

**INNOVATION AND CREATIVITY MODEL IN ORGANIZATIONS AS A  
BLIND VARIATION SELECTIVE RETENTION PROCESS**

**Juan J. Ocampo Pava**

*“All human activity, wheter in the largest multinationals and public sector organizations or the smallest charities, conferences and chamber corchestras- indeed in any circumstance in whixh social interaction takes place for an ageed purpose- revolves around organizing, innovating and managing.”<sup>1</sup>*

**Content:**

Abstract .....	2
PART 1 .....	3
Blind Variation and Selective Retention .....	3
Blind Variation: .....	3
Selective retention:.....	8
Variation, selection and retention in organizations. ....	10
Variation, replication and selection: .....	10
Parallel experimentation .....	11
Real life application: .....	13
PART 2.....	16
Innovation and creativity model® ICM:.....	16
PHASE I.....	17
PHASE II.....	18
PHASE III.....	19
SCHEME:.....	20
FINAL CONSIDERATIONS: .....	21
Netlogo simulation results: .....	21
Conclusions: .....	24

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<sup>1</sup> (Dibben, 2004)

References ..... 25

## Abstract

Today Organizations have come to the difficult position of reinventing their products, processes, and themselves, but do not know which mechanisms to use that could lead to innovation. Usually this occurs because they approach innovation in the same ways they have been doing it since the beginning of their companies, 2 or 3 people deciding about just one topic and leaving all “out of sight”<sup>3</sup> ideas behind; this way of innovation depends entirely on the few people involved in this process, and leaves different, creative thinking and innovative ideas outside the possible answers. This document proposes a methodology of innovation and product creation, based on the Blind Variation and Selective Retention proposed by Donald Campbell

First, the paper will describe the BVSR model, to then illustrate different approaches authors have made to the experimentation in organizations; finalizing with the proposal of a model, based on BVSR, that generates innovation in organizations, this is supported by the results of a model created in NetLogo<sup>4</sup>. This model will try addressing the commonly known problem of innovation in organizations, by including different perspectives, persons, areas, and hierarchy levels in an organization in a way they produce, by *blind* variation and selective retention, creative ideas that lead their company to better results.

### Key Words:

Parallel Experimentation – Variation – Selective Retention – Innovation

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<sup>3</sup> The term “out of sight” is used to describe all the possible ideas that exceed the companies usual way of proceeding.

<sup>4</sup> **NetLogo** is a programmable modeling environment for simulating natural and social phenomena. It was authored by Uri Wilensky in 1999 and has been in continuous development ever since at the Center for Connected Learning and Computer-Based Modeling.

## PART 1

This first part of the article will be dedicated to introduce all the theory that supports the model presented in the next part of the article. Topics as Blind Variation, Selective Retention, Parallel experimentation will be addressed.

### **Blind Variation and Selective Retention**

In 1960 Donald T. Campbell introduced the idea of Blind Variation and Selective Retention, which he believed was fundamental to all inductive achievements, increase of knowledge and for the fitness of a system to its environment. (Campbell, 1993, p. 56).

BVSR, as Campbell said, needs 3 basic things: Variation introduced by different methods, selection processes, and mechanisms for preserving and propagating the selected variations (Campbell, 1993, p. 56).

To understand this model it is very important to explain the two concepts in which it's based: Blind Variation and Selective Retention.

#### **Blind Variation:**

The term *blind* is used by Campbell to explain the variations produced without a previous knowledge of what results this variation could obtain. (Campbell, 1960, pp. 380-400)

There are 3 basic principles that *blind* variation should follow:

1. Must be independent from its environment conditions.
2. The tests can not be correlated with each other.
3. A new variation attempt is not the correction of a test made in the past.

It is important to acknowledge that there are different situations or behaviors, where *blind* variation is more commonly used, as described in *Figure 1*

*Figure 1: Opportunity for applying BVSR process.*<sup>6</sup>

This figure shows how, depending in the prior knowledge someone has, BVSR can be applied in a circumstance were new behaviors are needed.

