Self-expansion

redefining key psychology terms with system theory

ACADEMIC EDITION

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PREFACE

Dear Reader,

In this volume, I will attempt to provide insight on the theme of connection through three perspectives, namely, system theory, psychology, and practice. These three all revolve around the same concept: what happens, from the perspective of an entity, when that entity connects to another entity?

One of the key aspects of this line of thought is that the only reality existing for a given entity is its "own" reality. That is, its relationship to other entities can be described exclusively from the vantage point of the entity itself.

What do I mean by entity? This becomes relative precisely due to the way I focus on connection. An entity is not necessarily a single unit, as observed from an external vantage point; for example, from outside the entity. Rather, an entity is something that is recognized as a unit by the entity itself. Therefore, a person may be an entity. However, this person and their spouse, who coordinate their operations through communication and on the grounds of common interests, may also be seen as an entity. In that case, their decisions (those of the couple) in that context will be determined on the grounds of what their common interest is.

Adaptivity, an aspect that represents an absolute positive value of its own accord from the perspective of the entity, is the key principle, in the light of which I will be examining the effects of the systems' connections.

The notion of connection may at first seem of interest. However, since connection is not a key term in either psychology or system theory, is it worthwhile examining this notion at all? I believe that, by clarifying and encompassing the notion and quality of connection, it becomes possible to understand a range of phenomena in simpler and deeper ways than previously. We can obtain clear explanations for phenomena such as the (similar) traits of problem solving and altruism, or the relationship between religion and adaptivity.

While describing the different connection patterns and their effect on systems' behavior, I have reached some novel conclusions. I will try to justify these through everyday examples and, more importantly, by reflecting on theories espoused by acknowledged academic figures, such as Freud, Neisser, and Piaget.

By using system theory terminology, the first chapter discusses how two systems can connect. Also, some new notions are introduced to help understand how connections impact upon systems. The conclusions accepted in the first chapter will then in the second chapter, be framed in terms of the person, as a system, and its sub-systems, namely, cognitive schemata. An overview of the impact of the connections of these cognitive schemata on the human psyche will then be presented in the FIPP – Fodormik's Integrated Paradigm for Psychology – model in the third chapter. There will then follow an example chapter from the Student Edition dedicated to examining a particular theme in further detail, which will demonstrate how the FIPP model can be used efficiently.

Due to the novelty of my submission, I feel that it will generate further avenues of consideration. In this regard, I will endeavor to respond to any request for further information, or debate on this theme, from those who are open and interested; I can be contacted upon miklos.fodor@gmail.com

I wish you good reading, and a wealth of intellectual experience!

Miklós Fodor

System Theory Introduction

Introduction

Since von Bertalanffy (1968) and Wiener (1948), works that focus on the structure and operation of systems have enriched the literature on system theory and cybernetics. In particular, how they connect to their environment and expand to include the assessment of management, and related issues such as information processing. Fortunately, the practical application of theoretical models complements these, so paving the way to attaining von Bertalanffy's original goal. That is, the birth of an integrated science, one that incorporates scientific concepts espoused by various sciences, and so offers mutual benefits in their relationship with one another.

Strangely, little attention has been paid to the connections of sub-systems that comprise a given system, or how these systems influence other systems. Maturana and Varela's (1987) notions of autopoiesis and autopoietic systems seem to have resolved the question of how specific systems adapt, so assuring their survival. When discussing the adaptation, however, they omitted assessment of how adaptation takes place from the system's internal perspective. That is, how can a system inform itself (what sort of mechanism provides it with feedback) whether the changes it has undergone are good or bad from the perspective of adaptation?

In any attempt to project system theory results onto a person or organization (enterprise), I acknowledge that we know much about what goes on inside us. However, we have less information on how these systems behave in relation to one another. For example, how we cooperate, compete, or help one another in an altruistic way. The question I raise focuses on the analysis of an interim, yet extant, level of assessment. On the basis of published literature, we know a great deal of what takes place inside a specific system. This includes what happens when a specific system (A) becomes part of a larger system (B). B itself then becomes the main system. However, we know far less about two inter-connected systems, which are more than a single specific system, yet still do not compose an entirely new main system. (Let us call this undefined, interim system, C.)

For a human comparison, from the perspective of system theory, we are aware of what goes on inside a person, previously indicated as (A); and what goes on in a group or society (indicated as B). However, we do not know a great deal about potential interactions between two persons (indicated as C). The same applies during the life of an organization, namely: we are aware of how a given organization (A) works, and how the market (B), in which the organization operates. However, we do not have sufficient insight on, for example, the relationship (C) between a given supplier and its client's enterprise.

In the following chapters, I will illustrate the benefits of the theoretical concepts in footnotes by framing these in the context of physically existing systems; namely, people and organizations. The examples I present have been taken from these two main areas. However, ever since Miller (1978) espoused his theory, we know that a cell, organ, organism, group, organization, community, society, or supranational system, is structured on the grounds of the same organizational principle. That is why it may be no surprise that these theoretical concepts will also apply, and function, when projected onto the relationship between countries, political parties, and other groups.

Objects of Assessment

Before assessing the connections of systems, I should specify those systems that the following concepts relate to.

The most attractive attribute of system theory is that it identifies similar fundamental relationships between, for example, the units, branches, and divisions, of an enterprise; the parts of a complex mechanical machine; and the particles of a cell. Similarities are based on the way each of these entities has similar properties. These include that: they are systems; they have boundaries; their sub-systems underpin various functions; and they have structure(s), in that the sub-systems connect to each other in a specific way. From amongst these, the most relevant property is that the systems are in contact with their environment. That is, they are in contact with something that is not a part of the system, which is in the form of inputs and outputs. These systems generate outputs from inputs with the aid of their internal structure(s).

Regarding the numerous types of system, my following claims are only applicable to so-called complex adaptive systems (CAS) (Holland, 1995). More specifically, those systems comprised of organic matter. The reason for this is that a minimum level of complexity is required in order to ensure that a system is capable of adapting without external help, by simply altering the structure and connections of its sub-systems. This complexity, and the chances for successful adaptation, increase linearly with the number of sub-systems. The systems built of organic matter, being those made up of sub-systems that decompose/decay or evolve/replicate more easily, mean much less stable systems. These change far more quickly and dynamically. Consequently, these organic CASs are capable of fast and complex learning, which suggests that the system is capable of adopting hundreds and thousands of system states within a short space of time. From amongst these, the single most adaptive state is selected. The structure so selected can stabilize, since it provides good responses to environmental inputs.

So many factors influence live CASs during the course of increasing their adaptability that from a higher and less detailed level of assessment it seems that this process is trial and error learning (Skinner, 1950). The operant conditioning requires multitudes of system states. From a higher approach, we might view these as being produced by a random number generator within the system.

Another unique characteristic of the live system, as presented in detail by Miller, is that its sub-systems comprise live systems, and are therefore structured on the basis of similar principles; for example, including sub-systems with the same function. Perhaps my one deviation from Miller's approach is that, whereas Miller lists a limited number of complexity levels, I do not. Neither do I necessarily insist on quantising (relating a natural number to each complexity level of) the systems..

This will be relevant later, in the introduction on cognitive schemata used to describe human thinking, where:

a) cognitive schemata cannot be explicitly placed in the category of an organ, cell or organism; and

b) schemata connect at several, or even hundreds, of levels, to describe thinking and the human psyche, especially if we also accept basic sensory units as schemata.

I also prefer to extend the number of levels for similar reasons. In many cases, project teams or organizational units (or similar) with special competencies, do not fall on the "whole number" complexity level.

Sub-systems as operations

Miller differentiates various sub-systems according to what they process i.e. matter/energy; matter/energy and information; or information only. As we are aware of how all sorts of information manipulation is embedded in the material world, we shall be focusing only on information processing. That includes the relevant neurological, biochemical and physical processes enabling the described connections, which must be identifiable in the future.

The handling of these information systems has also simplified, due to how we consider them as operations that generate outputs from inputs. I use the term operation to emphasize an approach identical to that of Stephan (2004). That views the system as a function which, using the inputs and the characteristics of the system, generates outputs and a new system state.

What is important to us regarding the notion of operation is that the system works with multi-variable inputs, from which it generates multi-variable outputs. Moreover, due to the nature of transformation rules, not all inputs are capable of being transformed; only interpretable input will lead to usable outputs. The regularities stored in the structure of the system (its sub-systems and their connections) designate acceptable input patterns. These, therefore, are also stored in the system. This does not presuppose a pre-processing or pattern filtering sub-system: the filtering mechanism itself is encoded in the structure of the system. The system begins to process each input, which is performed successfully or otherwise.[1]

Pre-processing, or a filtering apparatus, is not necessary. However, in the case of more complex systems, this does not imply that the presence of a specialist sub-system to perform this function is a drawback. I will return to this later.

Before clarifying pattern and input relationships, let us consider the consequences of an approach that takes systems as an operation.

The most relevant outcome is that the connection of sub-systems becomes possible to understand; namely, that an output of a given sub-system may be an input of another sub-system. Furthermore, the connected sub-systems also perform an operation, which coincides with the way they create a system through these means. Several systems may use the same output as an input, and several outputs may compose the input of a given sub-system.[2]

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1 This is evident in humans when a hungry child places an object in their mouth, chews, and then swallows it (processes/conducts an operation on it). The child then places a solid object in their mouth and, as usual, begins to chew it, but stops this action when it proves unsuccessful. Or, a person places a piece of chewing gum in their mouth, chews it, but does not swallow it as they are unable to convert it into something edible i.e. the operation stops. A similar situation may occur in the life of an organization. For example, a supplier delivers an aluminum compound to a plastic manufacturing factory, instead of the plastic compound that was required (which can be molded.). Nothing occurs when the wrong base material is fed into the machines, and the production process breaks down, as the machine only heats the material to the melting point of plastic, not aluminum

2 Although focusing on the mathematics of the topic is not our objective here, I will nevertheless provide a simplified description for clarity. Let x be the input of sub-system A, and f(x) as its output. Let y be the input of sub-system B, and g(y) as its output. In this case, the two connected sub-systems will generate g(f(x)) from input x. If a third sub-system, C, also connects to B, and A and C jointly impact B – g becomes a two-variable function – then h(z) is the output of C (z is the input). So, x and z form the inputs of the system that is now composed of these

The notion of connection enables both:

- the system theory-based description of complex behavior and phenomena generating many inputs and outputs; and
- these sub-systems to receive information from one another.

This process of receiving information is independent of the time factor that, using the methodology of system theory, makes us capable of analyzing prolonged actions or sequences of phenomena. Moreover, we can observe a 'linear' sequence of this kind in various time horizons, or 'resolutions', since phenomena taking place on a daily, monthly, or annual, basis are embedded into each other.[3]

Integrated operations

A question remains: with limited storage capacities, how can all the operations that make it possible to process inputs be stored? A notion similar to the logical operation of induction is key to answering this question; namely, the integration.

What do we mean by integration, and how does it take place? Integrated operation comes into play whenever we manage to reduce two or more operations to a single operation in a way whereby information is not lost in the process i.e. the integrated system is able to perform what those operations were able to do. The inverse process, of generating the 'to-be-integrated' type of operations from the integrated operation, is termed deduction. In many cases, the integrated operations generate valid outputs even without the aforementioned (deduction) inputs, even if they contain less information (fewer details) than their deduced companions. This difference in information detail is generally negligible in relation to the degree of storage capacities that can be retained, or to how a lower volume of information can be better manipulated.

Integration may take place in either of two ways:

- When various operations contain the same sub-operations, and the integrated operation collects and summarizes these common sub-operations. In order for this integrated operation to 'know' as much as the operations to be integrated, a differentiating sub-operation (that making the difference) must associate with the integrated operation. Therefore, the common properties will be stored in the new integrated operation, while the inputs (with the help of the differentiating sub-operation and the deduction inputs) will produce the same outputs as that prior to the integration process;[4] or

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three sub-systems A, B and C, whilst g(f(x), h(z)) will be the main system's output. Remember that this is a simplified description; inputs or outputs are actually composed of several independent variables

3 In humans, the way in which a given person accumulates assets is a good example of a series of operations connected in parallel. The amount of money eventually at the disposal of the person is the outcome of a series of investment decisions, in which context the profit generated by a previous investment decision made over the years established the capital needed for the next investment decision, and so on. Production organizations (factories etc.) are prime examples of complex systems, the financial success of which may depend upon minor decisions. These might include whether workers should wear protective gloves, how prepared are its engineers, or the type of pricing strategy recommended by the marketing division

4 In many cases, the process of human categorizations proceeds as follows. When the members of a category (say, apples) are placed in the same batch, this composes a sequence on the basis of certain similarities, and in spite of certain distinguishing traits (red, green, yellow

- o Deconstructing the operations to be integrated, and reconnecting these in a new structure i.e. by means of restructuring, creates a new integrated operation. Here, this new integrated system is capable of producing outputs similar, but not entirely identical, to those of the operations to be integrated. Moreover, outputs generated through these means are more adaptive than those produced as an outcome of the integrating operation.[5]

The number of common sub-operations of these operations determines which of the above two options for integration will take place. The first option is characterized by attempts made to reduce redundancy (decreasing storage demands of identical sub-operations). In deconstructing, it is the correlation between outputs and inputs that may launch the integration process. If there are only a limited number of identical operations in relation to the operations that deviate, redundancy will not reduce significantly. That is why the deconstructing process will be launched, assuming that outputs and inputs correlate.

If different operations connect to a single operation, these operations will behave like an integrated operation. This is especially so if that single operation is also capable of generating valid outputs of its own accord.[6]

Description of the connections of sub-systems

As previously mentioned, the structure of the system determines two – closely interconnected – matters, namely: the operation itself, which the system performs; and the patterns derived from this, to which the system is incapable of responding. We originally narrowed the scope of systems being assessed in a manner that emphasizes living nature, which enables flexibility i.e. learning by means of transformation. The creation and cessation of sub-systems and structural changes (the creation and deconstruction of connections) accompany this transformation process. In accordance with Maturana's (1980) notion of autopoiesis, it is possible to state that – apart from physical materialization – systems are in a constant state of transformation.

This also implies, for example, that through changes in the sub-sub-systems, not only the operation to be performed itself changes, but also the pattern (designating the inputs acceptable in this context and still to be processed), hence ensuring an increase in adaptivity and survival for the system.[7]

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apples). The reason underlying the difference between the components of the category is unknown. For example, many people are unaware of why an apple is red or green. The example is even more extreme in the case of artificially created categories (say, a batch of yellow fruits: lemon, yellow apple, banana, pawpaw etc. which have nothing in common other than their category label)

5 Describing consistencies deduced from observations is an example of such interactions e.g. the laws of movement. The way in which it is possible to express this with the help of numerical deductions (digital), instead of through analogies, makes it possible to make much more accurate forecasts. Our output will then be more adaptive than the output generated by a non-integrated operation

6 The multitude of roles a person plays is an example of such a phenomenon: John Doe the employee, John Doe the husband, or John Doe the sportsman. John Doe is the same real person who integrates all these roles. However, the context, as deductive inputs, defines a given role

7 An example of pattern changes taken from the life of a person occurs when, for example, a person's standard of living, and so their behavior, changes. An example of this in the life of an

It then becomes possible to introduce the notion characterizing the quality of connections, or connection quality. By using system theory terminology, I define this by how well the outputs of a sub-system function as an input for the connected sub-system that receives the product of an operation. More specifically, the information distance, of the input and the pattern determining acceptance, is what controls this quality. The smaller the information distance, the more similar they are; 0 information distance implies a perfect match.[8]

The mathematical formula used to calculate information distance can be composed in various ways. These include: the sum of the square of the distance between the input and pattern values; the degree of correlation; or the sum of differences calculated following normalization. Without examining the minutiae of this formula, it can be seen that, in order for adaptation to take place, the input does not have to be a precise number, but needs to fall within the acceptance range. This acceptance range is also a property of the system and – as with the pattern – its structure ensues from the system.[9] [10]

If we accept the existence of such patterns, this exactly serves as a system theory definition of Plato's ideas. Accordingly, ideas are internal patterns (existing in our minds). Nevertheless, they may exist in the material world, in relation to which we measure our inputs. Consequently, ideas are inputs with 0 (zero) information distance.

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organization may be characterized by various changes occurring in the culture of the organization. Examples may include the tone in which an executive addresses employees; the quality of material an employee produces; or specific key figures (percentage rate of expected profit, staff numbers, and so forth)

8 In human relationships, this is most evident in the case of cooperation. A worker may perform only part of a task, and the next person working on the task can only work with what is received from the previous worker. (Car assembly lines are a classic example of this.) This can take place at divisional or executive levels throughout organizations. As an example, the success of the sales division of a trading organization will depend on the price and quality of the goods procured. If goods were procured at a price that exceeds their normal market retail price, the sales division will be unable to sell these, or only at a loss. Thus, the too high internal sales price (that at which the procurement division sells the goods to the sales division) can be an output that the sales division is unable to accept as an input, which is why the process will break down

9 Let us look at how this works in the case of neurons. Assume that five neurons connect to a given neuron, and that at least three of these need to fire for the base neuron to be activated. Therefore, if all five neurons fire, the information distance is 0; however, the neuron is also activated if only three or four fire. This means that the acceptance range represents a value equal or above 3 which also demonstrates the way in which the acceptance range in not always a finite interval, but may be open in one direction; for example, greater than x; smaller or equal to y

10 A special definition for information distance – the notion of quality level – has evolved in the case of base material functioning as inputs in production organizations. Namely, quality is what determines whether the desired output can be manufactured. Note that we are not talking of quality control, but about a simple attitude, namely, that someone wants to manufacture something, if at all possible: "The row material is not perfect. However, we are still capable of manufacturing the final product"; or "It is pointless attempting to manufacture the product from this base material."

For example, a similar input in the life of a person is food. If we are hungry, a visually unappetizing pizza (baked a few days ago) will suffice, as it will assume the same function, namely of satisfying our hunger

Types of connections

Just as a function may generate rational results on several values, so systems do not necessarily generate outputs in the case of a single pattern. Indeed, in many cases the most pertinent issues relate to determining the patterns to which an incoming input belongs.[11] In order to gain a better understanding of this type of connection, which can be called a categorizing system, we need to examine the connection variations of sub-systems:

- Base type: one input – one output. The system generates an output on the basis of the input.[12]
- Distributing: one input – several outputs. The system performs an operation on the input and then distributes the results of this in several directions.[13]
- Aggregating: several inputs – one output. Firstly, the system consolidates incoming inputs in accordance with its previous structure, then performs operations on these and handles the result as an output.[14]
- Several inputs – several outputs. This is not a base scenario, since it can be traced back to a combination of aggregation and distribution.

The categorizing system can then be conceived as a complex system composed of three linearly connected parts (sub-system groups).

One distributing sub-system, which duplicates the inputs in accordance with the number of patterns.

The number of base types of sub-systems connected in parallel with the distributing sub-system, corresponds to the number of patterns in the system to be categorized. The sub-systems each contain the patterns, from amongst which the various operations can be selected; these are performed on the input in line with the pattern. Information distance is calculated between the input received from the distributing sub-system and the pattern, concurrent with which the operation characteristic of the input is:

- either performed; or
- is not performed.

An aggregating sub-system is given the information distance from the preceding (base type) sub-systems. The aggregating sub-system selects the narrowest information distance base sub-system and either:

- sends the output – if an output was received – as the output of the categorizing system; or
- returns the original input – if an output was not received together with the information distance – to the selected sub-system, and only sends the output of this sub-system as the output of the whole categorizing system.

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[11] Example: recognizing form or shape in the case of people, or determining trends in share price movements in the financial world

[12] Example: a person who reacts to environmental stimuli through behavior; perhaps they see someone they know and say hello. Or in business, a marketing employee develops a strategy from a market research report

[13] Example: an actor who reads poems to people; a manager who distributes tasks to employees (X to do this, Y to do that)

[14] Example: a person in a decision-making context, subjected to further stimuli, who then performs an action. An example of this in companies is when an airplane or car assembly plant (see previously) manufactures a final product from many different parts

If scenarios connect

In the following, I assess the various relationships that may potentially form between the input and the pattern.

A. One input, one pattern:
The input
1. falls in the acceptance range; or
2. does not fall in the acceptance range.

B. One input, several patterns:
The input
1. falls in the acceptance range of the pattern;
2. does not fall in the acceptance range of any pattern; or
3. falls in the acceptance range of several patterns.

C. Several inputs, one pattern:
1. one input falls in the acceptance range of the pattern;
2. no inputs fall in the acceptance range of the pattern;
3. several inputs fall in the acceptance range of the pattern;
    a. narrow information distance between inputs i.e. patterns are similar;
    b. wide information distances between inputs i.e. patterns differ.

D. Several inputs, several patterns: this can be traced back to the combination of points A, B and C.

It seems evident that cases A.1, B.1 and C.1 correspond to the base scenario system: in such cases, the output belonging to the input is simply generated.

Scenarios A.2, B.2, C.2 and C.3.b result in the so-called suspension phenomenon; this will be discussed in the following section.

Scenarios B.3 and C.3.a lead to the phenomenon of competition.[15] Here, the output belonging to the sub-system with which the information distance is smallest is generated. If this cannot be explicitly determined, the system attempts to calculate an increasingly accurate information distance by returning to the source of the input and examining its components, or by examining the details of the sub-systems of structures containing patterns. As a last resort – if the above prove unsuccessful and the two inputs are not identical – use of the sub-system is suspended; see below.

Although both scenarios can be described in terms of the classical notion of

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15 In humans, an example similar to the animal world may be that of selecting a partner. Consideration is made of the physical, financial, and psychological circumstances a candidate for husband can create for their family, or how well a candidate for wife could satisfy the demands of her husband and children. Sport is a prime example of competition. Here, competition refers to who – perhaps by obstructing or outdistancing one another – is capable of proving that they are closer in terms of information distance to a set value.

A tender, or job application, procedure may be a concrete example of competition in business, in which case the first round corresponds to the first, approximate calculation of the information distance. This determines whether tender participants are within the acceptance range at all. Subsequent rounds make it possible to accurately define the input by gaining insight into the details of the sub-system structures underlying the inputs. This is achieved by concurrently calculating the information distance from the pattern competition, I would label scenario B.3 as the competition between females, and C.3.a as the competition between males, hence referring to mating phenomena in the animal world. While a female can be impregnated by only one male at any one time, and offspring are born as an output, the male is capable of impregnating several females in the same period. The analogy with scenario B.3 is that the male selects a female best suited to his needs from amongst the females (so females compete to prove to the sole male which of them is the healthiest). In the case of C.3.a (labeled as competition between males), the female selects the male whose inputs are best adjusted to her expectations (the males fight to prove to the sole female which of them is best in genetic composition, vitality, virility).

In accordance with the process described above, the competition process in the case of more complex systems presupposes the potential to gain insight into the processes underlying the system inputs. This is sub-structured and encoded within the structure of the system to find the optimum match. In the case of B.3 (competition between females), it is possible to calculate the information distance more accurately, in relation to the input that can be taken as a trait, by exploring the components of structures determining the patterns. In the case of C.3.a, (competition between males), the details underlying the structure of sub-systems generating inputs operating earlier in time may be of assistance in calculating the information distance from the pattern that can be taken as a trait.

