

## INPUT OF ONE FORMAL SYSTEM INTO ANOTHER \*

### Levels of Hierarchical Control System

We advocate every user of financial model for capital investment, who has a personal professional interest or is commissioned to participate in the study, negotiation and implementation of the project, as well as in its subsequent management until the return of the investment, acquaint with the theoretical basis described in this material. The benefit will be appreciated later.



**Formal Systems** Hierarchical Structures and Control



Syndrome “**Similar Levels**”



**Message Transfer**

**INTRODUCTION.** Messaging for engineering supports efforts by the engineering communities to communicate more effectively about the profession with those who practice it. We have to use the most effective messages about engineering and marketing. But the most sensitive on this subject are the risk analysis, which is entirely based on the information obtained by the expert assessors, which receives the expert-assessor from participants and observers of the research process. This *brief theoretical survey* summarizes progress in implementing said messages, but also recognizes that there is potential to galvanize additional action and thus suggests specific steps for major players in the engineering community to continue and build on progress to date. The use of word “*message*” here is conditional. Such a *message* could be a simple short definition or reference of a project or an event in connection therewith.

**When we are looking for** financing a business venture and describe an event of interest for our activity, we have to define at least two different kinds of activities for which this analysis refers to—more general one, **(RM) Risk Management in the investment activities** and another one—more specific, relating to a financial project of the capital investment, **Financial Modeling (FM)**, which consists of the primary at least four

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\* Colored repeating abbreviations and metamorphosed images of some meaningful terms and terms of the repetitive names, except for convenience, they are also a demonstration of the famous advantages of visual interpretation in written and subsequent verbal interpersonal communication.

different types of activities of one class for which it refers to—(i) **Financial Project of cash-flows in a business plan** with profitability evaluation, (ii) quantitative **Risk Assessment**, (iii) **Risk Management** of the investment activities, and (iv) **Online Cash-flow Control System** during the loan life by a financial advisor (by definition – no linked to equity). In this process there are at least two participants, *Developer / Investor (D)* and a specialist from the advisory community which is to create the concept and appropriate computer model of the project, the *Proficient (P)*. This is the real idea of a **Formal System** and its function in the **project finance**, but its application in practice is through language modeling, visual presentations and applications of high-quality calculations, based on **Theory of control**.

**In the practice**, in a long correspondence and subsequent discussion, we, *D* and *P*, strive to create a final understanding of everything - a complete and consistent set of data on the reality of the project. *D* attempts to outline a more objective picture than the one we (*P*) receives as a result of long and numerous observations and reflections on different industrial systems and projects. The aim is to "look from nowhere", unimpeded by the artifacts of human beings in their own business. We distinguish the objective technical and economic nature from what *D* sees it with the help of its particular sensory apparatus formed in its practice. This is more apparent than reality. It seems that this search cannot give any theoretical version, but a family of interrelated options, each of which describes it, *D* and *P*, version of the project. This is difficult for many *Ds*, including some working long time in the realm of the particular business. Most believe that there is an objective reality there and that they directly transmit information about the material world to their business. In the life this is called realism.

**In a linguistic** informal description of some word in such *communication*, spoken or written by *D* in human language for use by people, are applied as undefined terms. Every one word has some meaning for each of us which guides us in its application. As more ordinary the word is, the more associations it triggers in us. According to John Locke\*, their meaning is determined precisely by these prefixes, and we (*P* and *D*) are understood when the ideas in my consciousness correspond to those in yours (*D*). Today I can say what I mean by the description of the investment object, but how will I look tomorrow when I started to design what I was saying? Even if I write down what *D* understands, there is no guarantee that the future professional will understand and interpret them correctly (a common phenomenon in the practice of some engineering consultants). Until then, it will have its own "holistic" system of visions in

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\* Locke claims that ideas are the materials of knowledge and all ideas come from experience. The term 'idea', Locke tells us "...stands for whatsoever is the Object of the Understanding, when a man thinks"

the mind of *D*. His brain will have new connections as a result of pre-project communications and others will have lost, so that his thoughts and understanding will not be mine. If it is not the same for a person at different times or for different personalities at the same time, how can we really talk about the real meaning of a project costing millions? This line of interpretations of a project description as a principle exists in practice since the time of Heraclitus, who denies the possibility of wading in the water on the same river twice, because there are constantly moving “different waters” in it.

