THE DEVELOPMENT OF A BUSINESS STRATEGY SYSTEM FROM AN ENTROPIC POINT OF VIEW

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ABSTRACT

For a long period of time the building blocks of an internal strategic process and how this system evolves have been viewed, with few exceptions, as a static, linear and progressive process from conception to its fruition, without the inherent ability to map the evolution of every stage and benchmark the future versions of similar processes on the results of the previous.

To have a more dynamical approach to an internal mechanism we have designed and redeveloped this process based on a circular model with different stages, called sub-processes, that have the ability to feed themselves with information in a certain feedback loop and expand or contract when the capital or other variables change.

This behavior that is built-in and the structure of the modeled sub-processes is quite similar to self-similar patterns (fractals) and resembles the behavior of natural systems which have at their core the transfer phases based on the laws of thermodynamics.

One of the elements that the circular model will provide us, is the evaluation of a narrow usage spectrum of the time, capital and information variables, needed to complete the process. To be more concise, the model will red flag any abnormal usage of the variables based on previous development processes and will prevent any dead-on-arrival projects.

As a self-feeding model, to calibrate its sub-process need to run several projects of similar scope so it could proper evaluate the transferred values between sub-processes, it's recommended to integrate such a model into an resource planning program.

KEYWORDS: *Circular model; entropy stages in a internal system; internal business system; information-capital-time triad; non-linear model.*

JEL CLASSIFICATION: *P00 - General; P11 - Planning, Coordination, and Reform; P17 - Performance and Prospects.*

1. INTRODUCTION

This paper is designed in two parts of direct relation and equal interest, in the first one we will analyze the building blocks of an internal process, or how a project behaves from conception to it's fruition and we will propose an dynamic and homogeneous model in relation to the way in which randomness or entropy is spread inside the model. This dynamical characteristic can bring a natural method of developing the processes that will bring added value for an organization, signaling the misuse of resources and redeploying the energy previously used into a current process.

In the second part we will formulate a model to evaluate the impact of this randomness on the internal structure and subsequently the effects on the external relations of an organization and its industry, this part will not be presented in this article and was mentioned souly to buttress the fact that a system with decreased entropy (negentropy) will increase the entropy in the systems it encounters, so more accurate development forecasts inside the industry could me made based on this model.

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2. WHAT ARE THE BASIC ELEMENTS OF STRATEGIC MANAGEMENT, AND WHERE IS THE STARTING POINT OF THE SYSTEM?

To understand the building parts of any internal development process we have to understand the logical order in which actions are taken inside of an organization, the limitations on which they are subdued and the final result on which they come.

If we start our analysis by defining the primordial step as the Objective, from which all other spring and are subordinate, much as Peter Drucker defined it by the term M.B.O. "management by objectives" in his book "The Practice of Management" (Drucker, 1954), we can state that strategy and structure become relevant by subordination to a goal.

This objective can be a master-objective in the broad sense, as the one defined in the Mission of the company as well as other objectives (new products, services and so on) that are defined along the way, to give strategic flexibility to the structure in relation to the environment and as an catalyst for the master-objective. As a rule of thumb we may presume that the more minor-objectives an organization (structure) has thus the more flexibility it possesses, trough a better feedback relation with the business environment and thus a better degree of adaptability to any array of changes.

Having an objective, a goal, a reason demands a transfer medium from the abstract to the real (e.g. a product, a service), from the objective and the vision of the objective to the structure and its results, this intermediate state is defined as strategy.

As Alfred Chandler concisely postulated in his work *"Structure and Strategy"* (Chandler, 1962) *"structure follows strategy"*, so the way an organization fulfils its objectives is dependent on its Strategy and Structure relation, this can be turned into a biunivocal relation due to the internal and external limitations (technological, economical, geo-political and so on) and by the results of the minor-objectives that are in relation with the master-objective, this reciprocity is better put in context by Henry Mintzberg's comparison *"structure follows strategy...as the left foot follows the right"* (Mintzberg, 1990).
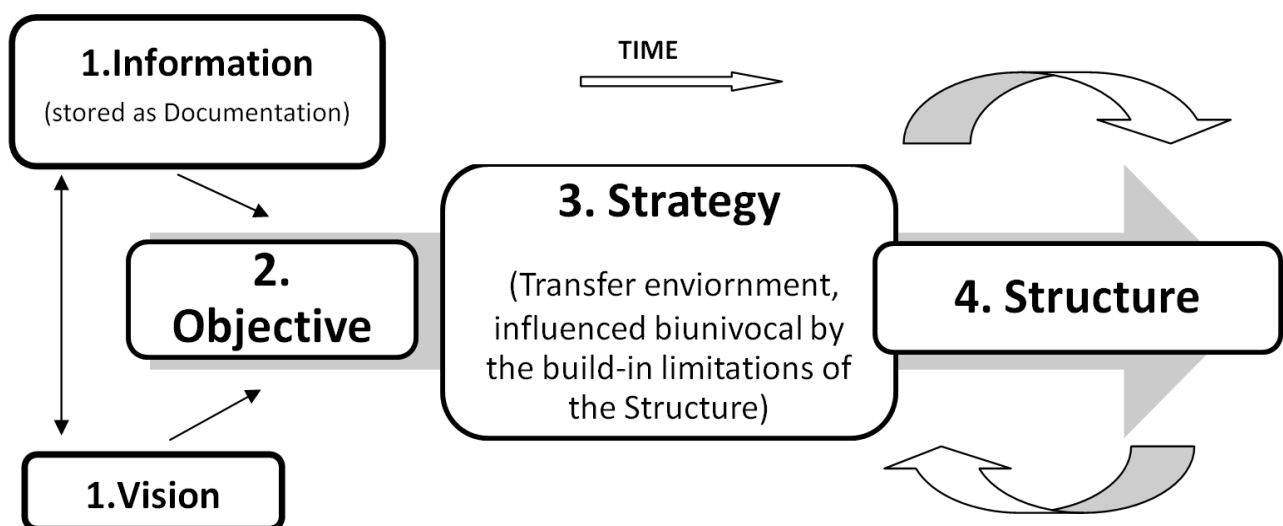