I would highlight that the issue of competition alone does not ensure that the sub-system 'for which they are competing' will connect to (choose) the sub-system with the best quality connections (and therefore the most adaptive, as will be explored later). The competition merely ensures that only those two sub-systems with the best fit will connect. We cannot assume the presence of an external arbitrator that, on the grounds of some absolute principle, selects the sub-system from amongst the various sub-systems. Even if there were such a rule (for example, choosing the most adaptive sub-system), there is only one factor that will decide which two sub-systems connect; namely, the output generated by, or which matches the pattern of, the target sub-system. Consequently, if the pattern of the target sub-system is not adaptive, it may be that a less adaptive alternative, of the many available, will connect. Should this occur, the two connected systems may, nevertheless, be jointly more adaptive than the two separate systems. However, the contrary is equally possible.[16]

Suspension

Suspension is one of the pivotal notions of our model. It is used to indicate bottlenecks occurring in a process – i.e. a system failure – because of the way that the input-output

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[16] An example of this phenomenon can be found in the context of choosing a partner: the principle of "like takes pleasure in like" (similis simili gaudet), or "opposites attract", often overrides a seemingly logical principle. That is, from the available options, everyone will choose the person who seems most attractive (prettiest/most handsome, richest, smartest). Selecting suppliers on the basis of personal connections, or similarities in the organizational culture or nationality of the two companies, instead of (uniquely) on the grounds of price and quality offered, can often be observed in the life of enterprises. Naturally, life itself often justifies these decisions, since personal connections, or a similar mode of thinking, can eliminate problems and divergences potentially arising during the course of long-term cooperation. This might not be possible on a financial/economic basis

relations between two-systems are unclear. This may arise due to:

- o The output of a given sub-system proving to be an inadequate input, as it does not fall in the acceptance range of the other connecting sub-system, and therefore the latter sub-system is incapable of generating a suitable output;
- o Two, potentially antagonistic, inputs are received by a given sub-system, which would imply the creation of two antagonistic outputs as the outcome of a single operation.
- o What happens in the case of a bottleneck? A system functions if it is capable of generating outputs from inputs. If it cannot, there is 'something wrong' with the system i.e. the risk of suspension prevails, unless something is changed:
- o Changes may take place in the structure of the suspended (receiver) sub-system, as a result of which the range of acceptable inputs changes, and the system is once again capable of generating valid outputs.
- o Another possibility is that the inputs needed by the receiver sub-system to process are defects or defective i.e. one of the preceding sub-systems performed incompatible operations, which is why it transmitted bad outputs.
- o A third possibility is that an error occurred in the structure of the main system (the way in which the sub-systems connect) and the penultimate structure in the blocked chain, instead of connecting with the last, connects to another structure to which it sends outputs.

Seemingly, the simplest change in terms of the system – which, however, becomes more of a complex restructuring at the level of sub-sub-systems – is when the pattern designating the scope of acceptable inputs is modified or expanded i.e. one new sub-sub-system is given a new pattern. Since the pattern is always generated from the structure of the sub-system, this implies that the structure of one or more sub-sub-systems needs to change or evolve. This presupposes the deconstruction, duplication and (repeated) bonding of existing valid connections. In overall terms, that is the restructuring of the sub-system, or the evolution of a new sub-system. This explains the importance of positing our model relative to organic CASs, as these are capable of the aforementioned deconstruction, duplication and bonding.

It is important to stress that suspension does not imply termination. Even a suspended sub-system may possibly be capable of generating some sort of output; however, it is highly probable that the operation it performs is not adaptive. Suspension simply means that it is necessary to make changes, and preferably avoid the use of the system, until these changes take place.[17]

Note that suspension does not presuppose an external agent, which arbitrarily marks as non-working the connection of two sub-systems. Suspension is a phenomenon that takes place of its own accord even in the simplest of systems, since information is blocked in the system. Consequently, the system either breaks down, or begins to generate invalid outputs.[18]

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17 Just as when a pipe is partly blocked, and the water cannot flow fully through or escape elsewhere; the water system still works, but the blockage needs to be eliminated sooner or later

18 The phenomenon of suspension is characteristic of both people and organizations. Whenever a couple fails to satisfy each other's demands – i.e. fail to act as, or to say the things, the other person expects them to – the relationship itself will be at risk. In this case, the couple retrospectively examines where things went wrong in the relationship, or finds a solution in the present by restructuring their systems i.e. changing their behavior and habits with the aim of again satisfying each other's demands. A similar situation may appear in a factory production

The manipulation chamber

Avoiding suspension is vitally important in ensuring the regular operation of a system. Suspension is due to the information distance between the input and the pattern being too wide. So, a system has an evolutionary competitive edge if it pro-actively 'engages' in connections between sub-systems that pose a threat to the operation of the system. In this context, a manipulation chamber performing the restructuring of connections most threatened by suspension (or possibly already suspended) may be of help.

A manipulation chamber is a sub-system with conditions ideal for speeding up the deconstruction and reconstruction of sub-sub-systems essential for restructuring. This not only implies more optimum conditions (for example, greater calculation capacity, better energy supply) in the physical execution of the manipulation chamber, but also an acceleration in communication. For example, sub-systems located at great physical distances from one another may possibly transmit their inputs to each other through a narrower bandwidth. By doing so, they can attempt to match their sub-systems much faster by duplicating themselves and placing those duplicates into a 'communication center', where the distance is almost zero. If the new structure with better parameters is created, this structure is duplicated back to its original place by replacing the old version, following which it is then tested in its native (original) environment; see the later section on testing.

I should stress that restructuring outside the manipulation chamber takes place of its own accord over time, albeit at a much slower pace. Another important aspect is that, although maintaining the special conditions in the chamber requires additional resources, a manipulation chamber is an investment that provides returns for the overall system, since it is capable of immensely improving the adaptivity of the whole system.[19]

It is also evident that the optimum size and capacity of a manipulation chamber is

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line. When the output of a given work phase fails to function as the input of the next work phase, production consequently ceases. In this case, it is up to the technical engineer or management to:

- change the technical instructions for the next work phase in order for production to resume and continue as normal; or
- make changes to the earlier phases of production, or at the supplier level (supplier development), that make it possible to avoid a break in production

[19] For example, as opposed to plants, this is why it is worthwhile growing and sustaining nervous systems in animals, which nonetheless 'only' coordinate their activities; they do not ensure movement, or the function of their metabolism. However, they contribute considerably to increasing their ability to adapt. The situation is somewhat similar inside the nervous system (as a system) in the case of the brain that has evolved in animals of a higher order. Here, the information impacting the system, namely, stimuli, is being processed. These examples demonstrate that the appearance of the brain or the nervous system is by no means facultative (either it exists, or it does not). Rather, that gradation is equally relevant; the size of the nervous system or the brain, and the proportion of those resources used by a given species, depends upon the complexity of the inputs it needs to process to adapt to its environment. Considerably fewer stimuli – to which it must react – impact a tree that does not have a nervous system, compared with an animal that is capable of controlling its environment in a far superior way, due to its ability to move. However, that ability to move and displace itself means that an animal faces a different stimulus environment from one moment to the next

directly proportional to the complexity of the environment. In cases where there is little potential for attaining considerable evolutionary advantages, high resource demands will not provide returns, as the connection between processes and sub-systems is relatively simple.

In this regard, it is possible to state that a manipulation chamber is not absolutely necessary. However, it offers the advantage of more quickly dissolving the suspensions. It is also evident that investment in a manipulation chamber offers greater returns for highly integrated systems (those with many sub-sub-sub-system levels) because it is not necessary to create such a chamber at each individual complexity level, or for every single sub-system. Rather, an extremely high capacity, centralized chamber is capable of preventing suspensions that pose a threat to the sub-sub-systems.

Which connection should be placed in the manipulation chamber with the aim of restructuring? It is perhaps not too difficult to conceive that the strategy I call the maximum distance rule ensures the highest degree of efficiency in the simplest way. According to this rule, the manipulation chamber has to deal with improving the quality of those connections where the combined information distance of the sub-systems and sub-sub-systems concerned is momentarily the greatest in relation to their inputs and patterns. By also taking into account the connections of suspended sub-systems, and by moving from the most significant operational failure towards the most insignificant, this guarantees that the chamber does everything possible to improve the adaptivity of the system as a whole. Since this rule is simple, it is equally explicit. Naturally, it may nevertheless occur that the two information distances calculated through these means generate similar results. Consequently, a stalemate similar to suspension evolves; namely, which suspended connection should proceed to the chamber at any given moment?

In humans, consciousness functions as the manipulation chamber. The most acute problem that at a specific moment persists enters this chamber i.e. becomes conscious. The process of becoming aware is none other than the duplication of sub-systems – the so-called cognitive schemata – threatened by suspension in the manipulation chamber. Several experiments (Christensen, 2005; Dodds et al 2004) demonstrate that problem solving takes place both consciously and outside the realm of consciousness. Further, that the solving of tasks requiring high calculation capacity and systematic trials is performed more efficiently in a conscious state (analytical thinking). In contrast to this, we often manage to more efficiently solve (synthetic thinking) creativity tasks, or tasks requiring unique solutions, with the help of processes outside the realm of consciousness; for example, in dreams, or spontaneously while doing something entirely different.

Management meetings, or meetings in general, function in organizations as equivalents of the manipulation chamber. Each participant brings their most pertinent problems to such meetings, taking the analogy of duplicating sub-sub-systems and their connections within the chamber. High-speed communication, and on-the-spot decision-making, is ensured through the presence of the crucial sub-systems. In the example of an organization, those crucial sub-systems deciding on a specific problem would be divisional or line managers. Therefore, information does not have to wander down through long organizational circuits (communication paths). A given problem, presented by a colleague first-hand to the participants of a meeting, may assume the role of the sub-sub-system copied to the manipulation chamber.

Testing

At first sight, the term 'testing' may perhaps seem a complex notion that presupposes the existence of an external agent (a tester). However, these are processes that can also proceed automatically. Whenever a system evolves, or is re-formed, it automatically attempts to create any connection with the rest of the sub-systems of the system. Namely, it attempts to use their outputs as inputs, or offer its output as an input.

By testing, I refer to attempts to make connections, and calculations of the information distance, between the input and the pattern during the course of this operation. If the new or restructured sub-system is incapable of connecting to other sub-systems in the manner described above, this will determine the position (not very central, and of and lower relevance) and status of the new sub-system. However, what if it does connect, but generates outputs incompatible with outputs generated by the system through alternative means (by bonding its sub-systems in a different sequence)? Then, either all of the old components of the system malfunction, or the new ones do. Therefore, suspension takes place within the system until this antagonistic situation is resolved by one means or another i.e. either by changing the old sub-systems, or by disregarding/restructuring the new ones.

Therefore, testing is an automatic process that may have two outcomes:

- nothing happens, and the new sub-system connects to the components of the main system through several means. Most probably, it will then become a useful component of the system; or
- suspension occurs, within the framework of which the components of the system are evaluated in further detail, and a potential correction procedure is launched.[20]

Indicator

With the help of testing and suspension, and the information distance between the input and the pattern, we can also understand the role of a value that is undoubtedly useful in terms of evolution. Although it is possible to define this value in the case of every system, it does not necessarily have to be stored and measured in the form of a value. This value, which relates to the viability and adaptability of the entire system, I will call (an) indicator. It refers – by producing different results according to the state of the system – to how adaptive the system, as a whole, is. Its rate is automatically deduced from the quality of the connections of the sub-systems it is composed of. The indicator increases in line with the number of intact and well-functioning sub-systems and connections, and decreases in line with the number of suspended sub-systems and connections.

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[20] Testing can be observed in human relationships when a new member joins a group. By and large, existing group members attempt to identify their common traits (school, profession, place of residence, political views, origin, etc.) in the new member. Beyond their abilities, and what they can offer to the group, this will determine their social status in that group. Should conflicts arise (the values of the group are questioned, the new member lies to different members of the group) that will lead to suspension, or exile.

A new technology is typically tested in business. This is to determine, for example, whether the base 'materials' currently used are suitable, if technicians are capable of using it, whether there are sufficient resources for its operation, and analyzing indicators (profit, quality) produced by manufacturing with this technology is compared with the existing method

I should emphasize that there is no explicit correspondence between the indicator and the sub-systems of the system, as the quality of the connection of sub-systems makes matters more complex.[21]

The vast majority of sub-systems were created to handle environmental inputs; survival in, and controlling, that environment, is the goal of the entire main system. The indicator provides information on this. To simplify: a system with a high indicator will have a greater chance of survival in the same environment than does a system with a lower indicator. This is also attributable to the way the suspensions of sub-systems – positioned at the 'boundaries' or 'gateway' to the system – receive environmental inputs. Consequently, information distance is also included in the indicator. If environmental inputs are not obstructed anywhere in the system, an adequate response, one best tailored to the structure of the system, will be generated. In that case, the system generates an appropriate model of its environment.

To provide a more concrete example:

The indicator corresponds to the way a person perceives the size of his or her own self. In a person's day-to-day life, this indicator (his or her self) is average in size. If the person obtains new information with which they are capable of placing their environment under more rigorous control, their self increases (expands). When confronting a problem that they are incapable of resolving, the person will experience self-narrowing, as some parts of the self are suspended. The relationship between the self (defined as the totality of cognitive schemata and the indicator), the phenomenon of self-narrowing, and expansion, will be analyzed in the remainder of this book.

In the life of an organization, the indicator corresponds to company values (if calculable, such as the share value in the case of companies listed on a stock exchange). So, if the organization better adapts to its environment by using new technologies and superior quality procedures, it sells higher quality products from a better position, which leads to an increase in the value of the company. If problems within the company inhibit adaptation, partial procedures will be blocked, and the value of the company depreciates.

Even though the notion itself is valid in the case of every organic CAS, the existence of the indicator has no direct benefits from the perspective of the system. To be able to contribute to increasing adaptivity, the system needs to gain, in some form or other, knowledge of its presence. For example, it is possible to determine the monetary value of a one-person micro-enterprise. Whether the entrepreneur fails (or chooses not) to take account of this is a different matter. In that case, this will not influence his decisions, for which reason he may sooner or later end up becoming bankrupt by making a series of bad decisions. The value of his enterprise may then become negative.

Equally, the indicator shows to the system whether its changes are in a positive direction i.e. whether the system is becoming more adaptive or not. If the indicator is effectively taken as a criterion, this is none other than a feedback circle for selecting changes. To be able to consider the indicator's changes when deciding on a change, it must be stored and measured in a separate sub-system. Once this takes place, and

[21] To provide a human example: the efficiency or performance of a group does not depend upon how many members it has, but on how well they are coordinated and communicate. In other words, coherence and understanding within a group is as relevant. Many military actions justify this claim; smaller, but more determined and unified armies, have defeated much larger, but comparatively disorganized, military forces

feedback on the indicator is provided, the system then assumes a motivational role i.e. controls changes taking place at a more complex level.

Feedback can be observed in both humans and organizations, which explains the idea of motivation. In humans, the sub-system controlling the indicator (that responsible for motivation) converts an increase of the indicator into happiness or joy, and a decrease into fear or anxiety. In companies, the same happens with a change in market control or value, in the appearance of a profit or a loss.

Scenarios of indicator increase

We can distinguish two key scenarios for increasing the adaptivity (indicator) of a given system, by examining whether the increase was – or was not – preceded by the suspension of sub-systems. This is relevant because the indicator may not only increase by dissolving suspension, but may also increase through the creation of viable connections that did not previously exist. The creation of better quality connections is common to the two phenomena. This may be seen as coincidence, since the combination and trial of the multitude of system states of the lowest level sub-systems is needed until the optimal connection and structure is found.

This process is based on the same set of principles. For the time being, therefore, I shall disregard the technical difference of whether the connections were created as an outcome of systematic trial in the manipulation chamber, or whether they were formed 'spontaneously' outside the chamber.

I should draw attention to another aspect. The way we seem to identify one scenario or another in many cases depends upon the level of complexity of the sub-systems we choose to perform our observations. Since operations are embedded into one another, a previously important sub-system may play an insignificant role if we examine its environment just one complexity level higher or lower.

"Miracle"

Firstly, I would like to discuss the scenario that I call a "miracle", one not preceded by suspension, but which instead evolves through the creation of a new connection. We should note that if a non-existent connection comes into being, its existence may result in a significant increase in the indicator of a given system. This situation (that an important link can be missed) results solely from the characteristics of the testing process failing to reach the point of creating this connection. This could be due, for example, to lack of resources or time. Or, within a complex network, there is too great a distance between two sub-systems, so that their connection establishes with lower probability.

The constant process of testing, within which sub-systems of a given system attempt to spontaneously connect, and those connections may or may not survive, could lead to the generation of operations that significantly increase adaptivity.[22]

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[22] Humor is an example of this in everyday life; we associate things that at first glance are seemingly unrelated, but upon consideration they are. In the life of an organization, this might be a contingent discovery enabling two separate things to connect through unique means. For example, Viagra, originally developed to treat cardiovascular problems, was found to reduce impotency, a more profitable use that dramatically increased the value of the company

"Fireworks"

Remark: I should define the type of firework referred to with this term. That is, a rocket that explodes into two or more segments and emits sparks, following which these parts also explode into two or more segments and so on, resulting in the exponential increase in its overall number of elements: 2, 4, 8, 16, 32, 64….

The lack of a connection may not only have an effect on the performance and adaptivity of two sub-systems, but also of further systems connecting to these. Then, beyond the connection of these two newly connected systems, the way in which further sub-systems can connect to these may be the outcome of the "miracle" scenario. Consequently, further sub- or main systems will connect until the two systems create a new system by linking up, dramatically increasing the adaptivity/indicator of the new system, and therefore its components as well.

The testing process feeds the "firework" chain reaction, which can be conceived as a chain of further "miracles" building on the original "miracle". This means that the system automatically begins to test the miracle as soon as the first "miracle" takes place i.e. it attempts to connect sub- or main systems to the new pair of sub- or main systems. If the entity modeled by the two systems in the environment also connects in reality, it is no surprise if the systems mapping the components of the entity also connect. The "miracle" will potentially last until there are unconnected sub-systems that can connect to each other.[23]

The sub- and main system dichotomy emphasized in the above description also demonstrates that "fireworks" may evolve through two means:

- A connection is created between two sub- or sub-sub-systems of two separated main systems.[24]
- Two main systems connect, as an outcome of which sub-systems connect like a waterfall, by means of deduction at lower and lower levels.[25]

To use a visual term, the fireworks may 'falter' i.e. if any one of the connections created from the top down and in a fast sequence is suspended, this may retroactively impact upon the whole of the "fireworks". It may even lead to the cessation of the

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[23] For example, recognition of analogies: say, the connection between politics and a ship, where the Prime Minister is the captain, the state is the ship, and the sea is the political arena. Or recognition of basic notions and connections; say, when children recognize that there is an opposite of most traits, which can also be paired. These produce a "fireworks" scenario in human thinking. A similar example in humans may unfold during the relationship of two people when a secret is revealed; perhaps telling the other person what hurt them, or that they love them. In such contexts, misunderstandings, antagonisms, and the lack of cooperation, disappear when a new detail sheds light on the situation. The way in which human beings add these details to the knowledge and experiences they already have, makes clearer more and more matters. The person then manages to further understand the other person. In the life of organizations, for example, replacing a malicious, hostile or incompetent colleague may engender a similar situation: the division in which he/she worked is once again capable of performing well from that point on; the division whose operations were affected is again capable of working at full capacity, with a beneficial effect upon the value of the entire company

[24] This is the case, for example, whenever a small misunderstanding is clarified, and so helps resolve a serious conflict

[25] This can be observed when a new scientific paradigm evolves, or, in the case of architecture, when a new concept plan emerges

newly created connections. This is possible if a connection that rules out the possibility for the two systems to compose an operation is suspended.

The phenomenon of faltering spectacularly demonstrates the way that two processes (testing and forming new connections) presented in two ways are identical. That is: the formation of new connections, as an instrument for increasing adaptivity or testing; or as a tool used to verify the quality of connections, is the same automatic process that takes place continually.

"FIPP pattern"

This term (FIPP – Fodormik's Integrated Paradigm for Psychology) refers to the name of patterns occurring in the context of the situation presented and discussed in detail in this volume.

This pattern is similar to that presented (in point A.1) earlier, with the difference that the "fireworks" is preceded by the suspension of connections. In this case, it is not necessarily the last link in the sub-system chain (the input receiver) that begins to restructure in order to eliminate suspension, and therefore restore the indicator. Instead, it is an increasingly larger section of the chain that begins to restructure, generally from one step to the next in the reverse direction, affecting increasingly higher-level systems. The suspension required for restructuring reduces the indicator at an increasingly faster pace, as if in a city an increasingly larger section of streets were to be closed for maintenance, making it increasingly difficult to move around.

Indicator decrease, and the suspension of increasingly complex operations, will continue until either of the following takes place:

- From the perspective of the system, it seems more adaptive to forfeit an entire operation (and the connecting sub-systems) for an indefinite period, rather than attempt to continue restructuring, since this restructuring process may affect a higher number of sub-systems affecting other vital operations, which otherwise function well.[26]
- Restructuring leads to a positive outcome i.e. the system finds the new structure that eliminates suspension. In this case, a relatively low indicator begins to dramatically increase, reaching a higher value than its original state. The reason for this is that the newly created connection induces a "fireworks" scenario, to which the revival of suspended connections is added.[27]

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[26] Without this mechanism, a person would concentrate on resolving a problem but simultaneously ignore their basic survival. To prevent this, people usually recognize that they are incapable of solving a problem, and give up. The size of the person's self decreases as a consequence, as they come to terms with the fact that they are incompetent in a certain area of life. The situation is somewhat similar in the case of an organization when they attempt to sell or close a division generating a loss. Naturally, the value of the company will also decrease, but perhaps not to the same extent as allowing the loss-making division to continue unchanged

[27] This phenomenon is discussed in detail in the present volume. A few examples: successful problem solving, love, and sexual relationships (more specifically, the orgasm). All forms of successful business process re-engineering (BPR), and costly R+D procedures, are examples of this

Necessity for systems to cooperate

The fact that the value of the indicator is also determined by the systems processing the inputs received from the environment underlies the way in which there is direct proportionality, and a cause and effect relationship, between the value of the indicator and the successful modeling of the environment. This means that the more accurately the system maps its environment in accordance with key aspects relevant to its own survival, the higher the indicator value. The way in which a given system only maps its environment according to certain aspects in a simplified manner, and in its totality, ties in with what Maturana (1980) espouses. Namely, that specific systems are only capable of recognizing specific aspects of their environment, and never the totality of the physical world.

At the same time, it is easy to perceive that simplification necessarily leads to disregarding certain facts. Naturally, a given system endeavors to map the environment to which it wishes to adapt to the fullest extent and in accordance with its characteristics. However, the omission of certain aspects – sometimes minor, occasionally major – is potentially risky. Therefore, if specific systems specialize in mapping a segment of the environment and, in the meantime, connect to other 'specialist' systems that provide complementary information on how their environment can be perceived, may seem to be an adaptive evolutionary strategy. This means that the system will attempt to connect to other systems.[28]

Ignoring for the moment the details of how various special systems cooperate, let us now investigate how the imperative that drives systems to connect with each other has an effect on indicator increase. To do this, I would like to examine in more detail the notion of communication to support my reasoning.

