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The Trigger

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ABSTRACT :*In the worldwide competition, you can face the event whether you need to design a new product or not to follow competition. Such a decision is generally very painful since it implies huge investment whereas you competitors, in the meanwhile would only need incremental modification. We provide a simulation tool and explain how it works in order to detect such a situation. We also show that a result can be a strategy, in the favorable case, to decide an incremental change program in order to push the competitor to start a brand-new program.We illustrate our paper through the example of the Airbus Boeing competition*

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I. INTRODUCTION

Everybody knows the dramatic story of the Boeing 737 Max and its failure bringing to the death, within 2 crashes, of 346 passengers. This B737 was designed in 1967 whereas its competitor, the A320 of Airbus, was designed in 1983. If we consider as roughly obvious that the design of the A320 was more or less following the trend of the market between 1967 and 1983 and that the trend more or less kept on for the years following this latter date, it was obvious for many years if not decades that the B737 would need to find a replacer before the A320.

The sad story of this competition will remember that in a completely financialized sector, where the basic rule is short-term profit, Boeing did all what it could in order to delay the decision to make a new plane and, instead, decided to fix its existing old model in order to incrementally push it towards comparable performance with its rival.

Until now, nobody can really blame Boeing to have acted this way, even if it can be blamed on many other subjects, in particular the very engineering it made on its Max, displaying rare technical flaw and, maybe most of all, but to be confirmed, putting on the technical teams so deep financial constraints that fixing the 737 was nearly impossible under the circumstances.

The goal of this paper is to describe a theory which I discovered in 2006, put in place whereas I was working within Airbus, which I have since then completed recently, thanks to the B737 Max crashes. Its goal is to provide a method, through simulations, in order to detect when we need to trigger the design of a new product in a given competitive industrial context. In other terms, the outcome of the method I propose is to give you a green light to start a new product from scratch, because whatever incremental change you would make on your existing one, would bring you to a (commercial) failure.

There is a cherry on the cake. This method also gives, in the framework of competition, possibly if you have the leading product, the outcome that you can figure out which incremental change to perform on your system in order to put your competitor's in the corner and oblige him to redesign a brand-new product. And when we tackle expensive systems such as planes for example, but not only, when the investment needed is in tens of billions of dollars, such a strategy, when well applied, can be quite destructive to unbalance the market and the competition.

II. THEORY REMINDER

This theory has been the objects of 2 books of mine. The first is in French [1] and the other is in English [2] and was very recently issued (2019). Here is a short summary of the main results.

First of all, any physical magnitude never is constant and can be mathematically modeled as a random variable. Let us call Y as an example, a magnitude we want to measure. For example, Y can be the speed of the wind. Why do we want to measure it? Simply because, as a former boss of mine used to say, we can master well only what we can measure!

Now, still considering the example of the speed of wind, what can the best process be in order to measure it? The obvious idea is to capture the wind. But, if we capture the whole wind, we are going to destroy the phenomenon and the measurement will not be reliable. Therefore, the method used today is the following. We have a theory of how the wind blows. Maybe the term model for the wind would be better. We capture the

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smallest part of the wind which can give us useful and reliable information. And since Y is a random variable, for sure, what we capture, which we call X, is also a random variable. We target the smallest part because this is the one which will perturb the less the whole phenomenon and which will therefore give the best picture of what happens at the very time of measurement.

Now, we are interested in knowing Y out of X. So, we look for the function, say h, so that $h(X)$ is the nearest to Y. Well, this is quite interesting but what do we call "nearest"? We need a distance for this. Generally, we consider the following function

$$\langle Y, X\rangle = E[XY]$$

Where $E[\ ]$ means the expectation. It is obvious that the above function defines a dot product on the space of random variables and therefore easily allows defining a norm and as a consequence a distance. In other terms, we are looking for the best function h which minimizes $\sqrt{E\left[\left(Y-h(X)\right)^2\right]}$.