Figure 1. Strategic Management System
Source: Răzvan Rădulescu, 2013

For the development of the Objective and the Vision that comprises that Objective, the system must be able to access and to contain a critical mass of information, defined as the build-in documentation at the starting point, so it would not be confused with the information that will be acquired as the overall system evolves (the acquired documentation) through latter stages of a continuum spiral processes that defines the structure.

The access and containment of Information into the Documentation will be viewed and defined as a sub-process. The critical mass of Information can be acquirement from the environment, for instance employing know-how form other systems (companies) or can be build-in in the system from previous experiences, or both, depending on the needs and means of the developer.

After the Vision, Information and Objective of a system are meet, they intertwine in a transfer environment between the abstract and the concrete. This environment or sub-process is like the ampoule of an hourglass that's dells with the transfer between the two bulbs, or as Ellen Earle Chaffe defined strategy inside strategic management systems: "*a two-sided concept comprising of both strategy formation* (called content) *and also strategy implementation* (called process)" (Chaffe, 1985). Gradually as we go forth from a temporal perspective, the newly defined strategy creates the structure. The conceptual becomes more analytical and the level of uncertainty in the system decreases due to limitations imposed by capital, technology, know-how etc. and the best practices used in the organization and so the Vision can become implementable.

The overall limitations are, of course, comprised in the Strategy sub-process, but the re-evaluation and adaptation, to the latest P.E.S.T.L.E. changes, is done in the next sub-process called Tactics. So, tactics may be viewed as the fine tuning stage of the Strategy before the Implementation is due and the Result(s) are met.

As shown recently by Wolf and Egelhoff (2001) the relation is both qualitative and quantitative and from this point on we can propose an order in the chain of sub-processes that derive from Strategy and are the directly dependent as building blocks of the section called **Structure**.
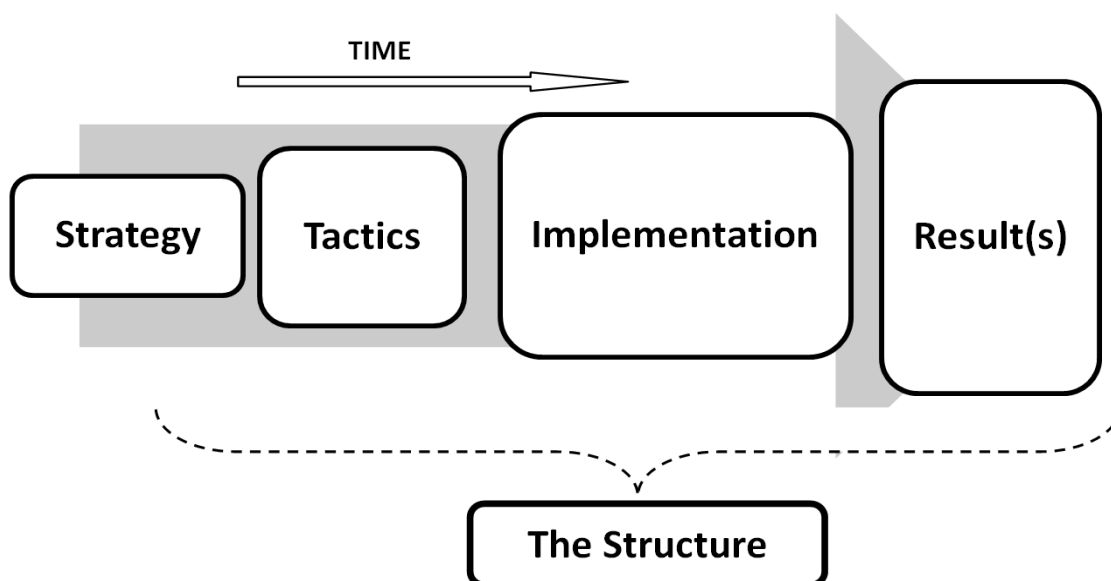

Figure 2. The streamlined Structure or the evolution from Strategy to Result(s)
Source: Răzvan Rădulescu, 2013