Connections within and outside the system

I would like to present two approaches to communication. Perhaps the simplest approach to the act of communication is by defining communication as the manner in which a system uses the output of a given system as an input of another system.

Another model treats the message the sender codes as an input, which is then sent to the receiver through a channel compatible with the code system. The receiver then decodes the information, which is its own output (Shannon & Weaver, 1949). Naturally, this process can also be viewed as a single operation. The reason I have considered these two approaches concurrently ties in with the physical realization of the systems. While we prefer to adopt the first, simple approach for conceptualizing communication within a system, we prefer to use the second approach for communication between systems, presumably due to the marked presence of the channel and coding-decoding processes. At the same time, it can be seen that the two approaches are almost identical. The one difference is that the technical execution of the act of communication in the case of the second approach is obvious.

[28] This type of cooperation between specialization and specialists occurs frequently in organizations: various bodies assume this function, all of which engage in mapping the same market environment, but from different aspects (technological, HR, marketing, financial). A person competent in only one specific area of life (for example, the arts, law, medicine, or finance) will be at a disadvantage, since they may encounter situations in which their knowledge is insufficient for adaptation: a lawyer falls ill; or a doctor facing a lawsuit needs a lawyer

My intention in this sub-chapter has been to draw attention to the connection of a specific sub-system to another sub-system, which only differs in terms of how it is physically accomplished i.e. whether it takes place inside or outside the system. Similar to Maturana's theoretical approach is Hugo Urrestarazu's (2004) boundary concept. Urrestarazu claims that what belongs to a system, what does not (and is contingent and changes according to system states), as well as the issue of boundaries, depend entirely upon the unique viewpoint of the observing individual.[29]

Naturally, no matter that we wish to perceive the connection between sub-systems and their intra- and inter-system characteristics as identical, physical realization is antagonistic to this. Namely, the way that this proceeds through a physically existing channel in the form of information. This then results in uncertainty of the existence of the connection, as it can cease when the channel is closed.[30] Sub-systems that store the act of communication itself serve to store connections threatened by rupture, in order for information to continue to resume flowing after reinstatement of the ruptured connection.[31] Contrary to the classical approach to memory (which espouses that only the transferred data is stored by the receiver), our model states that the entire act of communication is what is stored, not only by the receiver, but by the sender as well. As in the case of all other sub-systems, after a while the group of sub-sub-systems used by other operations breaks away from the sub-system registering the communication. Consequently, after some time has elapsed, it is the message itself that remains from an act of communication, and the circumstances surrounding it fade away. However, no matter how vague the remainder of the sub-sub-systems become, the existence of suspension-free connections remains, by and large, in place; for example, the memory of a friend, or of a lucrative cooperation.

Increasing the indicator outside the system

As previously discussed, the indicator rate relates to the number, and the quality of connections existing between, sub-systems. Connecting to other systems makes it possible to alter this. Namely, if the sub-systems of another system match the sub-systems of 'our' system, it is possible to effectively increase the number of these sub-systems and their connections. This not only prevails when a new sub-system is 'obtained', but equally applies when the sub-system is transmitted. This happens due to a reciprocal process, which leaves traces (in the form of connections) in both systems: on one hand, because of the way the sub-system itself is duplicated; on the other, due to the feedback circle confirming that duplication was successfully completed.[32]

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29 For example, a citizen of a country affiliated to the Schengen Area might forget that there is an actual Swiss border. However, for a citizen of a country that is not a member of the Schengen Area, that forgetfulness would cause a serious problem

30 For example, two people who leave the hearing distance of each other

31 For example, when the human mind not only stores what someone said, but the circumstances in which that was conveyed: memos of meetings, or feedback certifying that an e-mail has been read, serve this aim in an organization

32 In plain words: both giving and receiving information is a joy. This is what motivates, for example, teaching, publication, and artistic creation. In the case of enterprises working with information (consultancy companies, market research firms, R+D companies), by sharing information they generate profit so increasing the value of the company (the indicator of the

To go further: although the attributes of information differ between matters, mapping material things in live CAS systems also takes place in the form of information. That is, an action that the system performs in the physical world as an output is stored or processed in the form of information within the system. A consequence of this is not only data that may proliferate or be transmitted whenever connections take place, but also material things; money, objects, resources, and persons. So too does the information that is related to them (their representation) when connection takes place. The one difference is that, unlike information, material things, when distributed widely, become smaller and smaller.[33]

In order for another system to connect a given sub-system to its own network of sub-systems, the given sub-system must bring advantages to the system. Its benefits must substantially exceed the investment in the accompanying testing and the physical relevance of the act of communication itself. Therefore, only the proliferation of sub-systems that increase the adaptivity of another system can be imagined; for example, because of the way they integrate operations, or contain a new pattern or operation.[34]

Beyond transmitting new properties or attributes, there is another obvious advantage to system connection, which I have previously referred to. By linking operations over-reaching the system, operations also capable of processing more complex inputs may be created, or make it possible to process the same inputs at a higher standard (from several angles). The use of specialized systems in the various sections of the entire operation benefits the latter, as each system performs the part of the operation that it is most adapted to performing. Aggregation of resources (computing, storage, manipulation) is a further advantage of connecting systems.[35]

The phenomenon of emergence (Clayton, 2005) and the key *gestalt* principle (Köhler,

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company as a system). Moreover, the phenomenon described above is responsible for knowledge sharing, which plays a key role in evolution. This is the driving force that motivates a given member of a species to learn a new method (for example, to crack open a coconut) and then pass this knowledge on to other members of the species, which increases adaptivity at a group level (main system)

33 Altruism is an example of similarities in the described material and information sharing processes in humans, whilst companies manufacturing physical products are an example in the case of enterprises. Instead of information, two people connect in the case of altruism; one person gives money, clothes, or assistance, to the other person. That representation of the act of giving, formed in the consciousness of the giver, increases the size of their self. A company producing products or services connects to consumers through trading networks, retail channels, in which case the receipt of a product is not transcribed into the form of a representation, but in the form of money. The representation of money is a new sub-system in the system of a company, and contributes to increasing the indicator (i.e. the value of the company)

34 In the life of human beings and organizations this would translate to exclusively covering new solutions, data, or facts. Distributing known things (those that are unchanged) is a bad investment of energy, which is why it rarely occurs. The value of novelty shows why systems have a preference for connecting to other systems whose structure makes it possible for them to generate new things. In the financial world, it is possible to observe that everyone tries to copy the strategy of an innovative and successful company. The same applies in the case of people; namely, that they prefer being with people that teach them, or point out, something new

35 The many forms of division of work in the case of people and organizations, such as work performed on the factory line, exploiting gender differences, cooperation of specialists, and teamwork in general, are good examples of the connection of systems

1967), according to which totality is more than the sum of components, also describe the phenomenon of new operations ensuing from the cooperation of different systems.

Reproduction

Explaining the necessity of reproduction from the perspective of indicator and adaptivity increase is one of the interesting aspects of the theory outlined above. I have referred to the manner in which the connection of physically separate systems through the manipulation chamber engenders the phenomenon of duplication; that is, the way in which a duplicate – which equates to a memory – of the connection of the sub-systems is created in the two systems when connection takes place. This enables cooperation, in the form of a joint operation, to continue in the future. This means that while the connection is broken – for example, due to physical distance – the sub-systems continue to connect through this duplicate to perform their testing operations, albeit limited by the image stored in the memory. It is this duplicate that ensures an increase in the number of sub-systems, a precondition for increasing the indicator.

Therefore, system duplication has direct consequences on indicator increase, since, if a system duplicates itself or one of its sub-systems, it links to these through hundreds of connections. By detaching itself from the system in which it was duplicated, the newly created 'duplicate' system begins to physically behave independently and in a detached manner. The connections nevertheless remain intact. If the system feeds back, or reduplicates, its own new connections in the parent system (through which it 'refreshes' the memory), it is capable of increasing the indicator of this parent system. This occurs due to both the refreshed memory and new connections acting as an external agent concurrent with the 'regular' life of the parent system.

This implies that through duplication, the parent system increases its potential to increase the indicator, as well as adaptivity. On one hand it improves its own chances of survival by developing its internal and external connections. On the other, the new connections integrating the new sub-systems with the parent system are transmitted by the offspring system via its connections to the parent system. The following is required for this:

- The connection between the offspring and parent systems needs to be sustained, so assuring the opportunity to exchange their sub-systems and to refresh the memory i.e. it must from time to time communicate.[36]
- The identical sub-systems of the offspring and parent systems need either to remain intact, or to evolve in an identical manner. This is required to enable the new sub-systems (see above) to be smoothly replaced; this must occasionally take place, or at least for this process to occur with few suspended connections. In

[36] If a parent is not aware of the achievements of their children, or does not witness how their knowledge and skills develop, that parent will not be proud of their children. This implies that, beyond memories, they do not profit from having children. The same applies in the case of material processes: for example, when children help their ill or poor parents. If there is no interaction between them (even sending a check by post), the child will not help parent adaptation.

Regarding the connection between a parent company and its subsidiary, the processes described above are increasingly emphasized. That is why a parent company has legal rights ensuring its demand of a subsidiary for profits, or its ability to overrule, or take over, the management of its operations, even if this may go against the interests of the subsidiary other words, similar sub-systems guarantee that the new sub-systems will connect easily if placed in a similar environment i.e. testing will be successful. If the sub-system batch, to which the new sub-systems received from the parent/offspring must connect, has in the meantime substantially changed, many suspensions may evolve between the altered sub-systems. It may happen that more resources are needed to eliminate the suspensions than are obtained as a profit arising from good connections.[37]

Moreover, through these connections, the two systems also compose a single system (from the moment the offspring system is created), which is also a live CAS. This animates the system on the basis of the same principle, the key objective of which is adaptation.[38] The tendency for the sub-system to help the adaptation and survival of the system to which it belongs is also enforced, so improving its own chances of survival.

The other reason for creating the offspring system is that more complex operations can be performed if the offspring and the parent system are connected. Moreover, due to the similarity of the sub-systems (for example, those created during child-rearing) and their identical roots, testing will also be faster and smoother. Potentially, fewer connections between the two systems will be suspended.[39]

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37 The best example for sub-system similarity is what we generally call a good parent-child relationship: family members agree on most things (their operations generate the same outputs); they cooperate and help one another (the output a given member generates can well be used by another member as an input, etc.). A deteriorating family relationship is the process that corresponds to sub-systems that are initially similar, but change in different ways. For example, the child of a conservative family opts to take a liberal approach (or vice versa), or the child of a religious family moves away from their family tradition, possibly becoming interested in another religion, and conflicts (i.e. suspensions) arise in the family. There are ample examples of this, ranging from similarities/differences in values, through to everyday tension generated by teenager resistance and tension.

As in companies, launching actions in a common direction is what, for good or bad, helps parent and offspring systems. For example: for selfish reasons, a service provider to a given company begins to work for competitors of its existing customer. The service provider may even pass on sensitive business information or know-how to its new customers if not prohibited by non-disclosure agreements

38 An example of this is a group newly formed within the parent company, which equally wants to remain profitable yet avoid bankruptcy or liquidation at the group level. In humans, a child, together with the parents, forms a family unit, which 'wants' to survive independently i.e. its members fight against divorce or disintegration. The child may try to settle arguments between the parents to ensure that the family remains intact, and hence ensure their own security and chances of survival

39 Changes in the family or company empire are good examples of the connection of the parent and offspring system. The way family-run businesses are passed on from father to son is demonstrated by it being unnecessary to rely upon the occurrence of too many suspensions, due to their common roots. Naturally, as with the parent-child relationship in general, the precondition for the smooth handover of a company also ties in with how sub-systems need to remain similar to ensure that suspensions are prevented. This implies that, if the knowledge or personality of the son is very different from that of the father, succession will be just as difficult as when a stranger is the successor; a populist example can be seen the movie "Shark Tale"

Creation and cessation

A model focusing on connections would not be complete without examining the creation and cessation of connections between systems. In discussing creation and cessation, we need not only to provide responses to issues in connection with information, but also equally to address issues relating to what happens in the system's material appearance. The following claims are rather hypotheses, which future human neurochemical experiments need to justify or contradict.

The role of the capacity for increase of various systems, and the high degree of flexibility of live systems (mentioned in the second sub-chapter), play a pivotal role in the issue of the creation of connections, which are fed naturally by material processes. Flexibility is manifested in the way that, no matter how the boundaries of a given system may change (in which case the boundary is at the same time defined as a means for creating connections and as its 'place'), it will continue to expand. That is, within the given structural framework and due to the structure of the system – for example, its geometric structure – if it does not interact with other systems. If it does interact with other systems, it will create a connection that either improves the quality of the operations it executes (i.e. increases the indicator) or does not. The evolutionary principle comes into play from this point on: the connection remaining in place in the first case ceases as soon as it is created in the latter case.

Halting information flow, one of the preconditions for cessation, and which equally applies in the case of a connection that has already been created, is not used over a long period of time. A connection that is not used by the system will disappear, as will a forest trail that is not used or kept in order. This does not contradict the case when systems use or activate certain connections from time to time solely with the purpose of refreshing a rare, but highly useful, connection.

Traces of connections may remain for a long time even if the connection is not used, except where it is deliberately severed due to suspension. This can take place when restructuring occurs due to the dissolution of suspension, or when it ties in with testing of the connections of the systems. As previously advocated (in the section on testing), a system may test connections between sub-systems by checking that the operation within the two systems generates the same output. To illustrate this, let us examine a given system composed of sub-systems A, B, C, D, E and F. If, within that system, the same input proceeding from A and aggregated in F, transmitted through A-B-C-F or A-D-E-F, does not generate the same output, suspension will take place at F. This can only be eliminated through the internal structure of the sub-systems. Alternatively, since the two operations are redundant, it will result in the rupture of the connection with one of the sub-systems (B and C, or D and E).

Two systems can test their ability to merge via 'information ping-pong': before merging they process each other's outputs. In the case of operations f(x) and g(y), the formula for this is g(f(g(f(x))))... In this case, if either output fails to correspond as the input of the other system – or, as will be discussed later, no input whatsoever was received from the other system – this will lead to suspension of the connection between the two systems.[40]

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[40] As posited by psychology for some time (Taiyoba et al 2004), similarity in attitudes plays a key role in the formation and maintenance of positive relationships in the case of human relationships. This is what discussions with a single theme (e.g. on politics, human ethics) are good for. Within that framework, reactions and comments from others are expected, and the aim

One definitive form of the cessation of a connection occurs when a member of the given connection ceases to exist; dies, decomposes, deconstructs, becomes bankrupt, is wound up. This greatly resembles the process of mourning. The connection between the two systems is suspended, since an empty/0 output is compared with the output 'expected' as an input, which leads to suspension. In turn, this suspension may also affect the other operations of the maintained/sustained system, which until then have been running with the help of the co-systems of its sub-systems. Consequently, all of the operations affected will be suspended, so decreasing the indicator until it is incapable of restructuring its connections.[41]

Ultimate goal

In the light of these considerations, what can be said about the ultimate goal, if any, of a system? That is, when does a system stop changing? Naturally, this question is purely theoretical, since it is only possible to discuss stability and the final state by disregarding material processes, and then only in relation to information-type structures. The process of aging, and fluctuation in the supply of resources, are factors that indirectly impact information flow, the effects of which are irrelevant during the short period of observation.

What can be deduced from the above is that every system aims to maximize its connections, concurrent with minimizing the chances of suspension.

Why would a system stabilize because of the way it connects to all other systems? The answer is linked to the range of potentially executable operations. That the physical world (as the widest environment and system that can be defined) has sub-systems also modeling the various aspects of this world, guarantees that all inputs the super-system created through these means will always be processed by the most competent system. In other words, the multitude of inter-connected sub-systems will always engender an operation that makes it possible to generate the most adaptive output.

Would this be the case when connections are created to everything, to all existing systems? Is it true that the more systems a given system connects to, the more adaptive it becomes? An increase in the scope of operations, from amongst which the most adaptive system is selected, seems to justify this claim. At the same time, multiple connections are equally advantageous from the perspective of material processes, especially if this takes place concurrently, and principally if the system is capable of assuming a central position. Moving together with the other systems and the common

is to reach common ground. Should this not work – there may be a difference in attitude – then the friendship or relationship may be damaged. Information ping-pong is what can be observed in the context of regular supplier-client cooperation. Information wanders here and there, and the parties involved pay equal attention to the content of the communication and its form (reaction time, quality/accuracy of data provided, communication style, politeness, directness)

41 In the case of mourning, beyond the drastic decrease in the size of the self (indicator) causing a feeling of discomfort, habits also need to change for the system to survive; the main income earner may change, the lack of a person to discuss the day with, etc. The resignation of an executive or key employee causes a similar position in the life of a company. Then, other sub-organizations need to take over the operations performed by a given sub-organization. In the meantime, the value of the company decreases due to its vulnerability, bad organization, or sub-standard level of development

boundaries in the physical world makes it possible to further strengthen the system. This also provides greater protection, as well as better distribution, and potential changes of resources, similar to bartering.[42]

The other goal a system may reach is in developing the structure of its sub-systems to a point where all inputs fall within the acceptance range of its connections. This also implies the perfect modeling of a certain segment of the outside world. The system generates perfect outputs for each input, so preparing a perfect duplicate of the structure of the physical world within the internal structure of the system. The outcome of this congruence with the physical world is that the indicator increases to infinity, which also means that the indicator will lose its relevance once and for all. This occurs because of the way such a system is no longer capable of improving, or developing. Its processes, having reached a maximum adaptation level, are thereby finalized.

Lacking the opportunity for reaching an ultimate state, and so further increasing the indicator, also implies that motivation for all sorts of change will disappear. In a suspension-free state there is no point in taking on further development. This state, which at first glance may seem mystical, is what in human beings is termed enlightenment.

Consequences of physical differences between systems

In line with the objectives set out in the introduction, I have only focused on the information flow and processing aspects of systems. Since we have identified several connections in this limited context, let us now assess the consequences of the extent to which systems have become embedded in the physical, material world.

We have highlighted the manner in which the systems assessed are living systems.

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42 The issue of maximizing connections is most evident in the business world. Almost every single company endeavors to increase sales i.e. the number of connections to unique consumers. This may lead to extreme situations that approach the theoretical conjecture that everything connects to everything: think about imperialism, global enterprises, or monopoly endeavors. It is no coincidence that the state attempts to counterbalance such endeavors to maintain a balanced market economy. A group that forms an excessively large system due to its excessively greater ability to adapt, in which context proactive adaptation is dominant, changes its environment in an adaptive manner. That can negatively affect other competing companies and social sub-systems; social security, pension, politics, etc.

Damage occurs if this system is not entirely suspension-free, and the sub-system comes to "dominate" the entire main system. This implies a decrease in diversity. This also implies that there may be systems, within a certain sphere of environmental states, which react better than the near monopoly system that also contains suspensions.

There is also something similar in people, namely, the endeavor to control everything. Think of, for example, a mafia "Godfather", or leaders who want to know everything that goes on, be that person a dictator or an authoritarian company executive. I would prefer to provide an example of the opposite process: a drastic decrease in connections (in depressed people, or loners) surfaces as a problem in self-definition/identity. People who fail to connect to others do not receive any feedback about themselves. Moreover, they are much more at the mercy of the physical environment, which is why an identity crisis may arise. It is no mere coincidence that psychology has repeatedly focused on the importance of reference groups (Merton, 1949) and demand for affiliation in a group (the so-called affiliation instinct Murray, 1938)

The impact of this has been made evident in the way that such systems are capable of change and, assuming many system states, within a short space of time. These properties play a key role in the process of restructuring. It is, then, easy to see that speed directly correlates with adaptivity. A person or organization in trouble is capable of producing several scenarios expediently, and assessing whether these prove more advantageous in relation to the person or organization that performs them with fewer states, or more slowly.

Similar connections can be seen in the broad range of connections enabling information flow. For example, the limited ability sub-systems have in communicating with one another. The limitations of this parameter determine the various system states the system is capable of assuming, as well as the potential evolution of the connections of sub-systems.

The acceptance range is a special parameter in terms of adaptivity. The wider it is, the fewer suspensions the organism will experience. However, its outputs will also be less accurate. This may lead to suspension from other systems or interaction with the environment, even if communication within the system is smoother. The reverse applies if the acceptance range is too limited; that leads to frequent in-system suspensions. However, that also produces excellent outputs for both other systems and the environment.

The size of the acceptance range also affects the formation of integrated operations, in the way a system 'more easily accepts' an existing integrated operation. That is, it needs to comply with less rigorous criteria while testing, and has to integrate to a 'poorer' extent. If integrated operations are easily formed, the direct consequence of this is that inputs will be processed much faster, but less accurately (many different things will seem to be the same). Since integrated outputs enable better use of capacity, it is possible to state that with wider acceptance ranges, less resource and capacity is needed to generate outputs. However, these outputs will function as inferior quality inputs to fellow systems that have a narrow acceptance range. The same applies vice versa. To be able to generate any required outputs using the poor faculties available, it is an adaptive choice to use a wide acceptance range.[43]

Another aspect of physical difference is the size of the manipulation chamber. Without repeating in detail the earlier discussion, we might observe a direct proportionality between the manipulation chamber's optimum size and capacity, and the complexity of the environment.

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[43] As an example: people with poor mental capabilities who, nevertheless, can overcome everyday challenges by disregarding small differences and details. Instead, they manage their life in a wider context of connections, in the hope that this broad connection is a good model of the world they live in.

Companies specializing in the production of "Chinese products" (cheap products, but of questionable quality) are examples of this in organizations. These companies do not bother with controlling the quality of the used materials or building sophisticated production processes. That is why they are capable of manufacturing products at a lower price. However, their customers may often be dissatisfied.

People with narrow acceptance ranges are often seen as being anxious maximalists. Companies with narrow acceptance range – that we might also call demanders of high quality – can be found amongst luxury products manufacturers

More complex phenomena

Assessment of the quality of connections may provide an explanation for seemingly more complex phenomena that we encounter in our everyday lives. From amongst these, aggression is a good example.

The way in which aggression can be categorized in several ways (such as pro- and anti-social, verbal, physical, etc.) demonstrates the complexity of this notion of aggression. The idea of suspension explicitly simplifies assessment of the notion of aggression. Whenever we talk about suspension, we generally take the opposite of this as well: two sub-systems, from which it is not possible to determine which is the 'right' one, are also antagonistic from some viewpoints where antagonism is the precondition for an aggressive connection. Aggression is none other than the act of creating suspension in systems where it does not otherwise exist. However, this may take place in various ways. It presupposes an impact (for example, an inhibiting connection) transmitted by another system, which engenders the suspension of the connection between the two sub-systems. Sabotage is a prime example of this. For example, when someone gains access to the system, and reduces the operating ability and adaptivity of the whole system by severing connections between two sub-systems, or desensitizes one sub-system.

Antagonism and aggression are also closely related to the issue of competition. In some sports there is no aggression – for example, cross-country skiing – and competitors do not impede or interfere with one another. However, in other sports, the key aspect of competition not only mirrors the way we stake everything on reaching the finish line first. This may also entail interfering with or fouling other competitors in order to slow their progress.[44]

By using system theory terminology, it is possible to state that aggression is present in the latter form of competition, to the extent that one system is attempting to create suspensions in the other system. That occurs in order that the outputs of the latter system differ as far as possible from the pattern of the target sub-system, and vice versa. Here the target sub-system can be not only winning in sport, but also other genres of competition from different areas of life: love-relations (mating with the alpha-male); career (being promoted); admittance tests (being admitted or hired), etc.