How could you define something that everyone already has a clear idea for it? \*  
*P* should construct artificial mathematical structures that will lead to the appropriateness of the words used with their specific meaning as intended. In this case the words are divided into two classes – such which meaning is fixed and invariable, and one, which meaning will vary. In order *P* to make this way mathematical assessment, modeling and treatment, the words of the first class must be set somewhere outside the environment of this activities. These words build up a hard framework and accrete structure of the system; after then the construction could be completed entirely. This is a part of the procedure for legitimization the thought processes for obtaining reasoning and its expression by words, and therefrom to pass along to the axiomatic thought.

In the century of computerization and globalization, of Internet and Google, it becomes mandatory, as well as the consequence of ambiguities and uncertainty of the description by words from the spoken language of metalogical expressions. We both (*P* and *D*), are representatives of two mother disciplines: (*Pi*) math & computer digital interpretation of (*Di*) specific engineering technology in a production environment; the second one is more important. You may not agree with the idea that the technologies are algorithms, and that cows, tomatoes and human beings are just different methods for processing data. But you should know that this is current scientific dogma, and it is changing our world beyond recognition.

**Visualizing** the description of the design has made a significant contribution to both imagery: (i) images and drawings of tangible assets—buildings and technological equipment—unification of the ideas for them for the participants (*D* and *P*), and (ii) the icons in the text descriptions and its specific color approximate the perception of the content of the project with its essence from *D* and *P*. A little theory on this so important problem is highly recommended and useful for the ultimate goal, equally important for both parties (in an annex).<sup>1</sup>

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\* It is therefore in all our publications and project documentation to put reference links to external sources; thus, we achieve adequate understanding of important terms.

Model-dependent realism applies not only to financial models but also to the conscious and subconscious thinking patterns we all create to interpret and understand a simple production and technological line. A classic scientific way of explaining: it creates the impression of a three dimensional space of the shape of the technological equipment in the production workshop, which is presented in the documentation two-dimensionally and in fact is multidimensional—for example, the vision of  $D$  includes, first, the cash outflow of costs, but the  $P$ —cash inflow of the revenue, because his vision is primarily financial and marketing wherefrom the revenue for repayment of credit comes from, which proves the suitability of financing the project.

So, the purpose of **FM** is to overlay the two polymer patterns in (i) a **Financial Project** so that  $D$  and  $P$  to see things in the same, correct way. This means in practice optimizing business management during the credit period. And this is done through (ii) Quantitative **Risk Assessment**, subsequently (iii) **Risk Management** in the investment activity, and (iv) **Online Control of Income and Expenses**. This is the real view of the **Formal System** and its function in project financing, and its application in practice is through language modeling, control theory and applications of high-quality computing.

**Discussion** of the need for mathematical modeling of the description of events in order to manage them, especially in connection with risk assessment and management from them, started at the end of the first half of the last century.<sup>2</sup>

Over the past two decades, however, due to the developments of technologies and financial markets, their use becomes unavoidable necessity.



## Formal Systems

**Simple Formal Systems** (later for simplicity we will escape the attribute “simple”) exist, work and result on one *level*. Often the formal systems are built up exactly by this consecutive way of stratification as hierarchical *levels*.

**Formal system (FS)** is one which has a formal language, composed by symbols like figures and formulas. They are applied in the financial projects with performance and profitability evaluation in the business plan and unconditionally in the **risk assessment**. All they are built up though combinations of financial rules and mathematical relationships and set of axioms in such a way that to meet with the requirement that be a decision procedure for deciding whether the calculation of the financial parameters of the system involved is well formed or not, and whether the system reflects adequacy a non-formal description of the engineering project by means of spoken / written language. More specifically and in other words for a deeper understanding, a **FS** creates

isomorphism, which reverberates by the real words a venture in our brain through symbols, both describe one and the same performance of a risk factor. The symbols play quasi-isomorphic role of the objects and thanks to them we can think. Thus, it is transmitted complementary information from  $D \rightarrow P$  and in contrary  $D \leftarrow P$ . The questions are at what *level* is created the isomorphism, and is it that one on which will be modeled the system for planning, management and optimization. The word “isomorphism” is used when two complex structures can be set in accordance to each other such a way that to each part of one structure (linguistic described by  $D$ ) corresponds part of the other structure (described by symbols by  $D$ ), where “correspond” means that both parts play similar rolls in the respective structures, called “interpretation”.<sup>3</sup>