With both the conceptual/abstract section (Information, Vision, Objective) and the analytical/concrete section defined by the Structure of the system in place, we can go along and unify the two. Furthermore we have to add the elements that give an dynamic quality in respect to the conceptual/abstract relation of the system with the environment/industry, so we will add the Mission and the Values to complement the already mentioned Objective.
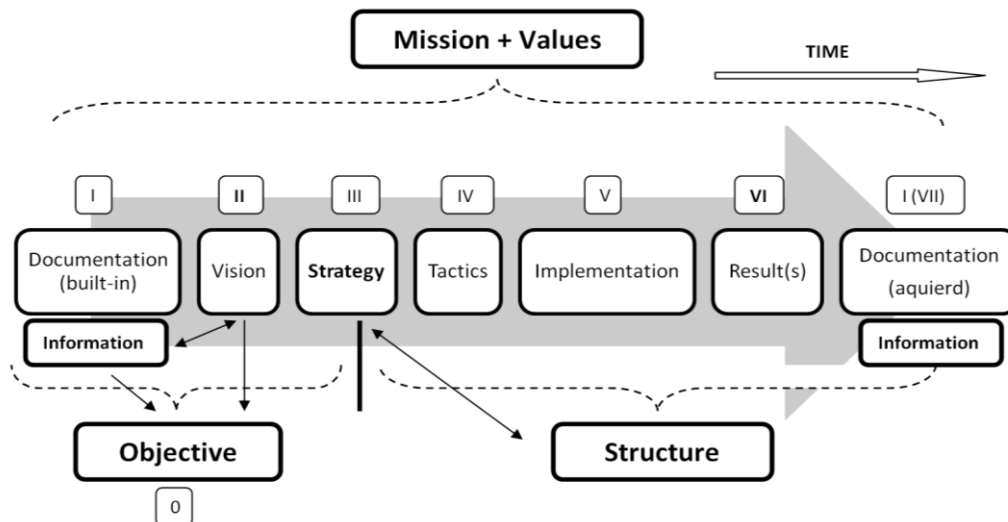
Figure 3. The streamlined evolution of a System, from Vision to Result.
Source: Răzvan Rădulescu, 2013

The Mission-Vision-Values triad (M.V.V.) will be the building block of the systems modus operandi (the intangible part of the business model) and will transform into more tangible elements as the system evolves and the sub-processes interact and develop until step six, the Result(s).

3. THE DYNAMIC CIRCULAR MODEL

3.1. Why and how we developed a different model for the process?
As we have seen earlier the limitations of a linear model are quite obvious as shown by Drucker (1954) Chaffe (1985), Mintzberg (1990) and others, so the constraints regarding the inability of this representation to accurate depict the feedback of the major sub-processes (e.g. Documentation, Strategy) as well as the inability to evaluate one in respect to the other is an important factor in the capacities of measurement of the process. Another clear limitation would be that the information acquired from previous similar processes is not present into the current process, thus making it impossible to represent the internal and external interactions and define it as a dynamic system.
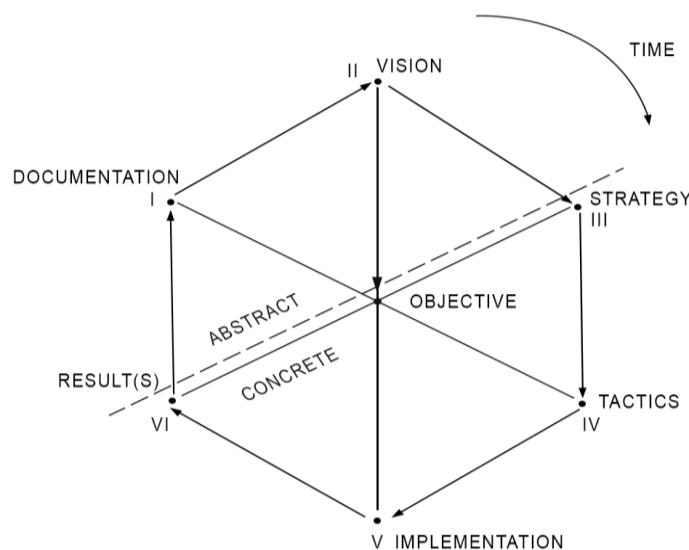

Figure 4. The circular model of the strategic management process, comprising its sub-processes with time as a constant
Source: Răzvan Rădulescu, 2013