Coming next... Through what I have so far promoted, I may have convinced readers that it is worthwhile examining the connection of sub-systems in further detail, since this complements our existing knowledge on system theory so well. We can identify, generalize, or translate, new connections into the language of system theory, by focusing on the quality of connections. We must remember that we need to relate pragmatically to exposing system theory connections. It is worthwhile thinking in terms of general terminology, until our conclusion becomes an end in itself, and that conclusion is possible to project onto the behavior of systems that physically exist.

In line with this objective, and having clarified the general frameworks, I shall concentrate on more concrete things, which will seem theoretical, as they still do not describe human behavior in detail. I will continue to use the results of the present system theory conceptual framework.

In the next chapter, I shall examine what happens if we take cognitive schema,

44 A demolition derby, is good examples of the latter

viewed as the units of thinking as sub-systems, and the formation of integrated operations, as integration. Will this be capable of explaining phenomena such as emotions, problem solving, learning, the self, and consciousness?

Should any reader not wish to read a further dozen pages of theory, upon which few concrete examples are presented, I recommend passing over the next chapter, and to continue with the subsequent chapter. The brief theoretical introduction that serves as a base for the remaining chapters of the book is presented in the third chapter, and focuses on the FIPP pattern. Here the indicator corresponds to the subjective size of the self, and building connections between systems corresponds to inter-personal communication.

The model's use in psychology

In this introduction, I explain human behavior and thinking with the help of the conclusions drawn in the previous chapter. I consider the human self as a system comprised of sub-systems called cognitive schemata. Sub-system connections, otherwise called schemata integration, are particularly emphasized in the following. This, as will be defined later, is a process identical to the connection of operations, and the integrated operation created from this process.

Some of the final conclusions arising from these assumptions will not be new to psychology. However, they provide a simpler and more general explanation for those previously espoused for phenomena that are not closely connected, such as aggression and altruism, or sex and religion. The strength of this approach is that it rests on few preconceptions – mainly rooted in system theory – and leads to results that can be easily transposed to day-to-day life or applied psychology.

PRESENTATION OF THE MODEL

Cognitive schemata

Cognitive schemata is the first key notion to be introduced, being a sub-system of the system we call the self. Since it is a sub-system, it performs operations; for example, mapping the physical world. In this case, it functions like a transformer, converting useful information on the subject from valid modality information in the physical world that surrounds us. The eye, which generates colors and forms from wavelengths and photons, is a typical example of this.

Sticking with this example, we will see that cognitive schemata not only operate as modality transformers. In each operation, cognitive schemata have an input and an output, and the schema itself is located in the middle. This implies that a schema receives information, does something with it, and then provides information (possibly of a different modality, or according to an alternative code system) to the schemata connected to it. Accordingly, another schema does not transform information directly received from the physical world. Instead, the output of a 'peer' schema will constitute its input. Returning to the eye example, retinal neurons begin to fire by reacting to a certain frequency. When some of these neurons fire according to a certain pattern, the output of another schema will be that the entity sees, for example, a red line.

If we consider the number of atoms in the physical world, it is easy to see that every person interacts with a huge volume of data that can only be stored in the form of patterns and by identifying connections. So, continuing with the example of the eye, it is enough to store the few bits related to the red line rather than storing each bit of information coming from the thousands of neurons of the eye.

In this regard, a schema needs to extract information received from the other schemata at an increasingly higher efficiency. Therefore, on one hand, the goal is to reach an increasingly greater information content (more specifically, information density or complexity), which is called induction. On the other, we must see that "information condensation" or "abstraction" is not performed for its own sake. We do it to store information and patterns in order to be able to adapt. Adaptation is when we generate new information on the grounds of these connections, which information helps us to find the appropriate behavioral or cognitive response to the changing environment. The process of generating the new information is what we call deduction.

Theoretically, information abstracting seems simple. However, that can be only when someone has not checked the integrated operation created through these means; that is, until the information deduced by the new schema – that created through induction – is compared with other schemata or reality. If the information generated by means of deduction perfectly reflects reality, or matches other schemata, induction has been performed correctly, and the entity is able to acknowledge that it has a new instrument at its disposal to adapt to reality. That is, its chances for survival have increased. In other cases, the schema needs to be discarded, or its use at least suspended.

As discussed in the previous chapter, there is value for entities in creating a feedback system to monitor the adaptation process; this system signals whether the entity is on the right track. The indicator functions as this feedback system, which is proportionate to the entity's ability to adapt i.e. the indicator increases if induction is performed successfully.

Determining when this decreases is an interesting issue. By taking the abovementioned feedback system into account, a decrease can be imagined as a warning sign, since it signals that the entity has less chance of survival, and therefore needs to do something. But when does the indicator decrease? When the next schema is incapable of decoding the output of a given schema as an input.

The question then is: what is responsible for this? The schema that is incapable of receiving the output of the other schema? The other schema that generates a useless output? Or there may possibly be bad schemata earlier in the process, the errors of which only surface later? Since there does not exist a power of a higher order within the brain of the individual, there is no one else who can decide. This antagonism is a warning to the individual. Possibly, none of the schemata are in order, which is why none of them are recommended for use. This is similar to a person choosing between a cheap, unbranded product, and an expensive brand.

Two events may take place in this case, namely:

The person accidentally finds a schema that:

- is decisive, and makes it possible to discard the other schema, as it turns out that the other can be equally used. (To follow this example, the person finds that a professional user may also use an unbranded product and be satisfied with it, or find a leading brand product discounted by 50%); or
- explicitly determines which of the two schemata needs to be used. (An acquaintance tries to reassure the person that the cheaper one is perfect if used only a few times. However, he needs to buy the dearer one for frequent, long-term use)
- or, further analysis of the situation is needed.

Further analysis of the situation requires examination of the schemata from which the two scenarios to be assessed receive information. That is, the sub-sub-systems of the sub-systems and preceding sub-schemata taking part in the process (investigating the different parameters of the product to be bought). These schemata are also compared, as are the schemata that provide inputs for these schemata, in the following. In general, ambiguity (an inability to define) continually increases if the matter cannot be decided either way. Consequently, the indicator continually decreases, as in more and more schemata they generate the opposite result from the same input. That is why they are risky to use, and are therefore suspended.

When analyzing the situation even more thoroughly, the original connections of the schemata also disintegrate, and new connections are created. This contradiction is dissolved when a new schema is formed from the new constellation of the other schemata (through the restructuring of sub-systems or the formation of integrated operations). This new schema contains the two originals, and simultaneously provides an explanation as to why the same result was generated in certain cases, whilst the outcome was the opposite from a different perspective. This schema is most valuable when, beyond dissolving the contradictions of two schemata, it is capable of generating (deducing) further schemata with the help of the deductive input.

It is generally true that one schema is not enough for deduction, but that another (the deductive input) is also needed to provide the necessary parameter. So, the power of explanation of the newly created schema (that results in the number of new schemata can be created through deduction) will be revealed when it begins to receive inputs from further schemata. That is, when it is capable of building connections with other schemata, and creating further schemata from them. This "testing process" functions automatically; in some cases it generates new connections, whilst in others it signals an inability to connect. The latter case causes the ability of using the new schema to be brought into question. During the course of testing, the indicator changes proportionately to the number of useable new schemata.

Communication

By applying the conclusions of the communication concept (presented in the previous chapter) to schemata systems and people, the unusual result is that it seems the brains of people connect during the act of communication, or that the minds of the communicating parties can be imagined as a common mind. If we set aside the modalities of communication i.e. if we perceive speaking or letter writing as the same type of communication as a person manipulating the schemata in his head, we can observe that it is possible to further generalize processes. The difference is that it is not the individual alone who tests his own schemata. The schemata of other people are also used, or other people assist them in testing. So, when an individual creates new schemata, they not only perform this in their mind to benefit themselves, but to benefit others as well. In addition, it is not only the number of available schemata that increases through the schemata made common during the course of interpersonal communication; so too do the volumes of computational and manipulatory abilities.

In the context of intra-personal (intra-system) communication, the person with whom the individual is communicating can explicitly be defined (i.e. with themselves, between schemata). In the case of inter-personal communication, the question arises as to how an individual selects the partner with whom their schemata system is combined, and with whom they share their newly created schemata. The answer is that individuals with whom they are most capable of efficiently communicating (beyond the costs accompanying communication, and communication with people best capable of increasing their indicator) can be classified in either of the following principal groups:

- Entities whose schemata systems they know best, and are therefore assumed to readily accept their schema. This primarily implies entities of the same species (or a limited group of these), with which their schemata developed in a similar way over the course of evolution. This could be family, profession, or friends. Or, in the wider environment, people belonging to the same culture (nation, culture, religion). In these cases, it is possible to anticipate that the schemata have the same structure, and connect in a similar way. Consequently, the sub-systems belonging to a new schema exist beforehand, and it is not necessary to anticipate numerous suspensions during the course of their formation.

- Entities in which it can be anticipated that integration dissolves a great number of suspensions. This is the case when the other entity that connects to the newly created schema has many schemata; for example, qualified experts operating in a specific field. In such cases, the new schema simultaneously comes into contact with several connecting schemata, and it is possible that the computational capacities mentioned above mutually help one another, so forming further new schemata.

In the previous chapter, in connection with communication is the question of whether this process actually communicates in the sense of classical information transfer? Or, if not, what else "can be communicated" (can swap hosts)?

The answer to the first question is that, since these are schemata, we cannot completely disregard the close connection of schemata to the things they represent in the physical world. That is, it is truly information that is flowing, and it is in this sense that we talk about communication. However, what is more important is that this information conveys models i.e. information transformation rules. Moreover, creating changes in the physical world – typically, moving objects – often accompanies schema sharing. These changes are created in order for the schema, and what it represents, to remain in harmony. For example, in receiving the right of ownership in the case of the sale and purchase of assets, by moving the object purchased and its purchase monies concurrently. Therefore, by taking these reservations into account, the answer to what else "can be communicated" is that not only ideas (as clear forms of information), but also objects, are shared. Action is in progress during the course of inter-personal communication in order to alter the external world to reflect changes in mental representations.

Motivation

Having accepted the usefulness of the indicator providing feedback on the success of the adaptation process at a system theory level, we can adapt this in the context of the survival of an individual entity. During the course of evolution, those species that managed to survive built all of their activities around this indicator. In other words, the species that constantly works on ways to increase this indicator, by definition, adapts better. Accordingly, this species has a better chance of survival than a species that, although having the ability to increase the indicator, is not motivated to increase it, and fails to experience its decrease as a penalty.

Note the extent of the power of this claim: we attempt to deduce the entire spectrum of human (or even animal) behavior to the increase or decrease of a single number. The way that we define this number can also be applied in:

- the time horizon of a given entity's life; and
- the time horizon of the evolution of a given entity; and so
- it is in perfect harmony with the basic principles underpinning evolutionary biology.

In the following, the only question remaining to be answered relates to how endeavors made to increase this number explain motivation underlying many actions.

Before reaching the point of thinking it impossible to find an answer to this question, one point seems certain: the cognitive schemata notion is flexibly defined through mental representation, and is interpreted as the representation of all existing objects and phenomena. So, if we opt to apply this, it will improve our chances of finding an answer to the question.

Diversification of mental representations

Ever since the advent of Maturana (Heylighen et al, 2009) and other radical contructivists, we know that people differ in the way they map their environment. What does this mean?

I suggest that even if identical twins are placed in the same environment and raised under similar circumstances, contingent events will still occur that impact each of the twins in different ways. Therefore, they will not create the same cognitive schemata. If the systems of cognitive schemata of two people are not perfectly identical, they will not map the physical world in the same way i.e. a new stimulus penetrating from the physical world will connect to different schemata and create different new schemata, from which point on the difference between the schemata systems of the two people will only increase.

To move from identical twins, let us focus on two unrelated people. What we see is that there are not two individuals who will produce exactly the same output in response to the same phenomenon. That only one entity will experience a given constellation of the physical world at a single given moment in space and time suggests that it is not possible to create identical schemata. From this point, it is possible to conceive that the subjective image two individuals have of the physical world they model cannot be identical. Naturally, this does not contradict the fact that only one physical world exists, and that this world contains the conditions in which the entity (also existing in a physical body) must live in.

So what we see is what every entity experiences – because they have no other choice – as they live in their own subjective world. However, that changes in line with what kind of schemata evolve in the given individual, who in the meantime attempts to create schemata, in the most coherent and unambiguous way possible, that map the physical world in which the individual is rooted.

Differentiating subjectivity and objectivity provides an explanation for how so many matters build on the same motivation. Perhaps you have so far considered biology, sexuality, problem solving, or spirituality, as different dimensions of reality. It is necessary to see that everything is placed on common ground through cognitive schemata. To demonstrate this with an example: although hunger is a bio-chemical process, when we become aware of this sensation, it presents itself in the form of schemata; the same happens with sexual desire. The way mental process and subjectivity correspond is most evident in problem solving. In the case of spirituality, we presume that some sort of metaphysical world exists beyond the realms of subjectivity. In the next sections of the volume we will see that this metaphysical world is none other than a reflection responding to the physical world and a mental representation of the physical universe as a whole i.e. it is also a subjective construct, a schema.

Body

What is the case with unconscious processes? This is an important question, since unconscious processes (outcomes of hormonal processes or reflexes) are almost inseparably connected with physical processes due to the degree that they are biologically embedded. Although it is difficult to see this (since our consciousness is unable to monitor such processes), similar mechanisms operate in the case of unconscious processes, even if they are biologically manifested in different ways. (Consciousness, and unconscious processes, will be examined later.) In order to perceive this, we must be aware of the consequences of the difference between the subjective and physical environment.

In the context of test signals (for example, monitoring body temperature, processes tying in with various homeostatic processes) information is coded in alternative modalities to that of consciousness. The reason for this is that we need to treat the body (which applies equally to the way any individual perceives their own body) as a physical reality that functions according to its own set of rules; biological, chemical, or physical. It represents itself through well-defined channels (for example, nerves, receptors) in the systems of cognitive schemata. This implies that our body is not a part of our subjective world, even though from an external perspective our body and our mind may seem to form a single unit. What is a part of our subjective world is the body's mental representation, a schema system created by modeling the body as a physical entity using our intra-body perception. As an example: the skin, muscles and bones of our hands are a part of physical reality. However, the mental representation of our hand (as a part of the body schema) is a part of our subjective reality. This is why there is no point in searching for a one-on-one correspondence between our body and our cognitive schema of our own body. Pathological cases, such as phantom limbs, or sportspersons whose body cognitive schemata include the sports equipment they use, or how they use their body in their sport – perhaps heading or kicking a ball – are examples of such incongruence.

Language

In the section that focused on mental representations, I mentioned that each individual component of objective reality composes different cognitive schemata in various people, which is why individuals have different cognitive schemata systems. This, however, is contradictory to our everyday experience; namely, that people label specific physical entities in an identical manner. Does the fact that people are capable of communicating, in spite of their different cognitive schemata, contradict this? Again, the answer is that we should not confuse physical reality with the subjective image we have of this world. The physical world ensures common grounds for conceptualizing things as others do by sharing and connecting cognitive schemata, even though we map the objects of this world in alternative ways. Beyond the uniqueness of the physical world, there are several instruments available that assist in this, namely:

- The brain structure of entities of a given species is similar, and the stimuli of the physical world are converted into subjective information, stored, and used through input channels similar in structure. For example, each person perceives the same range of colors; and reference levels are by and large identical, such as body temperature in relation to which we sense how cold or hot it is.
- The rule underlying the formation of schemata are also identical within a given species (for example, the cognitive schemata connect to each other according to basic logical operations such as IF, AND, OR, or EQV).

To summarize: even if the physical world could be identical to different people, if the perception and formation of cognitive schemata were not based on the same rules, the cognitive models of the individuals would differ to such an extent that any form of cooperation would be impossible. This does not mean that different individuals would be unable of co-existing. For example, ants and a person may live in the same house together, but they do not cooperate.

Another special form of help is available for reaching cooperation, and that is language. The components of language (words, terms, thoughts, expressions) are labels that explicitly correspond to individual cognitive schemata. When I say apple, everybody thinks of the same fruit, in spite of how someone may think of a green apple, whilst another imagines a red or yellow fruit. The components of language as labels (for example, verbs are schemata for processes, nouns represent schemata for objects and personal entities, and syntax functions as schemata for relationships between words) are ordered to a given schemata, just as a number and street belongs to a specific house: we do not need to know whether the house is built of brick or stone, the way in which we know it is number 12 indicates that it is the neighbor (usually) of numbers 10 and 14 (at least in countries where even numbers are on one side of the street and odd on the other).

These components of language help inter-personal and inter-entity communication through two means:

- The manner in which a species agrees on how a given label must exclusively correspond to a single cognitive schemata. This not only offers an expectation of a given entity. Equally, it applies in the case of other communication partners, helping to accurately define terms used jointly. This implies that entities agree that they are only capable of cooperating if they encode and decode information in the same way and, therefore, reconcile the rules underpinning the translation of schemata, for example, empathy. During the course of this reconciliation process, schemata are compared with the help of the testing process depicted above, so whenever suspension takes place, they attempt to dissolve it. Termination/elimination of suspension (described in the previous chapter) in turn leads to the formation of new (common) schemata. These common schemata enrich the adaptation repertoire (system of cognitive schemata) of both entities, and accurately specify language use. Hence, the indicator that represents the success of the adaptation is increased. This assists in understanding how motivation underlying communication works using the same rules as individual adaptation. Assessing communication through this approach provides an explanation for learning, research and exploration, as well as how new knowledge is disseminated within a species.
- The way in which the components of the language correspond to cognitive schemata helps so-called abstract thinking. In that context, only the label (not the whole schemata, together with the totality of other sub-schemata linked to the given schema) is used. Rules underpinning the manipulation of labels are also stored in the form of schemata and so form the composition of language.

Groups

If we claim that systems – and therefore people – connect to form a new system, and perform operations as a system on the inputs and outputs of people, it is then easier to understand the group.

Since a schema representing the personality of another person, and the self-identity schema of a given entity, may connect (for example, creating a marriage, or friendship schema, from the schemata of two distinct people), the schema of the entity representing the group or family they belong to may also integrate. The precondition for this is that the entity's indicator must increase during the act of integration. In other words, the entity needs to experience group membership as an adaptive, competitive edge. This may occur if the relationship with the group is suspension free i.e. the outputs of the entity correspond to the outputs of the schema representing the group. To use social psychology terminology, their attitudes need to be the same.

If the individual behaves as a sub-system (group member) of the newly created or joined system (the group), the individual is capable of acting in line with the interests of the group. These may override individual interests, hence providing an explanation for the phenomena of altruism, self-sacrifice, or heroism.

Ultimate goal: increasing adaptivity vs. reproduction?

In the previous chapter, I propounded the claim that adaptation is the ultimate goal of the system, rather than reproduction, as would be expected following Darwin's approach. This is no coincidence. As I have previously mentioned, the method of assessment, and the order of magnitude of the part of the system under assessment, determines the consequences we are capable of drawing. This equally applies in the case of people.

When engaging in assessment at the entity level, adaptation is the only possible goal that can be set. If we observe a higher complexity level (more than a sole entity), reproduction also surfaces as a goal, since in this case, we are not only capable of examining a given entity, but can also assess two entities (for example, an opposite gender couple) or a group. In this case, offspring become relevant (which can also only be observed at this level of assessment); more specifically, the product of the connection between the parents. To frame this in scientific terms, a new system (family) is formed through the connection of two systems; another system – the offspring – is created from this system by means of deduction with the aim of increasing the adaptivity of the parents. (This assumes that the parent-child relationship remains intact, and that their schemata system remains similar.)

To return to the chicken-and-egg problem (according to which reproduction supersedes adaptation), I believe that a preference between the two does not exist; the outcome of both processes is that entities that attempted to forge connections, and therefore managed to adapt, survived the course of evolution. Entities that managed to adapt, but did not reproduce (for example, because their physical build did not make them capable of this) became extinct. Moreover, every single act of communication is also a form of connection and reproduction; when an individual manages to pass on a schema to another person, a new duplicate of the schema is formed (replication). At the same time, this new schema connects to the other existing schemata of its new host.

Consciousness

In the chapter presenting system theory considerations, one example was of the manipulation chamber corresponding to human consciousness. In particular, that the amount of information that the manipulation chamber can process, and its "acceleration capacity", is dependent upon biological specificities (and their variations between species). If this is the case, the question arises: in human beings, would it not be more efficient to retain/operate the entire schemata system in the manipulation chamber? I propose that it is more efficient. However, there are limits to the cost-efficient mode of operation i.e. biological constructs ensuring speed and capacity can presumably only be generated at an extremely high cost (for example, from special proteins). Or its operation (blood supply, demands of oxygen or space, weight) may be far too costly.

The issue of consciousness can be explained with the help of a logical line of thought similar to the conceptual framework applied for determining optimum size. Namely, once we accept that we can conceive that consciousness (manipulation chamber) is not a black or white entity that either exists or does not, we can imagine the various levels of consciousness, for example, sleeping. These correspond to the state when, practically, the chamber does not operate, or only functions consuming significantly less resources.

The manipulation chamber not only works with the duplicates of existing schemata, but also performs the testing of schemata representing the freshly mapped models of the physical world. Psychology terms this process attention. Therefore, a phenomenon in the physical world, one largely incongruous with existing schemata, demands increasingly accurate modeling. This takes place in a way that schemata representing increasingly minute details of the physical world also enter the manipulation chamber as the sub-schemata of existing schemata. In the chamber, intensive work is in progress to connect these schemata to existing ones. This ties up the capacity of the manipulation chamber, as a result filling it. Consequently – adhering to the principle of prioritizing the maximum information distance connection – this "forces" other schemata out of the chamber.

By adhering to this approach in detail, it has become possible to create a single concept, and establish the common grounds of the notion of early and late selection (Broadbent 1958, Deutsch and Deutsch 1963, Treisman 1960, Lachter et al 2004). Therefore:

- early selection corresponds to the phenomenon that only those models representing the minute details of the physical world – those whose connections with existing schemata have been suspended, and which therefore pose a threat in terms of adaptation – can enter the manipulation chamber; whilst
- late selection takes place when the models of the physical world connect to existing sub-schemata and, due to the lack of suspension, do not enter the manipulation chamber in accordance with the maximum information distance rule.

The manipulation chamber hypothesis ties in with several claims espoused in connection with the role of sleep. Sleeping can be considered as the activity of the manipulation chamber when in a state of physical inactivity, during which attempts are made to make up for arrears caused by suspended connections. Due to the lack of new stimuli, suspensions between cognitive schemata with significant information distances are not created. So, the manipulation chamber also manages to work with schemata it did not have time for in a state of consciousness, owing to how these were 'bombarded' with information. This enables us to explain certain functions tying in with cognition during sleeping, such as those Jouvet (1992) mentions:

- Improving mood. As I will demonstrate later, indicator decrease ensuing from suspensions is what is responsible for negative emotions. Moreover, the two are closely inter-connected. As soon as suspensions are eliminated through the restructuring of schemata, the indicator is restored to its original, 'standard' level, or even a somewhat higher level, which is reflected in the way mood changes in a positive direction.

