pursuit of a particular goal.
seen as linking at specific points, but each map retains its integrity and distinctiveness in problem solving. Consequently, it is these map-linking elements that drive problem resolution at this order of complexity.

Individuals who maximally process information at the fourth order of complexity to solve problems chunk information into concepts. Jaques characterizes concepts as more abstract than categories but nevertheless as subsuming larger “chunks” of information. Thus a concept is a “category of categories” or, perhaps more precisely a meta-category. Meta-categories are explicitly constituted by particular sets of operations, which mean that their operational character remains “visible” in work. As in the case of third-order information processing, an individual solving a problem using information at the fourth order surveys the territory, which is constituted by categories and existing concepts. Territory is mapped by a selection process driven by relevance to the problem at hand. However, an individual at the fourth level does not conflate the map for the territory: the mapping function of concepts is explicit, and the distinction between the map and the territory is maintained. Thus the fourth order of information processing is distinguished from the third by greater portability of operations (a higher degree of abstraction) and therefore by an increased capacity of operations of this sort (i.e. concepts) to represent larger “chunks” of information. What allows this increased representational capacity is the fact that concepts are recognized as explicitly operational.

The transition from categories to concepts explains this connection. Categories are constrained by the “givens” of specific situations. As such, they are tied to ranges of particular situations. We could crudely characterize category-processing in assertions such as “All x’s are y’s.” This binds the relationship to the existence of x’s in particular situations, and to the discovery that whenever x’s are encountered, they are y’s. Concepts, on the other hand, are “hypothetical” in the sense that their manner of constraining information is by means of conditions-to-be-met: “If anything is an x, then that thing is also a y.” Although the distinction appears subtle, the hypothetical formulation is actually more abstract and is able to handle a greater range of “situations.”

Concepts as sets of operations for the control and direction of experience in the context of work thus preserve the mapping function of information explicitly. Because concepts preserve the distinction between mapping and territory, individuals using fourth-order information not only take into account multiple (alternate) maps, but they can form unifying maps that integrate information relevant to the problem at hand. This means that the perspective shifts from multiple alternate but overlapping territories, where problem-solving involves accommodating the solution to the constraints of these territories (third order) to a “larger view” afforded by a mapping that selects relevant operations (categories and concepts) and integrates them into a course of transformation leading to a particular goal (fourth order). At the fourth order of information complexity, the parts no longer drive problem resolution, but rather it is a “concept(s)” which becomes the driver that organizes the parts and to which the parts must conform.
This explains why Jaques insists that it is only when individuals are capable of processing fourth-order information that can there be notion of a unified whole system (Jaques, 1998).

APPLICATION

In the following discussion, we apply this distinction to show that it is capable not only of differentiating third and fourth orders of information complexity, but also that it explains what is distinctive about these orders.

Example 1

Consider the word “energy” in the following context:

In the case of an ideal system in a gravitational field, Energy = the sum of the Potential Energy plus the Kinetic Energy.

An individual who can operate with information at third order will deploy “energy” as a quantity that is generated from an equation that depicts “reality.” Thus the map and the territory collapse into one entity, and energy is concretized to mean some quantity resulting from a particular algorithm that depicts certain features of reality.

An individual who can operate with information at fourth order will deploy each variable in the equation as representing a concept. Thus “an ideal system in a gravitational field” is composed of a particular set of operations, as are the concepts of potential and kinetic energy. In this way the generic concept energy is conceived as a set of operations represented by the equation within constraints set by operations that constitute an ideal system in a gravitational field. Thus, as Bridgman’s analysis implies, the meaning of the concept energy depends explicitly on how we go about measuring it. In other words, the meaning of the concept is operationally determined, rather than seen as a depiction of something “static” that exists independently of such operations (Brause, 2000).

The word “energy” is used both at the third and fourth orders, but the meaning that the word “energy” carries is very different. At the third order, “energy” involves hypostatizing the result of measurement as though it were independent of operations, while at the fourth order the meaning of the concept is explicitly dependent on operations.

Example 2

Consider the phrase, “meat on the table,” and the way in which it is used in each of the following contexts.

It is important to have a varied diet. Make sure you have grains, fruits, poultry, fish, beans, eggs, milk, vegetables, and don’t forget to have “meat on the table.”
In this situation, “meat on the table” functions as a category encompassing potential food items. This argument thus exemplifies the use of information at the third order of complexity of information. While the category “meat on the table” was established by following a particular set of operations relevant to nutritional needs of the human body, the map and the territory in this example have been collapsed and are hence indistinguishable in this context. Thus “meat” is concretized into a category in which the operations are only implicit.