I shall skip the mathematical details, but it is a well-known mathematical result since the 1890s, that the best function h is given by

$$E[Y|X]$$

Which reads the conditional expectation of Y knowing X. And this is this law which I call, in my books, the law of the mean. Why? Simply because the result is a mean value. For example, if you want to obtain the best measurement of Y with a constant value, then the result will be $E[Y]$, that is, the mean speed of the wind.

This law can be interpreted, in engineering terms, in two different complementary ways. The passive one. You have for example a wall and it resists less, exactly or more than the mean wind speed. As such, it is more or less welladapted to its environment, the best being when you are exactly at the mean (a wall fits with a constant value).

Then there is the active case. You are an engineer and want to optimize your system. What do you need to do? Just target the mean and you will be best adapted!

Now, in nature, the environment is not composed of only one random variable. You have a random vector $(Y_1,...,Y_n)$ and, of course, you make measurements according $(X_1,...,X_n)$,and if the variables are independent, the best positioning will be

$$\left(E\left(Y_1|X_1\right),...,E\left[Y_n|X_n\right]\right)$$

This is wonderful and only applies to the caveman…

Indeed, in our world, where money is everywhere, the very characteristic of money is to link the variables, through a price, and make them dependent. The law of the mean becomes then

$$E\left[(Y_1,...,Y_n)|(X_1,...,X_n)\right]$$

And this changes everything in two main ways. Indeed, the variables are no more independent and if we consider, for example, random vectors having a continuous probability distribution, all the information is contained in the density which can be written as

$$f_{(Y_1,...,Y_n)|(X_1,...,X_n)}(y_1,...,y_n)$$

Where the relative weight of the $Y_i s$ is from social origin and is arbitrary. The second point, which is by far the most important,is that we have dropped the physical world in which, as I said before, the optimum is a mean value, for the money world where the goal is no more to reach a mean physical value, but a maximum value of created currency [2]. In the physical world, you approach the average asymptotically, but in the financial world, you target the infinite! This is a huge leap(there is no asymptote)! And this is not, in my opinion, a good one!

Referring to the competition worldwide, this very fact, by itself, explains in which world we are. But this has huge consequences. I shall not prove it here and refer to my books for this, but a theorem can be drawn out of it.

<u>Theorem:</u>

In a balanced market, all the competitors make the same products, with the same technology, with the same performance and for the same cost.

Just for the pleasure to see what happens in aeronautics, let us look at the following pictures of the B787 and the A350 hereunder.

Figure 1: Comparing the B787 and the A350

Who could discriminate between these two planes from far away enough? However, you could be tempted to say that for aerodynamic reasons, both planes need to look the same, but when you "open the box", they are significantly different. This is definitely not the case! And the subcontractors are also the same, with the same tricks at the same place and so on.

I shall complete my speech with an additional information. What do I mean when I say: "balanced market"? In fact, let's consider a market with several stakeholders. They will have a share $S_i(t)$ of the market depending on time for competitor i. What I call balanced is when the distribution $(S_1(t),...,S_n(t))$ is stationary, that is, the share of the market no more changes or, mathematically stated $\partial S_i(t)/\partial t = 0$. This perfectly applies, for example, to the competition where Apple (10% of the market) competes against Samsung (90%). And this result is mathematical with very general and obvious assumptions.

I shall end this paragraph by saying a word about what competition is. Indeed, let us look at the following figure.

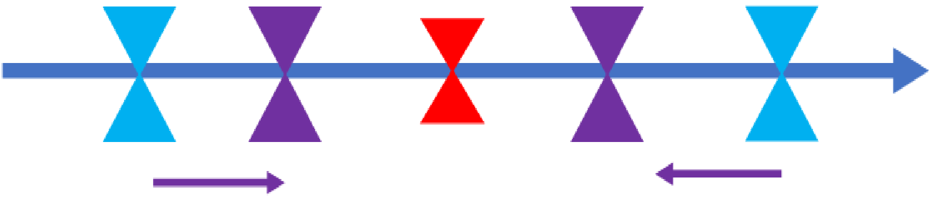

Figure 2: Plotting the law of the mean onto a line

The red plot represents the optimum, that is the conditional expectation. The blue plots represent the tolerance of the society. If you are within the plots, you are safe and have a share of the market. Now, if you increase competition, the blue plots are going to move towards the purple ones. And if you were between a blue and a purple one, you will be eliminated! What is interesting in the figure above, is that if you perform too well, you can also be eliminated [2], which is an usual point of view.