The circular design has the ability to transform a linear process into a dynamical and evolutive system that can morph into a three-dimensional system if we choose to represent the number of systems that feed one another and the time variable on a vertical scale. This may be at this point hard to represent graphically, so for the time being we will concentrate on developing the dynamic model.
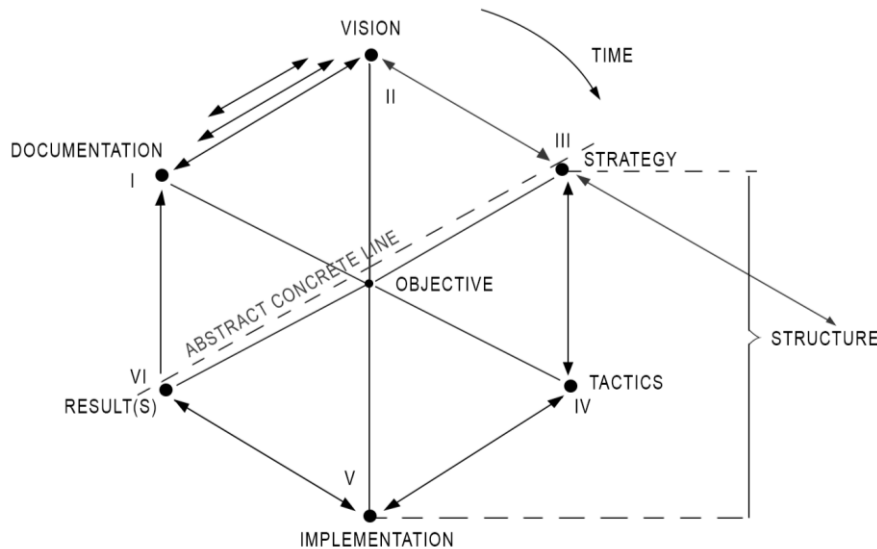

Figure 5. The circular formation of the Strategic management process with the inclusion of Structure and the bidirectional transfer between Documentation and Vision
Source: Răzvan Rădulescu, 2013

We can observe that inside this dynamic system its six sub-processes represented as a circular model are in fact motionless, the transfer lines between them show the morphing and communication between them, and basically the points where the entropy is present, resembling the **Boltzmann model of a solid in a resting position.**
When a system changes its state, the level of entropy tends to grow as this bidirectional movement is represented, at the beginning of the process, between the Documentation phase and the Visio phase, when entropy is at its highest.
Also as it develops the system has the tendency to stretch away from it's center (the Objective) giving this system a pulsating form as it's traveling trough all the sub-processes and so giving yet another need for the feedback loops on each stage/phase, to keep the system compact, as with every expansion the system tends to lose capital so it could attain a state of equilibrium.

3.2 The evolution of the circular model and the entropy of the system
To put in perspective and integrate the statements formulated previously, in respect to the abstract section of this system, we have designed a root model that takes represents the more conceptual elements of the system like Mission, Vision and Values triad, having the Objective position central as the "zero" stage.
From a strategy formation perspective, as the M.V.V. oversees the project the Objective and this triad much like the feedback loops of the sub-processes is interacting at every stage keeping the system compact and equally distant, in opposition to the strategy implementation stage (e.g. the limitations brought by information, capital and time).
This positioning will further set the bounds to the abstract and the concrete line of the process and the bilateral relation between the Documantation stage and the Vision. This bilateral relation is graphically depicted as a multilayered biunivocal transfer stage, thus buttressing the influence the mass of information has in the crystallization of the Vision stage.
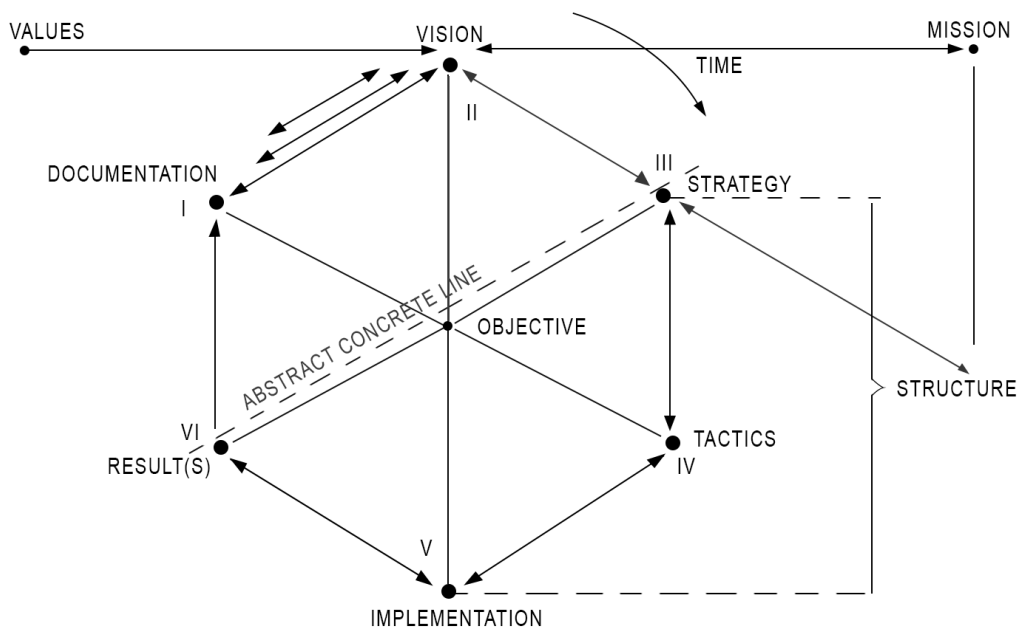
Figure 6. Circular strategic management process with the inclusion of the Mission-Vision-Values
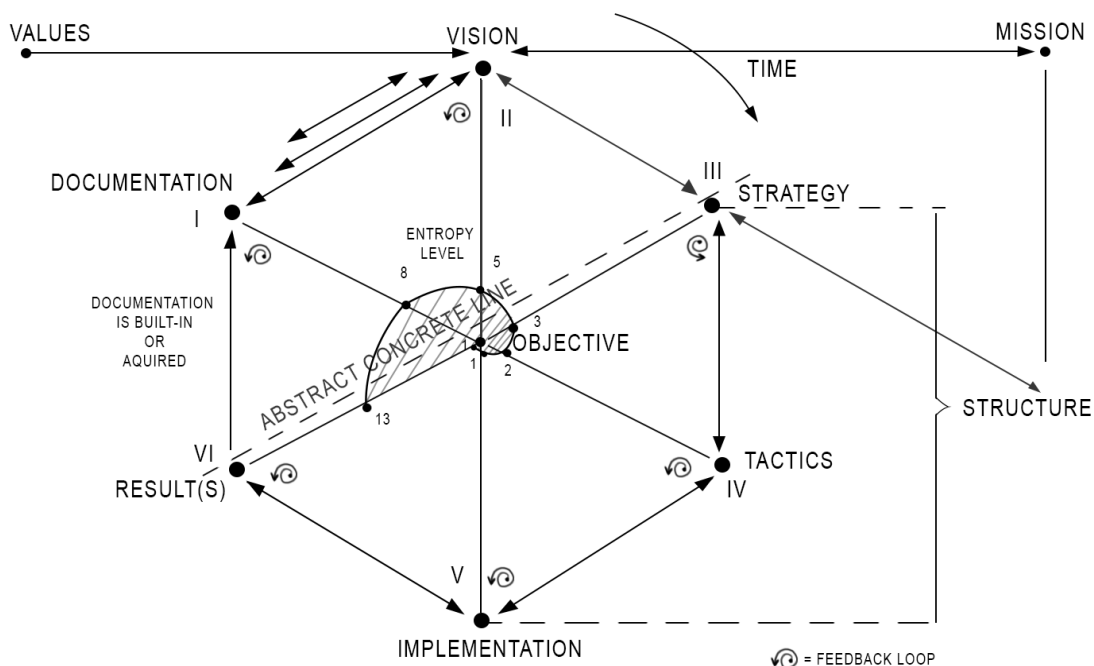*Source:* Răzvan Rădulescu, 2013

