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The research as a decision-making process
A viable system's perspective

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Abstract
The human being and its relation to the territory is symbiotically related to the evolution process. During the evolution, humans, like other species too, have always been in search for survival as an ultimate goal to conserve the viability of the system (i.e., the belonging class). Therefore, individuals are viable systems which aim the finality of survival through a dynamic equilibrium and homeostatic processes with supra-systems and subsystems with which they attempt to ensure states of consonance (structural compatibility) and resonance (systemic interaction) (Barile et al., 2019; Beer, 1985). To do so, they must decide and act, while searching for meaning that is their subjective perception on problems[11] and opportunities. The search for meaning is a natural tendency of human beings as they are inclined to attenuate the environmental entropy by giving a sense to the stimuli of the surrounding context, going from a composition of parts towards the whole[2]. In research, the measurement of meaning has been performed through the well-known scale of semantic differential, usually a 7-point scale of semantic values that describes an attribute or a person's attitude towards something (Osgood et al., 1957). Consequently, the individual behaves as an observing system, filtering information and constructing its own "invented reality" (von Foerster, 2003; Watzalick, 1984). In the field of architecture, environment, and territorial planning, the attitudes of the observer – which might be an academic researcher, an entrepreneur, a policy maker, or even the whole society – towards the territory and its ecosystem components are of a fundamental importance (Swanwick, 2009; Foroudi et al., 2020; Khandan and Rezaei, 2022).

The Researcher as an Information Variety
In its daily profession or occasional passion, the researcher is not much different from other type of decision-makers. As the decision-maker looks for information before taking his decisions and performing his choices, the same happens to the researcher. He is preoccupied with a problem that needs to resolve, and for this he needs informed decisions. We previously defined the researcher as an observer. On the other side, observation, either participant or in natural environment, is one of the diffused research methods, principally applied in qualitative research. Thus, the observer it is automatically dressed with the role of the researcher. The research takes the shape of the researcher's knowledge curve that is composed of information units (U-inf.), interpretation schemes (S-int.), and categorical values (C-val.). These three components make up what Barile calls Information Variety (Barile, 2009; Barile et al., 2011). In substance, every viable system is an information variety. Accordingly, the researcher as a viable system and as an information variety has a set of information units that is his "*database*", a series of interpretations schemes that are his attitudes, and a collection of moral values that we label as "*categorical values*". Each of these components has a predefined role during the decision-making process that the researcher will design and implement.
An information unit (U-inf.) refers to any incoming stimuli from the external environment and/or from the internal brain's memory center, subjectively perceived by the observer through the five senses in coherence with his motivations (psycho-physiological needs and desires), and further processed through internal elaborations. Therefore, the observer, through his processing capabilities, is able to transform the units of data into units of information by qualifying the data which take a defined shape and acquire significance. This process varies based on context and typology of researchers. Different observers use different loops and construct their realities relying on their

information variety endowments as well as on the relationship they establish with the designed context, taking into account the subjective finality of interaction. For instance, if a researcher travels towards a place for gathering data by the means of face-to-face interview, most probably he will recall from this process the way people responded, their characters and personalities, locations where they have been interviewed, and further aspects based on the primary finality of the researcher. But if the finality is to get quantitative data through a mere online survey, then the researcher will mainly recall technical details of platforms and social networks from where he has gathered the data. So, the motivation of the researcher or its finality of interaction with the perceived social-working context, and the emotions produced during the data processing towards meaningful information, define perception and memory which are very subjective varying the observers.