III. THE TRIGGER

1.1 Analysis of the situation

Let us now tackle our main subject and let us illustrate our speech through the Boeing Airbus competition filter. First of all, let me give some vocabulary. I call $(Y_1,...,Y_n)$ the environment vector whereas I call $(X_1,...,X_n)$ the knowledge vector.

What the above theorem says, in mathematical terms, is that given a same environment to two competitors, $(Y_1,...,Y_n)$, typically the aeronautics environment in our case, we shall have two knowledge vectors for the competitors $(Z_1,...,Z_n)$ and $(T_1,...,T_n)$ respectively verifying (this is the theorem!)

$$(Z_1,...,Z_n) \approx (T_1,...,T_n)$$

And I insist, for theoretical purposes out of the scope of this paper that we have the sign $\approx$ and not =.

Let us imagine now that from the equilibrium state, that is

$$E\left[(Y_1,...,Y_n)\middle|(Z_1,...,Z_n)\right] \approx E\left[(Y_1,...,Y_n)\middle|(T_1,...,T_n)\right]$$

We have a move. For example, Airbus decides its A320 Neo. This change at system level must be considered in its full generality, that is both a change in the environment vector and a one in the knowledge one. Potentially, Airbus equation is going to be now

$$E\left[\left(Y_1,...,Y_m\right)\middle|\left(Z_1,...,Z_m\right)\right]$$

Not all the environment has changed, of course, and not the whole knowledge either, but additional variables have come in. This new environment is imposed to Boeing, simply because if Boeing does not move, it will be in a situation where

$$E\left[\left(Y_1,...,Y_m\right)\middle|\left(Z_1,...,Z_m\right)\right] > E\left[\left(Y_1,...,Y_n\right)\middle|\left(T_1,...,T_n\right)\right]$$

And the market becomes unbalanced.Competing, Boeing might want to take the lead by settling down, say, a new environment vector such as $\left(Y_1,...,Y_l\right)$ where $l > m$. But, at minimum, they must target $l = m$. For the sake of simplicity, we shall consider this as an assumption, but it is not compulsory. And let us come back on some intuition (which could be mathematically formalized by the way). For sure, the 1967 concept will face an evolution wall before the 1983 one. Therefore, the Boeing concept, one day or another, will be limited in the size m it can deal with and this size is theoretically smaller than the one that Airbus can afford because its concept came later.

The problem is therefore the following one. Airbus has made its A320 Neo and is positioned at

$$E\left[\left(Y_1,...,Y_m\right)\middle|\left(Z_1,...,Z_m\right)\right]$$

Can Boeing follow the competition with its old B 737? Can it afford to make, through incremental change,

$$E\left[\left(Y_1,...,Y_m\right)\middle|\left(T_1,...,T_m\right)\right] \approx E\left[\left(Y_1,...,Y_m\right)\middle|\left(Z_1,...,Z_m\right)\right]?$$

If yes, then, for sure, the best option, because it necessitates less investment, is to make this equality occur. But if not, Boeing is to start a new program, potentially from scratch. And the investment is huge! I shall come back on the “from scratch” later. But, let us treat firstly how we can detect that we cannot follow the competition and when we need to trigger a brand-new program.