Figure 7. The circular dynamic structure of a process and the evolution of entropy trough the feedback loops of the sub-processes
Source: Răzvan Rădulescu, 2013

The next step in our model, as it can be seen in the figure above, is the integration of feedback loops that every sub-process must posses to keep its evolution in check.
This loop is strongly related with the entropy of the transfer lines and is a transfer environment between the internal variables (**information**, **capital** and **time**) and the external changes (technology,

markets, environmental e.g.) and it also has the function of keeping the system in relation with the Objective, an important capital saving function as we previously stated.

The three elements: **information**, **capital** and **time** are diminishing in entropy as the system evolves and as they are transformed in a tangible "product" in stage/phase 6 - The Result(s), thus meeting the Objective and having an approximately "zero" value of randomness.

The **information** (know-how) of the organization that operates the system can be viewed as Volume, the **capital** that is at hand can be viewed as the Energy of the system and **time** could be represented as constant in both the strategic as well as in the natural systems, giving us the access to the mathematical tools used in thermodynamics.

A recap of the six sub-processes and the relations between them:

Abstract
I.   *Documentation*: In this part, the subject (any person inside the company that is keen to resolve a problem) is constructing it's critical batch (or mass) of knowledge (form it's own sources or external sources);
II. *Vision*: The imagined, abstract solution, that forms on the basic batch of knowledge attained in sub-process no. I, and fulfills it's intended scope.
III. *Strategy*: From the Vision emerges the "*pattern in a stream of decisions*" as stated by Henry Mintzberg (1990) in his definition of strategy. It's the sub-process that labels future actions (objectives) in the order of their time-frame, complexity and interconnectivity;

Concrete
IV. *Tactic(s)* (plural): In this sub-process the methods that would be used to fulfill the objectives underlined in Strategy are developed. As you may see, we have used the plural form to buttress the possibility of multiple tactics, according to the efficiency and effectiveness evaluation capacities of the subject.

Tactics is also the final step in which limitations (technological, geopolitical, etc.) can be taken into consideration, preferably this evaluation should take place in sub-process no.III;
V.   *Implementation*: The realization of the tactics trough execution;
VI. *The Result(s)*: The completion of sub-process no.V, and the final step. After this the result will become incorporated into the Documentation sub-process for similar actions undertook by the subject or other members of the organization;

The relations between the sub-processes:

All of the relations are functioning on the basis of a feedback-loop, proportional with the level of entropy.

I.   - II. Bidirectional relation, with the highest amount of entropy involved. Is where the vision and the information necessary for it's development are crystallized;

II.   - III. This relation is also bidirectional and but is more related to the environment in which the solution will function. The entropy is starting to minimize.