Interpretation schemes (S-int.) are filters that work upon information units through learned algorithms. These are organizational patterns or cognitive frameworks since their main goal is to organize information in a meaningful way for the observer/researcher. Within the coordination function of a schema, it can be described the attention role, the selection role, the organization role, the interpretation role, and the retrieval role. Therefore, schemas through their organizational and interpretative roles shape information units. Furthermore, interpretation schemes are divided into general *interpretation schemes* (G_S-int.) and synthesis interpretation schemes (S_S-int.) (Barile, 2009; Barile et al., 2011). The first have a general character in the sense that have a larger perspective of observation comparing with synthesis schemes that are more technical and specific. Whereas synthesis schemes are *pro tempore*, general schemes are more persistent. For instance, the general attitudes of a researcher are more consistent over time (e.g., a predisposition to use more the qualitative methodology rather than the quantitative one), instead his emergent *behaviors* are more contextually applied (e.g., the application field or the used instruments such as interview, observation method, etc.). Another illustration can be the following. It can be supposed that a team of researchers are using for their scopes the library research, applying the methods of documents' analysis and the historical records' analysis, relying on instruments like content analysis of written materials, photos, notes, tape and film listening analysis, YouTube videos and documentaries, etc. While some of them focus only on content analysis of written materials, photos, notes, the other members of the team refer to tape and film listening analysis, YouTube videos and documentaries. Thus, it can be stated that the first sub-group prefers "*static*" documents (like photos), and the second sub-group selects "*dynamic*" sources (like videos). The chosen instruments are applied behaviors of the researchers in a particular context. In other words, their applied synthesis schemes. These schemes are derived from general attitudes or schemes that in the mentioned case refer to the dichotomy structure-system, where the structure is static (e.g., photo, written document, etc.) and the system is dynamic (e.g., video, movie, documentary, etc.). Consequently, the synthesis schemes are derived by the general schemes. In the present case, the general schemes refer to structure vs. system, static vs. dynamic, particle vs. wave, and so forth. Based on these attitudes, are derived the decisions and choices (i.e., behaviors) of the researchers. Hence, the same general scheme, varying the context, produces assorted synthesis schemes. It means that a synthesis scheme is a contextualized general scheme. The categorical values, which represent the strong beliefs of a viable system, are responsible for the refusal or acceptance regarding rationally justified elaborations exercising resistance to change. They are strongly linked to the emotional level of the decision maker and qualify states of unconsciousness which tell us if something is "*good*" or "*bad*". Also, this is related to the social context to which the researcher/observer belongs. The researcher has a belongingness need (Mallow, 1954, 1962) that is manifested through the interpersonal attraction of the subject towards a particular group (e.g., a research team). This association with a group that shares a common ground of values influence the perception of the individual's membership in terms of social identity (Tajfel and Turner, 1979).

Essentially, categorical values serve as a path during the operationalization of interpretation schemes. They guide general interpretation schemes in the way the latter are used to derive synthesis interpretation schemes. While the information units refer to the structural composition of knowledge, and the interpretation schemes refer to the knowledge shape, then the categorical values refer to the resistance opposed towards change. The latter are typically related to emotions. According to Härtel, Zerbe, and Ashkanasy (2005, p. 29), "*Emotions can express meanings and understanding because strong judgments and values are anchored in emotions and struggling*".

The implications of Information Variety components (i.e., U-inf., S-int., C-val.) on the research process are both implicit and explicit. Implicitly there are methodological implications of the researcher's choice; explicitly, results are affected. For example, a Researcher/Viable System/Information Variety that predominantly considers the U-inf. will be limited to a declarative knowledge (i.e., the "*know-what*" dimension of knowledge), and most probably to a descriptive study model relying on facts and things. Therefore, the collected data will remain an end in itself without permitting a schematic synthesis. This is because the observer lacks intentionality and action which are essential elements of data contextualization and interpretation. There

The researcher starts his journey by "crashing" into a problem, embracing and defining it. It is the so-called "problem statement" that the researcher constructs after a careful analysis of possible research gaps. It is exactly the problem that unfolds the opportunity to search for something new. As the eminent psychologist Erich Fromm reminds: "The quest for certainty blocks the search for meaning. Uncertainty is the very condition to impel man to unfold his powers" (Fromm, 1947).