**For example**, it could be developed **FS** with rules and axioms, which provide symbols, whereby the processes on this class are described, defined planned passive meanings as informative calculator. Those are: **Risk Management** – graphical analyses over the polar coordinate system and the matrix of risk factors with the initial risk assessments and specific impact over the business in the specific business environment; and **FS** – values of quantities on input materials and output production, prices, personnel with payroll figures, price of land, etc. of industrial facilities. The word “symbol” is an arbitrary term which interpretation is everything that is nonlinguistic nature.

**After then** the **FS 1** is inserted entirely into a biggest system with plenty of symbols – more links, functions, etc. representing therefore more information to **FS 2 (Level 2)**. As far as the rules and axioms of *Level 1* are have become a part of *Level 2*, the passive meanings of the symbols, describing the *Level 1*'s information remain valid; they compose a hard, invariable framework, which plays role in definition of the passive meanings of the **FS 2 (Level 2)**. On this stratification *level* the assessments made by  $P$  will form the lower *level* as summary assessments of the *basic-level* de facto information of the **Risk Management** -Section of the **Risk Assessment** open-source computer **8R PROGRAM** or any of our business plans, comprehensive pro-forma budgeting financial models of the planned business venture—mats formulas forming the cash-flows, their evaluations of profitability they earn and their graphical interpretation. The second system can in turn act as a framework of the third *Level 3*, etc. These *levels* are (or should be) *Isle of Security and Stability* on which we base our interpretation of the business venture on the whole because in the technical and economic systems their symbols, rules and axioms, usually create feedback systems for automatic control of the processes on every one *level*.

**The Top Level** whereon operates a **FS**, which constitutes the rules for operation of the whole system and its optimal control to achieve the purpose, e.g. a successfully

high yield operating with high value of profitability, and the **risk management** that form the minimal expenses for its achievement.

**Relationship** and the information streams of symbols between the *levels* are created by *P*. No way back. Otherwise we have to give up from the symbols, information and, at last resort – from the project. The only way is to look carefully each **FS**, each *level* of the pyramid as a separate object of automatic control without option to turn back. Thus, in the above said *no defined terms* we find understandable interpretations, which leads to an understandable comprehensive system, and in addition, on the place of a colloquial system (often highly deformed by the personal traits) we have one, completely described by means of symbols, simply entered in a software program for permanent operation.



### Similar Levels

**Each of us** by way of structure of the human thought since childhood wants to think, of all *levels* as far as to the mental capacity allows. The **positive mind** has a sense as a differential thinking and conscious understanding of their place in the formal system of hierarchy. Furthermore, different descriptions, coming as messages from *D* may be on *levels* of mind so distant each other conceptually, that there is no problem keeping them in separate compartments of his *mind*, unless these layers are not so close and thus to cause confusion and even encourage mistakes in their decision making.

And this happens when *D* in an effort to present his engineering ability or the profitability of his investment intentions is trying to understand does it can persuade others as unconsciously descends to his lower *levels* of the structure of *thought*. This is understandable because we are thinking at all *levels of the mind* of the same language— to one that is constantly spoken more often. This is the problem.