- o Preserving memories. Some of the suspensions are not significant enough to cause a serious decrease in the indicator; consider the inaccurate connections existing at the level of sub-sub-sub-systems. Schemata restructure, and reach a stable state in the process of dissolving these suspensions. This is accompanied by the permanent formation of patterns due to the consolidation of the structure; see consolidation processes.
- o Another consequence, not necessarily related to the function of sleep, is dream 'work', namely, when problems are solved whilst dreaming. This ties in with the termination of suspensions, similar to improving mood as described above. It is necessary to stress that dream 'work' is not identical to unconscious problem solving, which often surfaces in the case of divergent tasks. The difference is in the way the manipulation chamber is used: as the term itself suggests, unconscious problem solving takes place outside the manipulation chamber (i.e. outside the realm of consciousness) through trial-and-error based restructuring of schemata.

Perceiving consciousness as a manipulation chamber also explains why some schemata enter consciousness, while others do not. This corresponds with Farthing (1992), who describes non-conscious and conscious as being on the same continuum, and does not distinguish separate categories as a counterpoint of the notion of consciousness; namely, sub-conscious processes, pre-conscious memories, or unconsciousness.

The Self

The way in which the self is defined is the cornerstone of many psychological theories.

Throughout the present chapter, I have discussed entities whose only aim is survival. Besides this motivation, do they have any will at all? Does nothing else drive them? I believe that there is nothing else. A basic evolutionary rule, as people are also systems, is: "become more adaptive by increasing the number of your schemata (your sub-systems) and by better connecting with each other".

What is misleading is the way Western civilization failed to recognize this rule, and divided the assessment of human activities into several areas, namely: reproduction, social relations, cognitive operations, etc., and attempted to identify separate principles and rules in these areas. Although it managed to do this, the chasm between such areas only widened, to the extent that, for example, Western civilization began to consider the satisfaction of physical needs less worthy than, say, a scientific activity. Our culture, by moving away from finding what is common in the motifs, and thereby pinpointing what fundamentally drives human beings became unable to see the complete picture.

By failing to find a general principle, it came up with a notion capable providing an explanation for many phenomena, which actually personified the principle mentioned above – "become more adaptive..." – in the notion of self. It is as if there is a small person (homunculus) inside the mind of people, who directs their actions and makes decisions on the grounds of this principle.

Firstly, we need to distinguish two aspects of the self, which we will see are not independent of each other:

The first aspect is self-identification (self-reflection) i.e. who the individual is and how they differ from other individuals. This aspect adheres to the definition of self espoused by James (1890, cited by Kulcsár 1996) and Allport (1961/1985, cited by Kulcsár 1996). This implies a single schema that individually connects to all schemata that enter the manipulation chamber; see James's concept of "experiencing intimacy".

This also implies that, after some sort of schema is formed in the manipulation chamber, for example, resolving a situation, or learning an action, this schema is connected to the 'self schema, so creating the "I resolve the situation, I learned the action" type of experience/schemata. This also makes it evident that the existence of self-reflection depends upon the existence of a manipulation chamber. Therefore, in the case of the specimens of species where this does not exist, the notion of self is less relevant.

Moreover, the smaller the capacity of the chamber, the less relevant the notion of self becomes. A consequence of this is that, since the given entity is capable of reflecting on created schemata, its ability to adapt also increases, since it will avoid situations it is incapable of resolving on account of not having the right schemata to do so. In addition, through its connections with schemata, the self is capable of repeatedly duplicating the schema in the chamber i.e. recall the knowledge it has already acquired (which has not been lost following the weakening/cessation of connections due to biological reasons). This definition of self corresponds to the concept of self espoused by Rogers (1959). He defined the self as the totality of the experiences, ideas, perceptions and values of the person by stressing the importance of the self when explaining things that impact upon the person. With system theory terminology the explanation is the same, with the difference that one can provide a general explanation for experiences, ideas, perceptions and values by taking all of these as schemata. From this point on, the self, in the sense Rogers describes it, and the way we define self, relates to the same cluster, which determines the perceptions of the individual and provides a guideline for how and why this is.

The second aspect relates to experiencing the self. This is none other than measuring the indicator, which provides information of the size of the totality of schemata mentioned above, and the quality of their connections. This aspect is vitally important for the self, since it is the only indicator that is significant from the perspective of the individual's existence. As can be seen, this latter aspect does not necessarily concern only the cognitive dimension, but also a far more important dimension: the existence of the person itself.

The indicator, as a measurement, can only be interpreted in relation to something, since all quantities are only relevant if they refer to some sort of relationship of their own accord (ratio). In our case, the indicator may change as an absolute value. However, it has a meaning in the context of the fixed and permanently perceived physical world in relation to a previous value i.e. it increases or decreases in relation to this, or is higher or lower than this value. It has no independent meaning (although it may be interpreted similarly to the psychological notion of self-confidence). In the context of the individual, only an increase or decrease can be perceived.

The question arises as to why we experience the indicator as a size, and not as an alternative quality (for example, smell, or color) of the totality of cognitive schemata? The answer to this is that the relationship between the indicator and the totality of schemata is similar to how the reflection of an object relates to the given object itself. In the physical world, the main characteristic of objects is that they occupy a place in space; that is why size is one of their most relevant properties, and which can be defined in the case of every object. The indicator reflects the totality of schemata (as a cluster of 'something'). Consequently, at the level of sensation the most evident, and most basic, characteristic is the analogy with physical size. This provides information on the volume it occupies in space, as a relationship, for example, between bigger and smaller.

Moreover, many of our schemata depict our body. These schemata model our body as a physical entity, also including schemata storing actions that serve to change the physical world. The distance we are capable of penetrating the physical space is also a relevant aspect in terms of adaptation. For example, bound or by being inhibited in our movement, we are at the mercy of the outside world. Our body is incapable of impacting upon that world. However, with the help of instruments and objects, such as a weapon or a stick, we are each capable of keeping many times the space of the volume of our bodies under control. This implies that, from amongst the opportunities we have, we will experience the totality of our schemata as a volume-type quantity.

As highlighted earlier, the relevance of the indicator, and therefore increase and decrease, also plays a pivotal role in the terminology applied by the model and in the following, where we try to explain human phenomena of a higher order. As a rule, I believe it relevant to explain phenomena taking place in the individual, instead of focusing on schemata and sub-schemata. Therefore, I will be less concerned about the integration of schemata, but instead concentrate on how this impacts upon the life of the individual when introducing the notions of self-narrowing and self-expansion.

Self-narrowing refers to the phenomenon when the indicator decreases as a result of the suspension of schemata. Self-expansion refers to the phenomenon when the indicator increases due to the integration of two or more schemata.

Emotions

As opposed to the psychoanalytical approach, the cognitive approach is often criticized for failing to provide a proper explanation for the world of emotions as the counterpoint of cognition. What is the case regarding our model? Is it capable of answering where the source of specific emotions lie, when they are experienced, and where they surface?

Although our model operates on the basis of cognitive schemata, due to automatic processes aiming to increase the indicator, it comes to a conclusion similar to prevalent motivation and emotion theories in psychology. Namely, the ultimate goal of every human action is to increase adaptability, and distinguishing emotions and motifs serves this goal. According to Atkinson et al (1996), emotions and motifs are distinguished on the basis of how motifs are activated internally, whilst emotions are influenced from outside. However, what I have advocated so far washes away the difference between the notions of outside and inside, on account of how the individual lives in a physical world, in relation to which everything else is a part of the physical environment. What Atkinson dubs outside is actually a part of the physical world, represented in the form of a schema within the subjective world. Presumably, what Atkinson dubbed 'inside' i.e. as a corporeal process, is also part of the actual physical world, regardless of how, from an external vantage point, it takes place within a given entity. Therefore, it becomes pointless to distinguish motifs and emotions in this way.

What can we say about explicitly experienced phenomena, such as anger, joy or disgust? The theory of cognitive labeling, espoused by Schachter and Singer (1962), and Zillman and Bryant (1974), will help answer this. This approach suggests that increase in vegetative arousal is the common biological basis of emotions, to which cognition orders some sort of label, hence producing specific emotions.

However, what underlies this vegetative arousal? As will be discussed in the next sub-chapter, vegetative arousal can be perceived as a value that demonstrates the extent to which the indicator deviates from the average. This also seems logical from an evolutionary perspective. When the indicator greatly decreases (because of the way the system, the individual, is in danger i.e. is threatened by extermination) arousal needs to increase, since this is how the entity is capable of performing at an increasingly higher level. This performance increase must equally present itself when the indicator greatly increases, since the ability to act at a higher level is needed to disseminate the newly created operation. From amongst these two performance increases, negative values and penalties must associate with the former, whilst rewards must associate with the latter. The way the indicator relates to its regular value is what is precisely capable of ensuring this negative-positive trend i.e. the individual experiences indicator decrease as a penalty, and indicator increase as a reward.

Having made this distinction, we have managed to separate negative and positive types of emotions, such as those based on rewards or penalties. The way in which these types of emotions have an evolutionary competitive edge is evident, which is why it is no surprise that these emotions – although not specific emotions – can also be found in species functioning with less complex schemata, and in a less complex manner than in human beings.

We have already discussed how it is possible to define the indicator in the case of every living CAS (complex adaptive system). From an evolutionary perspective, measuring indicator changes is the next step on the road of development, and this plays a key role in understanding behavior. The following step on this development path is when the various patterns of the changes of indicators associate with schemata to enable situation evaluation. This is of key importance for planning behavior more accurately. This is not required in the case of less complex organisms, as so-called 'fight or flight' responses can be perfectly generated without having to evaluate the given situation. On the basis of this line of thought, it is no coincidence that the structures activated to determine the basic trajectories of the evaluation of emotions are in the most ancient part of the brains of human beings. Nor that the schemata to which they connect are stored in parts of the brain of a higher order.

The question is: what types of schemata are required, and how do they connect, to make the indicator change? In line with the target-relevance theory (Lazarus, 1991; Oatley, Johnson-Laird, 1987) that builds upon the theoretical framework of system theory, it is possible to state that indicator change is the precondition for an emotional response (target-relevance). That is, there are no emotions if the indicator does not change. The target-congruence notion of the same theory corresponds to the positive or negative change of the indicator. The degree of change of, or the type of schemata that link to, the situation, may be further criteria that determine the given emotion. For example, according to the target-relevance theory, whether the schema of the self relates to the given situation – or otherwise – will determine the emotion. Specifically, schemata that are in use at a given moment – for example, those in the manipulation chamber or the environment – are those that will connect to vegetative change.

It is possible to connect schemata playing a role in a given situation with certain characteristics: for example, the rate of change, speed, precision, etc., of the change in the indicator to the components of appraisal theory; (Smith & Ellsworth, 1987: pleasure, expected effort, action involvement, guiding the situation, detection of obstacles, importance, predictability).

Arnold (Reisenzein, 2006) draws attention to how event appraisal, needed for emotions to evolve, does not necessarily have to be conscious. This is in harmony with what I have so far espoused, since the indicator change described above, and schema attribution processes, will only become conscious (enter the manipulation chamber) on the basis of the maximum distance rule. That is, suspension that takes place in connection with a concerned schema is placed at the top of the list.

According to the observations of Ellsworth (1991), vegetative arousal and cognitive appraisal are events prolonged in time. This corresponds with how the testing of new schema creating connections to be built with other schemata, or registering the quality of the connections of these new schemata, are time-consuming processes. Moreover, these new connections produce an array of results, not only one single value. This range of results modulates the situation, and so that also has to be appraised.

Before examining the question of arousal more thoroughly, five questions raised in an article by Lazarus (1991, p.820), in which he outlined the (five) criteria of a sound theory on emotions to provide coherent responses, will be discussed:

Question: "What are emotions?" Answer: On the grounds of what I have so far described, emotions can be defined as indicator changes that connect to cognitive schemata (labeling). The way in which these cognitive schemata connect depends upon the person, the stimuli in an environment in which the system functions, and the patterns of indicator change.

Q: "Should physiological changes be a defining attribute?" A: Definitely not. Physiological changes are only causes and consequences of schemata changes taking place, and the indicator changes accompanying these. Where physiological changes are independent of the will of the person (for example, in Schachter and Singer's experiment, the injection of adrenalin, or a secretly injected drug causing euphoria), it causes the same type of changes in the schemata system as the physical environment does.

Q: "Should emotional meanings be dimensionalized into a few basic factors, or treated as discrete categories?" A: Since, by connecting to cognitive schemata, vegetative reactions constitute emotions, and there are, theoretically, an infinite number of schemata, the number of emotions is, in theory, also infinite. This is exactly what the person experiencing a given emotion feels. He or she believes that each individual emotion is unique, and cannot be reproduced or categorized, even if an external observer groups emotions, or they are grouped on the grounds of linguistic similarities. Perhaps a child will not love their mother and father in the same way, or even love their mother differently at different times. Therefore, the answer to this question is that, if we do not want to lose any relevant information, we need to classify emotions within an infinite, number of categories.

Q: "What are the functional relationships amongst cognition, motivation, and emotion?" A: Cognition (which is not a separate notion, but the summarized activity of the schemata system) is what makes the indicator change; this can be perceived as an emotion when the sensation of the indicator change connects to a specific schemata. The endeavor to increase adaptivity is really motivation, which is not a separate process, but the direct consequence of the way the person functions as a system. If the system reaches a more adaptive state, the indicator will increase, which triggers a positive emotional response. And vice versa.

Q: "How can emotion theory reconcile biological universals with socio-cultural, developmental sources of variability?" A: Although in almost every person vegetative changes proceed according to the same set of rules, this on its own does not mean anything from the perspective of universal emotions and their differentiation. Cognitive schemata are the other component of emotions, which vary by culture and in the specific phases of human evolution, by ensuring the variability of emotions. However, strikingly similar biological processes underpin these emotions.

Arousal

I have previously focused on arousal, the general activity level of the brain, in the section discussing emotions. However, I only referred to the way it relates to the indicator. I compared the absolute value of the change of the indicator with arousal, which I would now expand upon in the light of arousal theories. Ever since Hebb proposed his theory (1955), we know that arousal closely correlates with performance, which is expressed as an inverted U-curve i.e. lack of action is the outcome of extremely low arousal values, whilst extremely high values disorganize action. Neither engenders optimum adaptation in the short run.

What is then the case with extreme indicator values? When two schemata containing the totality of sub-schemata are suspended, the indicator dramatically decreases; these schemata fill the manipulation chamber. The manipulation chamber will also be full when the "fireworks" scenario accompanying the connection of two complex schemata uses the indicator with the aim of creating more and more new connections. The "fireworks" engenders a dramatic increase in adaptation ability. However, this level of saturation of the manipulation chamber may engender a decrease in adaptation ability in the short run since, due to lack of space, other ordinary, everyday suspensions will have insufficient resources to be dissolved. Therefore, the two extremes will lead to bad adaptation in this case, as well as in the case of arousal.

In spite of this parallel, arousal and the indicator are by no means identical. The following relationship exists between the two: the absolute value of the deviation from the indicator's average = arousal. What does this imply? When the indicator is in a more or less neutral state, this is excessively low arousal (sleep); low, or medium, deviation is optimum arousal, whilst high deviation is excessively high arousal, when performance declines.

Notice how the handful of suspensions that will prevent restructuring later on is needed to increase adaptivity. This concurrently engenders arousal ensuring optimum performance. In short: medium-level arousal enables regular activities, and vice versa: regular activities engender medium-level arousal.

Therefore, does a slight decrease in adaptivity have any positive effect at all? This is not easy to answer, since there is a missing link in the question raised, namely performance. Therefore, a slight decrease in the indicator is, in many cases, a precondition for performance. This can be interpreted as a goal, an event that will increase adaptation. The way positive emotions accompany indicator decrease is the product of a learning process: the sensation of a slight increase in arousal is associated with the chance of reaching a higher state of adaptivity. This association is a product of the way suspension generally precedes the attainment of a higher state of adaptivity, or how the potential to reach that higher level is inherent in suspension.

Psychology has been aware of the concept of eustress for some time. This was introduced by János Selye [Hans Selye] (Selye, 1956) as the counterpoint of stress, which can be conceived as the outcome of indicator decrease caused by suspension. Contrary to distress, eustress accompanies positive emotions. However, at a vegetative level it also shows similarities with changes taking place due to stress. Consequently, however surprising it may seem, and in spite of how the connection of over-complex schemata results in significant increases in adaptivity, the vegetative reactions accompanying this may take their toll on the person.

“Automatic action”

Although I have particularly focused on phenomena concerning various systems and sub-systems, it is a fact that the majority of human behavior is nothing but the use of existing operations. Since these cannot cause suspensions (or only to a minimum degree) these types of behavior do not enter the conscious realm (the manipulation chamber). I will call processes that are largely irrelevant from the perspective of scientific research “automatic actions”.

Whenever schemata of higher order exist (for example, I would like to travel by car from X to Y), operations take place between their sub-schemata and the physical world without any sub-system entering the manipulation chamber. This situation is characteristic of all everyday actions that are not conscious; for example, some movements executed when driving. In this context, the chamber will continue to fill with pairs of schemata having maximum information distance aimed at restructuring. However, if there are good models of these outside the chamber (i.e. with small information distance connections) hundreds, and even thousands, of outputs are generated without leaving any particular trace. Therefore, to continue with the example provided above (driving from X to Y), if we have routinely driven this route for years, while driving the manipulation chamber may engage in eliminating suspensions of schemata connecting to another area of life; for example, questions such as what should I get my wife for her birthday; how old was I when I first visited the seaside; or talking to somebody on the phone; etc.

As soon as the output of a given schema becomes an unsuitable input for the next schema, and the information distance is also great (for example, I see an accident on the road), this connection will be at the top of the priority list and enter the conscious realm to restructure as quickly as possible. I begin to drive more carefully, and slow down as a precaution.

If I am a driver without a routine, my schemata will have not developed sufficiently, so I drive the entire journey in a way that my schemata in connection with driving will restructure inside the chamber. This is what will always be prioritized. It is for this reason that I will remain conscious of the act of driving throughout the entire journey.

In spite of the way they may have formed outside the chamber, the totality of connections being forged increases the indicator. However, since these are schemata with a definite and broad system of sub-schemata, very few new connections will be established. Instead, existing ones will be used. Accordingly, my self will not necessarily expand just because I managed to drive from point X to point Y.

Flow

The concept of flow, introduced by Mihály Csíkszentmihályi (1990), is a combination of the “fireworks” scenario and automatic actions. When explaining the fireworks scenario, I alluded to the way the number of connections created from one another through chain reaction increases exponentially, which is why the acceleration role of the manipulation chamber also comes into play.

The phenomenon of flow takes place when the schemata connections encoding the main properties of schemata of a higher order are available. Although schemata that are easily created from the connections of these are available, a few sub-schemata are nevertheless missing. This implies that the development of detail is what is in progress, which means that a series of connections is being created, resolving many partial problems. In such cases, some connections are suspended. However, the information distance is not exceptionally great i.e. it is not so great that their restructuring in the chamber takes a long time, but is not adequate for it to be resolved outside the chamber. That is why, by entering the chamber, suspended connections spend just as much time inside the chamber as it takes for the next suspension to take place. This engenders a series of slight expansions of the self, which keeps the indicator at an optimum, slightly positive, level.

Ensuing from the above, for this scenario to take place several preconditions need to be fulfilled:

- schemata required for creating connections need to be available i.e. the preconditions for creating a connection need to be in place and a major suspension must not occur;
- a sufficient volume of sub-schemata need to connect for the series to evolve in due time; and
- the complexity level of sub-schemata to be connected needs to reach a level that they are placed in the top rank in the case of suspensions, hence forcing all other schemata out of the chamber (consciousness).

Peak experience/enlightenment

As mentioned in the first chapter, enlightenment is a religious concept implying complete absorption in the world. The distinction between self and non-self disappears, as does motivation. A state of all-encompassing knowledge emerges, which is accompanied by a continual feeling of joy and happiness.

In spite of this being primarily a key concept of Buddhism, our model does not exclude the existence of a similar state. By definition, this state only evolves once, is irreversible, and takes place only when all of the schemata in a person connect to form a hyper-complex operation. At first sight this seems impossible. However, the fact that the physical world is a coherent whole does not exclude the possibility of mentally modeling the entire world.

The complete lack of suspension results in motivation ceasing. This implies that the indicator reaches its theoretical maximum, and so creates a permanent state of joy. All-encompassing knowledge is the natural outcome of modeling the entire world. Since every schema has been integrated into a single schema, and this implies that the "self" schema has been integrated as well, the person and world unite to form a single whole, and the boundary between the two disappears.

Although this phenomenon is best described through the notion of enlightenment, we see similar constructs in psychology, such as that of Maslow (1962) (peak experience) or Wilber (1986) (trans-personal self).

HOW THE MODEL CONNECTS TO CURRENT TRENDS IN PSYCHOLOGY?

Having become acquainted with this model, it is worthwhile reviewing:

- o Which concepts surface in the theories of other authors and, if there are any, can these be used perfectly identically, or is there a difference in their definition? If we find that there is a difference, does this rule out the use of our concept?
- o How it relates to other theories; do they contradict or complement one another, or lead to the same result?

The novelties of this model, and how it helps explain psychological phenomena, will be discussed from the third chapter of this volume.

Piaget and the constructivist learning theory

Due to the way the schemata concept plays a pivotal role in the model, we should focus on the author who first proposed this concept; Piaget, the father of constructivist learning theory.

The first main difference between his use of the concept of schemata and ours is that, in Piaget's approach, the emphasis is on schemata being cognitive structures. This is understandable, as he focused on the cognitive development of children. The approach we operate with emphasizes the schema i.e. being a model and a system (closely related to the mental mode concept introduced by P.N. Johnson-Laird, 2004). It is for this reason that our model has more explanatory power, since it identifies the same principle underlying phenomena that is mentally represented. Beyond cognitive process in the narrow sense, this equally includes processes tying in with social relations, body image, and movement. This is why, beyond the input-transformation-output structure, it does not espouse anything else about the details of schemata. For example, by allowing various modalities of information to be processed. Or transforming information from one modality to another.

The other major difference ties in with how we interpret schemata i.e. in a narrower or broader context. Piaget uses the concept to explain very specific experiences or phenomena of which, in his view, there are a few hundred or thousands (a quantifiable, and a relatively slowly increasing, number) in the brain. We, on the other hand, operate with a far less stable, permanently changing, and almost infinite, number of schemata. Two things make it possible to assume that there is a much wider sphere of schemata, namely:

- o Schemata are composed of schemata. Therefore, what we classically dub as schemata of a higher order, are actually schemata structured and composed of several other schemata.
- o Schemata are formed every moment, and are in a continuous state of transformation, since their goal relates to mapping the permanently changing physical world and providing new information upon it as far as is possible. These schemata attempt to achieve this by increasing quantitatively as well as qualitatively. That is, on one hand, new schemata are formed by mapping external impacts. On the other, existing schemata attempt to increase their level of integration. Piaget treated schemata as discrete constructs, which can become well defined in time, and are formed and transformed from time to time. Our model moves beyond the phenomena identified by Piaget. It not only applies Piaget's mechanisms to a

discrete schemata system, but also to an almost infinite number of schemata that can be viewed as a continuum. Consequently, the same connections and suspensions take place at various levels as those Piaget describes when observing schemata engendering visible and perceivable consequences. In other words: the same process is taking place in the background when the eye unconsciously connects points to form a straight line as when object constancy is evolving.