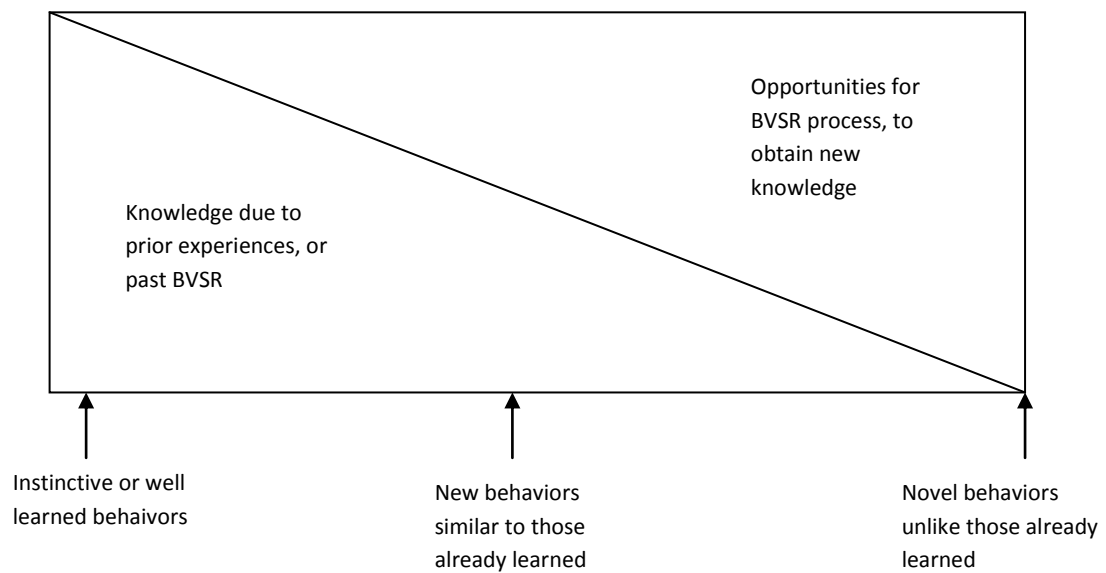


Figure 1 shows three different behaviors: *Instinctive or well learned behaviors*, *New behaviors similar to those already learned* and *Novel behaviors unlike those already learned*.

<sup>6</sup> (Cziko, 1998)

Each behavior depends on the knowledge of the process on investigation that the agent has. To exemplify this behaviors let us think about an experienced shoe maker, his core knowledge is on making shoes because he has been on the business for 50 years, but customers want more products. With his prior knowledge of shoe making, he decides to produce an invention with similar production methods and characteristics (materials, costs, market etc.). to shoes, his core product. So the last couple of years, the shoe maker have been learning the art of making leather belts, acquiring new but similar behaviors. Time passes and fashion evolves, things change and now people do not like to wear shoes or belts, it is time for the business to change and address new behaviors that are unknown to the shoe maker, so it is time to introduce BVSR in order to maintain his customers and survive the competitive market.

Three things must be highlighted with this example:

1. Total knowledge sets boundaries that biases experimentation, and usually selects ideas or choices that are similar to the accustomed way of doing things. When there is no knowledge about something, blind variation is more prone to appear because there is no preconception of what could fail or not in the market making any idea a good idea. This will open the directors of a company a bigger spam of possibilities and options to approach a problem
2. As Benjamin Franklin once said “Death and taxes are unavoidable”, but there is a third that should be added: “organizational reinvention”. Market is always in constant change and if organizations do not change, with high probability, could die. Making BVSR an opportunity to facilitate reinvention and surviving for a company.
3. Each time a novel successful behavior is created, and retained, knowledge in the company will increase. This knowledge could be the behavior obtained, or the documentation of the process made in order to obtain the conduct.

#### Selection Mechanisms:

People could argue that this blind variation would lead to chaos or maybe to useless results, but that's not completely true (nevertheless, you can get to some kind of chaos and maybe useless results for the specific problem), once different ideas are conceived by

blind variation, there are different selection mechanisms that will act as filters for different the variations made. There are different types of selection mechanisms; this paper describes Campbell's (Campbell, 1993) and Popper's (Popper, 1972) propositions.

Campbell proposes 10 different states, where selection can be made, and depending on the situations some are useful or not. (Campbell, 1993, pp. 57-71)

1. *Non-mnemonic problem solving*: This type of selection mechanisms could be resumed as instinctive selection. To exemplify this state it's useful to think in breathing. You breath as a result of previous selection of processes of surviving, but you do not imitate, analyze or select it as a results of communication.
2. *Vicarious locomotors devices*: These devices are used for exploration, and their functions are to identify sets of sense data, for a posterior application in the habits or knowledge. Think in a blind's cane as a vicarious locomotor device.
3. *Habit and 4. Instinct*: Habit gives the bases for the selection to instinct. There are some objects and situations that become learned selectors for future trials.
5. *Visually supported thought*: This state relies on the visual representation of the items to select. The ones that seem intelligent, purposeful or insightful will be selected for following trials.
6. *Mnemonically supported thoughts*: These thoughts are supported in memory or prior knowledge, and help to combine different thoughts into useful information.
7. *Socially Vicarious exploration*: this exploration is made by one member and if it's selected by him, it's selected by all the others of the group.
8. *Language*: Is much related with mechanisms 6 and 7, because is the way of communication successful outcomes in other stages of selection.
9. *Culture*: It's the selection of past practices that are passed through generations, and mold the selection.
10. *Science*: Selection is obtained by contact with the environment, experimentation and analysis of quantified results.

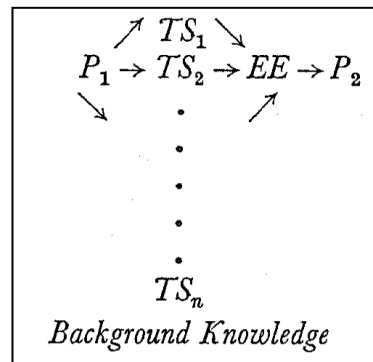
These 10 selection mechanisms are not a sequence, there are situations in which some will be useful and some will not, or sometimes various of them will act at the same time, for example visually supported thought could be acting as selection mechanism of scientific selection mechanisms that are being used. That is why it's important to know them so you

will acknowledge when a selection mechanisms is acting, or could act, and be conscious of the opportunity of applying them in order to select the most “powerful” ideas.

To understand Poppers idea is significant to know his proposition represented in Figure 2:

Figure 2: How to approach a problem<sup>7</sup>

This figure shows how selecting “successful” solutions, that came from previous variation, to a problem, can result in new problems or ideas, that could answer the initial problem or open a new space of investigation (innovation).