1.2 Why trigger?

The question we ask now is very easy. When are we in a situation when we are stuck and must trigger a new program? And the answer is pretty obvious: when whatever the incremental change in our former system sums up to kind of a decrease in the performance. In other terms, this means that $E\left[\left(Y_1,...,Y_n\right)\middle|\left(T_1,...,T_n\right)\right]$ is maximum, but not in the natural mathematical sense of what we call a maximum in math, usually (be careful!). What this means is that, in the technological context we are, whatever the change we make, as soon as $m > n$ we shall have

$$E\left[\left(Y_1,...,Y_m\right)\middle|\left(T_1,...,T_m\right)\right] < E\left[\left(Y_1,...,Y_m\right)\middle|\left(Z_1,...,Z_m\right)\right]$$

We have reached the maximum (profitable!) evolution of our concept! The specie must die, like the dinosaurs!

I would like to underline the fact the equation above is written not in technical terms or physical terms, but in economic terms. The actors are not targeting any mean value, but a maximum in their earnings, which is the dark face of the law of the mean. It does not mean, however, that there is no engineering or physics behind! In fact, the more the burden is put on finance, the more the vision of the physical reality is twisted [2]. And the more risk there is to mistake.

The question is whether we can detect the maximum. The basic idea in order to make such a detection is the following, through simulations.First of all, let us modify both the environment and knowledge vectors according to what we can expect, as data from the outside or as what we are able to do. Of course, a cost is always attached to this and we are looking at the economic equation and an engineering team will make the link between finance and technique. This will in the end allow the consideration of a domain which can be walked through by the different concepts we can imagine, and we shall obtain, through simulations, once again, a full range of values for

$$E\left[\left(Y_1,...,Y_m\right)\middle|\left(T_1,...,T_m\right)\right]$$

For a wide range of variables and of lengths of the random vectors. If, in this domain, the value

$$E\left[\left(Y_1,...,Y_n\right)\middle|\left(T_1,...,T_n\right)\right]$$

Appears as the maximum value, then we need to change our concept. Otherwise, we look for the simulation which will have outcome the biggest value (don't forget that the outcome is an amount of money, say in dollars).

Things might seem simple, but they are not! The biggest work is the translation from the engineering stuff into the financial one and viceversa in order to have a reliable study. And because the physical reality through the cost function is twisted [2], much care is necessary to get significant results. But, if we look a posteriori to the damage the B737 Max caused to Boeing, the work is worth the trouble.

1.3 The cherry on the cake

I met in my life a very specific situation which should not exist. In this field, at that time, there was an activity for which the company I was working with did not know the (technical!) performance of its competitors. Let us assume then that in a sane market the different players know each other's performance. Now, if the best situation of the current market is

$$E\left[\left(Y_1,...,Y_n\right)\middle|\left(Z_1,...,Z_n\right)\right]$$

Can there be an incremental modification to disrupt the sector by imposing the competitors to start from scratch instead of performing incremental modifications to follow? And the answer is obviously yes if you are in the good situation when, on the paper, as an outcome of the simulation described above you can afford

$$E\left[\left(Y_1,...,Y_m\right)\middle|\left(Z_1,...,Z_m\right)\right] > E\left[\left(Y_1,...,Y_m\right)\middle|\left(T_1,...,T_m\right)\right]$$

Whatever the choice for the competitor (in the physical limits however). If we keep the example of planes, while it will cost you, say 200M$, it will cost 10bn$ to your competitor to reach, say, the same result or roughly.

We therefore can see that the initialmethod, which was kind of defensive, can be used as an offensive weapon on the market. For the stock value of the company, probably this is the most profitable way to run it when it has a technical advantage.

1.4 Starting from scratch?

The question is whether we start from scratch for a new program or not. Starting completely from scratch probably is a bit difficult in terms of knowledge since, at least, we should know the physics which does not change so fast (a theory of physics lifetime is about 500 years).

Nevertheless, if we do not start from "almost" scratch, then we shall fall into, again, incremental evolution. And this is probably what Boeing would have done if they had started a new program instead of their B737 Max. Why?