There is another advantage in extending the scope of the size and volume of schemata in relation to the way Piaget uses this. We will not only be able to understand the way less complex schemata with visible consequences (schemata of a lower order) function. It will also become possible to examine schemata being processed at a slower pace. For example, the process of writing a study is also stored in a single schema, despite it taking possibly several months to complete; that is why it needs to be examined differently to a single one-off event. At the same time, schemata of a lower order (writing an introduction, or compiling a list of references) play a role in the formation of the final schema. . This is similar to the schemata Piaget observed. However, the roles of integration and testing only fathom processes of a higher order than schemata. The partial schema of this process can by no means be, for example, a simple action, such as finding a special computer key (say #), which could already be observed in the short run. It is similar to screening a film of the whole life of a person at various speeds (frame rates); the same patterns can be observed in every version.

What I have promoted so far may simply seem to confuse the concept of cognitive schemata, whereby this would have no serious advantages in relation to Piaget's concept. However, whilst Piaget's approach identifies two different and non-compatible phenomena in connection with the manipulation of schemata (assimilation and accommodation), our model manages to explain a wider range of phenomena with a single concept. Piaget defined the concepts he used in the following manner: "The filtering or modification of the input is called assimilation; the modification of internal schemata to fit reality is called accommodation." (Piaget, J. & Inhelder, B. 1969, p.6). Beyond it being impossible to consolidate the two concepts, the problem they pose is that Piaget fails to specifically define why one specific technique is used in a given situation. Some general references are provided; namely, accommodation will surface if assimilation is no longer possible. However, what Piaget means by "no longer possible" is vague.

In relation to the above, our model consolidates the two concepts into restructuring, in a manner whereby this single concept is always taking place. The only question is, at which level of schemata (complexity) does this take place. This consolidation can be harmonized with Piaget's concepts if we differentiate the change: whether it takes place in schemata (for example, in the patterns of sub-systems) that either engender perceptible changes in behavior or are accessible through self-reflection or interrogation. Therefore:

- Assimilation occurs if restructuring only happens in schemata of a lower order (the acceptance range of the observed schema changes); whilst
- Accommodation takes place if schemata of a higher order restructure.

This answers the question: which (and when) of either assimilation or accommodation takes place? The answer is always that the same process takes place and only the technique used for observation will determine whether the observer notices accommodation or assimilation. This depends on whether the observer registers perceptible changes in behavior (accommodation) or does not (assimilation). Fundamentally, schemata are changing continually i.e. it is always accommodation that is taking place. In those cases where we do not perceive the effect, this is termed assimilation.

Another aspect deserving mention is when comparing the two schema concepts. Although Piaget did not specifically focus on this, the schemata system nevertheless has various levels due to its hierarchic structure i.e. more complex schemata connect to other more complex ones, and less complex schemata connect to other less complex ones. In identical modality information, there is then no reason to exclude the possibility that a less complex operation provides an input for a more complex one. This implies that schemata do not have a hierarchical structure or, if they do, that that structure is not discrete, but is described by continuous numbers. The only hierarchy in this context is that the operations of certain schemata cannot be directly connected without incorporating a transformation system in the process. For example, where a neuron and a schema represent a concept. This is due to the way schemata are built, and that there is a difference between the coding of the output and their inputs.

Beyond the criticism of Piaget, we need to clearly see the advantages of the constructivist learning theory. Namely, since it focuses on phenomena that can be clearly observed by the eye and perceived comfortably over time, its results can also be handled in a concrete and easy way. It is important to stress that, in spite of the way we apply a broader framework in terms of time and complexity than does Piaget's model, and handle schemata complexity as ongoing, we do not contradict the constructivist approach. Rather, the model presented can be conceived as a critically corrected extension of Piaget's approach, which retains the basic principles of the theory and also counteracts its critics (for example, Baillargeon, 1987).

The two typical criticisms of Piaget's work can be readily reconciled in our model:

One critical approach relates to the accurate definition of development phases and their precise sequence, as described by Piaget. The potential drawback of our model, which is more general than Piaget's approach and contains less concrete aspects, may become an advantage. The way in which it specifically focuses on principles makes a great degree of generalization possible. That does not exclude the existence of processes and operations (even intrauterine or in connection with the embryo) that the external observer is not aware of. Our focus on general principles exclusively promotes the principles of connection/testing and suspension/restructuring. This implies that it remains sufficiently flexible to adjust to the way Piaget imagined.

The other critical approach, connected to the approach of Lev Vygotsky, is in connection with the issue of embeddedness, according to which development is subject to the culture and environment in which the child grows up. This approach is in harmony with the approach taken by our model, claiming that the formation of operations will only depend upon the phenomena to be mapped in the physical world. Therefore, as an example, if we take a person who has been blind since birth, he or she cannot be expected to form schemata relating to color mixing. The precondition for this would be the existence of a certain number of schemata relating to colors.

The principle of the connection of operations alone does not create distinct phases, and justifies those who claim or view development as an ongoing process (for example, Klahr 1982, or neo-Piagetian theorists, such as Mandler 1983). According to our model, development is an organic process, the outcome of which is the formation of new schemata by means of restructuring. This may seem to proceed in phases (as per neo-Piagetian theorists), or a single process, depending upon which level of schemata we observe. If needed, we can discover new schemata on a daily basis; or as another extreme, perceive childhood as the attempt to form one lone schemata, which we call an independent adult's world view.

Our model perhaps best adheres to the approach of knowledge acquisition put forth as a criticism of Piaget's theoretical framework, which espouses that processes are identical in every phase of life and that only the volume of knowledge accessible increases with age. This similarity is even more evident if we consider knowledge as the totality of schemata.

A final thought in connection with learning theories is that, having discussed Piaget's theory, it becomes evident that it corresponds to our model in how it traces learning back to restructuring. One of the general dilemmas of learning theories ties in with identifying motivation underlying learning i.e. finding an answer to the question: why do children learn? That there is no consensus amongst the answers provided in psychology to this seemingly simple question presumably ties in with how the question itself is rather awkward. Moreover, learning, as a concept removed from the context of cognitive operation, takes the wrong approach. Either learning does not take place at all, or everything is learning, since the more detailed and better modeling of the outside world (as the means for increasing our ability to adapt) is a permanent and continuous program in all individuals. Whether there are any perceivable manifestations of this – perhaps a child picks up a book and reads or a philosopher seemingly stares into oblivion – is a different matter. Intra- and inter-personal communication will nevertheless be performed continually to make operations underlying schemata increasingly accurate. What ensures this is the penalty/reward motivation system building on indicator change.

Philosophical background

Hegel

The Hegelian dialectic can be detected in the description of the transformation of schemata from the perspective of integration. Therefore, a schema, as a thesis, will sooner or later find the schema that specifies its purpose. Should the contrary apply, the given schema would relate to far too many things, which is why the scope of interpretation needs to be limited; in our case, this can only be another schema. This other schema serves as the antithesis, and its tension with the other schema is what the main principle of this dialectic is. In our case, suspension is what is considered as counter-tension, which, once eliminated (through synthesis), will create a schema through the process of restructuring. As espoused by Hegel, we will consider this new schema, created with the help of synthesis, as another thesis, which will activate the thesis-antithesis-synthesis process all over again.

Plato

The other relevant philosophical approach ties in with Plato's idea concept. In his famous cave analogy, Plato reveals the way ideas are unreachable. Therefore, two worlds exist: one is the world of ideas of "perfect" objects; the other is the world we live in, which is a poor duplicate of the world of ideas, just as shadows appearing on the walls of a cave are poor depictions of the objects around the fire that cast those shadows. What Plato called the physical world (as opposed to the world of ideas), I call the subjective world of the individual. In our view the physically existing Universe refers to the unknown and unattainable, which in Plato's theory is the world of ideas.

Aristotle

The concept of logical operation, namely, deduction and induction introduced by Aristotle, has been mentioned earlier in connection with cognitive schemata. However, what deserves mention is that it is perhaps no coincidence that these concepts developed the way we presume schemata operate. Therefore, if schemata – which correspond to premises or thoughts in philosophy – connect in alternative way to one another, and comprehend each other differently, so logical concepts highly relevant to describing human thinking would not use these either.

Neisser

Our model avoids the use of the concept of cognition, and only focuses on the connection of schemata. However, the concept of cognition, which can be conceived as the operation of the overall system of schemata, is similar to Neisser's approach (Neisser, 1976). Beyond the way they both approach work with schemata, the most relevant similarity is that both theories – assessing different levels and focusing on different aspects – treat sensation, perception, and thought, as phases of the same process. They both attempt to provide an explanation for this through common basic principles. Moreover, both theories support the idea that the role and aim of schemata pertains to increasing adaptivity, and that the individual's cognition corresponds to the operation of the totality of schemata.

Beyond these similarities also lie differences, primarily due to Neisser's hypothesis, which proposed, contrary to what we have described, that there are significantly fewer schemata. This enables Neisser to work with a schemata concept that "lives its own life" (is less integrated with the rest of the schemata) and can be well defined. Consequently, as with Piaget, Neisser is forced to introduce a new concept in his theory; namely, that of schemata change, which he describes as a separate process and phenomenon.

This concept was introduced because the inability of two schemata to connect could not be explained through the suspension of lower level schemata – or even lower, should these schemata not fit – and the restructuring that followed. That is why Neisser was forced to work with changes to independent schemata. Piaget also raised the same theoretical question. If schema levels are limited and discrete, what will determine the number of levels, and why should this be discrete, since the physical world, as a whole, does not have any discrete layers; say 7, 15 or 194? This layer-structure also fails to correspond with the principle of Occam's Razor (which states that we should not integrate any theories in a model that could otherwise be disregarded for explaining the same phenomenon) i.e. why do we state that something is not continuous, since, should we do so, we need to assume that there is an agent (a variable, or something formed subsequently) that causes and determines levels.

By assuming this type of discrete schema layers, the only option left for Neisser was that there are schemata used to represent the world i.e. individuals have to look for their existing schemata in the world. Should the individual find schemata other than those they have, they will be forced to change their schemata. This is like the tail wagging the dog: would it not be far simpler to adopt the principle that the individual wants to map the world as best as possible in every situation? Further in this regard, that the easiest course is to simply take the outside world for granted – i.e. treat "incoming" inputs as facts – as a point of departure, instead of the contrary i.e. to fathom the external world through our schemata?

We have previously reviewed these potentials in the system theory introduction, when the individual comes into contact with stimuli (inputs) of the physical world during the act of perception. In this case, two things may happen:

- o if these stimuli, as inputs, fall within the acceptance range of the pattern of existing schemata, nothing special will happen. The individual will generate the output pre-determined by their schemata; or
- o if these stimuli correspond only in part to existing schemata, there is an available schema and another formed by modeling the outside world. These two schemata will connect in a state of suspension, and attempts will be made to dissolve this in the way previously described in several instances. It will begin to model the physical world in increasingly greater detail. Concurrently, it will also compare the minute details of the physical world with sub-schemata of existing schemata, up to the point where it reaches a level at which the sub-sub-sub-schemata and the minute details of the physical world will eventually connect. This connection process proceeds according to the scenarios described earlier, and produces a state that, at a macro-level, corresponds with the phenomenon described by Neisser as schemata change.

The final point of the above description may correspond to the top-down (Helmholtz) and bottom-up (Gibson) approaches, which our model integrates, as with Neisser's approach, but by using a different concept. The most relevant difference between the two concepts is that Neisser treats perception as an active process, whilst this is described as a passive process in our model. The way in which this is understood as an active process is not what is problematic. However, presuming intention i.e. the individual is searching for something in their environment, contradicts the principle of Occam's Razor.

Regardless of this, at the level of phenomenon, Neisser's model does not contradict our results. Restructuring taking place at a lower level, and the "digging deeper and deeper" process accompanying this, may actually seem as though the individual is searching for information in his or her environment. That is, the individual seemingly transposes their own schemata when modeling the physical world, and searches for its existing structures. It is a completely different matter that Neisser's model fails to provide an explanation of how the individual comes to terms with an unknown mass of information, in which case they are unable to use existing schemata to structure the outside world.

By using the passive-active dimension, it is possible to distinguish the two approaches. One is from the perspective of whether to take the order in the mind of the individual as a point of departure (Neisser). Or if one should endeavor to find order existing in the physical world, and is therefore prepared to transform their entire schemata system for the sake of adaptation, as in our model.

To summarize, Neisser's "analysis by synthesis" approach (perception fathomed through the comparison of the physical world with our schemata) completely corresponds with our approach. In the first step, the individual attempts to use existing cognitive schemata to decode the stimuli of the outside world. The only difference is that we go one step further. We not only suggest, in connection with stimuli that fail to fit schemata, that it is the schemata that change, but also describe how this takes place, and what happens when there are no schemata available that would be capable of representing the physical world. This way, we can disregard the concept of anticipation (once again, in line with the principle of Occam's Razor) by bearing in mind that, if a single model of the physical world corresponds to several schemata, the most active schema at a given moment will have a better chance of fitting.

In relation to theories presuming classical passivity, our approach adheres more to Neisser's approach, in the sense that we presume the use of the system incorporates existing schemata when perception functions. Also, that when schemata are available, real-time structuring of stimuli will take place as well as during the perception process.

Freud

Most of the theories that touch on the notion of 'self' try to clarify the way it relates to the psychoanalytical personality model. Firstly, it is worthwhile examining the way the concept of consciousness relates to Freud's concept of sub-consciousness. In our view what becomes conscious, and what remains unconscious, is a deterministic process, independent of any external agent or will. The maximum information distance rule is that which will automatically set what is processed in this chamber.

This automatism and mechanization is in harmony with Freud's highly deterministic approach, despite Freud not stressing self-functioning automatism, but instead emphasizing predestination. Therefore, what "rises up" from the sub-conscious realm is determined by rules in both Freud's thinking and our model alike. This is so even if we attempt to explain this through a principle resting on evolutionary grounds, while Freud uses analogies; hydraulic models (Fromm 1973).

Freud did not call the entities he used in his theories schemata, but rather ideas, mind contents, instincts, etc. However, Freud also described the phenomenon of suspension in a much more dramatic way, and with concepts that do not seem to be as scientific as the terminology used today. According to Freud, suspension takes place when impulses or mind contents released from the id collide with the super-ego. If the terms impulse and mind content are substituted for schemata, it is easy to discover the two poorly connecting schemata in the context of the id versus super-ego battle. If we are adamant about keeping the super-ego and id dichotomy, it is plausible to state that super-ego schemata contain the huge number of consolidated schemata of a higher order with well-functioning connections. These may, nevertheless, be bad models of the physical world, but seem to be a point of reference. Conversely, the id is a series of models spontaneously mapping the smaller-larger details of the physical world, which certainly include the internal biological processes of the body, namely, hormones, reflexes, etc.; they might be better quality representations than existing schemata.

The manipulation chamber corresponds to Freud's ego concept. If a connection results in poor outputs, but not so weak as to become the first to enter the manipulation chamber (according to the maximum distance rule), the connection will stay outside the realm of consciousness. Improving the connection's quality will then be performed slowly outside the chamber. Not counting the case when suspensions are created at a faster pace than the system can dissolve them – for example, continual bad luck, or continuous 'attacks' of ambiguous information from the environment – each suspension will sooner or later take place in the manipulation chamber; for example, when sleeping. Regardless of the will of the individual, simply because a particular connection's information distance becomes the biggest, it will be duplicated in the manipulation chamber with the aim of restructuring and reconnecting. This corresponds to the Freudian concept of integration in consciousness, when the self attempts to mediate between the super-ego and the id to dissolve the tension between them.

To summarize: the Freudian basic personality structure (ego-id-superego) perfectly corresponds with our model, whereby we take mind contents and ideas as schemata and the ego as the manipulation chamber.

I should draw attention to another similarity with the two key concepts used in our model, namely, some dynamic psychology concepts with self-narrowing and self-expansion. In Freud's work on the term libido we can partly recognize the motivation for expanding the self, while the notion of death-instinct corresponds to the drive for a pleasure that a sufficient increase in arousal creates when going through a small self-narrowing. Naturally, Freud could not use the same schemata-based concepts for defining these terms as we do. Traces of the two concepts can also be identified in Lipót Szondi's (Leopold Szondi's) theory, namely, ego-systole and ego-diastole. However, no matter how similar the two concepts may seem, they are nevertheless used in an entirely different context in connection with pathology and the Szondi Test.

If we manage to describe the human psyche without instincts, and purely through cognitive concepts, do instincts exist at all? I must stress that our approach is not a purely cognitive theory, to the extent that it provides explanations only for the phenomena related to thinking. The endeavor to increase the indicator introduces an explicitly motivation-based aspect in the approach; from that point on it coincides with an approach presuming dynamic systems, such as psychoanalysis. Therefore, instead of instincts underlying impulses providing the source of dynamics, it operates with terms of connections and, consequently, the endeavor to improve adaptation. This implies that in the way we consider certain instincts as determined in their existence, due to the existence of biological faculties in our model, we take the existence of given schemata for granted.

In Freud's theory, instincts attempt to enter the conscious realm as if they were tiny creatures with their own will, or at least having their own energy. In our model, due to the random connection of existing schemata, some schemata will connect well, while others will do badly at connecting. Consequently, the act of suspension is what drives the individual, just like the energy provided by instinct in Freud's model. The individual attempts to reduce suspensions, or, in Freud's theory, to get rid of energy. This is the same thing, except that it is described visually with an opposite pole. When, by finding the right connection, suspension is eliminated, the same thing happens as when an instinct is satisfied. As tension between super-ego and id impulses damages the individual – causes mental disorders – so suspension also damages the individual, since it engenders a decrease in adaptivity i.e. the indicator decreases. As with the integration of schemata, the fulfillment of an instinct is a self expanding, positive experience, although our approach prefers to highlight how this relates to increasing adaptability, and sharing this with other members of the entities. On the contrary, Freud conceives this as a necessary bad, which, however, benefits mental well-being. Therefore, the answer to the question raised earlier, of whether instincts exist or not, is that we are able to notice instincts if we view the world through Freud's eyes, notwithstanding that in our view they are a sub-cluster of a much more layered type of phenomenon.

Functions of a higher order

Having examined the grounds of our theory in detail, let us assess which theories it connects to. I have so far focused on the schemata level, by discussing in detail what takes place at this level in the case of general psychological phenomena, such as perception.

Seligman

Before examining the various phases of the life cycle, let us consider the theory of learned helplessness in the light of the above, since we are assessing a phenomenon with well-grounded neurological parameters (for example, Dwivedi et al, 2005, or Maier and Watkins, 2005) i.e. a robust theory. The key component of the experiment establishing a paradigm (Seligman and Maier, 1967 and Thornton and Jacobs, 1971) was that if people have no influence over when they are rewarded or penalized, they become more depressed in the case of failures than those people capable of influencing their own lives. As the term suggests, this is an approach rooted in behaviorist theory. In this context, by thinking in terms of S-R (stimulus-response) reactions, Seligman believes that people can be taught to experience themselves as either competent, or incompetent, entities. Therefore, the answer to the – seemingly slight – theoretical question, namely, whether one fathoms their own destiny or not, is yes. That is the outcome of the same type of learning process – which usually takes place during childhood – as tying a knot.

This experimental result is in tune with what our model posits. Moreover, underlying arguments also perfectly comply with what our model suggests. However, we can see matters slightly clearer with the help of the concepts introduced so far, and may perhaps be able to provide an alternative explanation for the phenomenon.

What actually takes place according to our concept? In the case of those individuals who were capable of influencing the act of reward/penalty, the output of the schema representing this influence fitted well to the consequential pattern. Disregarding whether the person was actually penalized, this improved the adaptability of the person and created a new operation. It increased the indicator, and expanded the self (which worked out which strategy would improve their situation and therefore experienced self-expansion). In contrast to this, when the person was rewarded or penalized on a random basis, due to the random nature of this act, the information distance between the output of the schema of the strategy and the consequential pattern engendered suspension. A new operation could not be created. Even the use of schemata storing solutions adopted earlier were suspended i.e. people experienced self-narrowing and were forced to deem a part of their self useless.

Consequently, the smaller self naturally made them feel less competent, which led to the adoption of an avoidance strategy in a new situation. That is, by avoiding risks, they attempted to create a situation in which they would not have had to use schemata that otherwise exist, but are in a state of suspension.

Our model may have been even closer to Seligman's theory if he had explained suspension – by using behaviorist terminology – through the inhibition of schemata, instead of explaining it as learning a new attitude towards the world.

Csíkszentmihályi

Previously, I discussed the phenomenon of flow. It is no coincidence that it resembles the concept introduced by Csíkszentmihályi (1990). To assess the similarities of the two concepts in further detail, let us examine what conditions are needed for flow to take place according to Csíkszentmihályi, and how these relate to what has been proposed in connection with the following scenarios:

Condition (C): Explicit goals in harmony with the capability of the person. Reaction (R): the sub-schemata constituting the main structural components of schemata of a higher order need to be in place, or need to appear with other schemata that provide ‘raw material’ for the sequence of schema connections taking place in the manipulation chamber.

C: Strong focus on consciousness. R: this is in line with our concept, since operations are taking place in the chamber throughout the entire process.

C: Awareness of self-consciousness ceases. R: the two concepts are not entirely identical in this case, since, in our view, all integrated schemata created in the chamber connect to the schema of the self.

C: Distorted perception of time. R: perception of time also implies creating a connection; for example, a glance at your watch, reflecting on the inner clock. This does not take place inside the chamber, because the question of time does not represent sufficient information distance to enable it to enter the chamber.

C: Prompt reaction to signals arising during the course of the given activity. R: the key component of the scenario is that integration is permanently taking place, which eliminates suspensions (feeding off either external or internal sources).

C: Balance between the person’s abilities and the difficulty of the task (the task is neither too simple, nor too hard). R: If there is no balance, either the “automatic action” scenario will take place, or we can talk about a serious, prolonged, stalled, typical problem solving context where two complex schemata are suspended.

C: Feeling of control over the situation. R: permanent integration where the indicator is kept suitably high, which provides feedback for the individual on adaptability increase and control over the environment.

C: The activity is intrinsically rewarded, which is why it is not difficult. R: indicator increase is rewarding of its own accord.

C: The person is completely absorbed in what they are doing, and focuses all their attention on this. R: Since the principle of maximum information distance is enforced, nothing else enters the chamber/consciousness besides the series of sub-schemata that need to be integrated.

Erikson

When, instead of choosing from amongst different things, we talk about the connection of antagonistic things in regard to human life, Erik Erikson’s (1950) theory, focusing on life-stage virtue, may be thought of. Erikson explicitly builds his theory on personal development of opposite poles. These opposite poles are the high-level schemata (to be connected) that evolve in various life stages, and which characterize that specific period in life.

Erikson’s concept, and our definition of integration, show significant similarities. The ego – used in the Freudian sense, which, however, may correspond to our concept of self as, conceivably, the totality of schemata – is truly enriched when the two schemata that had earlier suspended connections **both** survive, and one does not overwhelm the other. So, restructuring takes place instead of competition. This is exactly how our model defines integration: by preserving the components it was composed of, a new entity is formed.