In the next context, a rancher is making an argument for a particular methodology to be used to assess the quality of a bull to be sold as meat to consumers. He begins by stating that you first must consider the bull’s genetics and environment (i.e. climate) in which the bull resides. He further emphasizes that one must sometimes accept less than the desired genetic qualities because of unfavorable environmental conditions. Then there is a set of checkpoints in which a bull could receive a negative evaluation, making him unsuitable to serve to consumers. These checkpoints extend over a five-year period and a part of a 10-year business plan. To conclude his argument about assessing the quality of bulls as a consumer product, the rancher states, “But the bottom line is to put meat on the table” (Brause, 2000: 57).

In this example, “meat on the table” functions not as a category but as a concept. “Meat on the table” represents a business model for ranching. The rancher is referring neither to an actual (physical) piece of meat, nor to the category of meat, but rather to the operations that collectively bring about a quality product. Thus the integrity of the map and the integrity of the territory are maintained, yet they are not conflated.

Example 3

Let us turn to a more complex example. Consider an argument made by a candidate in the 2004 Democratic primaries:

SALINAS: Senator Graham, in your state, there are many, many immigrants. Of course, we have the Cuban-American immigrants who have a completely different situation.

But for those that come from other countries, would you support legalizing them?

GRAHAM: This has to be put in the larger context of our relations with Latin America. This president came to office claiming that he would build a new era of relationships within the hemisphere. He has. Unfortunately, he didn’t tell us that they would all be policies of benign neglect and indifference.

In Mexico, President Fox has been rendered a political lame duck halfway through his terms (sic), largely because George W Bush did not fulfill the commitments that he made.

In a country in a commonwealth in which we have had a long historic relationship, Puerto Rico, they have 50% higher unemployment, 50% higher children without health
coverage. And we have not yet solved what kind of relationship that country wishes to have with the United States.

I believe that we should have a policy of earned amnesty for those people who came into the United States undocumented. And that would provide that if they, after receiving a work permit, then met the standards of that permit, after a period of time they would be eligible to get a permanent residence in status in the United States. (Washington Post, September 9, 2003: 6)

Senator Graham uses information at the Fourth Order to make his argument. Despite the requirement of brevity in a Primary Debate, there is evidence of the Senator’s application of concepts to state and support his political position. For example, the Senator uses the two concepts “relations with Latin America” and “benign neglect and indifference” to declare his position on the root cause of President Bush’s current policy. He then cites his real-life experience, (conditions of Puerto Ricans and US commitment to the Mexican President), indicating that the concepts mentioned are capable of doing “work” in his argument.

Senator Graham then proposes a solution to the problem using the concept of “earned amnesty.” Rather than just being a solution that rings hollow, such as calling for peace, love, and happiness throughout the world, with no real plan of how to attain that result, the concept “earned amnesty” represents a model which establishes criteria for eligibility for citizenship.

Keeping the territory and the map distinct, Senator Graham creates a position that is portable. This same argument could be applied to different presidents at different points in history.

Now, consider an alternative response to the reporter’s question with a seemingly similar political view regarding immigrants:

RESPONDENT: President Bush doesn’t care about immigrants. He does nothing to help them. They don’t get work or housing or food from government programs. President Bush ought to make it legal for immigrants to stay in this country.

FOLLOW-UP QUESTION: How should President Bush go about legalizing the status of immigrants?

RESPONDENT: I don’t know. He just should.

The respondent uses information at the Third Order to define the problem and provide a solution. The respondent uses categories such as “caring,” “help,” “work,” “housing,” “government programs,” and “making it legal” to make the argument. The map and territory conflate, limiting the portability of the root cause and solution. The application of this particular argument is limited to a specific president located in a specific point in history.

CONCLUSION

Following Bridgman’s point that each concept is constituted by a unique set of operations, our approach has been to take the orders of information complexity,
which have been descriptively established, as concepts and then to ask what set of operations is distinctive for each order. In this way, we have sought specific sets of operations that will differentiate the third and fourth orders. This approach should extend to the definition of the other orders, but we have focused on the third and fourth order because they are both problematic and crucial in analyzing information processing and the theoretical structures that depend on them (such as the concept of stratified levels of work (LoW) as measured by Time-Span (T-S)).

To summarize our proposal, the third and fourth orders are differentiated by the types of operations that survey and account for information in a work context. The third order is characterized by the deployment of categories, which involve the “emblematic” representation of information. By this we mean that, in their function of subsuming lower level, more concrete information, categories remain tied to ranges of specific (actual) situations, even though the category itself is understood as extending to new situations, just as an emblem is an exemplar of the class it represents. By contrast, the fourth order is characterized by the deployment of concepts. As we have seen, concepts are explicitly operational, and thus are still less tied to particular (actual) situations. Thus the explicitness of the operational character of the information managing tools (categories or concepts) makes for the distinction.