*P: Problem*

*TS: Tentative Solution*

*EE: Error Elimination*

Basically, Popper thought that for every problem different solutions could be proposed, and from the error elimination (Selection) problems could be solved or just change to different problems, which will then become the new problems(sub-problems) to solve; all this in order to answer the initial one.

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<sup>7</sup> (Popper, 1972)

There are two main things that should be highlighted; First, that this models doesn't completely eliminate the unselected proposals and second, and the most important for our concern, the proposition of the plastic controls as the error eliminators or selectors.

The plastic controls, includes theories, propositions, aims, proposals and arguments, (Frederick, 2011). This controls are based on argumentation, as Popper said “[...] critical arguments are a *means of control*: they are a means of eliminating error, a means of selection. *We solve our problems* by tentatively proposing various competing theories and hypothesis [...] and by smutting them to critical discussion and to empirical tests, for the purpose of error-elimination” (Popper, 1972, pp. 239-243)

There are different types of selection mechanisms, that are useful or not depending in the situation we are in, but that are always present in all decisions we constantly make. In order to provide the model of selection mechanisms, some of the above will be addressed, but it's important to know about them, because the combination of those could lead, in a more deep investigation, to a better result.

### **Selective retention:**

Selective retention is the process in which different ideas, habits, process etc, are maintained after being subject to different filters (see Selection Mechanisms). This selection is retained when constant replication of the new habit, process, idea etc. occurs and a new knowledge is really acquired.

This cycle is very important for the propose of the model, so it is fundamental to understand that the key point in BVSR, is the possibility to have different cycles running at the same time (Cziko, 1998). All of these cycles competing for scarce resources in organizations time, money and people. (Later parallel experimentation will be discussed).

Besides the ideas produced to solve the initial problem or question, there is a big probability to obtain unexpected results that are not involved with the original question, this phenomena is called *Serendipity*.



There are a lot of cases of variation leading to great innovation in different subjects of life such as:

- *Heavy Metal* sound was created by the necessity of Black Sabbath's Tony Iommi, of playing his guitar. To accomplish this he started to try different methods of solving his difficulty and as a result, with this not being his initial goal, obtained the sound that characterizes Black Sabbath and heavy metal.
- *The traveling Wilburies* (Accidental Rock band from the 70's conformed by George Harrison, Bob Dylan among others) started as a collaboration for the Side B of a George Harrison single, and resulted as a group, conformed by various artists of different music genders, with a top 3 album in the US music charts.
- An initial search for a medicament against cough, resulted in one of the most famous soft drinks around the world: Coca-Cola.

And like these, you can find a thousand more examples of great innovation products that were the result of BVSR processes.

Additional considerations:

To conclude this first part it's important to underline:

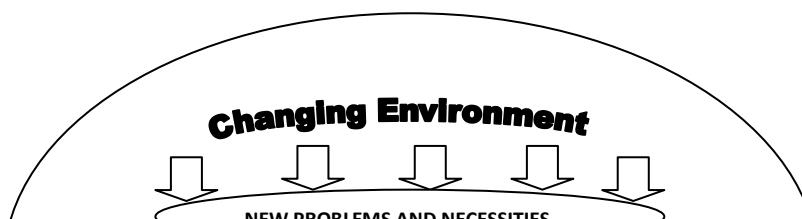
1. BVSR is a process in which constant change is present.
2. Different ideas, methods, aims are the elemental basis of the model.
3. Selective mechanisms are the error-eliminating mechanisms that the model precise to achieve goals and results, expected or not.

Along with the considerations above, it is important to consider the environment in the process of BVSR, because it is the constant change of it, that generates the new problems and necessities people and organizations face every day, making the environment the trigger for most of the BVSR processes.

A virtuous cycle it's obtained from this constant change, knowledge increase, argumentation increase, questions and doubts raise, and this is the only way evolution and progress occurs: when there is no stability and originality is required.

*Figure 3: A BVSR approach:*

Figure three gives a visual idea, of the BVSR approach to a problem.



As you can see in Figure 3, the environment is always changing, this change creates new necessities and problems, and there are different ways to solve these new circumstances, the usual way is to try one idea and make it work, or use BVSR resulting in a variety of ideas that could give a more creative solution.

It is important to notice that this type of approach, the BVSR, accepts that there is no unique answer to a problem and there is always a better way to solve a problem; this idea contradicts what usually happens in life: the conception that there is always one and only truth.

### **Variation, selection and retention in organizations.**

Now that the bases are settled, it is appropriate to understand the applications of these theories in organizations, and to know how innovation, creativity and knowledge can be obtained by variation, selection and retention.

#### **Variation, replication and selection:**

Organizations are in constant competition for customers, suppliers, profits and market share, to list a few, so it is crucial to innovate their products, process and/or strategies. As Dickson says the only processes that are not necessarily different between firms are: machine processes and technological processes (Dickson, 2003, p. 263), so if an organization wants to succeed they must look for the best way of doing the key processes in the organization.

That's why companies must search for ideas, product or processes that will add value to their organization and/or customers, in order to survive the competitive market they are in, companies need creative destruction.

The term creative destruction occurs when new processes and their products are created and old ones are replaced (Dickson, 2003, p. 261). Usually this creative destruction is a result of innovation or imitation of different practices that come from different sources (new employees, benchmarking, theories etc.).

This new processes must approve artificial selection which “involves the deliberate, conscious, calculated thinking by economic agents, within the system” (Dickson, 2003, p. 262) that are responsible for the nurture and reproduction of processes or products created, to then, survive the selection on selection (SoS) pressure. SoS links the market forces with organizations, it proposes that market forces apply a selection or winnowing mechanisms that choose a product, project or organization, resulting in the success or failure of it. (Dickson, 2003, p. 264) .