Maslow

Readers may associate Maslow and his famous pyramid (Maslow, 1962) – aiming to demonstrate the hierarchical structure of human motivation – with matters related to health and happiness. Maslow’s pyramid has been widely criticized (Wahba and Bridgewell, 1976) on several grounds: that there may be more levels than those presented in the pyramid diagram; that they should be grouped in an alternative manner; or that their sequence may not be so rigid (i.e. fulfillment of a given need is not necessarily a precondition for proceeding to the next level, as Maslow claimed). It is nevertheless worthwhile considering Maslow's basic concepts, both because his views have become widespread, and that they coincide with our intuition.

Our model considers all sorts of schemata connections that are positive in terms of increasing adaptivity. That is why every new thing – be it eating a delicious meal (level of physical needs) or elaborating a new theory (need-to-know and understand level) – may be equally important. This is at once true and false. It is true that every schema connection positively affects an individual. However, the extent to which this is positive may vary substantially.

The indicator-increasing impact of a connection created between two schemata depends upon the number of connections of the sub-schemata that connected. This includes the number of stored connections (dissolved suspensions), which is reduced by the number of suspensions remaining. Therefore, two factors need to be taken into account if we are to determine the extent to which something makes us happier:

- How strong is or was our desire for something i.e. the number of suspensions that can be potentially improved. The higher the number of suspensions, the greater our attempts to restore these.
- The coverage of the scope of what we are doing i.e. how many schemata the new connection affect, which includes sub-schema connections.

The first factor makes Maslow's pyramid sequence relative, since we do not have to focus on an absolute sequence, but on always stopping the most annoying thing at any given moment. In fact, on the basis of the principle of maximum information distance, what we claim is that everything we do is because we would like to stop any disturbance to our self. Through this approach, we have managed to find the common grounds of an action performed to avoid being penalized and to seek reward. What remains is that, from amongst the two things with common grounds, we will first engage in whatever best expands our self.

The consequence of the second factor is that we are capable of determining the social value of something, and reasoning that those activities better appreciated socially cause greater happiness, even if this is often at the expense of a greater degree of discomfort or difficulty. Such socially appreciated activities are typically more complex, and are composed of a higher number of sub-schemata. The more sub-schemata two connecting schemata contain, the higher the chances are for creating schemata capable of increasing the adaptivity of others. More specifically, adaptivity increase achieved through schemata sharing is seen in that, each time we form a new schema, this is coupled by an imperative to share. By creating schemata that also interest others (preferably the highest possible number of individuals in the group, who connect to the new schema to increase their adaptivity) the effect generated by our schema multiplies. Through this, we become capable of exponentially increasing our indicator as the schema spreads.

This implies that connecting the highest possible number of schemata is not the only priority. The quality (new properties, modeling accuracy) of the newly created schema also plays a key role in dissemination.

To return to 'the eating vs. creating a theory' example mentioned previously: eating food, which is a simple task, will dissolve fewer suspensions in the individual. For this reason, the indicator will not increase as substantially as when someone is creating a scientific theory in which numerous complex schemata participate. Moreover, the suspension of schemata linked to hunger will rarely comply with the principle of maximum information distance in the context of other suspensions; it will only be discussed infrequently, as it does not bring a great deal of new information. Therefore, its spread to the schemata systems of other individuals is highly limited, which is why indicator increase will soon cease. However, the schemata of a scientific theory create many new connections, and are capable of dissolving many suspensions. That is why it is also capable of creating new connections in the schemata system of several individuals, which in turn increases their indicator. This feedback on the increase in group members' adaptivity then generates new connections in the schemata system of the 'creating' individual. This further increases the indicator (with a continuous multiplying effect) as long as there are new group members with whom the schema can be shared.

In summary, we can state that the impact of a new schema is equally determined by two criteria: the number of group members whose adaptivity was affected; and the number of schemata within a person that the new schema could connect with. The closer we are to the top of Maslow's pyramid, the greater the number of actions creating such connections.

András Angyal

65 years ago, András Angyal instinctively recognized the problem inherent in the image of the person, which was split into various scientific branches of psychology at that time. By reacting to this, Angyal attempted to establish the basis of a holistic psychological approach building on system theory, which conceptualizes the person as a whole, rather than in terms of partial processes. This is similar to our model. This concept, which he first published in his book 'Foundations for a Science of Personality' (1941) was, in retrospect, doomed to failure. The then underdeveloped state of system theory, and the lack of elaboration of the concept of cognitive schemata, made it impossible to provide detailed explanations for certain human phenomena. Regardless of this, in relation to the knowledge available at the time, his intuitions proved to be extraordinary. They have stood the test of time, even if we have managed to reduce the two central concepts of his approach to a more general principle.

Angyal viewed the person as a system with two types of motivation in the context of its environment; namely, autonomy and homonomy. Motivation underlying autonomy – as the motivation of the system to develop its ability through which it can control its environment – was already known at the time. Homonomy, as opposed to detachment, is the drive underlying fusion with the environment.

The same trends are very evident in the terminology we use, according to which the individual attempts to create functional connections with his or her environment. Angyal's notion of heterogeneous environment (Angyal, 1941) corresponds with connections riddled with suspensions, and which are therefore avoided.

Angyal explains the concept of aspiration from an alternative, process-based – not static – comparative perspective. According to this, aspirations geared towards autonomy correspond with the production of schemata through which the environment – with the help of its increasingly better quality models – can be increasingly controlled. Aspiration geared towards homonomy increases the modeling efficiency of schemata by connecting existing schemata, while concurrently creating an increasingly holistic image of the surrounding physical world.

In relation to Angyal's approach, the new consideration we add is that two antagonistic complimentary processes (aspirations towards both autonomy and homonomy) can be integrated by reducing these to a third principle (the drive to connect). This is most interesting in the way Angyal also used the concept of connection. He used the concept of 'love' to explain the relationship between two systems (people) when discussing the concepts of self-surrender and self-determination (Angyal, 1951). However, in contrast to our model, and in line with his own concept of aspiration geared towards autonomy or homonomy, he treats the two notions as opposites, as two aspirations that determine human behavior, which must be in balance to avoid neurosis.

Both components of the self-surrender/self-determination dichotomy concern our relation to the environment. There is an inherent antagonism in the way Angyal combines two complexity levels. We are able to pinpoint his attempt to draw a comparison between corporeal sub-systems; for example, the nervous system and the vascular system. This is not surprising, as Angyal was a doctor. However, what is surprising is when he talks about this love of two systems as self-surrender, the outcome of aspiration geared towards homonomy. He then fails to realize that these sub-systems are integrated into a system of a higher order (a more complex system), such as the body. Angyal emphasized that self-determination – which he defines as detachment from the outside world and which, in our model, corresponds with the increasingly good quality modeling of the physical world, or pro-active adaptation – is the opposite of self-surrender. This refers to the drive to assimilate into the environment, to become a part of a greater whole. Indeed, during the course of self-surrender, connection takes place at one higher level, upon which process the individual reflects with the help of his schemata.

To make this even clearer through an example, we need to clarify the notion of love in the following context. A person tries to be different to everyone else (self-determination) and then surrenders him- or herself (self-surrender) when the person finds a spouse. Both people are then able to become a part of a greater whole (couple). According to our model, this is nothing other than the attempt made by the person to adapt, with the aim of perfecting their schemata system. Then, at a completely different observation level – say society or the family – we see that this person, as a system, connected to another person (also a system) and created a new main system, namely, the couple.

This process only becomes evident at a higher level of observation. At that level the person becomes capable of mapping – with the help of self-reflection – through which process indicator increase also takes place. Angyal is adamant about the way neither of these two processes are impaired. The two processes need to be in balance, whilst in our view these two processes complement one another. Namely, both processes individually increase the indicator, and their impacts accumulate. Consequently, rather than keeping the two processes in balance at the same level, the maximum effect can be reached by maximizing them. ,It is important to stress that in relation to the example, our model provides a much more general explanation for phenomena in the context of which the person is capable of connecting to groups which can be considered as systems, such as ideologies, sciences, enterprises, etc., by applying a similar process description.

Further chapters

Having presented the theoretical frameworks, I will now present a short summary to reduce what I have so far proposed to a few basic concepts, and reconceptualize these in a model dubbed FIPP (Fodormik's Integrated Paradigm for Psychology). We will then be able to continue the discussion within this more compact conceptual framework. This also enables us to examine an example phenomenon: the circular reaction. The relevance of what I have so far espoused can then be observed, as can the possible benefits its use could achieve.

Introduction to the main concept (FIPP)

In this introduction, I present an overview of the model used throughout this book. The model examines what roles happiness or communication play in the humans' ability to adapt. An alternative approach to this question is: from an evolutionary perspective, what created the various states of mind, and why do we communicate with others at all? This seemingly too abstract, philosophical question is closely related to the concept that relates most to human existence, namely, the self. By clarifying the motivation underlying these basic human characteristics, I believe that I can provide an explanation for various types of behavior, reactions, and social phenomena.

The following section discusses these issues in plain language. Unlike the remainder of this book, the footnotes to this section are recommended for readers who wish to connect the present section with the theoretical approaches underpinning the model presented.

Principal concepts

The main modell – Fodormik's Integrated Paradigm for Psychology or FIPP – operates with three known psychological concepts: Self, Environment and cognitive schemata. We redefine them as follows (henceforth the redefined concepts of Self and Environment are indicated with capitals):

- The **Self** is the essence of a person that perceives the Environment.
- **Environment** is what the Self focuses on. As a part of the Environment, social Environment refers to that group of people which is important for the Self.
- **Cognitive schemata** are the basic elements of thought. By structurally modeling the outside world they assist in the perception of the Environment for the Self (similar to a translation of the physical world to mental elements). For example, these are the ideas, concepts, shapes, categories, and technologies. The formation of a new schema creates a new model of the Environment; using that new model, the Self is able to structure and perceive, control and react to its Environment.

The Self and its cognitive schemata are only partly comprehensible to others. Getting to know completely another person's cognitive schemata is impossible, even those of people using well-defined, similar schemata. The Environment is completely subjective, and accessible only to the Self that developed and uses it. It is partly free from physical reality, since it was created by the Self.

Note: The partial independence from physical reality described above does not contradict the Self trying to model, understand and adapt to the physical world by discovering its rules and relations with the help of cognitive schemata.

The Self perceives its own size in relation to that of the Environment, and the proportion of these helps to characterize the ever changing relationship of these two entities. In addition, the relationship of the Self and the Environment is a key issue, as it shows the effectiveness of the adaptation of the Self i.e. how much it is subject to the Environment.

The model

The model introduces two new concepts according to the possible relationships of the sizes of the Self and the Environment:

- o **Self-narrowing**: when the Self perceives the Environment as becoming increasingly larger, and itself becoming increasingly defenseless. The extreme is the demolition of the Self by the Environment.
- o **Self-expansion**: when the Self manages to control the Environment, and so the Environment becomes part of the Self, enriching rather than threatening it. In this way, the Self becomes bigger than the Environment. At the extreme, we can imagine the Self exploding into the Environment and destroying itself.

These relationships are dynamic, and being subjective constructs they can scarcely be interpreted in numerical terms. The emphasis is on their relationship with each other, and on how the Self experiences its relationship with the Environment.

The FIPP-pattern

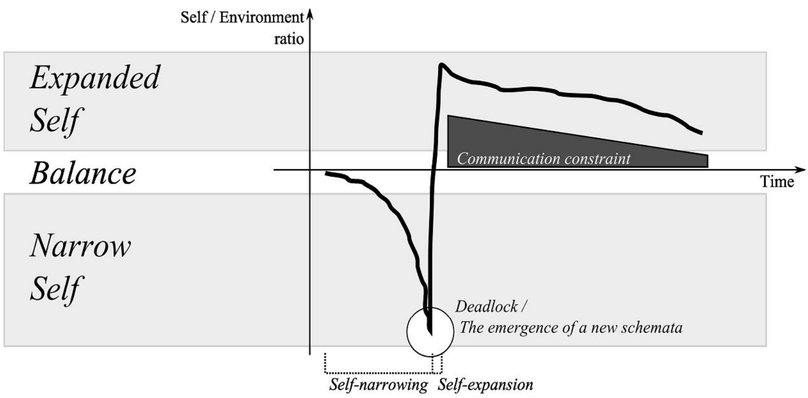

Figure 1: FIPP-pattern

With the help of the concepts of Self-narrowing and Self-expansion we can characterize human behavior in the following pattern:

> the establishment of a new cognitive schema changes the course of Self-narrowing and converts it into Self-expansion.

The new cognitive schema typically emerges from the integration of two or more incongruous cognitive schemata. The integration is a process whereby the old opposing schemata disintegrate into their individual building blocks (that are also cognitive schemata). From these individual blocks, a new schema arises that contains the major characteristics of the two previous - opposing - schemata. The new schemata is superior to the previous two.

Supplement to the pattern: the imperative of communication

Following the establishment of the new cognitive schema, the Self expands only for a short time, as long as the Self does not hand on the new schema to its social Environment i.e. it is retained for itself. If the Self begins to spread the new cognitive schema, the Self continues to expand. During the process of expansion, energy is generated, which is used in disseminating the new cognitive schema.

What is self-confidence?

The notion of Self cannot be avoided in psychology: it surfaces in psychoanalysis, cognitive sciences, and social psychology. It is nevertheless less widely used in an everyday sense. Instead, people tend to use a similar notion, namely, self-confidence. Moreover, self-confidence is a key concept in today's success-driven society, which, for many people, is a precondition for good performance or a happy life. This is no mere coincidence. Self-confidence is none other than the relative size of the Self.

What do I mean by this? Probably everyone knows, or has met, a person who has far more self-confidence than the average person. In some, we may feel that the person is rightly proud of themselves. In others, however, there may be no real reason for this. Perhaps the most interesting phenomenon is when self-confidence changes: a reticent person suddenly becomes verbose and overtly self-confident, or someone who has always stood up for themselves becomes anxious and uncertain.

A consequence that can be deduced in the latter case is of self-confidence not being a permanent property, such as height, but changeable. If we observe ourselves, we can notice changes in our self-confidence within a single day. Therefore, does our Self, using the size of which we have defined self-confidence, undergo change?

To answer this question, we need firstly to understand what the Self is composed of. There are many definitions of Self in psychological literature. I recommend adhering to a simple definition, namely[45]: let us take the Self as a camera, through the viewfinder of which it is possible to perceive events taking place in the outside world, and which is capable of inducing changes in the surrounding world. What the camera 'sees' at a given moment is what we will call "Environment". The camera, the Self, decides how to react to the basis of incoming information, for which it is equipped with devices capable of processing this incoming information. These devices are what we call cognitive schemata*[46], which term refers to the way thinking (cognition) is comprised of units.[47] These schemata build on one another (as we will see later) to form, amongst other things, categories or words and sentences.[48]

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[45] in line with James's and Allport's ego concept referred to in the previous chapter

[46] definitions of the terms marked * also appear in the glossary

[47] in this case, the camera is analogous with the visual system, which regularly receives inputs from the outside world (the Environment), performing operations on these, with the help of its sub-systems (cognitive schemata), to generate outputs

[48] cognitive schemata are systems comprised of sub-systems, which are also cognitive schemata

How does self-confidence relate to what the camera sees? Everything is fine if we are simply admiring through a camera's viewfinder a calm, grassy plain. However, if we notice a lion in the distance, we become less confident, and may lose our self-confidence when the camera focuses on the lion and we see that the animal has noticed us. Therefore, the wider and more detailed we see the Environment, the less we will be aware of the camera i.e. our Self. This Self-Environment relationship is, in general terms, labeled self-confidence.[49]

The way we feel is what truly counts: is it the Environment that is controlling us, or do we control the Environment? If we experience that our Self is big, the reason for this is that we feel, at least in the given situation, that we can achieve anything. If we feel tiny, we feel helpless; that the Environment may destroy us at any given moment, or at least cause serious damage.

What have cognitive schemata to do with this? How large we experience our Environment depends upon whether we have any schemata with the help of which we are able to control the Environment. A schema generally implies an understanding of something i.e. having a certain sort of knowledge. It attempts to map the structure and logic of the Environment to a degree that not only enables us to understand how the Environment functions, but effectively influence the way it functions through this knowledge. This creates a feeling of power i.e. it makes us feel self-confident.[50]

We have reached the point of explaining happiness, since self-confidence and the feeling of power is also a positive emotion; it makes us feel happy and joyful.

What is the competitive evolutionary edge of happiness?

We have seen that happiness appears if we manage to gain control over the parts of the Environment that are important to us. But why do we need to feel anything at all? If we were not to feel anything when we control the Environment (the sensation of Self-expansion, or happiness in the general sense), nor when we are subject to the whims of the Environment (the sensation of Self-narrowing or anxiety), we would simply not do anything at all. We would not move, and would be under-motivated. Without movement, reaction and adaptation, we would quickly be destroyed; say, as if a lion approaches, and we take no notice of it. There is nothing wrong with this on its own accord; nature would still work perfectly without our adaptation. However, the way evolution works is that anyone who fails to adapt will, generally, not multiply either; this species, therefore, sooner or later become extinct. Therefore, the fact that we are living here and now demonstrates that human beings are a species whose ancestors were equipped with a certain property. Namely, a feedback circle that tells us both that it is worthwhile adapting and that it is hazardous to be at the mercy of the Environment. Today, there are no descendants of those who were not equipped with this.

What exactly is this adaptation that is capable of expanding the Self to such an extent? Cognitive schemata function like models: they grasp certain main aspects of what we experience as the Environment. Some schemata manage to do this well, whilst others do not. Schemata that fail to adequately grasp the key components of the

[49] I use the concept of self-esteem to present the indicator concept discussed in the previous chapter, which serves as a basis for defining the degree of adaptation

[50] cognitive schemata, per definition, can equally be conceived as models of the outside world and operations. By connecting to one another, these operations shape the outputs of the person, as a system

Environment will, sooner or later, end up in contradiction either with a given property of the Environment or of another schema. To take a different approach: the way we know that our schemata are dysfunctional is that they sometimes generate the same response, whilst in other cases they generate a different response to the same Environment as another of our schemata. Whenever we experience our schemata as dysfunctional, we set these schemata aside (in other words, suspend their use) and put all our energy into fathoming this schema so as to make it a well-functioning one.

How, then, can we turn a dysfunctional schema into one that functions well? A watch repairer takes apart a watch that does not work properly, replaces the broken part, and then puts it back together (rebuilds it). So we too take our schemata to pieces (which, as we know, is also composed of schemata) and then put it back together in a different way, to see whether it will produce more adequate or appropriate responses like this. If it does not, we disassemble it again – and again – until it begins to generate responses adjusted to our needs. If two schemata are antagonistic, we need to disassemble both schemata and attempt to create a common schema that dissolves this antagonism (schemata integration); this common schema will be equipped with the same knowledge as that of the two separate schemata.

Since we take the Self as the totality of our schemata, whenever we excise a given schema or a group of schemata because we feel they are faulty, the size of the Self shrinks. This is like a clock that haphazardly stops from time to time. When it is taken to be repaired, we miss the clock even if it functioned properly only occasionally. This demonstrates that, in many cases, a lot of things need to go wrong before things get better (we have to do without the clock while it is away for repair). Another example that shows a temporary decrease in performance while restructuring something: in order to make our room more comfortable, we need first to disorder it by moving the furniture. This may make it difficult even to find a place to sit, apart from the temporary inability to use the room.[51]

A newly-repaired schema generally connects better to other schemata than does its predecessor. This implies that the size of our Self has also increased (in absolute value) in relation to the beginning of the process, although it may have reached its nadir midway through. This point (or deadlock, to use a different term) is when all of the schemata required to put a well-functioning schema together have already been disassembled, and for this reason our Self is at its smallest size during the course of this process (cf. figure representing the FIPP-pattern).

Why do we communicate?

There are reasons as to why people communicate, such as the need to cooperate. Knowledge transfer is another relevant function.[52] When we imagine a happy person, we rarely imagine them as sitting quietly and on their own. Communication is an integral part of happiness, or, as will be seen later, happiness always accompanies an imperative to communicate[53], and an attraction to companions.

[51] I have specifically focused on the so-called FIPP pattern scenario here, and disregarded the "miracle" and "fireworks" scenarios

[52] as demonstrated in the previous chapter, the ultimate goal of communication relates to increasing the number of connections. Cooperation and knowledge sharing are simply sub-cases of this ultimate goal.

[53] testing is an automatic procedure, which requires communication

I will again propose arguments similar to those in connection with the competitive evolutionary edge of happiness. Thousands of years ago, there may have been people that might have realized 'something' and felt happy; however, they did not share this knowledge, or anything else, with others. Perhaps another group of people soon defeated this group, simply due they shared their knowledge, which led to the proliferation of immediate knowledge sharing. In this 'winning' group, individuals did not have to discover everything on their own, which is why their group knowledge accumulated. Therefore, the descendants of people that kept ideas to themselves died out, as did those unmotivated to adapt.

A new schema also requires communication from another aspect. An individual begins to use this schema when completely convinced that the schema does function well. When a person takes a clock home from the repair shop, they will check it from time to time to see whether it is still ticking, or by comparing the time it shows with that of other clocks. Similarly, alone, an individual is limited in his ability to test his new (or newly restructured) schema. Rather, it is also necessary to use schemata in the minds of other people. The given individual is unable to confidently use their new schema until they know that it functions well. Consequently, the individual continues the control process by exchanging schemata; which we call communication.[54] Schemata exchanges can be performed using different channels: verbally (through discussions, arguments), or in writing (writing letters, publishing, writing a blog).

To summarize:

- The Self is the totality of schemata
- Cognitive schemata convert information from the Environment into action
- The quality of cognitive schemata determines whether the Environment or the Self is bigger
- If the Environment is bigger, we experience Self-narrowing
- If the Self is bigger, we experience Self-expansion
- Control over the Environment may be realized with the help of a new schema
- In most cases, several schemata need to fall to pieces for a new schema to be created; the various parts connect to form a new schema
- The new, well-functioning schema engenders Self-expansion
- The new schema needs to be tested; it has to be connected to other schemata
- Once schemata inside the individual has been compared (tested), it then needs to be compared with the schemata of other persons
- Schemata testing with others engenders the need to communicate, and ensures the dissemination of new knowledge
- Self-confidence is the popular term used for the size of the Self
- The feeling of happiness – similar to the feeling of being penalized, or anxiety – is required to motivate (penalize, reward) a person to adapt.

[54] in fact, the testing procedure seemingly only differs in terms of whether the information moves beyond the physical boundaries of a given system. The underlying formation principle is identical in both cases

EXAMPLE CHAPTER FROM THE STUDENT EDITION – Function practice (circular reactions) and the description of cognitive schemata

What is function practice (circular reactions)?

If anyone has seen a child dirtying, then cleaning, a toy fifty times, then dirtying it again, they will know what function practice is. The same practice occurs when a child learns to stand up, then falls down, then stands up again, as long as they are able to physically do so or learn how to stay on their feet. I would not limit use of the concept of function practice solely to children: when a 16-18 year old juvenile finally obtains his driving license, all he wants is to drive, and every opportunity to get behind a steering wheel will be taken.

If anyone suspects from the foregoing that the phrase "function practice" is the same as practice, they would be close to the truth. This term was invented to distinguish the everyday use of the word "practice" with a more general meaning, one based upon the phenomenon that people can be happy with things that, theoretically, are not beneficial in the short term. Moreover, that a seemingly boring thing can be endlessly repeated while enduring a deal of inconvenience, such as a child continually falling down.