[1] *"Everything is therefore caused and causal, aided and aiding, direct and indirect, and all are held together by a natural, impeccable link which ties the most distant and differing things together. I maintain that it is no more possible to know the parts without knowing the whole than to know the whole without knowing the parts individually." (Pascal, 1999, p. 71).*

are exactly the S-Int. to attribute intentionality to the thought, allowing the data that from simple symbols to be transformed into meaningful information. Thus, the researcher relying on S-int. utilizes a procedural knowledge (know-how) that usually grasps a vertical dimension of knowledge or a specialization. It might be the case of those researchers that are more focused on applied research rather than fundamental one. It might also be the case of those researchers who are specialized in a typical research instrument (e.g., questionnaire, focus group, etc.). Instead, it is different the case of those viable systems that possess an information variety which is mainly equipped with C-val. Here, the researcher might not have a strong core competency in a particular field or method, but it is gifted with a natural talent or *dynamic capabilities* that are hardly rationalized, and at the same time very effective in finding the best path in turbulent times (Teece et al., 1997). This type of researcher does not rely on a particular doctrine, yet revealing a deep knowledge of principal human problems and existence. The greatest inventions of all times have always passed through emotions and intuitions, and therefore through categorial values (as the latter are anchored in emotions and judgement). Hence, we can conclude that a researcher endowed with strong C-val. prefers the fundamental research instead of the applied one. It is more attracted by the philosophical speculation instead of data manipulation, preferring to producing ideas and discovering new horizons.

The Research Process between Information and Entropy: The Knowledge Curve

The researcher as a decision-maker constructs a dynamic reality that passes through different discovery stages, namely: chaos, complexity, complication, and certainty, depending on the possessed information and the entropy degree of the viable system. These phases are represented through a knowledge curve or the 4C-curve as it is shown in figure 1 (Barile, 2009; Iandolo et al., 2018). Referring to *figure 1*, it appears comprehensible that the higher the information units (X-axis), the higher the rationality (i.e., certainty – the pink area). However, problems differ in character; this is why Simon coined the terms *bounded rationality* and *satisficing*, describing those phenomena that are not fully understandable and for which an acceptable (not optimal) level of decision-making should be aimed (Simon, 1947, 1959; Augier and March, 2004). The more the rationality is bounded, the greater is the entropy (Y-axis), and the more the decision is intuitive. Previously, the components of information variety were explained by referring to different typology of viables systems/researchers. A researcher, in its path towards the discovery combines the information, schemes and values to reach a conclusion. His knowledge encompasses what Plato defined as justified true belief:

•*True* – what does it correspond to in the world? An object, subject, or every observable fact that is known by the community and corresponds to something in the world. It refers to a declarative knowledge (know-what).

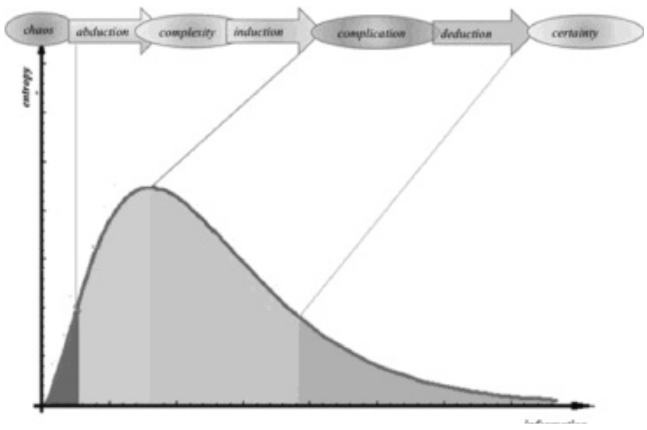

Figure 1. The Knowledge Curve
Source: Iandolo et al., 2018, adapted from Barile, 2009

•*Justified* – what procedure did you follow to acquire it? Paths of action, strategies, norms, rules, tactics, etc. It refers to a procedural knowledge (know-how).