**Significant association:**<sup>4</sup> For the system on one PC at the same time there are many *levels* of description, conceptual much closer together than those *levels* in our heads. When performing a software program, operation jump from *level* to *level*, and are described in the same programming language (for example, the program **8R-PROGRAM** we use for **Risk Assessment** is basic for applications, on the platform of Excel from Office 2016 package of Microsoft). Of course, the description of the lowest *level* is extremely complicated as functions of a large number of algorithms in the memory, input and output blocks and central processor which processes information data from and to them in the form of the so called "words", while on the higher *levels* the description is in blocks, which are becoming more integrated and less in number; and finally, if you afford us to include in the operating system also the operator, then at the highest *level*

you stand—the most sophisticated thinking system, similar as the computer brain structure. The difference is that brain structure might think (in general) and the computer—only perform a limited repertoire of operations of the bits of the word by the symbols, with the other part – to address the position, with the third – to name already written somewhere operations (in assembler language). The symbols in this case are binary code\* 1 and 0, YES and NO, or as it is more convenient you make association with the operational functions of human brain cells. We will not be distracted to the specifics of the nature of both digitization and will only associate transfer of messages between the *levels* of the structures when the formal systems of each of them have done their job - bottom-up information only; upside down only imperative management commands. This way works also our system for **Risk Assessment** of *D* and **Risk Management**.



### Message Transfer

**Through** the **FS** *D* provides quantity assessment of the engineering project and its risk factors and their impact over the financial project. He transfers the *message* about that as disturbing effects, caused by some risk factors to the upper *level*. There another, more integral **FS** controls by the same language the described event as the error (the difference between the real and specified desire) becomes smaller and thus again to the *upper level*, which is even less and this way reaches the *top level* of the pyramid. From there *P* or  $P+P+P$  issues an imperative message—order, indication, instruction – down to the *level* on which proceeds *D*. This transfer from the *top level* to lower *levels* in the system we are operating does not happen by programming in assembled language with algorithm of the process in super blocks, as in computing. Otherwise we go into the trap of some of the hardest software, in the world of software developers, with which we again must walk through the same way of interpersonal communication we are trying here to decipher. In contrary, we have created a program for scoring events of the engineering world in order to avoid algorithm errors arising from subjective errors of language communications. This program is friendly for everyone without special training - political and financial analysts as repeat again, using normal plain words in the normal way plain language of communication for the expression of thought. Thus, and this way only can lead to optimal solution of the problem in compliance with the goal with satisfactory accuracy with a deviation 5% measurement error, as it is commonly called in our practice of expert analysts *P*.

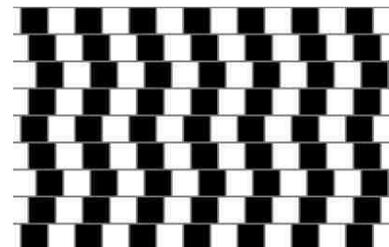
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\* The John Bull's algebra is propositional calculus [[more](#)]

**There is** a deep philosophical and simultaneously simple question of the communication between *P* and *D*:

*Do the words, thoughts and even images (by which we describe the engineering subject matters and events) follow formal rules, or not?* The answer is: we sensed isomorphism as retaining information transformation. Even a visual presentation by picture can often create a false perception, an illusion, like this one.

As far as mathematicians and financiers *P* on one hand, and auditors making due diligence of an engineering project, on the other hand, are the only consumers of **FS**. The idea of this people is to construe and analyze **FS** with rules and axioms, which provide to the symbols, reflect some part of the reality of the engineering environment as *D* has been adequacy of the real world described. We can select “sense” on the basis of isomorphism between the structure of the **system** and



The parallel straight horizontal lines appear to be bent

the events of the real business. Then the question is: *can the whole reality to become FS?* Generally, as more complicated the isomorphism is, more hardware and software is required; financial modeling and **Risk Assessment**, made by *P*, will be more sophisticated. Our goal is to see the meaning without seeing or seeking for the isomorphism. Thus, when we describe a project in the executive summary every used word is bearing some meaning for us, which conduct us in its use. As more usual the word is, much associations it induces in us, as so more ingrained its meaning is. Thus, it becomes clear and causes more reasonable our style on the linguistic description of the **FS** and each *level* of the structure of control of the whole system, represented by the symbols and their table Microsoft Excel interpretations.