So the question is: How do organizations generate creative destruction? How can they create variation to survive or at least increase their possibilities? One possible solution is parallel experimentation.

### **Parallel experimentation**

“The problem of variation is the problem of introducing enough variation into an optimization procedure so that we do not get stuck in only a local optimum” (Ellerman, 2004, p. 78). As Ellerman said, local optimums are a problem for organizations, because they are investing scarce resources in projects that will not return the maximum possible benefit. Parallel experimentation is an option to avoid this problem, basically consists in having different probes that are semi isolated from the selection pressure and where results can be cross communicated and compared, and finally unify the results of the whole group.

A very important aspect of parallel experimentation, is the idea of dividing the whole in small groups, this will lead to a smaller selective pressure and will allow variation to act more freely and blindly, “The average of small sample will vary more than the average of a

large sample” (Ellerman, 2004, p. 80). Think in a classroom where you have 80 students, how many talk? How many give “outside the box” ideas? Now think in 10 student classroom, participation will increase; people are more comfortable expressing themselves and offering more variation to the initial problem.

Table 1: (Ellerman, 2004, p. 82)

	<b><u>Series Experimentation</u></b>	<b><u>Parallel Experimentation</u></b>
<b><i>Evolution</i></b>	Selection of the fittest among given possibilities	Variation to generate more possibilities
<b><i>Optimization on rugged cloudy landscape</i></b>	Climbing the hill you are on (Fight rather than flight)	Jumping to other hill (flight rather than fight)
<b><i>Genetic algorithms</i></b>	Exploit	
<b><i>Experimentation</i></b>	Series experiments, each putting most resources into the One Best Way <sup>8</sup>	Parallel Experiments putting some resources on a number of promising ways
<b><i>Simulated annealing</i></b>	Cooling (to settle into nearby low energy configurations)	Heating (to generate a new set of possible configurations).
<b><i>Searching a tree</i></b>	Depth-first search	Breadth-first search
<b><i>Growing a tree</i></b>	Pruning	Branching
<b><i>Hirschmanian exit voice dynamics</i></b>	Voice: commit to making the given option better	Exit: exit to find a better option
<b><i>Jane Jacobs’ two moral syndrome (1992)</i></b>	Guardian syndrome based on commitment to given option	Commercial syndrome based on search for better options.

Table 1 is a comparison between series experimentation, which consists in spending all resources in the most promising experiment, and parallel experimentation that spreads resources between parallel experiments.

As you can see, parallel experimentation offers possibilities and opens the way for innovation and creativity in organizations, as Ellerman said evaluation is made by

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<sup>8</sup> One best way refers to the idea that there is sufficient knowledge in a domain, so there is confidence that there is no alternative way of solving the problem.

benchmarking of the performance of the parallel experiments, while series experiments compares the results of the previous experiments made, so at the end in series experiment you compare the present with the past, in the other hand parallel experimentation compares present possibilities, offering more alternatives for innovation.

This variety of experiments also minimize risks for the enterprises, because in case one experiment fails its purpose, there are different and developed ideas which will minimize de impact and makes possible a quick answer for the circumstances.

The variation offered by parallel experimentation, gives organizations the opportunity to innovate in their process, products and strategies they give for granted and could handle the constant change in the environment, maximizing the organization performance in the long run.

Ellerman describes parallel experimentation as the best strategy for approaching uncertainty, isolation from selective pressures in order to avoid promising but suboptimal options, and finally benchmarking and learning as the way of unifying and strengthening organizations' performance.

### **Real life application:**

The example below is an investigation made by Juan J. Ocampo (Ocampo J. J., 2012), for the implementation of a sales management model in a Colombian company leader in the production of motorcycle parts.

This investigation exemplifies parallel experimentation in organizations, and how knowledge and innovation can be achieved by an organization, utilizing this method.

The investigation consisted in offering the company a model for managing their sales department, so in order to attend their necessity a process of variation, selection and retention was used.

### **Variation:**

In the variation stage 9 different models ( from different resources, markets, authors, concepts etc.) were investigated, obtaining:

-4 sales management models from Web articles

3 sales management models from academic Bibliography

2 sales management models from real companies

Once the initial variation was completed, a selection mechanism had to be applied in order to filter the information and finally retain the model that would attend the company needs.

**Selection Mechanisms:**

The selection mechanisms used were artificially settled by the company management and tried to cover a most of the characteristics that a real sales management model asks for. There were 6 different criteria to evaluate each model.

1. Sales force management
2. Planification and forecasting strategy
3. Client interaction
4. Client knowledge
5. Attends financial requirements
6. Continous evaluation and improvement

Each model was studied carefully and graded in every criteria, to finally select a base model to answer all the companies necessities in the sales department.

**Selection:**

Once a model was selected, the criteria were the model was weak or didn't address, were then obtained from the other, already investigated, models and added to make a model adjusted to the company requirements.

**Retention:**

Creative destruction is obtained by replacing the old sales model used by the company and the modifications made to the selected model, customized and applied, is then subject to SoS from the market, that can be measured by sales increment, new customers, lower costs etc., deciding the survival or not of the new model.