•*Belief* – are you willing to act upon it? The willingness is rooted in subconsciousness and in some categories that make resistance towards change. It refers to a value system (know-why).

Thus, the researcher as a viable system and information variety is an entity who makes decisions and aims to solve problems relying on information, schemes, and values. While the decision-making typically happens in the first two areas of the knowledge curve (i.e., chaos and complexity), the problem solving (or the decision performing) typically happens in the areas of complication and certainty. To better understand this point, may be deemed necessary an explanation of the Knowledge Curve (*figure 1*). The curve is also called 4-C curve due to the problematical areas that covers:

•C1 = *Chaos* – a situation in which the viable system unconsciously faces a fastidious sensation but it is not aware about the origin/cause, the effect, and the solution. So, both problem and resolution scheme are incognita. For example, this is the initial stage of every big discovery (e.g., Einstein's relativity theory, Archimedes' principle, Nash equilibrium, etc.). Even the most senior researchers, before coming to a conclusion or producing a new formula/theory/postulate, first pass through a confusion state due to the lack of information with regards to the new situation they are facing. Thus, if today we are certain about touchscreen devices, before they were discovered the scientists were confused (under chaos).

•C2 = *Complexity* – a problematical area characterized by the viable system's consciousness about the problem. Although the problem is known, the viable system is convinced that there is not a pathway yet on how to solve it. For instance, these are all those health situations where a diagnosis can be accurately stated, but the cure is still missing.

•C3 = *Complication* – a context in which the viable system becomes more optimistic about the problem resolution, but the formula (i.e., the interpretation scheme) it is not yet in its hands; it is just a matter of time. As an illustration, here the researcher might need to use a structural equation modelling but it is lacking mathematical and computer skills. However, the researcher knows that the skills can be either recouped or the solution can be outsourced.

•C4 = *Certainty* – this is the last area characterized by that type of problems that seems to be very easy to solve (99% certain) because a method already exists and the viable system it is equipped with that. These sound like repetitive problems, such as organizational routines. For example, a researcher who continuously manipulates data with the same software. It should be noted that certainty cannot be 100%, as it is demonstrated graphically in *figure 1,* where the curve runs asymptotically with X-axis. The reason is that every solution (e.g., theory) should be open for improvement (new hypotheses and innovations). Popper (2005) calls it *falsifiability*; Kuhn (2009) calls it *paradigm shift*; Schumpeter (2003) defines it *creative destruction.*

The above areas are distinct/connected from/with each other by three types of reasoning:

•*Abduction* – the launch of hypotheses, which is the first step of scientific reasoning.

•*Induction* – the experimentation of the hypotheses (i.e., hypotheses testing), going from particular single cases to generalizations.

•*Deduction* – the deriving of a conclusion starting from general statements (premises).

Epilogue

It might seem clearer now that the decisional activity of a researcher depends on the subjectively perceived information that a respective observer has about the problem. In this way, considering the information units and the entropy levels, the problem can be qualified as chaotic, complex, complicated, or simple (certain). If the viable system faces issues extended along the first two areas of figure 1 (C1 & C2), it means that due to the information deficiency (in case of chaos) or information redundancy (in case of complexity, where information and entropy increase simultaneously), the rationality is truly low (i.e., bounded). Therefore, the tendency is to use more categorical values and some general schemes, which is typical of those type of decisions labeled as "*decision-making*". If the viable system encounters a problem referred to complication or certainty areas, then synthesis schemes and information units are more present to solve the problem. This is the reason why the paradigm of the Viable Systems Approach makes a distinction between decision making (occupied more with strategic tasks and intuitions) and *problem solving* (focused more on operations and routines) (Barile, 2009). During the research process, scholars can benefit of this perspective because of the increased awareness on how to move along the knowledge curve.

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