First of all, the engineers only have a conjunctural knowledge, not an absolute one. As an example, if you consider a non-traditional geometry for a plane and try to figure out what the drag and lift coefficients are, say through simulations, you will not get anything significant. I can say this because this is what happened to me in 2013. I had a machine whose drag and lift coefficients I had calculated in 10 min by hand, and after 6 months simulation on a High Power Computer, the result was a drag coefficient within 10% of my prediction and a lift coefficient of zero, which was not possible. So, this shed discredit on the simulation results. And we concluded the study with the strong belief that in the aerodynamic software there are "hidden variables" and "hidden knowledge" from the designers which is far from being visible by the users. And this will, for sure, prevent original ideas to emerge.

The second paramount point is that starting from the white sheet of paper is roughly impossible in this beginning of the 21st century. Indeed, just look at the Caravelle, the French plane which was designed in 1952 and compare it with the A350, whose design dates back to 2006.

Figure 3: Comparison of the Caravelle and A350 with 54 years different of age

As you can see, the difference in the concept is roughly zero. Inside the box, to take again an expression I used earlier in this text, things changed because some other technologies evolved. But the basis is always the same and the basic architecture remains the same. So, looked at through the law of the mean, we just improved the optimum and converged towards the conditional mean which corresponds to a given theoretical knowledge, achieved through the available technology.

Besides, today, the only way research is carried out, is through incremental innovation and focusing on some specific technology in order to increase locally the performance of the plane. Fashion consists in decreasing the consumption through the obvious worn out well-known trick of increasing the double flux and increasing the software to better monitor and save energy onboard. This is intellectually, let me say, indigent!

After some decades now of such miserable work, the aerospace engineers have become “limited”. Who is able to make a plane from scratch (other than replicating the type he already knows)? Who is able to make a new launcher from scratch? Who is able to make a satellite, a missile, a helicopter from scratch? Roughly no one. Those who knew are too old and retired or, for those who could, they work in small startups where they think that technique is primordial against finance on the contrary of what happens in big groups.

Let us look at what happened in the space sector with Space X. Their concept is far from being smart, but they tackled the problem the right way, that is decreasing the cost from $20,000/kg in orbit to now $5,000/kg. Would there be a new Elon Musk for aeronautics, he could drop the cost by at least 2, maybe more, under the condition that the certification authorities are honest and stop protecting both Boeing and Airbus unduly. But, can you find someone proposing a real breakthrough for flight transportation? These persons are very rare because nobody has been trained to this now but for very few exceptional people. Let me ask the question another way: to transport people point to point quickly and cheaply, do we need a plane like a Boeing’s or an Airbus’s? The answer is obviously no, but no one yet has agreed to bet on any outsider.Yet, it could be extremely profitable. Indeed, the big companies are so much sclerosed that they will die like the dinosaurs before realizing they were bitten!

Therefore, for the wealth of any big company or group, there should be teams realizing true concepts from scratch in a continuous way. There are many ways to do this for not too much money. And the big advantage is that the day when you need to make a new program, then you are ready to make a true one which will be a game changer. Today, the actors, whatever the industrial field, not only aerospace, are simply unable. And this is where their weakness is. Once again, if the certification authorities (including cars, quality norms, etc.) stop unduly supporting the leaders of the market, they will shortly collapse.

I shall conclude this paragraph with a straightforward statement. Starting a new concept from scratch should be the rule. But, in fact, this is never the case in a so-called mature market and this is a big mistake!

1.5 The fast follower strategy revisited

While there are leaders on the market, some competitors take as a strategy the one of fast followers. They replicate the technology they generally have not developed and play with the production costs. We can see a good example of this in the field of tires manufacturing where the leader is Michelin. The question I want to raise here is to know whether as a fast follower you can kill the leader.

And the answer is obviously yes. Indeed, as before, in particular if the leader only faces fast followers, this means that, in theory, those do not even try to compete in the R&D process. Under such condition, to make a parallel with automation, the leader faces an open loop system. His trend, therefore, will be to capitalize on its knowledge. And this will bring it to what could be called “absolute convergence”, that is, it will become very specialized, but on a very narrow spectrum.