III.   - IV. The relation in which the limitations are improving the Strategy so it can evolve in a usable set of Tactics. Entropy is starting to be controllable by having to do more with the effectiveness-efficiency paradigm;

IV.   - V. The critical point in which any flaws in the above sub-processes are revealed. This may be, from a temporal point of view, far from the vision and strategy sub-process, so any possible changes in the input until this process should be taken into consideration;

V.   - VI. The relation that is characterized by the least entropy.

VI.   - I. The relation when the result becomes part of the documentation, is unidirectional.

3.3 The mathematical resons for the choosing of the circular model

As it can be observed, the fluidity and complexity of this model are hard to grasp if we use a linear (streamlined) version. So for more eloquent graphical representation of the sub-processes and the relation between them we applied a circular model, were we could also include the feedback loops of the sub-processes and the level of entropy.

In the development we represented the Abstract - Concrete line to the dephasing of the π and 2π in relation to the 8 steps of the revolution represented before. We have to mention that point 3 is equivalent to the sub-process of Strategy and the positioning of π is similar to the position of the A-C line when it cuts the transfer line from Strategy to Tactics, as well as the positioning of the 2π cuts the transfer line between the sub-processes of Result(s) and Documentation.

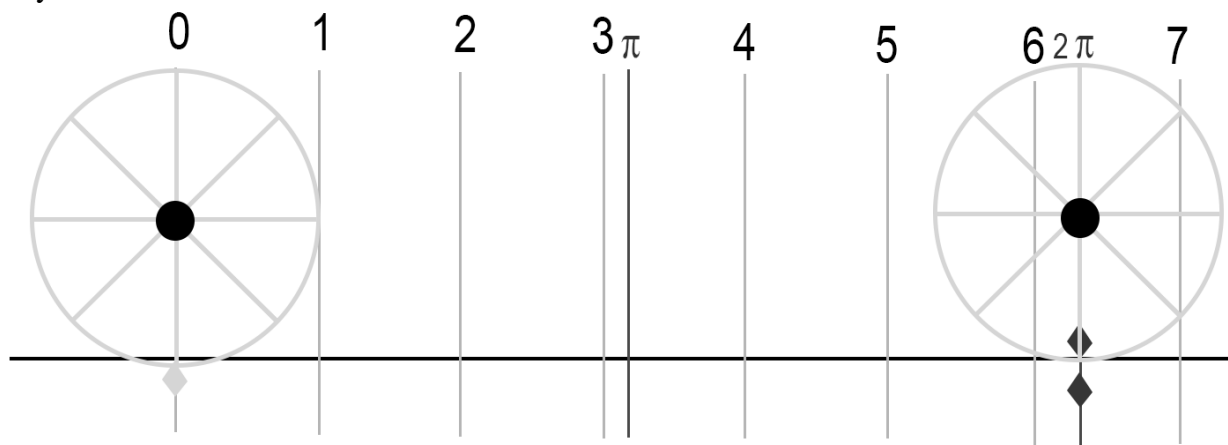In this way the process "rolls" through the eight steps instead of progressing trough them in a linear way.

Figure 8. The evolution trough the major six sub-processes and minor two described as a complete revolution of a circle from 0 to 2π
Source: adapted from John Reid (June 2011)

So we opted for a circular model, much like the radian (π) representation of the circle that evolved from the steradian representation (° angle based) for a series of reasons: it is self-feeding, gives us mathematical tools to operate with, has a more graspable visual impact that we can better use to understand the feedback loops for the sub-processes.

4. RESEMBLANCE TO OTHER SYSTEM DEVELOPMENT METHODS (S.D.M.) AND STRUCTURES

This model as presented by Boehm (1986) is a software development process model, combining elements of both design and prototyping-in-stages. Also known as the spiral model or spiral development, it's a Systems Development Method (S.D.M.) used in the IT industry and is intended for vast, expensive and technically state of the art projects with the iterations of development estimated between typically 6 to 24 months, and may be viewed as the closest resembling model to our own.