Figure 4, Motorcycle Part Investigation Method<sup>9</sup>

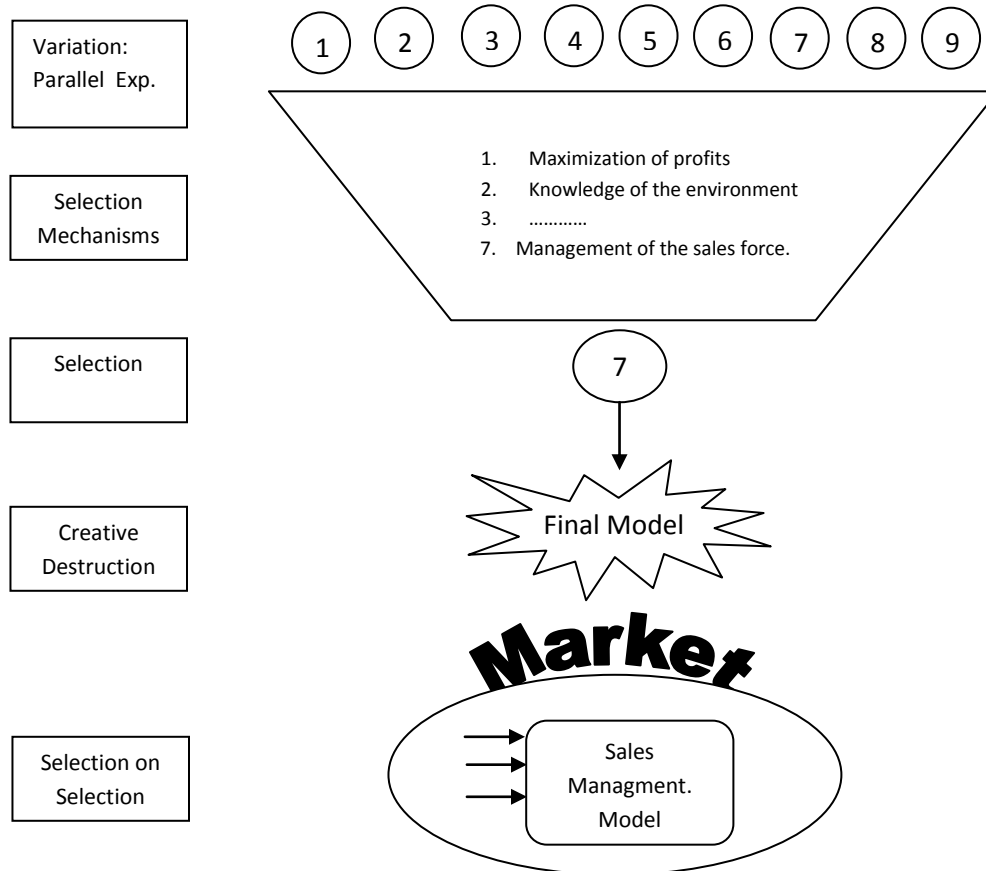


Figure 4 shows the procedure of the investigation made for the motorcycle company, beginning with the initial variation (investigation), passing through the selection mechanisms and ending with the creative destruction and selection on selection pressure.

As a result from this method the organization acquired: (Ocampo J. J., 2012)

1. Benchmarking of different companies
2. Knowledge and documentation of 9 different Sales models
3. A customized model for the company - Creative destruction
4. The probabilities that model will survive increased, because of the study of 9 different possibilities, not only one specific model.

<sup>9</sup> (Ocampo J. J., 2012)

5. In case SoS compromises the model, the knowledge obtained in the investigation can be used for another experimentation in new models, making the resources needed to decrease.

The idea of this example is to show how variation, selection and retention can be used in real life organizations, providing benefits for them. It is possible that at first more resources will be needed, but the knowledge, creative destruction and future results will compensate this initial investment.

## PART 2

*The object "towards which every human being must ceaselessly direct his efforts, and on which especially those who design to influence their fellow-men must ever keep their eyes, is the individuality of power and development;" that for this there are two requisites, "freedom, and a variety of situations;" and that from the union of these arise "individual vigour and manifold diversity," which combine themselves in "originality."*<sup>10</sup>

In the first part of the this article bases were settled; the BVSR process and the selection mechanisms of Campbell and Popper were explained to understand the essence of variation, selection and retention as a innovation and creativity mechanism of, to latter recognize the benefits of having parallel experimentation and creative destruction in organizations, this was exemplified with the Motorcycle Sales Management model Investigation.

The second and final part of this article will propose an Innovation and creativity novel, based on BVSR and parallel experimentation that will help organizations and managers to address the innovation challenge they are constantly in. All this supported in the results of the simulation of a Innovation and creativity model made in Netlogo (Ocampo & Gomez, 2012)

## Innovation and creativity model ICM®:

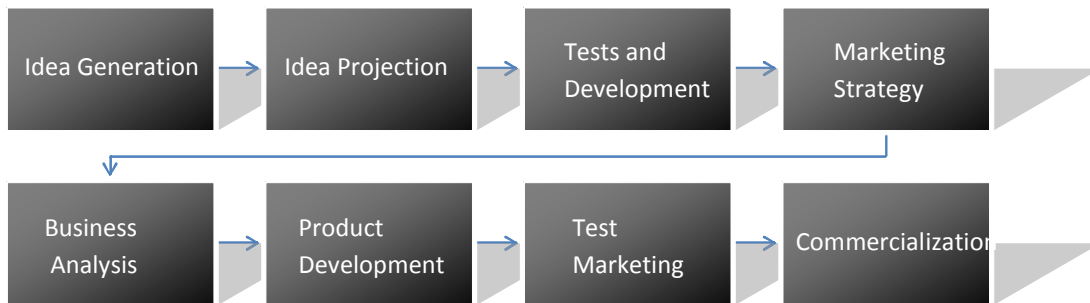
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<sup>10</sup> Mill, John Stuart; On liberty 1984, SARPE publishing. 96



Based on blind variation, artificial selection and parallel experimentation, the model above will try to address creativity issue in organizations. The theoretical basis for structuring the model was obtained from the model of product development purposed by Kotler and Armstrong (Kotler & Amstrong, 2008) showed in Figure 4.