This explicitness of operational character has certain implications that are indicative of information complexity in situations of actual work. One who processes information maximally at the third order does not factor into deliberation the operational character of categories, and thus categories are deployed as transparently representative of the “givens” in the situation. Because the person processing information at the fourth order of complexity takes account not only of the information but also of the operational nature of concepts that organize information, the “givens” of a situation are seen as “takens:” in other words, the “givens” of the situation are seen as constituted by how one interacts in and with the situation. This gives processing of fourth order greater flexibility and range in finding “solutions” to a given problem. From the perspective of the third order, the structures of the work situation appear as fixed; however, at the fourth order, these structures are seen as “results” of particular types of transaction. This means that, at the fourth order, new ways of mapping the territory of the situation become visible. This contrasts with the perspective of the third order, in which “new” means different combinations of the “givens” in the situation of work.

We have applied this framework to three examples to illustrate what we believe to be the explanatory power of this conceptualization of the third and fourth orders. This constitutes merely an explanation of our hypothesis, not its testing or defense. This essay, then – in the spirit of scientific investigation – should be taken as a suggestion for a program of research concerning the hypothesis.

One of the most interesting aspects of the problem of differentiating the third and fourth orders of information complexity is that this distinction and the
methodological problems it poses apply as well to any theory-building enterprise. This means that what we learn from the attempt to clarify the distinction among orders of information complexity has implications for the theoretical framework of requisite organization. This speaks to the recursive nature of information complexity: If – following Jaques and others – we are correct that (genuine) concepts emerge only at the fourth order of information complexity, then this calls for an assessment of “concepts” in use in the theoretical framework itself. We may find that some such “concepts” are in need of systematic analysis in light of the concept of concept.

As in any enterprise that aspires to a genuine scientific methodology, the concepts in use in Requisite Organization evolve. Yet this aspiration itself implies that the evolution of concepts is not arbitrary; on the contrary, it is constrained both by the data (material) and by the method (conceptual means) of the work. Much more needs to be said about concept formation – particularly in a theoretical enterprise – but for the moment we may observe that the notion of concepts as sets of operations for the organization and transformation of experience provides access to the major themes in Requisite Organization. Among these themes we find the commitment to the primacy of method and the analysis of presumptions in use and the need for reflection on the ethical implications of the theoretical enterprise and its application.

As Aristotle remarked concerning the science of ethics one should expect a degree of precision consonant with the nature of the subject matter of a science. This precision is partly a function of the bounds imposed by ethical considerations. Ethical concerns arise both in concept formation – because the theoretical concepts concern persons – and in application – because the theory has profound impact on the work lives of individuals. Any science of this sort makes the methodological problems more complex and the need to examine the presumptions of this science more urgent.

NOTES
1 Viz., the analysts’ Current Potential Capability (CPC) must be at Stratum IV with a Mode of at least Stratum V.
2 For the purpose of this line of thought, we assume that science involves inquiry in the sense proposed by Dewey. For a fuller discussion of this point, see Dewey (1938) Part IV, “The Logic of Scientific Method.”
3 Dewey’s approach to abstraction may suggest that abstraction is a continuum proceeding from lower to higher degrees. Cf. Dewey’s discussion of abstraction in the “General Theory of Propositions,” in Logic: The Theory of Inquiry (Dewey, 1938, Chapter 15). Jaques and Cason’s research points to the notion of abstraction as a discontinuous change of state.
4 The term “processing” opens the door to confusion, in as much as Jaques uses this term in his concept of types of information processing, including declarative, cumulative, serial, and parallel. These types of processing involving processing something and what is processed is

7 Aristotle, Ethica Nicomachea, I.3
information at some order of complexity or other (see Jaques, 2002, p. 33). Thus, the use of the term “processing” is consistent and is illustrated in phrases like “serial processing of information at the third order of complexity.” Although the present discussion concerns information complexity, our contention is that a fuller understanding of both processing types and orders of information complexity will yield in a more robust (and testable) theory.

5 See The Life and Behaviour of Living Organisms (Jaques, 2002) for a discussion on second-order information complexity.

6 Note that the term “work” is here used in the technical sense, signifying the exercise of judgment and choice in the pursuit of a particular goal.

7 Aristotle, Ethica Nicomachea, I.3.

References


Matthew M Daude Laurents
Department Chair
Philosophy, Religion, Humanities, Women’s Studies
Austin Community College
1212 Rio Grande Street
Austin
Texas 78701
USA
(mdaude@austincc.edu)