Once the fast follower has waited for long enough and a narrow spectrum enough, it is time to secretly start a new disruptive R&D program. Typically, as before, if the equilibrium of the market was given by

$$E\left[\left(Y_1,...,Y_n\right)\middle|\left(X_1,...,X_n\right)\right]$$

Then the basic principle to break it is to add variables. The narrower the spectrum of the leader the easier it will be. If, in addition, you are supported by a powerful country, you are going to make some lobbying so that the new variables $Y_{n+1},...,Y_m$ are going to have the biggest weight as possible in the probability distribution $f_{(Y_1,...,Y_m)|(X_1,...,X_m)}\left(y_1,...,y_m\right)$. And you are done!

Under such circumstances, you have quite a good chance to kill the leader and take the leadership. The lesson learned, however, of this short theoretical study in the case of the fast follower, is something which is already overwhelmingly known. When you are the leader you should not sleep on your success and should behave as if you had true competitors!

IV. COST, IMPLEMENTATION & IMPACT

1.6 Implementation

The environment vector is to be cut into pieces corresponding to domains. For example, these domains are technique, fuel market, passengers and airlines expectations, access to the market, geographical localization, strategy, geopolitics, etc. Each of these fields has obviously subfields. If we take technique, for example, we have all the traditional functions: power, propulsion, structure, GNC, etc. And all these functions have their subfunctions up to materials and the raw products they are made of. This is for a complete analysis, but for the beginning we can start with a more superficial study.

Once we have identified the variables we want to take into account, we need to go to the knowledge vector. The knowledge vector is given by what we know, but, above all, the teams must figure out random variables with probability laws about their probable evolution. This is why we absolutely need specialists to work on this subject in all the fields which have been selected. In this process, probably many people will be tempted to consider either Gaussian of Lognormal laws, but if we want to take disruption or radical change into account, we should definitely consider Levy processes. This does not make the math to treat easier, on the contrary, but this is the price to pay in order to have a reliable picture of what might occur. During this phase, no idea should be considered as weird or not plausible. And this where the need for specialists and experts is limited. Generally, these persons are limited by their own knowledge. So, the team should bring in “Candide”, asking the right questions and raising the right problems.

Finally, all this needs to be converted into currency in order to calculate the law of the mean.After simulatingthe walk through the whole explored domain, we should know the potential limits of our system and identify the most profitable zone, which should become the target in a logical world.

1.7 Cost

The consequence of the implementation paragraph is that the cost is going to be high given the number of participants. Nevertheless, once the basic work has been done, if the model is fed on a regular basis with new data and insights, the decision tool should be both efficient and cheap.

1.8 Impact

The impact on the company is pretty big because the decision process is backed by a simulation, on the one hand, and takes into account, in a well-done process, where the competition is, on the other. Therefore, the council advisory board should be easily convinced of what to do and, in case of a need for heavy investment for a new program, this should ease the favorable votes. On the contrary, in case some members of the council advisory board would oppose an important decision such as the one of heavy investment in a new program, each individual will have to strongly explain why he opposes. The case being, the opinion of the board member can be inserted in the simulation and a new run can be performed with a new result to debate.

V. THE DELAYING PROBLEM

I shall end this paper through tackling an interesting problem, still taking as an example, the aeronautics case.

As said earlier, the B737 has been designed in 1967 and the A320 in 1983. It is extraordinary that both companies mainly live on so old products: 52 years for Boeing and 36 years for Airbus. There are very few industrial sectors in which this is the case. We can attribute this either to the slow convergence to an asymptote, which basically would mean that theoretical progress has roughly not occurred along these years or that there is a specific organization which prevents competitors to come in.