Figure 5: (Kotler & Amstrong, 2008)



What figure 4 represents the steps that should be followed in order to make a new product.

The Innovation and creativity model is divided in three phases: Variation, Selection I and II, and finally retention and replication.

**PHASE I**

Variation:

The first phase of the model consists in the creation of small groups (7 ± 2 members), that will be located in a comfortable space with all the required materials (Markers, balckboards, pen etc.). These spaces are called BLACK BOXES; there should be a minimum of 3 Black boxes in order to obtain enough variation.

Each box contains a topic, could be a problem, a process, an image etc. and will be the subject of discussion for the group that gets in the box. There should be the same rounds as boxes and every round the groups must randomly change.

These groups must be randomly made and have to include people from different areas and hierarchy levels of the organization, this will give the groups the necessary diversity and facilitate position and personality encounters, subjecting ideas to a first selection mechanism: plastic controls.

Also the size of the group will provide the isolation from other selective pressures, so there a bigger probability that people inside the group express their opinions and ideas, and no possible innovation will be let outside.

When the groups are made they should be subject to activities that promote creative thinking and dialogue (ex. 6 Thinking hats created by Edward de Bono in his book '[6 Thinking Hats](#)', the post it wall exercise, brainstorming, mind maps etc.) and should be moderated by experienced people, that don't participate just organize the dialogue and maintain the order.

All the ideas must be documented so knowledge will be acquired, and for future analysis, the documentation must include, the topic of the box, the creative promoter activity, people of the group and the ideas that were offered. This will help for post-activity analysis were identification of the creative people, activities that promoted the most ideas and so on should be identified.

## **PHASE II**

### *Selection I:*

The first selection will be made in a similar way as the variation was made. Again different groups will be randomly conformed, and they will use different selection mechanisms to evaluate each idea.

At this stage projections of the ideas should be made (*Visually supported thought* see selection mechanisms p. 4) and should get punctuation for posterior evaluation. Another selection mechanism should consist in the evaluation of the idea in different criteria (*Science* selection mechanisms p. 5). The criteria should take in consideration: vision, mission, value proposition, strategy, resources (human and monetary), feasibility etc., but must be flexible enough to allow innovative ideas, which could not be related with the initial problem, to survive.

At the end each idea will have a punctuation that will help the directives the decision making, but will include more points of view and criteria, not just theirs.

From this phase some ideas should be selected for further exploration and development, but different to other models the organization has obtained at least 9 innovative ideas, which have been roughly explored, but that are kept in the documentation for future experimentation or revision.

For each of the ideas that are chosen, could be 1, 2 ,3....n, a marketing strategy and business analysis should be made, in order to have a more real and complete sight of the idea, and the more feasible and attractive ideas will be selected.

Remember that all this should be carefully documented in order to keep the knowledge obtained inside the organization.

### Selection II.-Selection on Selection

Once the ideas, products or new processes are selected, prototypes in case of products and blueprints for processes should be made for the Selection II. In this stage of the phase the ideas will be subject to Selection on Selection (more on page 8). This SoS Will be made by experimentation with focal groups, marketing test and if the topic is about processes test drives must be made. In this first tests SoS pressure comes form the people in the focal groups, or the members of the team were the process is first tested. This SoS is made to obtain data that will be analyzed by the management, to finally decide which idea or ideas should be applied and/or commercialized.

### Feedback

Feedback it's a key issue for the ICM because it will give the senior management, the final results of the model; also, it will show how effective it is and which items should be improved for future experimentation.

This feedback should include quantitative and qualitative results such as: economic achievements, life cycle development, survey analysis, market share etc.