The first version or phase starts with a design/programming objective and ends with the client (who may be internal) evaluating the process until that point. Analyzing and evaluating the product development efforts are applied for each phase of the project, having in mind the end objective of the project.
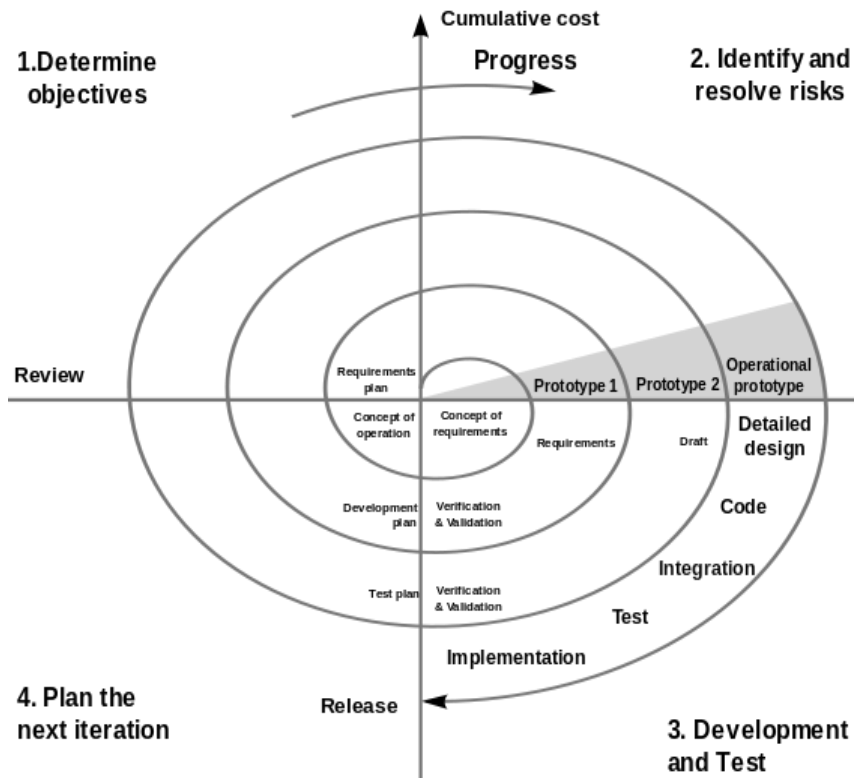
Figure 9. The Spiral model, developed by Barry Boehm
Source: adapted from Boehm, B. (1986)

The Boehm model without it's measurement capability of the variables that constitute each stage, it's still the nearest attempt of a dynamical development model, alongside the configuration used by Boltzmann to represent the first step in the thermodynamics of a solid, is the base for our circular model.

The Boehm model has its limits when it comes to the relation between versions of the same product, being used in the development of a singular product trough different stages called prototypes.
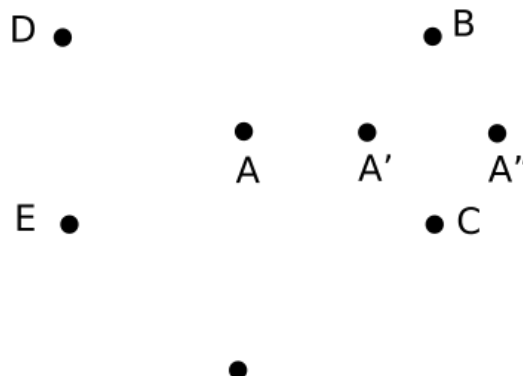

Figure 10. The representation of Ludwig Boltzmann molecules in a "rest position"
Source: Graphic illustration by Dave Dunford (Dec. 2010)

To reinforce the link between the circular strategic development model and the thermodynamic model, we present the example of a static solid that has the natural configuration of a circular model.

The circular model without the energy dispersion (or entropic energy dispersion) is resembling the same form found in nature as the arrangement of the molecules of a solid.

When energy (or in our case, capital) is the system is increased, according to Boltzmann, owing to increases in thermal motion, the rest position of molecules will be pushed apart, the body will expand to an increase in the measure of entropy, the same statement being valid for the circular model.

5. DEFINING ENTROPY AND ITS ROLE

Entropy is defined as a thermodynamic property which serves as a measure of how close a system is to equilibrium, as well as a measure of the disorder in the system. In the context of entropy, internal disorder in a stable state and is synonymous with equilibrium, thus a system inherits this attribute that maximizes or minimizes itself in relation to the amount of energy contained in the system. In the development of an internal process the state of equilibrium must be met in the final stage - The Result(s) and this tendency restricted in the other stages.

Internally the entropy can be lowered by external action, for example in the case of thermal machine where the entropy in the cold chamber is reduced by an exchange of energy with the environment (thermodynamically entropy). This local decrease in entropy as it's only possible at the expense of an entropy increase in the surroundings lead us to the presumption that a series of low entropy internal processes may determine an increase in the entropy of the industry as a whole.

The degree of entropy in our model, due to lack of enough data, has been developed as a classic Fibonacci sequence:

Table 1. A proposal for the dispersion of entropy in the circular model

Sub-process	Proposed value of sub-process	Relation	Transfer
0* - Objective	0	0)-I)	From 0 to 1
I - Documentation build-in	13	I)-II)	From 13 to 8
II - Vision	8	II)-III)	From 8 to 5
III - Strategy	5	III)-IV)	From 5 to 3
IV - Tactics	3	IV)-V)	From 3 to 2
V - Implementation	2	V)-VI)	From 2 to 1
VI - Results	1	VI)-VII)	From 1 to 1
0 (VII) - Documentation acquired	1	VII)-0)	From 1 to 0

    * Position 0 (zero) is the intersection of Abstract-Concrete line with the relation VI.-I. (realization-documentation).