I shall choose the second option and it is the certification process which protects the actors. For example, when Airbus decided to make its A380, which is a scale up of the A320 basically, the certification cost was about \$2bn. This is not acceptable since we are just speaking about a plane manufacturer, which exists and makes planes since more than 50 years and has nothing to prove but that it keeps on making good and safe planes. On the other hand, for those who would object that the certification process is a guarantee, the failure of the B737 Max exactly proves the contrary.

I had the occasion to propose a straightforward and logical alternative on social networks. Indeed, there is a big difference in a, say, random failure with serious consequences and a bad design with deterministic failures, putting the life of passengers at risk. Solving this problem is simple. Just put a norm on the criticality of events[2]. The authorities then record the criticalities and give a penalty to the company according to some specific law. The penalty must be dissuasive, of course.

This has the great advantage to put the responsibility on the designer of the product, on the one hand, and to have an objective means of measurement and regulation, on the other.

[2]Criticality is the couple (probability of occurrence, seriousness).

This being acquired, this should allow some new insiders in the field, since the entry ticket, which is the certification, is over. In such a context, if we concentrate on companies such as Boeing and Airbus, can they keep on living with old products such as the B737 and the A 320? And the answer is mathematically no, as I am going to prove it now.
Indeed, in this duopoly, the balanced market is reached through the realization of

$$E\left[\left(Y_1,...,Y_n\right)\middle|\left(Z_1,...,Z_n\right)\right]\approx E\left[\left(Y_1,...,Y_n\right)\middle|\left(T_1,...,T_n\right)\right]$$

Now, this equation should be written more completely as

$$E\left[\left(Y_1,...,Y_{n(t)}\right)\middle|\left(Z_1,...,Z_{n(t)}\right)\right]\approx E\left[\left(Y_1,...,Y_{n(t)}\right)\middle|\left(T_1,...,T_{n(t)}\right)\right]$$

Where t is the time. What can we draw out of this? Very simply that if you do nothing, that is if $n(t)=cte$, then the competition, in a non-protected market, will catch up easily.

Let us take a concrete example of this which is occurring now. This is the case of the C919. Since both competitors Boeing and Airbus do not really move forward, the Chinese have all their time in order to catch up.
Please, be aware that the less you change your system, the less, when you perform “incremental research”, your leap is big compared to previous state, simply because you are reaching an asymptote. I could see such a case in the space field when Europe decided to replicate an American liquid apogee engine for a telecommunications satellite and where despite much effort and money, they could not reach the American performance.
But the problem when considering the Chinese is to realize that both equations above, have a unit, be it dollars, euros or renminbi. And because the cost structure of the Chinese is much lower than the western one, even if they only asymptotically catch up, they will win the competition because they will achieve, for sure

$$E\left[\left(Y_1,...,Y_n\right)\middle|\left(U_1,...,U_n\right)\right]>>E\left[\left(Y_1,...,Y_n\right)\middle|\left(Z_1,...,Z_n\right)\right]\approx E\left[\left(Y_1,...,Y_n\right)\middle|\left(T_1,...,T_n\right)\right]$$

The only difference between what really occurs and what I just said is that the market is still protected, and the Chinese have decided to pay the cost of the entry ticket. But if, in aeronautics, the west wants to spark a new disruptive actor as Space X, the best remains to change the rules of the game and stop protecting the historical players

VI. CONCLUSION

Aeronautics in this paper was only a pretext in order for the reader to better grasp the ideas which are developed, given the recent events concerning the B737 Max. But the method described is applicable to all sectors, as much industrial (cars, trains, ships…) as the service area (banks, insurance companies, universities, science…). The method described allows detecting when we, as a competitor in a field, need to change paradigm under the threat that if we do not do it, we shall fail. The method consists in a simulation, with a whole team. This is kind of huge work, but it is worth the trouble. If, by chance, we have a slightly more advanced concept than the competitors, then there is a possibility to use the same method in order to disrupt the market and force the competitors to the corner.
We also added some mathematical proof of the noxious character of protected markets through the certification processes.

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