## **PHASE III**

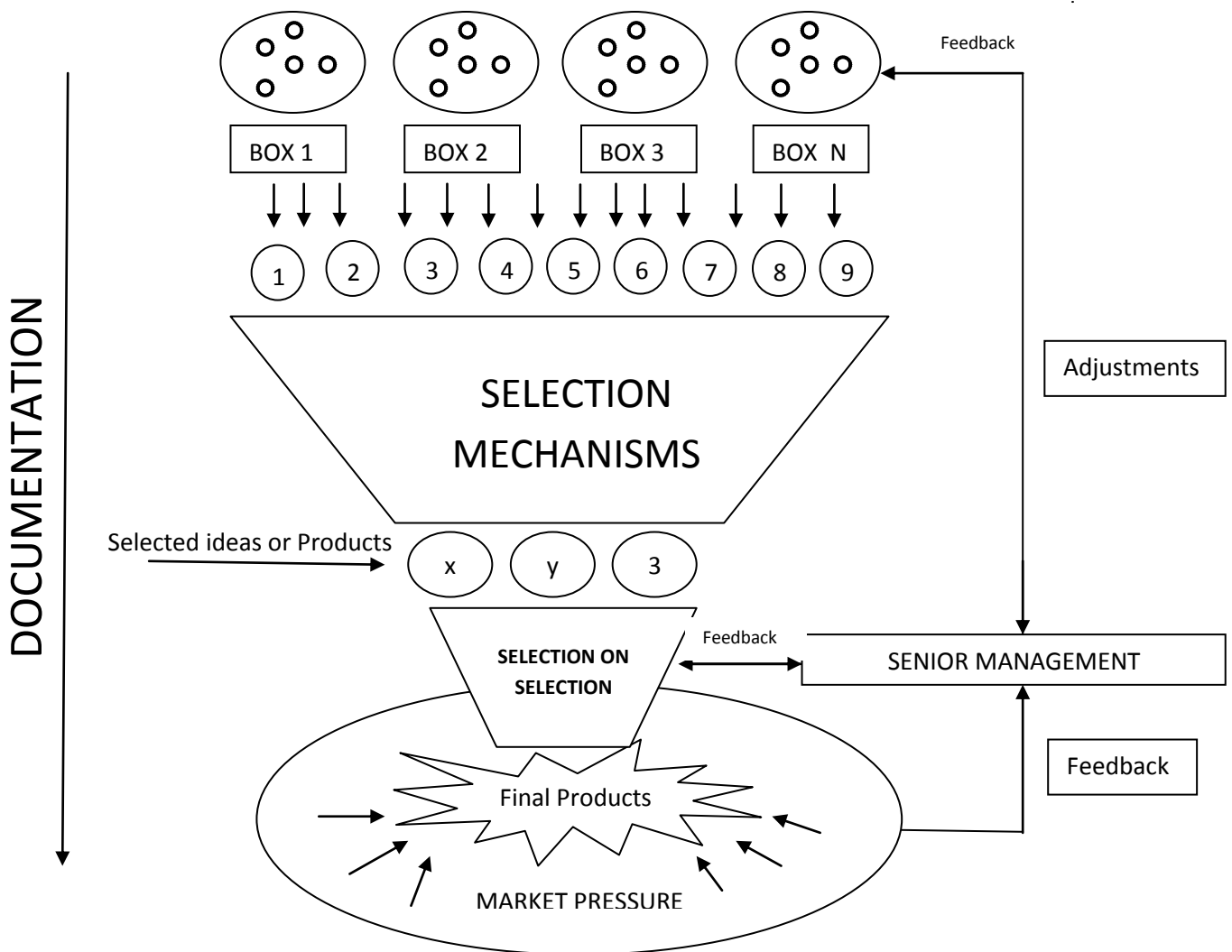
### Retention and replication:

Finally, the third phase will concentrate in regrouping all the documentation obtained from the realization of the model, to observe, analyze and have final considerations of the

activity made. This will help the organization to improve latter experimentation and adjust to its requirements to, every time, obtain better results.

For example managers could identify the creativiest people to include them in future tests, also could recognize which black boxes methodologies are producing the most interesting results and which ones should be exchanged for new activities. This activity will also help the management to spot the people that works efficiently in groups or not, which people work well together and whom should receive team working advice.

**ICM® Scheme:**



The picture is divided in 4 parts, the first one is the Black boxes, were the initial ideas are discussed, afterwards the ideas are subject to different selection mechanisms that should decide which ideas are going to be more developed and will gain some resources. The third part is the Selection on Selection box, were the managers choose the most interesting ideas and take them to further tests. Finally is the market box, were the products or new processes are subject to finally SoS pressure made by the final users, and feedback should be analyzed by the managers in order to make new adjustments to the model and the final products.

### **Final considerations of the model:**

- The black box step is crucial for the good performance of the model that is why, the communication and freedom of speech should be encouraged, it is a hard work because normally lower hierarchy level are afraid to speak but it is the manager work to decrease this initial problem.
- In order to promote participation and enthusiasm in future experimentation, different motivation rewards should be given to the participants of the experiment, could be monetary, or free time etc. This could increase the participation rate and the people will be more likely to endeavor better results.
- This model requires resources (time, money and people) and perseveration, this model looks for long run results so managers must compromise and be patient.
- It's important to define the feedback methodologies and revision cycles.
- The selection mechanisms should be defined by the managers of leaders of the activities, for the company have power of decision in the model.
- It is important to constantly search of activities that encourages innovation and brainstorming.

### **Netlogo simulation results:**

Netlogo is a programmable modeling environment for simulating natural and social phenomena. It was authored by Uri Wilensky in 1999 and has been in continuous development ever since at the Center for Connected Learning and Computer-Based Modeling (Wilensky, 2012). Using this software a model of the ICM was created (Ocampo

& Gomez, 2012). The models tries to replicate the methodology proposed before, by simulating 3 different black boxes and a market. The participants of the experiment will be employees of the Sales, Production and Finance departments. And will be subject to the different phases of the model