**Emphasize the fact** that in order to have an interpreted **FS** at whatever hierarchical *level* *internal* immanent consistency, it has to have some *imaginary* world —i.e. in our case a business venture with its profits and risks or series of events with only one constraint the mathematics and metalogic in it to be the same as in the real world—in which all interpreted theorems to become veracious. We have to accept a common basis, which definitely must include the logic. Obviously, it comes to convey *messages* between above. A message transfer at a higher hierarchical *level* should be *first* out of the context of the message to be able to be decoded clear enough; *second* to be true, adequate at the input and output; and *third* to be easy for understanding. It is of critical importance their logic construction to be decoded clear enough. This logic leads us to differentiate three types of information carriers when the subject is capital investment and the specific risks: *internal*, *frame* and *external* message.

- ⇒ The most familiar is the INTERNAL message—it's one that must be transferred and contains brief description of the project—subject, area of the business, background, market niche, customers, etc., and their impact over the selected risk factors. To understand it means to extract the meaning, which the sender *D* was imply.
- ⇒ FRAME message: “I’m message, decode me if you can!”; it is transferred implicitly by the invisible structure of the information carrier. To understand it means to be recognized by *D* as the necessity of decoding gear.
- ⇐ EXTERNAL message draws our attention immediately, if the frame message is recognized, and our attention is switched to the *upper level*.  
External *level* is an implicit message, in sense that the messenger *D* cannot guarantee that the message will be understood. The external message is generally a set of triggers but not an ordinary message.

**Three-message level logic** is only the beginning of the analysis of how the meaning contained in the messages. However, it focuses our attention to an academic approach of the work of analyst *P*, which later reflects in a higher security of the third party in the process –the auditors making due diligence of the business.



**This brief theoretical survey**, as we called it at the beginning, is just one introduction to the problem. The aim is to provoke in every reader and more educated participant in any stage of the pre-project study, financing and realization in business practice maximal objectivization of the verbal descriptions and subsequent mathematical modeling of the financial structure of the investment. This will satisfy both sides - the developer of the innovation that invests in it and the financier (lender, guarantor, insurer).



This brief survey of Theory of Pattern Recognition of events of the engineering practice through numerical methods of mathematical logic is made for more deeply understanding of financial modeling by

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<sup>1</sup> On one hand, to place icons in a selected place, we look for a *reason* through the content, information; on the other, we look for *reality*, through the optical illusion. In a Neoplatonic way, we can understand this twofold experience: why it is possible to grasp reason and reality through illusions and becoming? According to Plotinus, images and material frames are closer to non-being than being: “when we are dealing with the sense of the text description; because there is nothing to remember, but only affections of substance”. However, when the images are unreal as the icons, they open the relationship with their origin. In this sense, we cannot consider the unreality of images to be pure inconsistency, because they are the effect of a higher, simplified, reality: “Now it

has already been said that what comes into being cannot be the same as that from which it comes.”

The icons, as graphic images, are derived from a higher reality and show this themselves. This higher reality has to be the reason of unity and meaning of images; therefore, it cannot be there material support, but a rational reality. Indeed, when we watch an icon picture, we are interested in *what the images represent*, and in the material image equipment, or in the images themselves.

When we are watching a graphic image of an icon image, we are aware that we are seeing an optical illusion, and yet we focus our attention on the *continuity* of the image. Even when we see a casual selection of images, we consider, above all else, the continuity of the images.

MOVING IMAGE AND CONVERSION

Vincenzo Lomuscio

<sup>2</sup> When a situation, as the complexity of its structure and because of the apparent evolution cannot be contained by ordinary means, the participants are asked to investigate this situation as in their specialty explore natural phenomena, and to propose solutions. Creation of theory of situation requires the creation of an abstract model, whose properties are identical to the properties of the object. The model always is mathematical, so as the particular problems in nature are transferred into mathematical categories. In scientific and technical analysis is good to have an electronic machine to entrust the creation of the model. When we observe its operation and direct them in the right request, we will find the answers to all complex issues, because we have made the model. This approach is borrowed from the fundamental “The Elusive Theory of Everything” of Stephen Hawking, Professor of Mathematics at the University of Cambridge, the post once held by Isaac Newton and from “Bulletin of the Association of Political Economy”, Paris, March 1959.

<sup>3</sup>                   ↑ ↑

▲ It’s recommendable in complicated texts to insert pictures as illustrations of the contents.

<sup>4</sup> Douglas R. Hofstadter, GÖDEL, ESCHER, BACH, 1999