Source: Răzvan Rădulescu, 2013

The first restriction encountered by such a model is lying in acquisition of necessary data to run the model clearly, although not impossible, the collection of a critical mass of data takes an incredible amount of time, even for a Fibonacci sequence which is roughly the simplest dispersion we can propose the collection of data is an arduous task without the help of script imbedded in a resource planning software

The bottleneck stands in the assumption that the subjects can clearly recollect the information from previous projects without biases, thus making this experience walkthrough an insidious task. Also consulting the financial books that weren't staged trough the 6 sub-processes of a project but bundled per project lead to inaccurate data for the dispersion of capital inside the project development process. One solution may seem at this point the verification of the thesis is setting the triggers for the beginning and the end of each sub-processes and the transfer stages between them inside an integrated Enterprise Resource Planning system (or E.R.P.), so we could evaluate the usage of resources (capital and information) in an accurate timeframe.
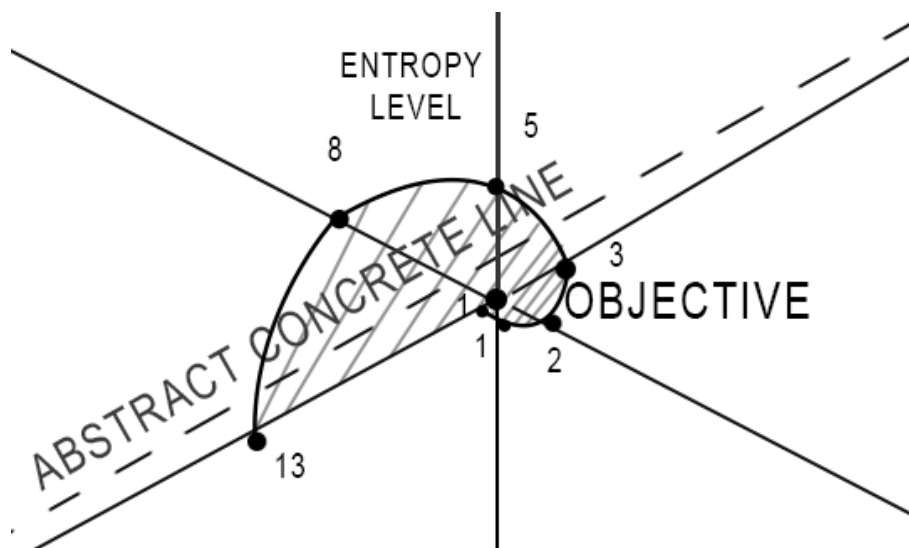
Figure 11. The proposed dispersion of entropy
Source: Răzvan Rădulescu, 2013

Another scenario, pending the result from a survey already taken with the support of company from the IT sector, the capital entropy dissipated will be compared to the Fibonacci sequence model that we used as a benchmark, the capital dispersion and time elapsed in a project will be a quantitative measures, as the information dispersion is a qualitative measure, so they we will evaluate them by distinct means.

Table 2. A section of the quantitative measuring survey

No.	Question	A	B	C	D	E
Sub-process **I** - Documentation						
1.	Time needed to document on the project in hand?	1 day	3 day(s)	7 day(s)	1-2 weeks	more …………
2.	Capital budgeted for the documentation (estimated as ratio to other parts of the project)?	<10%	10%-20%	20-30%	30-35%	>35%
3.	Co-workers needed?	1	3	5	7	…………
4.	Hours/day (estimated)?	1-2	2-3	3-4	4-6	>………

Source: Răzvan Rădulescu, 2013

As we the results from the first batch of quantitative survey submitted to an organization are still idle, we estimated as relevant a population of 2 to 5 organizations, so that the result could be used in a relevant manner. Depending on the clarity of the results from the first batch, there could be another step of surveys done on 3 levels in the same organization:

- Information + Time: survey for the developers of products;
- Capital + Time: survey for the financial specialists that budget the development process;
- Information + Capital + Time: for the top-management that unify the first two components of the process.

The second proposition is lacking the clarity in quality of the information provided by the subjects of the inquiry, due to there biased nature and an large measurement units used to recollect certain stages of the processes.

At this moment the data we posses is insufficient to validate the Fibonacci dispersion of entropy or to propose another function.

6. CONCLUSIONS

The transition from a static, streamlined view of an internal process to a more dynamical and measureable model has the goal of optimizing the usage of resources.

As more and more development model deliver products that are dead on arrival without having the proper tools to identify the misuse of an organization internal energy that is put into those flawed attempts is creating long term strategic problems that can halt or decrease the value of the company.

Also a discrepant relation between time, capital and know-how that are invested in such projects is creating an unnatural state inside the company, thus requiring more assets to delivery the same output and increasing the fragility of the organization to certain glitches in the working capital and creating additional administrative costs.

The fact that optimization of singular processes is crucial for a company is not the sole need for the rethinking the models on which production are based, the squandering of information that is passed on from process to process without putting emphasis on those early stages of development is creating inconsistencies in the latter stages of the project when any modification is more expensive and requires more time to complete.

The introduction of feedback loops based on a fractal development of every transition state gives the process a dynamic relation between the objective envisioned, the strategy used and the structure created so they could be better intertwined.

Far from having a measurable model, the circular model proposed in this paper gives a frame in which we could put more emphasis on the trigger stages of a project, and narrowing the stages in which entropy is at its peak thus optimizing from a general perspective the areas in which resources may leak.

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