To understand this phenomenon more precisely, we must examine what mental processes occur during function practice. Mental processes connect with cognitive schemata, therefore we should initially consider the nature, formation and function of these schemata.

FIPP's interpretation of the concept of cognitive schema

A cognitive schema is the key to cognitive science. There is a great deal of literature on this subject; here is one understanding of this concept.

Previously, in other topics and, briefly, in the introduction to FIPP, a cognitive schema was described as the basic element of thinking, that it is nothing more than a mental model of a certain aspect of the outside world. So, almost everything that assists thinking can be considered as a cognitive schema: concepts, categories, theories, symbols etc.

To understand the concept of a mental model, let us recall the definition of the term 'model': a model is a copy, which always copies the original thing in a simplified way. It seizes only one or two aspects of reality, and disregards other aspects or dimensions. It does all this to provide the brain, through simplification, with a manageable amount of information. The less important, but still essential, information, can predict accurately enough how the modeled entity will behave. So, we could define the reasoning of all models, and therefore the ultimate goal of cognitive schemata, as: to help with, and provide, adaptation, so that the chances of a person surviving in the outside world increase by properly representing that world. This happens in the case of every lesson learned, even on a somewhat primitive level at S-R reactions. The lack of the S-R reaction, or learning, would lead to that individual's death.

If the mouse we place in a labyrinth did not model the labyrinth in his brain – for example, from stubbornness or stupidity, he did not examine what routes and crossovers there were – and so did not learn where the food was, it would eventually starve to death.

Levels of reality (and of modeling): the multiple aspects of reality

In order to understand the function of cognitive schemata, let us first take a slight detour via the relationship between reality and its mental representation.

When talking about reality, in most cases we think of a mechanical image of the world consisting of physically extant atoms, one which obeys the laws of physics. The important thing is not whether the world is like that, or whether it includes extra parts that cannot be described with atoms, but that our brain is capable of forming an image, of only limited complexity, of this mass of atoms. Our brains do not operate on the level of atoms, nor with the representation of atoms, but with relationships.

These relationships can be between atoms, but to adapt to our complete reality we must cope with the different levels of their establishment and combinations of atoms. As an example: a person may be affected by 10^{1000} atoms. Of these, he might perceive 10^{100} atoms, equal to 10^{50} shapes that are combined in 10^{30} objects, down to one piece of the world in which he lives. Cognitive processes – even if not on an atomic level – will deal with things within the spectrum of the level of (10^{50} different) shapes to the level of one piece of universe. This presumes that it has to somehow structure these stimuli (the information), and thus the 10^{1000} atoms. Here, structuring means extracting the pattern or essence of different groups of atoms by using our mind's ability to model. As in each person these atoms group themselves differently, it is clear that our models will also differ, even if, seemingly, we talk about the same things. The difference of our models is reflected in our differing reactions to the same inputs.

Key to understanding the reason for modeling is that the functioning of our mental abilities is based upon limited mental capacity. We can readily admit that the full complexity of the universe (compared with the number of combinations of the 10^{1000} atoms) is impossible for our minds to grasp. Perhaps it is also conceivable (and parallels our everyday experience), that we can manipulate simultaneously just a few cognitive schemata. We can listen to, or concentrate fully on, just one source, while keeping several other, different, matters in our heads. Disregarding, for example, 99.5% of the 10^{1000} atoms building our outside world, and purposely not wanting to become known to those, does not seem to be an efficient strategy, as it is possible that we may be endangered by something from that 99.5% territory which we pay no attention to, or avoid. In summary, we can say that we have to live in a world where our life depends on 10^{1000} different things and our brain's capacity is able to parallel process 10^{1} different things. How can we achieve this?

The answer lies in hierarchies. Hierarchies make it possible not only to sum or multiply numbers, but also to raise them to a higher power. Let us assume that we could raise our capacity by 10% at the cost of a lot of pain, beginning with, say, 10 units. But what is 10, 11 or even 20, compared with 10^{1000}? What would happen if we could somehow double or triple our capacity? It is still 20 or 30, almost nothing compared with 10^{1000}. However, if we increase the base capacity exponentially, then we can reach $((10^{10})^{10})^{10} = 10^{1000}$ in just a few steps.

What is modeling based on hierarchy? That the brain extracts the essence: the similarity of elements of a set with different complexity. It does the same on the levels of perception, when creating categories or establishing regularities, and when it forms paradigms. Only the units differ: at the levels of perception the unit is the physical stimuli; in categories it is the properties; in rules it is the experiences; and so on. When the similarities are extracted, these become a new element of a more complex set: firstly, the basic stimuli, then the essence derived from those, followed by the essence of those essences...to, eventually, the so-called cognitive schemata, which models a certain detail of our world.

This ability is insufficient by itself, as the constant extraction of essence results in decreasing data-like knowledge of the world; we would see fewer details with which to understand the connections. But to adapt ourselves to our environment, we need access to all information. So as not to lose the full picture, our brain needs to be able to jump, switch between, and connect matters between, levels. This occurs because a particular detail may be of interest, next time the overview is important, and so forth. Moreover, sometimes one needs to view the same cognitive schema with its child-schemata. Besides this ability to move and connect between levels, two additional abilities are required to make this method function: induction and deduction.

Induction happens when the brain extracts the essence from lower-level schemata. Deduction is when a higher-level schema, accompanied by a lower-level schema that is on the same level as the constituents of the higher one, form a new schema.

Before we accept that there is order in our brains, I should express doubt that we can talk here about a multi-story construct similar to a pyramid, where every cognitive schema understands which level it is on. I have no proof, only an intuition, that there are also schemata halfway, or one-third of the distance, between stories.

It is possible that the connections are far more chaotic than in a regular pyramid. Rather, we should imagine the world of schemata as a collection of small and large pyramids embedded in each other. However, regular pyramids will be used to illustrate the following; they provide a satisfactory model for a base.

Before examining cognitive schemata in detail, we should look at the philosophical results of connections between reality and our minds. That we cannot obtain first-hand information on the physical world, due to the boundaries of our perception, is not new. Thus, by considering the above, we can state something of the reality that a person perceives. Unfortunately, nobody can prove that reality is not that you are the only person who exists in the world, and that everything you perceive is only a dream. Or that reading this is only a dream. If we disregard this possibility, and presume that there are people and other entities around us, then we can also state that the outside world connects with the Self which processes its environment only in the form of those mental representations that process the information. Similarly, our effect on reality can be considered real only in that we give a command to perform an act, then nothing happens, then new information reaches us of the change – presumably as a result of that act – in our representation of the world. Whether anything changed in reality, or what this change might concern, is an insoluble riddle.

In my opinion, the concept of the 'outside world' is an unfortunate construct: it is so difficult to define objective reality that it seems a pointless exercise. If we accept that reality is not necessarily the way we perceive it, then we immediately start looking on our world from the viewpoint of a being independent from everybody. It is probable that these independent beings have different organs of sense, different logic, that they model the world in different ways, and may not even think on a neurological basis.

However, even if we could contact them – while trying to reduce both their communicational code system and ours to a common denominator – we would inevitably build on our own logic and mental representations to understand what they see. To summarize: we have to accept that the outside world only reaches us through our mental representations. Its cognition is basically determined by our cognitive schemata, which we cannot get rid of, even if we wanted to. Perhaps we achieve the least distorted image of the outside world by recalling childhood experiences, when the majority of our cognitive schemata did not limit the way we saw, heard, felt, etc.

Cognitive schemata and ideas. Categories and their typical examples. The borders of cognitive schemata

On representing the world and categories, perhaps one should recall Plato on ideas. There are many differences and similarities between cognitive schemata and ideas. While a cognitive schema is a mental construction, the concept of ideas refers to the essence of certain things. They are free from mistakes and all earthly attributes.

The two concepts are not the same. However, the reason this requires consideration is that we can consider an idea as the title of a cognitive schema or its theoretical designation. Plato seems to have felt the essence of cognitive schemata when he wrote of generally valid things. He imagined the ideas as something perfect, and the physical objects as poor quality copies of the ideas. In our approach, cognitive schemata are more akin to a list of relations, or a set of rules: an entity which integrates the common property of every object (those that are parts of the category) under discussion. This entity is perfect in that it is a mere mental construction, and reality does not distort it with its own mistakes.

Yet cognitive schema should not be confused with the typical example of a category, which marks that element which best fits the definition of the category.

These parameters/rules/definitions form the essence of each cognitive schema. As definitions of categories they are empty statements, worthless constructs, but when filled with content, new, individual elements emerge. Beside these definitions, another important characteristic of cognitive schemata is their connections with other cognitive schemata. These connections can point upwards (cf. induction), downwards (cf. deduction), or can be on the same level (cf. association). We have not so far examined this last variant.

Association is that type of connection when cognitive schemata of the same rank connect with each other; the aim of that connection is simply to become a part of a model within a larger system.

Another type of connection is at least as important. Namely, those negative connections that guarantee differences. These are the connections that designate the borders of the cognitive schema. They do so by designating a group of cognitive schemata with which it has no common properties; if two cognitive schemata had common properties, they would then be connected positively by these properties. We can also see this principle in real life: we often define something by saying which things are not characteristic of it. This is important in cases when a part of the definition is not the fulfillment of a requirement, but the lack of it. How these cognitive schemata can be imagined is now considered in detail.

The road network metaphor

Cognitive schemata are nothing other than connections similar to that of a road network. There are cities (which are akin to cognitive schemata) having districts within in them; this is similar to cognitive schemata forming new units by building them onto each other. There are then the main roads connecting these districts, with one, two, or three lanes, which show the strength of the connection between the cognitive schemata. The larger categories of cognitive schemata are connected like cities and towns in a country.

The analogy has two important parts:

- the connections between cognitive schemata form a hierarchical network. This means that something is not connected to something else, where the 'something' can also be a sub-network. This network and its sub-networks are similar to physics, where particles were divided into smaller and smaller parts, until finally it was realized that there was nothing else, only waves. The difference between particles and cognitive schemata is that, in the latter, we find neurons instead of waves; and
- the other is leveling: as there is also the street-district-city-country-region-continent series, here we can identify levels as well.

Archetypes

As previously examined, the way matters are organized in the world has little or nothing to do with the way we organize the world in our heads, due in part to:

- the limits of the organs of sense;
- the simplification made by the organs of sense in translating the outside world; and
- the limits of our brain capacity and its pre-wired nature and structure.

These influence how the world is represented.

The abovementioned limits seem to hinder us in adaptation, as we are not taking our decisions using all available information. This might be true, or these limitations also exist in other human beings, and aid communication between people. That others do not see in the infrared range either, or that others also do not have much greater mental capacity (and so on), enables almost identical models of the world to be made, and so we can share them.

Apart from these limits, people go through the same life phases due to their physical-biological nature: a child is born, has a mother and father, can be either male or female, experiences gravity, acceleration, collision etc. All of these limitations and common points determine the models we build.

Examples of models that are probably attached to the human species, and as such span differences in culture, include:

growing: the brain has to determine the principal direction or orientation; by following lines of gravity, up and down are perceived. Experience shows that something that is small can also become bigger, by growing. The end-products of growing range between the dwarf and the giant, as definitions of the two extremities. Following this logic, it is no wonder that the concepts of up and down, big and small, dwarf and giants etc. can be found in every culture.

God: regardless of what people think or believe about the origin of the system they find in the world, the presence of a system is perceived in one way or another. The operator, the top of the system, is a cardinal point for everyone that has to be named.

No matter what we call it – the Creator, a higher intelligence etc. – we are talking more or less about the same thing.

Extra-terrestrial: if we look at our environment as a system that we live in, there has to be something beyond this system. In this extra-system there might be living creatures. Whether these living creatures are as an African native is to Westerners, or how a UFO is viewed by a modern man, or witches were viewed in the Middle Ages, is all the same: we exist in our system, and there is something beyond it. Also, that that something has always been named by ourselves with different names, even if nobody had seen them.

Moreover, we feel fundamentally that these models are not comparable with transient modern constructs, such as, say, acid rock, or the wearing of ripped jeans, but that they carry a certain universality. For Jung, these models had a unique importance, as archaic concepts building bridges to the deepest layers of our psyche. The subconscious operates using mainly these models, so they form the language of the subconscious. Jung calls them archetypes.

Spontaneous Self-expansion

A better understanding of the concept of cognitive schemata makes it possible to be understood more precisely and to explain certain exceptions. The FIPP emphasizes the process – of Self-narrowing → establishing a new schema → Self-expansion – while ignoring spontaneous Self-expansion. That is, where two schema accidentally merge through a connection and establish something new. The following example is rather tabloid-like, but it sheds light on the process of easy Self-expansion. Let us assume that somebody's favorite actress is Angelina Jolie, and their favorite actor is Brad Pitt. He respects both persons and holds them in high esteem, for their beauty and talent. Then he reads that they have married each other. Any happiness he feels about this comes from establishing the cognitive schema of a perfect couple, on the basis of the cognitive schemata of perfect stars. Of course, there is a testing phase here as well, just as we have seen in the chapter on Problem Solving. The person attempts to match the existing information on the actor and actress to determine whether their personalities fit each other and if they would form a good couple. Perhaps, if Brad Pitt had married Pamela Anderson, that would have established a more contradictory cognitive schema. From this, we can see that it took no serious effort to establish the new schema. Moreover, the fan's skills and abilities were not questioned while reading the news, so the Environment did not endanger his Self that much. Accordingly, the Self-expansion is not so frenetic either, but is enough to produce the usual sharing imperative, so he might relate this news to other friends and fans in his environment.

The establishment and growth of cognitive schemata

The essence and precondition of a cognitive schema are its inner rules. These principally define the cognitive schema, whatever it might be: a mathematical formula, a tune, or an object. Connecting this rule with other cognitive schemata, the schema becomes increasingly embedded in the net of pre-existing schemata. In other words, the cognitive schema's net of connection spreads.

From this description, it follows that there are cognitive schemata with either smaller or greater nets of connections. Those with a smaller net are therefore less determining, and those with greater networks blend with the mass of cognitive schemata. An example of a larger cognitive schemata is the schema of a man, or a woman, which is also connected (either positively or negatively related) with the schemata and other properties of all the people we know.

The net of connections of cognitive schemata is capable not only of spreading, but also of restructuring and shrinking. They rarely vanish without trace, since they remain in the form of actual facts. Only their system of connections restructure radically, to the extent that its shape bears no resemblance to the original.

The establishment of a new cognitive schema does not expand the Self solely due to the establishment of the new connections. It is also based on the former experiences that anticipate the number of new connections to be established. For example, when an art dealer buys a Picasso for 1 million USD, he is neither happy nor unhappy. He has spent a considerable amount of money. But he is almost sure that that expenditure will enable him to sell on the painting and so make a substantial profit for himself; perhaps, at the moment of purchase, he anticipates how he will spend that profit.

Alternatively, when a new cognitive schema is established, the Self also expands as it expects a number of new connections to be created soon, which pleases it. Perhaps someone discovers a new restaurant in his neighborhood; he is happy that there is a new menu available to try. The cognitive schema of the restaurant will make new cognitive schemata of meals, which connect with the cognitive schemata of taste.

The pleasure of having established new cognitive schema accompanies the testing process previously mentioned, which examines the congruence of the world and the cognitive schema. For example, the restaurant may seem nice, but is it clean? It may be nice and clean, but are the waiters polite, civil? In order to avoid this scrutiny, and so reduce the pleasure of the establishment of the new cognitive schema, in most cases a person will:

- complete any missing information with positive things: the restaurant is nice and clean, so the toilets must also be clean. We do not eradicate our pleasure by inspecting all of the rooms to check their condition;
- examine the topic at a higher level – by making a so-called "general impression" – before going into the detail step-by-step. For example, if I often frequent Starbucks, I enter one of its outlets anticipating an understanding of its condition that I may never bother to verify. The same applies to the restaurants of a particular district of a city, or in the case of a national cuisine. If I go to a Chinese restaurant, I am more or less aware of what tastes I can expect there.

The results of testing increasingly fill and enrich the cognitive schema, resulting in a detailed picture being formed. Naturally, the enrichment of the cognitive schema cannot be reached only with the help of outside stimuli, but it also requires inner processes: we say that we are "ruminating" on a problem. At such times there is no new input, it is only the variables of the structure trying to connect with other, pre-existing and different, cognitive schemata. This happens when someone reads a theory and tries to understand it by bringing up examples, attempting to rebuild it, and so on.

Experiencing a cognitive schema that has a stable, unambiguous inner structure, and that it is connected with other cognitive schemata, provides further pleasure. Although the new cognitive schema was established earlier, henceforth it is both usable and ready to make new connections.

Once a cognitive schema is ready for use, it becomes subject to more or less intense verification when in use. Verification is either direct, or meta-reflective, about the value of its use.

Definition of function practice (circular reactions) with the help of cognitive schemata

This preliminary examination of understanding cognitive schemata enables us to attempt to explain the phenomenon of function practice, or circular reactions. Principally, it relates to the establishment of cognitive schemata, and the growth of their net(s) of connections. Moreover, we can also say that function practice is no more than all of those attempts to increase the net of connections that are motivated by the reinforcing effect of Self-expansion. The latter is the function pleasure that we can observe in function practice, and which has been previously described in psychology. Function pleasure is the happiness we feel when becoming increasingly successful at an ability we have to learn, or a series of acts as we use them.

However, what is the phenomenon in connection with which we can declare that we are becoming more successful?

As previously seen, after the main connections – the essence of the cognitive schema – congregate, the cognitive schema then begins to shape the system of connections that determine its relationship with other cognitive schemata. In an admittedly artificial manner, we can divide these relationships into:

- inner connections, which organize the constituents of the cognitive schema; and
- outer connections, which organize the relationships of the cognitive schema.

This division is not the best way to view the schemata, as these connections do not have to differ in quality merely for occurring within cognitive schemata. Within the cognitive schemata, there are also other cognitive schemata; recall that a cognitive schema is established through the integration of other, lower-level, cognitive schemata, or by the extraction of their essence through induction. Perhaps a method of distinguishing inner and outer connections is by measuring the strength or density of those connections. This would be similar to the road network metaphor, showing roads within a city and those leading to other cities. Both inner and outer roads are similar, but while those within the city have just one or two lanes, the roads – or highways – between cities can have three or four lanes.

The greater strength of a connection is due to the inner connections of the cognitive schema having become more harmonic, so making the inner contradictions vanish. The solving of these minor, internal contradictions leads to small Self-expansions. For example, we can hit a ball with a tennis racket, but a good coach can instruct us how we can hit it with more confidence, and with greater accuracy and power. To avoid selecting incorrect methods of achieving these aims we must practice, which makes the connections stronger.

The road network metaphor can be used to illustrate two further points. That the city is already there (the cognitive schema is established) means that its road system becomes increasingly complex – the inner net of connections of the cognitive schema grows – and also has some traffic. What else can then be done to improve what we have, in order to be able to travel from one part of the city to another more quickly; how can we increase the efficiency of the modeling? To achieve this, we must do away with dead-ends, replace two-way streets with one-way streets (so dissolving mini-contradictions), and by broadening main roads (so strengthening the connections by practice). That is how it looks at the micro level of cognitive schemata.

On the behavioral, macro, level, the previously mentioned function pleasure can be observed: the better we do something, the more we initially like it, but we then become bored with it. The order of this progression is:

- o initially, the child or adult cannot solve a problem
- o using the trial-and-error method, he proposes a solution
- o the solution is often wrong, but the proportion of good solutions begins to increase
- o the proportion of good solutions almost completely outnumbers the errors, so the problem can be solved with almost complete certainty
- o in dealing with the problem, boredom sets in, and:
- o he stops the activity and does not begin again
- o it becomes a necessary, automatic, routine, undertaken by pure reflex
- o the problem is made more complex, testing his success at solving the more complex puzzle

But rather than becoming bored, why do we stop before reaching peak (100%) performance? Why do we not strive to become completely perfect? The answer: after awhile, our investment is so much greater than the profit or advantage earned, that it seems to have become an enterprise which would provide a deficit if further investment were made in its development. Even if not a deficit, a better investment can be made in an enterprise where equal effort promises greater reward. Here, profit and effort should not be thought of as abstract numbers, rather in terms of language of the psyche i.e. Self-expansion and Self-narrowing.

Why is it like that? Repairing small mistakes in an almost complete cognitive schema requires restructuring of the whole schema. However, the increase of performance and competence, which would lead to Self-expansion, is hardly noticeable.

People who become bored with their profession do not realize that they can reach and obtain in other fields of life the Self-expansion they are used to. However, due to a failure-averse attitude, or the lack of a risk-taking attitude, they do not dare to change. They stay in the field where they are acknowledged, they do everything routinely, yet the meaning of their life, and their happiness (series of Self-expansions), is missing.

My comments on function practice could be taken as a mere by-product of human thinking. However, function practice is much more than that: it is the key to understanding thinking and human development. If someone did not want to practice functions, he would not only give up function pleasure, but would stand wholly incompetent in the world. As the establishment, growth and use of cognitive schemata are not to be separated, they take place in a continuum, and the same processes occur. Connections are established the same way, the only question being "Just where do we stand on the scale? Just above the base when the connections are established, or significantly higher following function practice?" So, although function practice was previously a good concept, closer examination shows that it is no more than the normal activity and spreading of a schemata. Being a concept difficult to define, its use should be limited to the one phenomenon, or perhaps two, necessary in child psychology.

A final detour: play as autotelic function practice

Playing is another favorite philosophical question. It has no economic profit, yet it consumes considerable energy and is seemingly undertaken with, and followed by, great pleasure. Questions arise: why is play established? How can we define it precisely? To what can we oppose it? Etologists have defined play as practicing crucial behaviors without any negative repercussions. Psychology describes play as a form of function practice with no specific aim.

Upon this, a key issue remains unanswered: what motivates the play; where does the most important constituent of play – pleasure – come from?

FIPP provides an answer: a great amount of information congregates in a child's head, which is stored in the form of separate cognitive schemata, the connections between which have yet to be established. So, during play, an array of new cognitive schemata are continually being established, which cause frequent Self-expansion during play. We have examined why people like play; the rewards of play are the reason we invest energy in it. Behind the accompanying, and frequent, Self-expansion is that – as the new cognitive schemata are established from existing information, and children lack many basic level connections – children find connections easily when playing. Without realization during play, most cognitive schemata would not be established. We would then have a great deal of encyclopedic – but little usable – knowledge. Another major point is that play is a model of reality which does not contain the inconveniences – in military games, death and injury; in medical games, pain and illness – so the profit is disproportionately large compared with the investment. There are virtually no inconvenient episodes, but the great number of realizations causes a great deal of Self-expansion.

This raises the question of why do we not play until the end of our lives? Because play only models the outside world. We manipulate the outside world on a high level in vain; it remains a model. It does not matter if we always win at "Monopoly", our personal wealth remains the same. If the play-acting is of an exceptional model of reality, it can be a small step to matching it to the real world. This in turn raises the question of personality, principally in connection with our response to stress. As an example, what are our feelings when we begin to play poker with stakes of real money, rather than with matches or tokens?

One difference between play and work is that, at work, we no longer manipulate the models of mental representations, but the representations themselves, so our actions are irreversible.

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