Figure 6: ICM® Netlogo Interface

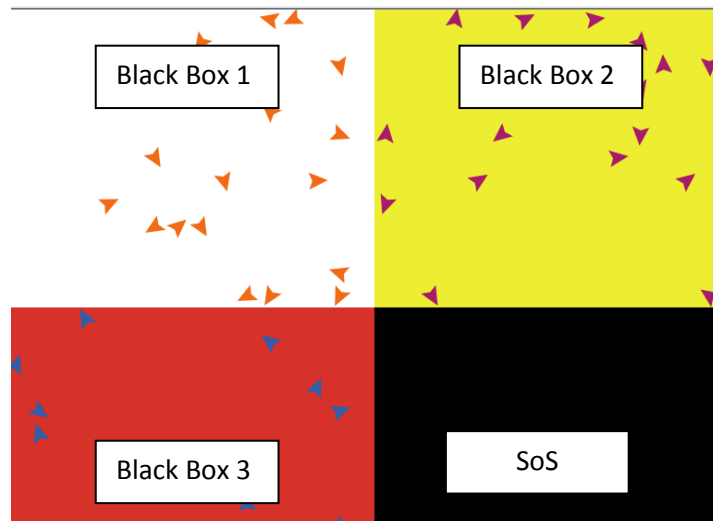


Figure 6 shows the interface of the model in its initial setup. There are 3 different “black boxes” in which the 3 groups are distributes, and finally the obscured box, represents the SoS phase.

1. Description of the model:
  - 3 different groups of people randomly chosen and created: Sales, Production and Finances.
  - Each group has 3 different topics of preference: Production Costs, Production Time and Product Design.

	<b>Priorities</b>		
<u>Group</u>	<u>Costs</u>	<u>Time</u>	<u>Design</u>
<i>Finances</i>	1	2	3
<i>Production</i>	2	1	3
<i>Sales</i>	2	3	1

Priority 1 will get a score between 6-8.

Priority 2 will get a score between 3-5.

Priority 3 will get a score between 0-2.

- When a product is designed each person of a “black box” will assign a number, depending in his preferences, and finally the product will be the result of the average of the item (costs, time, and design) of the product. This will give the characteristics of the product.

**Example:**

Black Box 1 has one finance, production and sales group member let's call them: F1, S1, P1, and each of them gives a score for the product.

F1: costs 8, time 4, design 0

S1: costs 4, time 1, design 7

P1: costs 5, time 6, design 1

Final Product:  $((8+4+5)/3)$ ,  $((4+1+7)/3)$ ,  $((5+6+1)/3)$  = costs: **5.66**, time: **4**, design: **4**.

This was made for 3 rounds, each round the groups were randomly changed.

After the Phase I is completed, the resulting products are sent to different groups that will grade them depending in a function of preferences showed next:

Finance: (cost value x .6) + (time value x .3) + (design value x .1)

Production: (cost value x .3) + (time value x .6) + (design value x .1)

Sales: (cost value x .3) + (time value x .1) + (design value x .6)

The final score of the product will be the average of the grade obtain.

**Example:**

Product 1: costs: **5.66**, time: **4**, design: **4**.

F1:  $5.66 \times .6 + 4 \times .3 + 4 \times .1 = 3.96 + 1.2 + .4 = \mathbf{5.2}$

$$S1: 5.66 \times .1 + 4 \times .3 + 4 \times .6 = .566 + 1.2 + 2.4 = 4.1$$

$$P1: 5.66 \times .3 + 4 \times .3 + 4 \times .1 = 1.698 + 1.2 + .4 = 3.2$$

*Final Product Score: 4.16*

When all the products are graded, the first 5 products are selected and “thrown” to the SoS, which will have a randomly made preference function that will determine which products are successful and will be sent to the market.

**Example:**

SoS function:  $(\text{Random}(0-8) + \text{Random}(0-8) + \text{Random}(0-8))/3$

If  $\text{SoSfx} < \text{Final product Score}$  the product is sent to the market, else is eliminated.

2. Results:

The model was executed 3 times obtaining the results that are shown next:

Run 1: Products that went to market **4** out of 5

Run 2: Products that went to market **5** out of 5

Run 3: Products that went to market **5** out of 5

As the results of the simulation show, every run achieved at least 4 interesting products that could be made and sent to the market, and because all the variation and selection that the product survived, the probabilities of success are very high, also the company will have at least 4 other options (In this simulation) to choose in case the first one doesn't survive.

**Parallel experimentation helps industries to create more option to be graded afterwards, amplifying the possible range of creative and innovative ideas, and increasing the probability of success for the ideas that are able to get to the last SoS pressure made by the market.**

Conclusions:



- BVSR offers the opportunity of approaching the problem from different perspectives, and accepts that it doesn't have only one possible answer, but amplifying the possibilities of achieving a creative answer to the initial problem or achieving a totally new idea.
- Selection mechanisms are always acting in our decisions, but the BVSR approach makes them more conscious and utilized in a more powerful way, because you can adjust them to your specific needs.
- Creative destruction is important because it shows continuous renovation of their products and process, vital aspects for organizations that want to stay in competition, innovate and keep up with the changing environment
- Parallel experimentation facilitates innovation and creativity in organizations, by "betting" in variety. It looks for long run results and sustainability through time.
- The ICM® is a model for organizations that think in long term results, it doesn't work for people who want easy and quick results.
- The ICM® incurs in more costs, but increases the probabilities of success, because the product, idea or service obtained has already passed through different selection mechanism and is a result of high diversified ideas, that include a variation of people, perspectives and ideas.
- The ICM® gives organizations an advantage from market rivals, by introducing creative destruction, innovation and knowledge in organizations.
- This kind of creative thinking changes the traditional way of "brainstorming" because it firsts gives the opportunity to any idea to be presented, and usually first people are object to different constraints that limit their imagination and possible creative ideas.

*"CHANCE FAVORS THE PREPARED MINDS"*

Louis Pasteur

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